Proceeding of the 1st International Graduate Conference (IGC)

On Innovation, Creativity, Digital, & Technopreneurship for Sustainable Development
In Conjunction with
The 6th Roundtable for Indonesian Entrepreneurship Educators 2018
Universitas Syiah Kuala October, 3-5, 2018
Banda Aceh, Indonesia

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Welcome Speech from Rector of Universitas Syiah Kuala
The 1st IGC & The 6th RIEE 2018 - Universitas Syiah Kuala

Assalamualaikum Wa Rahmatullahi Wa Barakatuh,
In the name of Allah, the Most Beneficent and the Most Merciful, may peace, mercy, and blessings of Allah be upon you. Dear colleagues, professors, lecturers, researchers, ladies and gentlemen. On behalf of Universitas Syiah Kuala, I would like to express my sincere gratitude and welcome you to the 1st International Graduate Conference (IGC) on Innovation, Creativity, Digital, and Technopreneurship for Sustainable Development 2018 in conjunction with Roundtable for Indonesian Entrepreneurship Educators (RIEE) 2018. Moreover, I honorably welcome our keynote speaker, Dr. Mohamed Abdel Kader Ismail Henan University China, Assoc. Prof. Dr. Hamdan Said from University Technology Malaysia, and Dr. Syaifullah ST, M.Eng from Universitas Syiah. And our invited speakers, Pinpin Bhaktiar, ST, MM, CPM; H. Jhody A. Prabawa, SE; and Mr. Sunil Tolani.

I am optimist that the 1st IGC on Innovation, Creativity, Digital, and Technopreneurship for Sustainable Development 2018 is able to accomplish its goals in addressing critical research priorities in Entrepreneurship Education, especially on Innovation, Creativity, and Business Digital, as well as information and knowledge gaps in global and specific regions. This event gathers academicians, researchers, and practitioners from all over the world to discuss and share important technological on entrepreneurship and start up business challenges, social and sciences contributions and capacities, and make recommendations for future research, practice and policy for a sustainable development.

Sustainability is a strategy that drives long-term growth and effectiveness in development, either in the social sciences, science and engineering, and health and sciences fields. Therefore, encompassing technology with the society is crucial for attaining long-term sustainable development because it bears the largest potential for improvement. In this era, the digital revolution creates both new opportunities and challenges for the humankind. Society is required to transform and adapt to the new environment and situation. However, not all of us can adapt and embrace the changes. Many are left behind, and there are also those who do not receive the opportunities offered by the digital revolution. We believe that that technology, innovation and societies can facilitate sustainable development. For that matter, all academicians, researchers, and practitioners should focus their research on helping countries and people to sustain their development. Corresponding to this matter, the theme of the conference this year is “Innovation, Creativity, Digital, and Technopreneurship for Sustainable Development”. This conference envelops a wide range of interesting topics related to all theoretical and practical aspects in entrepreneurship, but not limited to business/management science, veterinary science, agriculture, biotechnology, marine & Fisheries and Biodiversity.

I would also like to take this opportunity to express my deep appreciation to the Advisory Board, Organizing Committee, International Scientific Committee, institutions, companies, and volunteers for their efforts to make this conference happen, and many others who have generously given help in the process. Although we try our finest to be professional, on behalf of Universitas Syiah Kuala, please accept our sincere apologies should there be inconveniences that occur before, during, or after the event. I hope everyone have interesting and stimulating discussions in these couple of days. I sincerely pray that this conference is a
great success not only as a platform to share knowledge and experience, but also as a chance to begin continuous and productive cooperation and friendships. May God bless us all with good health to make this event a successful and enjoyable one!

Best Regards,
Prof. Dr. Ir. Samsul Rizal, M.Eng,
Rector of Universitas Syiah Kuala
**Welcome Speech from General Chair**

**The 1st IGC & The 6th RIEE 2018 - Universitas Syiah Kuala**

Assalamualaikum Wa Rahmatullahi Wa Barakatuh,

On behalf of the organizing committees, I would like to welcome all of you to Banda Aceh, Indonesia, for the 1st International Graduate Conference (IGC) in conjunction with the 6th Roundtable Indonesian Entrepreneurship Educators (RIEE) as a part of the 2018 Graduate Conference of Universitas Syiah Kuala. The IGC and RIEE as an international conference is the first time carried out by Universitas Syiah Kuala in 2018. Therefore, we would like to express our sincere appreciation for your support to the conference.

Under the theme of "Innovation, Creativity, Digital & Technopreneurship for Sustainable Development" and "Changes to Digitalpreneurs", this conference features a rich program, including Universitas Syiah Kuala Entrepreneurship Expo 2018, a keynote speech delivered by Dr. Mohamed Abdel Kader Ismail from Henan University, China, Assoc. Prof. Dr. Hamdan Said from Universiti Teknologi Malaysia, and Dr. Syafullah from Universitas Syiah Kuala, Indonesia. In addition, the conference invites speeches from the outstanding entrepreneurship society, H. Jhody A. Prabawa, the Founder & CEO of Neosentra Group, Pinpin Bhaktiar MT.MM. CPM, the Founder and CEO MAHAJIREHLAND, and Sunil Tolani, the Founder & CEO of Calibreworks.

Nowadays, economy educators and entrepreneurs are intended to create innovation and find new ideas to develop entrepreneurship matters in facing the 4.0 revolution industry era. Thus, through the conference we offers a special opportunity to bring together educators and entrepreneurs from around the world, and serves as a platform to deliver innovative research results and the current creativity, innovation and development in the fields of education and entrepreneurship. I hope it can influence the youth association, especially students from Universitas Syiah Kuala, to create new innovation and improve the development of education and economy in Indonesia, even at the international stage.

The selected papers in this conference will have the opportunities to be published in Scopus. Scopus is a scientific publication, which is the largest abstract and citation database of peer-reviewed literature: scientific journals, books and conference proceedings.

The conference has received 92 submitted abstracts. These papers on various topics are divided into 4 parallel sessions in the conference. To all members of the organizing committees, the international scientific committee, the reviewers, and the collaboration partners, we would like to thank all of them for their tremendous efforts to organize this conference successfully, especially to PERWIRA Community, who has believed on us to celebrate this marvelous event.

We look forward to having a successful conference, and we hope that all attendees enjoy and benefit from this conference.

Best Regards,

Dr. Iskandarsyah Madjid

General Chair
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Geospatial Information and One Map Policy: Challenges and Opportunities in Innovation and Competitiveness of Entrepreneurship of Industrial Revolution 4.0

Sugianto Sugianto, Hendra Syahputra, Muhammad Rusdi, Muhammad Iqbal
Rapid Assessment of Soil Quality Indices Using Infrared Reflectance Spectroscopy

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Abstract. In this present study, we investigated the use of near infrared reflectance spectroscopy (NIRS) as a rapid and robust method to assess and evaluate soil quality namely soil carbon organic (SOC) and pH. Diffuse reflectance spectral data were acquired and recorded for 20 g soil samples from four different site locations in Aceh province. Spectra data, in the wavelength range of 1000-2500 nm, were corrected and enhanced using de-trending (DT). Actual SOC and pH parameters were measured using standard laboratory procedures whilst prediction models, used to predict SOC and pH of soil samples, were established using integration principal component analysis and multiple linear regression (PCA+MLR) approach. Prediction performances were evaluated and justified based on statistical indicators: coefficient correlation (r), root mean square error (RMSE) and residual predictive deviation (RPD) index. The results showed that both soil quality indices (SOC and pH) can be predicted simultaneously with coefficient maximum correlation (r) were 0.97 for SOC and 0.99 for pH, whereas residual predictive deviation (RPD) indexed were 4.84 for pH and 3.96 for SOC respectively. It may conclude that near-infrared reflectance spectroscopy can be used as a fast, robust and accurate method in assessing soil quality indices in the form of soil carbon organic (SOC) and pH simultaneously.

Keywords: NIRS, Soil, SOC, Carbon-Organic, pH

1 Introduction

To grow optimally, plants require healthy soil condition whether it is food crops or plantations. In fact, the soil must possess physical and chemical properties that are suitable for plant growth. Healthy soil conditions can be seen generally from its texture, structure, and humidity. Soil chemical properties are related to the number of nutrients needed by plants, with the amount needed will be different for each growing phase [1]. Soil fertility is largely determined by the presence of nutrients in the soil, both macronutrients, secondary, and micronutrients. Nutrients that are lacking in the soil will obviously affect plant growth. The growth rate will be very disturbed and susceptible to disease because soil nutrients do not meet the minimum requirements needed. Conversely, the number of excessive nutrients in the soil will also affect plant growth and the surrounding environment [2], [3].

In precision agriculture practice, fertilization and excessive use of fertilizer will cause pollution to the environment because it can cause artificial nutrient deposits that are not utilized by plants. This, of course, will accumulate and make new problems especially pollution due to the use of pesticides, fertilizers, and fertilizers that are above the normal amount [3].
Carbon organic or sometimes called as organic carbon content (SOC) and pH, are two of the main soil characteristics that play an important role in precision agriculture practice. The amount of SOC and pH must be known the certainty and precisely because they will determine the fertilization dose and the use of the right fertilizer so that the optimum amount of nutrients in the soil is sufficient [1], [2]. Organic carbon levels and pH play an important role in agricultural practices because these factors are able to improve the availability of nutrients and soil texture. Thus, knowing these two factors (organic carbon and pH) will help in the decision-making process in precision agriculture or precision farming practices, especially for the selection of plants that are suitable for the existing environmental conditions. In addition, this will also determine suitable types of fertilization and irrigation to produce maximum agricultural production.

It is difficult to predict organic carbon (SOC) content and pH rapidly and in real time. This requires testing in a laboratory which is normally time-consuming, while the soil conditions must be immediately known so that plants can grow optimally and ideally. In addition, conventional testing in the laboratory is also sometimes complicated in the process, requiring chemicals and can cause environmental pollution [4].

Alternative fast, robust, non-destructive and pollution free methods are required to determine quality parameters of soil carbon organics and other soil characteristics. Near-infrared reflectance spectroscopy (NIRS) has been developed and widely applied in many sectors including in agriculture and soil science [5].

Near-infrared reflectance spectroscopy (NIRS) technique works based on the principle of interaction of electromagnetic radiation with biological objects like soil. This method is potential to be applied to determine soil nutrients and other related properties including carbon organic and pH. The advantage of this method is: simple sample preparation, non-destructive in nature, no chemical waste, pollution free, simultaneous and high speed of analysis [5].

The overall research findings of numerous studies on the application of near-infrared spectroscopy (NIRS), shows that NIRS was feasible to be applied as a rapid and non-destructive tool for quality attributes prediction in agricultural sectors. The prediction model performance was sufficiently robust and accurate with correlation coefficient (r) range of 0.93 – 0.99 and residual predictive deviation (RPD) index was 1.53 – 4.68 which is categorized as coarse, sufficient and excellent prediction models respectively.

Based on advantages and excellence of NIRS as a new, fast, simultaneous and robust method to determine agricultural and food qualities, we attempted to apply the NIRS method in predicting soil quality parameter in form of C-organic and pH. Prediction models were established using soil spectra data using a combination between principal component analysis and multiple linear regression (PCA+MLR) method. Obtained results were then compared to actual SOC and pH measured by standard laboratory procedures.

2 Method

2.1 Samples

A bulk of soil samples from four different site locations in Banda Aceh and Aceh Besar area were taken and stored for two days to equilibrate before spectra acquisition and further chemical analysis.
2.2 Near-infrared spectrum acquisition

Infrared spectral data in the form of diffuse reflectance spectrum were taken of all soil samples using an infrared instrument (FTIR, Thermo Nicolet Antaris II MDS). The basic measurement with the probe detector was chosen as a basic measurement in high-resolution format. Infrared spectrum was collected and recorded in wavenumbers range from 4000 to 10 000 cm$^{-1}$ with co-added 32 scans and averaged. Spectra data were stored in a local computer with three different file formats (*.SPA, *.JDX and *.CSV) [5].

2.3 C-organic (SOC) and pH measurement

Once after spectra collection was completed, all soil samples were taken immediately to measure soil organic carbon (SOC) and pH using elemental analyzer and thermal conductivity detector. Soil organic carbon was expressed as % SOC [1]. Actual carbon organic and pH data were measured in triplicate and averaged.

2.4 Spectra data correction

In order to obtain accurate and robust prediction results, infrared spectra data were enhanced and corrected using the de-trending (DT) method [5].

2.5 C-organic and pH prediction model

Prediction models used to predict SOC or C-organic of soil samples were established and developed using original untreated spectra data (defined as a raw spectrum) and enhanced spectra data (DT). Prediction models were established using combination between principal component analysis and multiple linear regression (PCA+MLR) [5], [6].

2.6 Model evaluation performance

Soil organic prediction performances were evaluated for their accuracies and robustness using several statistical indicators: coefficient of determination ($R^2$), correlation coefficient ($r$), root mean square error (RMSE) and the residual predictive deviation (RPD) (Munawar et al, 2016; Munawar et al, 2013). It is obvious that the good model should have high $R^2$ and $r$ coefficient, the low value of RMSE and few number latent variables of PCA [7], [8].

3 Result and Discussion

3.1 Typical spectra of soil sample

Typical diffuse reflectance spectrum for soil samples was presented in Fig.1. it shows several peaks represent the vibration of molecular bonds of C-C, O-H, N-H, C-H-O, and C-H. Original spectra data before correction were still interference due to noise resulted from light scattering [9], [10].
Fig. 1. Typical diffuse reflectance spectra data of soil samples before correction.

These noises were corrected using pre-treatment method namely de-trending (DT). There are still many correction methods such as multiplicative scatter correction (MSC), mean normalization (MN), standard normal variate (SNV), Mean centering (MC) and combination among them. As shown in Fig. 2, DT correction method clearly enhance spectra appearance and remove some noises due to light scattering.

Spectral data acquired from the near infrared instrument generally contain background information and noises which are interfered and affected desired relevant soil quality information such as C-organic and pH. Interfering spectral parameters, such as light scattering, path length variations, and random noise resulted from variable physical sample properties or instrumental effects need to be removed or minimized in order to obtain accurate, robust and stable calibration models. Thus, it is very necessary to pre-process spectral data prior to prediction model development used to predict C-organic.

Fig. 2. Diffuse reflectance spectra after corrected and enhanced using the de-trending (DT) correction method.

As shown in Fig. 2, spectra data were corrected and enhanced using DT, MSC, and combination of DT+MSC. The de-trending pre-treatment method tends to remove nonlinear trends in spectroscopic data, while MSC method used to reduce amplification due to light scattering and offset due to additive chemical effects in near-infrared spectra.

3.2 Prediction models

After spectra pre-processing were completed, we established prediction models used to predict C-organic on soil samples. Partial least squares regression (PLSR) models were built.
based on untreated and treated spectra using soil samples datasets with the wavenumbers range from 4000 – 10 000 cm⁻¹. The correlation coefficient (r), standard error prediction (RMSE) and residual predictive deviation (RPD) index, were compared.

C-organic prediction model consists of the relationship between the observed response variable y (Y-variables: soil C-organic) and the independent variable x (X-variables: diffuse near-infrared reflectance spectrum). The primary information that can be gathered from the interaction of the near-infrared radiation with the biological object is its physical, optical and chemical properties. Prediction result for soil C-organic (SOC) was shown in Table 1.

Table 1. SOC prediction performance using diffuse reflectance spectra data

<table>
<thead>
<tr>
<th>Spectrum</th>
<th>Statistical indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>R²</td>
</tr>
<tr>
<td>Raw</td>
<td>0.81</td>
</tr>
<tr>
<td>DT</td>
<td>0.95</td>
</tr>
</tbody>
</table>


Firstly, C-organic (SOC) prediction model was developed using untreated raw spectral data. It achieved correlation coefficient of 0.90, with RMSE value = 0.23 and RPD index = 3.14. When the prediction model was developed using DT spectra data, the correlation coefficient was increased become 0.97 and RMSE error prediction was decreased to 0.12 and RPD index obviously better than previous. Moreover, accuracy and robustness of C-organic prediction model were significantly improved when the prediction model was developed using DT spectra data. It achieved r = 0.97 with RPD = 3.96 and error decreased to 0.12. Scatter plot derived from actual C-organic versus predicted C-organic were presented in Figure 3.

![Fig. 3. Scatter plot between actual and predicted SOC of soil samples using NIR spectra data.](image-url)
Furthermore, the pH of soil samples was also predicted using the same spectra data as SOC prediction. The prediction model was established using raw untreated and DT treated spectrum by regressing pH actual data as Y variable and spectra data as X variable. The models were constructed using PCA+MLR method and the result is presented in Table 2. As shown in Table 2, the NIRS method can predict pH even using raw spectrum data. The correlation coefficient is 0.94, with RMSE value = 0.07 and RPD index = 4.28. Just like in SOC prediction, de-trending (DT) correction method can improve prediction accuracy and robustness. It achieved maximum correlation coefficient $r = 0.99$ and RPD index = 4.84 with lowest error RMSE = 0.03. Scatter plot derived from actual pH versus predicted pH were presented in Figure 4.

<table>
<thead>
<tr>
<th>Spectrum</th>
<th>Statistical indicator</th>
<th>$R^2$</th>
<th>$r$</th>
<th>RMSE</th>
<th>RPD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw</td>
<td></td>
<td>0.75</td>
<td>0.87</td>
<td>0.26</td>
<td>1.73</td>
</tr>
<tr>
<td>DT</td>
<td></td>
<td>0.80</td>
<td>0.90</td>
<td>0.21</td>
<td>2.70</td>
</tr>
</tbody>
</table>


Fig. 4. Scatter plot between actual and predicted pH of soil samples using NIR spectra data.

Judging from obtained prediction results, both soil quality indices in form of C-organic and pH, we may argue that NIRS can be employed and applied as an alternative fast, effective and non-destructive method to determine and predict soil quality. We may also use this particular method to predict other soil quality indices with the satisfactory result as well as previous studies. Further research, of course, is still required to develop prediction models and validate using independent data.
4 Conclusion

Based on obtained results, we may conclude that near-infrared spectroscopy can be applied as a rapid alternative method used to predict soil organic carbon (SOC) and pH. Spectra correction using De-trending (DT) was obviously improved prediction accuracy and robustness by increasing correlation coefficient between actual and predicted C-organic and pH, increasing RPD index as well as lowering RMSE error prediction. DT spectra correction provide the most accurate and robust C-organic prediction result with correlation coefficient $r = 0.94$ and RPD = 3.96. whilst for pH prediction, correlation coefficient $r = 0.99$ and RPD index = 4.84 respectively.

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Beggars and Its Solutions In Banda Aceh City  
(A Study of Attempt and Role of Social Agency)

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Abstract. As time goes by, the number of beggars in Banda Aceh is increasing. This has an impact on various things in this city which is known as "Madani city". This research about "Beggars And Its Solutions in Banda Aceh City (A Study of Attempt and Role of Social Agency)". The problems were taken in this study is the effort made by this department in dealing with beggars in Banda Aceh. The purpose is to find out what is being done of this department in dealing with beggars in Banda Aceh. This research is descriptive qualitative. the subject is an employee at the Social and Labor Department of welfare related to the beggar control. Data collection obtained through direct observation, in-depth interview on the informant four research and documentation. Data is analyzed using qualitative methods, consisting of three grooves activities going on simultaneously: data reduction, data presentation, and drawing conclusions or verification. research results have shown. That caused by several aspects, including the economic aspects or no jobs available as principal; social aspects such as low levels of education and skills; cultural aspects such as not working hard, no discipline, no responsibility, and no confidence. As well as the efforts of the Social and Labor Department Banda Aceh, among others are policing, and all citizen order to not give money to beggars, give skill or ability and place them back in their respective areas.

Keywords: Efforts, Countermeasures, Beggars

1 Introduction

Prosperity is the ultimate goal which wants to be achieved by an institution, a group or an individual; because it can bring on the ideal level in which both material and spiritual needs can be implemented. However, this matter cannot still be gained and felt in particular for a marginalized individual or group. It might occur since there are different various measures and indicators of prosperity. One institution or an individual may have been assumed 'prosperous', in contrast to, for another group or other people are still not.

As the impact of economic prosperity that is not reached, this affects toward social prosperity of society. This thing is proven with the fluctuating number of population which is categorized as social prosperity disabled person. Social prosperity is a condition which a citizen’s social, spiritual, material needs can be fulfilled so that he/she can develop and do his/her social function [1]. Social prosperity is an instrument that can be used to solve social problems which emerge because of various factors as poverty (i.e. material and spiritual).

Social prosperity disabled person in Indonesia has currently classified into 22 types; which one of them is the beggar who gets serious attention from local and central government
(province, regency, municipality) due to the emerged descendant problems. The existence of beggars lately makes people who live in the urban area feel worried since almost everyday we can find beggars in intersections, shop window, markets, cafe, terminals, government and private institutions, that beg in order to fulfill their hope and request.

From some sites above we can see a variety of beggars whether children, older people, man, woman, educated person or uneducated person. Various ways they do for begging such as showing the pity face, using sympathy words, wearing ragged clothes, acting as a disabled person, and acting as a money collector for building praying house and foundation. From several modes above, they can get relatively much money every month and it is equal or bigger than a civil servant’s monthly income. This activity becomes a new job for them and neglects normative aspect in order to fulfill daily needs which are called capitalist economic system with its number is unlimited. Their dignity has lost and does not feel embarrassed if they do not work.

The phenomenon of the beggar has become a provincial and national problem including Aceh province. Based on the statistic data of Aceh provincial government from 2010 to 2014 showed that from the period of these times the number of Aceh population who was categorized as poor people was about 881.26 thousand people or 18.05% [2]. In addition, during these times the number of vagrants and beggars in Aceh province was 2,221 thousand people.

The existence of beggars causes the beauty of the city becomes disturbed and looks messy. The reality of this community group does not have a permanent job and residence. They have often supposed the trouble makers who break the beauty of the city and are not conceded its existence in a social reality [3].

In the latest years, the presence of beggars increases from year to year. The current beggars who beg in Banda Aceh city are generally from a number of regencies and municipalities such as eastern area (Binje city, Lhok Nibong, Langsa, Idi, Simpang Ulim,), northern area (Matang Geulumpang Dua, Geudong, Lhoksukon, Lhokseumawe, Bireun, Jeunib, Samalanga, Jambo Aye, Punteuet, Kandang dan Nisam), southwest area (Manggeng, Sawang, Nagan Raya dan Meulaboh), central area (Bener Meriah dan Takengon), Pidie area (Keumala, Grong-grong, Sigli, Tringgadeng), the Greater Aceh (Ujung Bate, Neuheun, Krueng Raya, Sibreh and Seulimum), Banda Aceh area (Lampaseh, Punge, Blang Cut, Lamreung dan Barak Bakoy) [4].

Social Agency of Banda Aceh is one of a government institution that gives a social service for Banda Aceh citizens. In doing its task function, Social Agency of Banda Aceh has some tasks in the field of prosperity, empowerment, aid, social rehabilitation accordance with the established regulation. Doing the regular raid and putting the beggars in the decrepit homes are some efforts are employed by Social Agency of Banda Aceh in solving the problem of vagrants and beggars.

There were some previous studies relate to the phenomenon of beggars. A study conducted by Afrizal [5] with the title “Beggars Social Life” (A Case Study in Banda Aceh City). The purpose of this research is (1) To know what factors does someone become a beggar; (2) To know how are the social life of beggars; (3) To know what are the attempts done by the government in overcoming the problem of beggars.

From the research findings revealed that the factors that caused the beggars increased more in Banda Aceh city namely the economic, lazy, and disabled factor. To solve the problem of beggars in Banda Aceh city, the government had done several efforts such as (1) controlling; (2) socializing prohibition of giving money/charity for beggars in public places; (3) giving a work skill training; (4) giving a working capital for a productive economy.
2 Method

The method used in this research was descriptively qualitative through a case study. This research aims at exploring the attempts of Workforce and Social Agency in overcoming beggars in Banda Aceh city. The source of information attained by means of secondary and primary data. While, the technique of data collection employed through observation, interview, and documentation.

Having collected the data, the researchers began aggregating, organizing and classifying of data became into the ordered units. Aggregation is an abstracted process particular matters into general matters to find out the pattern of general data. Data were organized chronology, category or were included into a typology. The technique of processing and data analysis undertaken systematically through looking for and arraying of which are gained from the result of the interview, field note and documentation, then drawing a conclusion.

3 Result and Discussion

1) Factors that cause the existence of beggar

a. Disabled factor

Disabled person falls into three categories namely physical disabled person, mentally disabled person and physical and mental disabled person.

From the result of the researcher’s observation in the field a part of beggars who beg in Banda Aceh city has the physical disability such as blind and cripple. This condition makes it difficult to look for a proper job. In addition, the loss of confidence toward their ability becomes a reason for them to be a beggar.

b. Being lazy for working

A number of such social problems as unemployment, poverty, and beggars are caused by various factors from the society itself like resigning toward to fate. Consequently, they do not want to work hardly because it has been predestined that they live in poverty. They also do not want to try other works which actually can be done, but they prefer to choose to be a beggar.

c. Low Skill

Begging is an easy work because it does not need the capital and a particular skill to be a beggar. This work can be done whoever whether man, woman, children, a disabled person as well as the person who has the whole body.

The opportunity for this work is not so difficult and widely open to everyone. People can easily beg as they do not know how to finance their family life because of low education and skill.
d. Economic factor

The economic factor is the main cause that makes someone becomes a beggar. The income that they get from a previous job is too low and does not meet their daily needs such as food, cloth, and house. As a result, they live in poverty.

e. Urban society’s desire to giving

The rapid advancement in the urban area causes a part of people who live in rural area migrate to the central city to look for an established job. Unfortunately, they come without having sufficient skill and knowledge. Because of this, they want to be a beggar in order to survive in the city.

On the other hand, urban society does not desire to eradicate the number of beggars who continuously increases, in contrast, they often give money/charity for beggars due to the feeling of pity. Actually, it matter is the early cause that makes beggars add more and more.

2) Attempts of Workforce and Social Agency in overcoming beggars in Banda Aceh city

Begging is a social problem which needs a serious handling and controlling. Thus, if it is not well handled, so this social problem will increase drastically. To solve the problem of beggars in Banda Aceh city, Workforce and Social Agency has done some attempts namely:

a. Making a particular team

In controlling beggars, Social Agency of Banda Aceh forms a special team. This team consists of civil servant polices, syariah (Islamic) policies as well as the Social Agency staffs. They have authority in controlling beggars in Banda Aceh city. While Workforce and Social Agency solely provides building and monitoring of beggars that are in Banda Aceh city.

b. Controlling

The government through the Workforce and Social Agency conducts a routine raid every day which is done by Social Agency staffs and works together with civil servant polices. The raid is focused on the beggars who are in traffic light intersections and public places.

The raid of beggars in Banda Aceh city is continuously carried out which involves among institutions by visiting public places in which the beggars usually beg in order to get valid data of beggars periodically. Each beggar is raided will be caught and proceeded in accordance with the established law.

c. Socializing prohibition of giving money/charity for beggars in public places

Another attempt conducted by the government is socializing for vehicle users and general people by setting up a pamphlet, a street banner or an appeal that contains prohibition not to give money/charity for beggars who beg in every traffic light intersection or public places because it can disturb the safety of street users and also the environment of people who live in urban area.
d. Delivering to shelter home of province

To follow up the raid as mentioned above, so it is coordinated with Social Agency of Aceh Province for building and training of beggar in the shelter house of Social Agency of Aceh Province.

e. Returning to the place of origin

After having controlled, the staff delivers all beggars to Workforce and Social Agency. They are given advice and building by the staff. After that, after giving advice and building, they will be identified and returned to their place of origin.

Based on the results of the study as has been presented previously reveals that the beggars who are in Banda Aceh city do not present suddenly, but their presence is influenced some factors namely economic matter, lack of skill, being lazy for working, disability and age factor. The economic factor is the prime one that makes someone becomes a beggar. It is caused their income from previous work is insufficient. That is why they have to move to the city in order to get an additional income for surviving their life and paying their children school fee.

Nonetheless, they are not equipped with adequate skills. In consequence to, when they already arrive in the city it is quite difficult for them looking for a job as they expect. Thus, they prefer more to choose to be a beggar because begging does not need a particular skill even if becoming a vagrant and beggar must be ready with vile remarks from society. As stated by Munthalib and Sudjarwo cited in Iqbal [6] the vagrant and the beggar is a group of people who accustomed to survive in a poverty and scarcity condition. However, not all beggars are unskilled, but they like more begging because they can obtain a more income. As a result, it makes them lazy looking for another job instead of being a beggar. It is in accordance with Edy Zaqueus that said being lazy can be interpreted as ‘unwill’ of someone to do what he/she has to do. Conversely, there are other works than becoming a beggar. Nevertheless, they have felt comfortable with the current, so they do not consider to look for another job.

Disabled and age factor can become the reasons why someone wants to be a beggar. Because of the disabled body, they feel confident to do normally certain works and activities. Hence, begging is an appropriate optional work due to incomplete physical condition. Additionally, people who see them will feel pity because they hope will get an additional income. Ironically, it is followed by people who are supposed not the disabled person so that they can get enough income and it has become a strategy for most beggars.

Age factor also encourages someone to becomes a beggar. Getting an elder person with the body has begun weak becomes the reason why he/she is reluctant to do other works. Therefore, begging is an ideal job for them because it does not need a special skill and does not spend many energies; but it gets much money. This matter makes many elder people do not want to be placed by the social agency staff in a decrepit home.

Another factor is the lack of attention from the family members of a beggar. Actually, the beggar’s family should advise or forbid him/her not to beg. None of them, vice versa, who gives advice or prohibit but they are very happy because when the beggars go home their children will get small change from the result of beg. The other factor that makes the number of beggars enhances more and more in Banda Aceh because many rich people who often give money to beggars. Consequently, the beggars keep begging and their number keeps increasing. Accordingly, we should not give them money anymore in everywhere. We feel pity to see them, it is better for us to donate/give our money/charity through various institutions that are
concerned to empower beggars. By doing this, it is hoped that the number of beggars in Banda Aceh will decrease automatically.

There are some impacts that emerge because of the presence of beggars in Banda Aceh namely disturbing traffic and the beauty of the city as well as society. The traffic in Banda Aceh is quite busy because it is the center of the city in which a variety of community layers exist and gather here. With many private vehicles make traffic are so busy particularly on working days. It gets worse and it disturbs traffic and because there are a number of beggars in intersections, and it disturbs traffic and can make accident for drivers and beggars.

One of another impact that appears due the presence of beggar is disturbing the beauty of the city. Banda Aceh is the capital of Aceh Province which should look clean and comfortable; however, because of the presence of beggars around Banda Aceh city that occur vice versa since beggars are identical with ragged and faded clothes and indirectly their existence disturbs the beauty of the city. Society begins feeling worried with many beggars that gad around Banda Aceh city both in intersections and stalls particularly when they come to stalls take a turn and this makes stall’s visitors feel disturbed to enjoy their food and drink.

With the number of beggars that keep increasing and many descent problems that arise from the beggars, the government of Banda Aceh city by means Workforce and Social Agency tries to handle the problem of beggars with various efforts as stipulated in Local Regulation No 11 2013 about social problems that states Social Agency is an institution that obligates to overcome beggars. One of its tasks is to cooperate with civil servant polices and syari‘ah polices do the routine raid in every intersection which is used by the beggars and other public places. This raid is meant to make an arrangement, beauty and control. It also aims to cut the link of beggars life in order to live back normally in society. Having done raid, civil servant polices and syari‘ah polices of Banda Aceh city hand over the beggars to Workforce and Social Agency in order to proceed furthemore.

Afterward, Workforce and Social Agency will make a list of the beggars who are caught in a raid, give advice and guidance so that they are aware of and do not beg again. If found the beggars who are from Banda Aceh, they will be given the direct guidance by Social Agency and after that, they will be returned to their family. If they do not have their family anymore, they will be delivered to decrepit homes that are in Banda Aceh. While for beggars who are out of Banda Aceh city will be delivered to Social Agency of Province to be given a building in the shelter home which is located in Ladong of Mesjid Raya Subdistrict. Having built they will be returned to the place of their origin. Apart from doing a raid, Workforce and Social Agency of Banda Aceh City also appeals for urban society does not give money to beggars who gad in intersections and stalls. This appeal is made in the form of the pamphlet and is place in every crossroad. The appeal is also done by the staff to the urban society of Banda Aceh city.

Workforce and Social Agency has not currently done a building for all beggars who are caught in a raid Banda Aceh because there is no a place that accommodates the raided beggars because the shelter home of LIPOSOS that becomes a special program of Social Agency will be ready in 2016. Thus, Social Agency for the time being only provides various buildings to disabled beggars and others. The buildings given for disabled beggars are the skill for sewing, massaging and giving the stuff for working. For beggars who are not disabled given a special and continuous building after the shelter home of LIPOSOS in Lamjabat is finished its construction and it is predicted will begin its operation in the mid of April or June of 2016.

In overcoming the beggars in Banda Aceh city, Workforce and Social Agency encounter some hinders which made the efforts which were done not maximal. The barrier was faced by the Social Agency staffs because most beggars are from out of Aceh such as the Greater Aceh and Medan (North Sumatra). That is why the building programs such as giving a working capital
aid and skill training are difficult to be implemented because it is an obligation of each Social
Agency of regency and municipality. Nevertheless, Social Agency of regency and municipality
has not made a special program on how to overcome so that the beggars who caught do not
come back again after they return to the place of their origin.

4 Conclusion

Based on the result of research as has been stated in the previous chapter, the researcher can
draw some conclusions related to the attempts of Workforce and Social Agency in overcoming
beggars in Banda Aceh city. The conclusions are:
1. The factors that make someone becomes a beggar are:
   a. Disabled factor
   b. Being lazy for working
   c. Low/inadequate skill
   d. Economic factor
   e. Urban society’s desire to giving

2. The attempts of Workforce and Social Agency in overcoming beggars in Banda Aceh city.
   a. Controlling
   b. Forming a particular team
   c. Socializing prohibition of giving money/charity for beggars in public areas
   d. Returning to the place of origin
   e. Delivering to shelter home of the province

REFERENCES

The Effect of Work Satisfaction and Downward Communication on Performance of West Aceh Polres With Intrinsic Motivation as a Mediation Variable

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Abstract. This study aims to determine the effect of job satisfaction and downward communication both simultaneously and partially on intrinsic motivation and its simultaneous impact on Employee Performance on Personnel Performance in West Aceh Police. This research was conducted at the West Aceh District Police. As objects of this study are job satisfaction, downward communication, intrinsic motivation, and personal performance. The subject of this study was the West Aceh Police Resort Personnel. The population in this study was 441 personnel from West Aceh Police. Sampling using the stratified random sampling method. In this study the total indicators used were 25, then a sample of 120 samples was used. From the results of the study, it was found that Intrinsic Motivation which is considered to have the most influence on the performance level of the West Aceh Police Resort because this variable is the variable that has the largest Beta coefficient (0.37) compared to other variables such as Downward Communication and Job Satisfaction. In fact, job satisfaction was not proven to have a significant influence on improving personnel performance because the H1 hypothesis was rejected.

Keywords: Job Satisfaction, Downward Communication, Intrinsic Motivation, Personnel Performance, West Aceh Police

1 Introduction

One of the decisive aspects of achieving organizational performance is employee performance. If the employee's performance is not good, the results obtained are also not good so that the goals desired by the organization cannot be maximally achieved. For this reason, attention from office leaders to meet personnel needs is highly expected, so that employee performance will be good. Likewise for the Indonesian National Police (POLRI) institutions. Personnel who have good performance will always make changes in a better direction.

Many obstacles can be suspected as the cause of the low performance of the police personnel. One of them is Intrinsic Motivation. Intrinsic motivation itself is the motivation that is formed within ourselves when we do something without a reward from the environment. We simply enjoy a certain activity or view it as an opportunity to explore, learn, or actualize our own potential [1].
If the motivation from within has not been seen from the members of West Aceh Police, then the impact is on the performance of the person concerned and cumulatively influences the performance of the West Aceh Resort police.

Downward Communication. Downward communication is the delivery of information from superiors to subordinates in accordance with the structure in the organization. The use of this communication is very effective for delivering instructions, directing, controlling the subordinates. Communication can be written or oral which can be adjusted to the context and content. The message that is delivered to downward communication must be clear and easy to understand, especially if it is a command. Often the failure of communication is caused by differences in the point of view between communicators and communicants.

The purpose of this study is to test and analyze:
1. The Influence of Job Satisfaction on Intrinsic Motivation at the West Aceh Police Station
2. The Effect of Downward Communication on Intrinsic Motivation at the West Aceh Police Station
3. Effect of Job Satisfaction on Personnel Performance of West Aceh District Police
4. Effect of Downward Communication on the Performance of Personnel at West Aceh Police
5. Effect of Intrinsic Motivation on Personnel Performance of West Aceh Police

2 Literature Review

2.1 Employee Performance

According to Kane [2], performance is not a person's characteristics, such as talent or ability, but is a manifestation of talent or ability itself. This opinion shows that performance is a manifestation of ability in the form of real work. Performance in relation to position is defined as the results achieved relating to the function of the position in a certain period of time [3]. According to Mondy & Mondy [4] when used as a basis for decision making, employee performance evaluation can be very useful. But to be reliable, the performance appraisal must be fair and impartial, so that it can constructively capture key parameters of employee performance. Ideally, the measure of employee performance must be known by employees as the core that determines job expectations, where employees can not only measure actual performance but also be motivated to achieve established criteria. Employee performance influences the success of an organization if good the performance of employees of an organization will be good for the organization in the eyes of the community [5].

2.2 Intrinsic Motivation

Extrinsic motivation occurs when we are motivated to behave or engage in an activity to get a prize or avoid punishment. In this case, the employee is involved in behavior not because he enjoys it or because he feels satisfied, but to get something in return or avoid something unpleasant [6]. According to Suparta [7], intrinsic motivation involves involvement in behavior because it is personally beneficial; basically, doing an activity for its own sake rather than the
desire to get external rewards. Basically, the behavior itself is the expected reward. Maznah, Ma’ruf, & Sofyan [8] convey the dual motivation theory which suggests 16 (sixteen) factors that can motivate someone to work optimally known as intrinsic work motivation and extrinsic work motivation. Intrinsic work motivation is the motivation that is directly associated with the implementation of tasks, which include: recognition, achievement, possibility to grow, the possibility of progress and the work itself.

2.3 Downward Communication

Downward communication is the flow of information and messages from a higher level in the organization to a lower level. Effective downward communication is very important for organizational success [9]. In other words, the message flow starts at the top of the organizational hierarchy and moves down to the lower level. The response to a communication from below moves up on the same track. [10]. Ideal communication occurs when the message to be conveyed to someone is well received. The message will be carried out well and guaranteed to be effectively implemented when accompanied by other factors for the communication process [11].

2.4 Research Paradigm

For this research the paradigm used is as follows:

![Figure 1. Research Paradigma](image)

2.5 Hypothesis

Based on the framework described earlier, the hypothesis proposed in this study are:

H1. Job Satisfaction, Downward Communication, Intrinsic Motivation and Personnel Performance in West Aceh Police have been good

H2. Job Satisfaction influences Intrinsic Motivation in West Aceh Police

H3. Downward communication has an effect on Intrinsic Motivation at the West Aceh Police Station

H4. Job Satisfaction influences the Personnel Performance of West Aceh Police

H5. Downward Communication affects the Performance of Personnel of West Aceh Police

H6. Intrinsic Motivation affects the Performance of Personnel of West Aceh Police through Intrinsic Motivation.

H7. Job Satisfaction influences the Personnel Performance of West Aceh Police through Intrinsic Motivation.

H8. Downward communication affects the performance of the West Aceh Police Station Personnel through Intrinsic Motivation.
3 Research Methods

3.1 Location and object research

This research was conducted at the West Aceh District Police. The object of this study relates to job satisfaction, downward communication, intrinsic motivation, and the performance of West Aceh District Police personnel.

3.2 Sampling

The population in this study were all personnel of the West Aceh Police, namely as many as 441 people. The sample is a portion of the number and characteristics of the population. In this study the total indicator used was 24, then a sample of 120 samples was used.

3.3 Data analysis method

The data analysis technique used in this research is The Structural Equation Modeling (SEM) of statistical software package AMOS 22.0 for hypothesis testing. The SEM equation model is a set of statistical techniques that allows the testing of a series of "complex" relationships simultaneously. Testing this hypothesis is to analyze the value of Critical Ratio (CR) and Probability (P) value of the data if compared to the required statistical limitation, that is above 1.96 for CR value and below 0.05 for P-value (probability). If the results of the data show the value that meets the requirements, then the proposed research hypothesis can be accepted.

4 Result And Discussion

4.1 Test Measurement Model

The following figure shows the relationship between indicators and unobserved variables (latent variables) in the Measurement Model.

Figure 2. Measurement Model with loading Factor

The results of the measurement test showed that some indicators of the research variables have a value of factor loading below 0.5. The following table shows net measurement results that can be included in structural testing.
Table 1. Loading Factor Measurement Model

<table>
<thead>
<tr>
<th>No</th>
<th>Indicators</th>
<th>Variable</th>
<th>Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>X11</td>
<td>Job satisfaction</td>
<td>0.706</td>
</tr>
<tr>
<td>2</td>
<td>X12</td>
<td>Job satisfaction</td>
<td>0.738</td>
</tr>
<tr>
<td>3</td>
<td>X13</td>
<td>Job satisfaction</td>
<td>0.632</td>
</tr>
<tr>
<td>4</td>
<td>X14</td>
<td>Job satisfaction</td>
<td>0.755</td>
</tr>
<tr>
<td>5</td>
<td>X15</td>
<td>Job satisfaction</td>
<td>0.588</td>
</tr>
<tr>
<td>6</td>
<td>X21</td>
<td>Downward communication</td>
<td>0.882</td>
</tr>
<tr>
<td>7</td>
<td>X22</td>
<td>Downward communication</td>
<td>0.907</td>
</tr>
<tr>
<td>8</td>
<td>X23</td>
<td>Downward communication</td>
<td>0.915</td>
</tr>
<tr>
<td>9</td>
<td>X24</td>
<td>Downward communication</td>
<td>0.884</td>
</tr>
<tr>
<td>10</td>
<td>Y1</td>
<td>Intrinsic motivation</td>
<td>0.899</td>
</tr>
<tr>
<td>11</td>
<td>Y2</td>
<td>Intrinsic motivation</td>
<td>0.939</td>
</tr>
<tr>
<td>12</td>
<td>Y3</td>
<td>Intrinsic motivation</td>
<td>0.839</td>
</tr>
<tr>
<td>13</td>
<td>Y4</td>
<td>Intrinsic motivation</td>
<td>0.717</td>
</tr>
<tr>
<td>14</td>
<td>Y5</td>
<td>Intrinsic motivation</td>
<td>0.658</td>
</tr>
<tr>
<td>15</td>
<td>Y6</td>
<td>Intrinsic motivation</td>
<td>0.528</td>
</tr>
<tr>
<td>16</td>
<td>Z1</td>
<td>Personnel performance</td>
<td>0.830</td>
</tr>
<tr>
<td>17</td>
<td>Z2</td>
<td>Personnel performance</td>
<td>0.804</td>
</tr>
<tr>
<td>18</td>
<td>Z3</td>
<td>Personnel performance</td>
<td>0.877</td>
</tr>
<tr>
<td>19</td>
<td>Z4</td>
<td>Personnel performance</td>
<td>0.808</td>
</tr>
<tr>
<td>20</td>
<td>Z5</td>
<td>Personnel performance</td>
<td>0.766</td>
</tr>
<tr>
<td>21</td>
<td>Z6</td>
<td>Personnel performance</td>
<td>0.810</td>
</tr>
</tbody>
</table>

From table 1 above shows that all the indicators included in the model have been eligible to be included in the next data processing. The result of the model test is shown in table 2 below:

Table 2. Criteria Goodness of Fit Measurement Models

<table>
<thead>
<tr>
<th>Criteria index</th>
<th>Cut-off Value</th>
<th>Result of analysis</th>
<th>Model Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi-Square</td>
<td>Expected to be small</td>
<td>279,286</td>
<td>Good</td>
</tr>
<tr>
<td>CMIN/DF</td>
<td>CMIN/DF &lt; 2</td>
<td>2,381</td>
<td>Not good</td>
</tr>
<tr>
<td>GFI</td>
<td>≥ 0.90</td>
<td>0.917</td>
<td>Good</td>
</tr>
<tr>
<td>AGFI</td>
<td>≥ 0.90</td>
<td>0.914</td>
<td>Good</td>
</tr>
<tr>
<td>CFI</td>
<td>≥ 0.90</td>
<td>0.947</td>
<td>Good</td>
</tr>
<tr>
<td>Baseline Comparisons</td>
<td>Approaching 1</td>
<td>&gt; 0.5 for NFI, IFI, TLI and CFI</td>
<td>Good</td>
</tr>
<tr>
<td>Parsimony Measures</td>
<td>Adjusted 0-1</td>
<td>Pration, PNFI, PDCF</td>
<td>Good</td>
</tr>
<tr>
<td>RMSEA</td>
<td>≤ 0.08</td>
<td>0.108</td>
<td>Not good</td>
</tr>
<tr>
<td>AIC</td>
<td>Default Model &lt; Saturated</td>
<td>504 &lt; 573 &lt; 2127</td>
<td>Good</td>
</tr>
<tr>
<td>ECVI</td>
<td>Default Model in between Saturated &amp; Independence</td>
<td>4,235 &lt; 4,821 &lt; 17,880</td>
<td>Good</td>
</tr>
</tbody>
</table>
4.2 Structural Equation Modelling Analysis

Analysis of data processing result at full stage of SEM model is done by doing conformity test and statistical test. Results of data processing for the analysis of full SEM model shown in Figure 3.

![Structural Equation Model](image)

**Figure 3.** Structural Equation Model

4.3 Hypothesis Testing

After all, assumptions can be met, then will be tested hypothesis. Testing 7 hypothesis of this research is done based on Critical Ratio (CR) value of a causality relationship. as in table 3 below.

<table>
<thead>
<tr>
<th>No</th>
<th>Hypothesis</th>
<th>CR Cut off</th>
<th>P Value Cut off &lt; 0.05</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Job satisfaction to Intrinsic motivation</td>
<td>0.409</td>
<td>0.683</td>
<td>H1 Rejected</td>
</tr>
<tr>
<td>2</td>
<td>Job satisfaction to personal performance</td>
<td>4.179</td>
<td>***</td>
<td>H2 Accepted</td>
</tr>
<tr>
<td>3</td>
<td>Downward communication to Intrinsic Motivation</td>
<td>2.053</td>
<td>0.040</td>
<td>H3 Accepted</td>
</tr>
<tr>
<td>4</td>
<td>Downward communication to personal performance</td>
<td>4.180</td>
<td>***</td>
<td>H4 Accepted</td>
</tr>
<tr>
<td>5</td>
<td>Intrinsic motivation to personal performance</td>
<td>4.126</td>
<td>***</td>
<td>H5 Accepted</td>
</tr>
</tbody>
</table>

From the results of structural testing, there is a hypothesis that is accepted and the tone rejected. Hypothesis 1 which examined the effect of job satisfaction on intrinsic motivation was rejected because it did not fulfill the conditions accepted. Whereas the other 4 direct hypotheses, namely H2-H5 are accepted. This means that there is a significant influence between the independent and dependent variables on each of these hypotheses.

In other words, the variable has the effect of increasing the dependent variable as long as the independent and intervening variables can be increased by the leadership in this case the West Aceh Police Chief.
4.3 Direct and Indirect Influence

To see the direct and indirect influence of the variables found in this study, it must first be seen the number of coefficients obtained. Based on the results of processing using AMOS 22 software. Based on the result of the coefficient of structural equation modeling the direct and indirect effect are presented in Table 4;

Table 4. The direct and indirect effect

<table>
<thead>
<tr>
<th>No</th>
<th>Indirect Effect</th>
<th>Result of the Sobel test</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Job Satisfaction in Personnel Performance through Motivation</td>
<td>Because the result not significant so there is no indirect influence</td>
<td>There is no indirect influence</td>
</tr>
<tr>
<td>2</td>
<td>Downward communication on personnel performance through motivation</td>
<td>2.042 &gt;1.96</td>
<td>there is no indirect influence in partial</td>
</tr>
</tbody>
</table>

Because the direct influence of Downward Communication on Personnel Performance is significant and the indirect effect through the Intrinsic Motivation variable is also significant, the variable of Intrinsic Motivation, in this case, is called Partial Mediation.

5 Conclusion And Recommendation

5.1 Conclusion

1. Testing of hypothesis 1 (H1), the namely descriptive hypothesis is done by using one sample test with a 3.4 cut-off value with the results as stated in the One-Sample Test table. It can be seen that all indicators on the 4 variables have significantly below 0.05. Thus it can be concluded that all the variables in this study are Job Satisfaction, Downward Communication, Intrinsic Motivation, and Personnel Performance are good.

2. From the Confirmatory test, there are 3 indicators that do not meet the requirements because they have a number of loading factors below the required one, namely 0.5. So that the three indicators namely X25, X26, and Z7 must be delimited from the model.

3. In the first Goodness of Fit test, it was concluded that the existing measurement model is not fully fit with the existing data so that the model must be improved using Modification Indices, especially to improve the performance of CMIN / DF and RMSEA which are still outside the required limits. After repairing the model, CMIN / DF and RMSEA have entered the required boundary range so that the measurement model is considered to have fulfilled the requirements to proceed to the structural stage.

4. From the results of testing the hypothesis, of the 5 direct hypotheses tested only 1 is not significant, namely the influence of Job Satisfaction on Intrinsic Motivation because it has a CR and P value that does not meet the requirements.

5. Testing indirect to see the effect of job satisfaction on Personnel Performance proved not to meet the requirements for further testing because the influence of IV on MV is not significant. However, for testing the second indirect, the two specified conditions have been fulfilled so that it can proceed to indirect testing using Sobel Test, Aroian Test, and Goodman Test. The three results of the test produce a test statistic above 1.96, so it can be said that H1 is accepted. In other words, it can be interpreted that the
Intrinsic Motivation variable can act as a mediator that relates Downward Communication to the Performance of West Aceh Police Precincts.

6. Because of the direct influence of Downward Communication on personnel performance is significant and the effect is not direct which through the Intrinsic Motivation variable is also significant, then the variable of Intrinsic Motivation, in this case, is called Partial Mediation.

5.2 Recommendation

1. From the findings of this study, it is proven that Intrinsic Motivation is considered to have the most influence on the level of performance of West Aceh National Police personnel because this variable is a variable that has a large Beta coefficient (0.37) compared to other variables such as Downward Communication and Job Satisfaction. In fact, job satisfaction was not proven to have a significant influence on improving personnel performance because the H1 hypothesis was rejected.

2. Therefore, if personnel performance becomes the main concern for improvement, it must be done through increasing Intrinsic Motivation by improving the quality of Downward Communication carried out between superiors and prisoners in the ranks of the West Aceh Police. To increase the work motivation of West Aceh police officers, the indicators that need to be improved are those that have the lowest average value, namely "Interest in deepening work to avoid problems in carrying out work" with a value of 3.875. After that, the second lowest value indicator that needs to be improved is "Feeling the importance of working as part of employee contributions to the company" with an average value of 3.992.

REFERENCES


Authors' Instructions: Analysis of Fire Extinguishing Services Based on Disaster Mitigation at the Fire and Safety Department of Banda Aceh

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Abstract. Fire and Safety Department is a government agency that specifically handles fire prevention. Fires can result in material losses and have a high potential for death, thus requiring attention to the safety of residents of residential areas. This certainly requires an organization/agency that provides good and optimal service to obtain success, especially in the Fire and Safety of Banda Aceh. This study aims to analyze the service system of the Fire and Safety Department of Banda Aceh to the community and develop alternative strategies to improve the provision of fire services to the community. The data used in this study are primary data and secondary data. The primary data is obtained from observation, interviews, and distribution of questionnaires. The secondary data obtained through books, journals, and the Central Bureau of Statistics of Banda Aceh. Respondents in this study were 47 people. This study uses a qualitative descriptive method and SWOT analysis (Strengths, Weaknesses, Opportunities, Threats). The results of the study show that the Fire Service and Service System of the Fire and Safety Department of Banda Aceh are currently quite good. The administration system in accordance with the SOP, facilities, and infrastructure that have begun to be adequate in handling, and have good teams and management. Only in terms of facilities and infrastructure that are still lacking in regular maintenance, thus making the firefighter team's performance less than optimal. One of which is the 18 hydrant points in Banda Aceh, only 14 points are functioning properly. The results of the SWOT analysis show that the strategy needed is a growth strategy obtained from the meeting of the two axis points that lead to the V quadrant. Therefore, there are five strategies using the SWOT analysis, such as increasing mitigation efforts with a program of periodic maintenance on facilities and infrastructure so that it will be ready to use at any time and improve employee performance with socialization programs to improve knowledge and skills in handling fire cases.

Keywords: Service, Mitigation, Strategy.

1 Introduction

Fire is one of the most frequent disasters. Hot and dry weather with excessive sunburn, human conditions, and habits in the use of machinery, technology, and tools improperly: cultivating arable land carelessly: factory use that does not refer to security and the application of improper fire prevention often causes fire disasters. This includes almost all parts of the social
order and government and other special arrangements such as small to large scale companies or factories [1].

Fire Department is a government agency that specifically handles fire prevention. The main purpose is to be able to overcome, prevent and cope with fire incidents in Banda Aceh. The implementation of the tasks carried out by the Fire and Safety Department of Banda Aceh has not run smoothly as expected by the community. This can be seen from the lack of socialization to the public about the dangers of fire and the limitations of facilities and infrastructure to reach dense residential areas so that the efforts to prevent and help fire suppression cannot be carried out properly.

Based on information from the daily newspaper Serambi, at the end of 2015, a fire truck type Firedom feal 33 M-CMU was shouted by the residents during the process of fire outage of Sinbun Sibreh supermarket. Hundreds of people around were shouted because the water sprayed was only a little. Though the mentioned fire truck is referred to as the most sophisticated fire truck in Indonesia. Although the fire truck that was bought for Rp.16 Billion, its performance like plant sprinkler car and the water available is not much different from the usual fire truck.

The success of work in service delivery cannot be separated from the good performance of the members of the organization, both individual performance, and team performance. The level of organizational performance can be seen from to what extent the organization is able to reach the targets, objectives, vision, and mission have been determined. With the policy of regional autonomy, the government in the district level is required to be able to develop and increase the various potentials through related agencies to improve organizational performance.

A previous study conducted by Adelberty [2] on the quality analysis of the Surabaya Fire Department, explained that the quality of service at Fire Department of Surabaya City based on service quality dimensions, in general, has not been optimally fulfilled. Especially in indicators of officer attitudes, ease of procedure, service according to SOP and service satisfaction get low scores. This incompatibility is not solely from the fire department itself but also influenced by external factors, which are related to lack of public participation and awareness, traffic congestion, incorrect information, hindered by crowds of people watching fire events, and the influence of infrastructure, including difficult access to locations where fires are occurring. Such as a narrow entrance alley, the number of portals, a gate that is not in accordance with standardization, and the number of speed bumps, and the density of buildings in the fire area.

A previous study conducted by Widayanto [3] on the Performance Analysis of Fire Extinguishers in Fire Fighting Efforts at the Fire Department of Semarang City, explained that the results of the classification of service attitudes, human resource qualifications, education, and training were still weak. This is based on the results of the study which each indicator gets an average score below 60%.

From the description and previous study that have been explained, this study aims to analyze the system of providing fire services at the Fire and Safety Department in Banda Aceh and develop an alternative strategy to improve the delivery of fire services and safety in Banda Aceh.

2 Methods

This research was conducted directly at the Fire and Safety Department of Banda Aceh. Address at Jalan Soekarno-Hatta No. 53, Gampong Geuceu Meunara, Jaya Baru Sub-District, Banda Aceh. The method used in this study is descriptive which was a method aimed at describing existing phenomena.
The population in this study were all employees at the Fire and Safety Department of Banda Aceh, which numbered 87 people. Samples will be selected using the Simple Random Sampling method or random sample [4]. Slovin formula used to determine the total number of samples [5]. The total samples were 50 people, that were 47 respondents from the employees of Fire and Safety Department of Banda Aceh and 2 respondents from the community based on their experience served by the Fire and Safety Department of Banda Aceh, and a key witness when the fire occurred in Banda Aceh to get more detailed information about the service of the Fire and Safety Department of Banda Aceh.

The data collected through several steps. The first step was an observation to directly see the availability of facilities and infrastructures owned by Fire and Safety Department of Banda Aceh in serving the community. The second was by distributing questionnaires to obtain detailed information about the services in serving the community. The last step was deep interview and documentation relating to the availability of facilities and infrastructure that support the service system. In the process of data processing the steps that must be taken are editing, coding, data entry, and data cleaning.

Then, the data will be analyzed using a SWOT analysis (Strengths, Weaknesses, Opportunities, and Threats) to design a RENSTRA (Plan and Strategy) service to improve the service of the Fire and Safety Department of Banda Aceh to the community. Service planning is a dynamic, continuous process, including the process of formulating a problem and the process of implementing a predetermined plan followed by an evaluation. The results of this SWOT analysis will direct the results of this study on the formation of strategic planning. Planning this strategy is a more detailed elaboration into a medium-term work plan in order to implement what has been formulated.

3 Discussion

The main task of the Fire and Safety Department of Banda Aceh is to carry out the government affairs in preventing, responding emergency, preventing fire and rescuing. Because of the working area of the Fire and Safety Department of Banda Aceh is adjacent to the working area of the Fire and Safety Department of Aceh Besar, the Fire and Safety Department of Banda Aceh expanded its work area to 10 KM farther from Banda Aceh to assist the work of the Fire and Safety Agency of Aceh Besar. Before carrying out the deployment of personnel and fleet assistance, firstly the coordination between leaders must be carried out. The task of Fire and Safety Department includes formulating fire and rescue policies, providing support for the implementation of regional government in the field of fire and rescue, fostering and mentoring agencies in their work areas in order to respond to fire disasters and to rescue if it occurs, until evaluations and reports related to the fire sector and rescue.

3.1 Service System

In carrying out its duties, the non-structural assets such as a post or a guarding place for Fire and Safety Department of Banda Aceh have 5 post points, namely:
1. Headquarter, located in Geuceu KotaBanda Aceh
2. Auxiliary Unit Post, located in Pango, Banda Aceh
3. Auxiliary Unit Post, located in Jeulingke, Simpang Mesra, Banda Aceh
4. Auxiliary Unit Post, located in Gampong Mulia, Banda Aceh
5. Auxiliary Unit Post, located in Keudah, Banda Aceh
To carry out the main tasks and functions of the organization, the currently available resources are 9 units of fire extinguisher cars, 1 unit of a ladder fire engine, and 3 units of supply cars. To support the easy running of the fire problem, the Fire and Safety Department of Banda Aceh also has hydrants spread over 18 points in Banda Aceh. Out of 18 hydrant points scattered in Banda Aceh, only 14 hydrants work properly, the remaining 4 are damage.

In terms of the quality of service for the officers of the Fire and Safety Department of Banda Aceh, all of the 47 of the officers surveyed claimed to have provided maximum service to the community according to the SOPs that apply in the department. For example from the indicators of the ability and attitude of the officers to the community, and also the ease of procedures given by the Fire and Safety Department officers to the community in accordance to the SOP. The community only needs to call 0651-44123/133, and the officers will immediately arrive at the location. Nevertheless, the firefighters often get a bad response from the panicked communities. Furthermore, the employees of the Fire and Safety Department claimed that they got a fake phone call several times so that when the Firefighters arrived at the location, there was no fire occurred. For this reason, the respondent from the department hoped that there would be a special policy or punishment from the Government towards the people who made false reports so that this incident would not happen again in the future. Because this is very detrimental to the Fire and Safety Department officers, especially the Fire and Safety Department of Banda Aceh.

The results of this study are the same as the previous study conducted by Vendri[6]. In his research on Strategies for Improving the Service of Fire and Safety Department of Province of DKI Jakarta, there were many obstacles faced by the firefighter in serving the community. For example, facilities that had begun to be damaged so the officers could not work optimally, and so many ignorant people tried to fake call to the department. For this reason, a special budget slot is needed for the maintenance of facilities and legal policies for the people who violate these rules.

3.2 Alternatives Strategy

From the results of the study that has been done. Starting from the observation, distribution of questionnaires and interviews, the internal and external key factors (IFAS and EFAS) which are important in the analysis of services at the Fire and Safety Department of Banda Aceh along with weight values and ratings can be seen in table 1 below.

<table>
<thead>
<tr>
<th>Internal Factors</th>
<th>Weight</th>
<th>Rating</th>
<th>Weighted Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>STRENGTHS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have 5 post and 1 headquarter</td>
<td>0.07</td>
<td>2</td>
<td>0.14</td>
</tr>
<tr>
<td>Have had 3 types of fire engine</td>
<td>0.08</td>
<td>2</td>
<td>0.16</td>
</tr>
<tr>
<td>Have collaborated with PDAM (Indonesian Water Utility Company) for the water supply other than water that obtained directly from nature</td>
<td>0.12</td>
<td>3</td>
<td>0.36</td>
</tr>
<tr>
<td>Have had 18 Hydrant</td>
<td>0.16</td>
<td>3</td>
<td>0.48</td>
</tr>
<tr>
<td>Have had 1 phone number that easy to remember by the community</td>
<td>0.09</td>
<td>3</td>
<td>0.27</td>
</tr>
<tr>
<td><strong>SUB TOTAL</strong></td>
<td>0.52</td>
<td>1.41</td>
<td></td>
</tr>
</tbody>
</table>
Judging from the SOP of Fire and Safety Department service, the number of fire engine units is still lacking

<table>
<thead>
<tr>
<th>Description</th>
<th>Weight</th>
<th>Rating</th>
<th>Weighted Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do not have a smaller fire engine to reach narrow roads</td>
<td>0.08</td>
<td>2</td>
<td>0.16</td>
</tr>
<tr>
<td>PDAM (Indonesian Water Utility Company) water pressure is not strong</td>
<td>0.10</td>
<td>3</td>
<td>0.30</td>
</tr>
<tr>
<td>Out of 18 hydrant point, only 14 points work</td>
<td>0.11</td>
<td>3</td>
<td>0.33</td>
</tr>
<tr>
<td>Telephone numbers for emergency calls are charged</td>
<td>0.12</td>
<td>3</td>
<td>0.36</td>
</tr>
<tr>
<td><strong>SUB TOTAL</strong></td>
<td><strong>0.48</strong></td>
<td><strong>1,29</strong></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>1.00</strong></td>
<td><strong>2.7</strong></td>
<td></td>
</tr>
</tbody>
</table>

*Source: primary data (modified), 2019*

From table 1, the maximum possible value is four which identifies maximum strength without any weakness in the service factor of the department. The lowest value is zero, which means that these factors are a full weakness without the slightest strength in the service factor of the Fire and Safety Department of Banda Aceh. The numbers bigger than 3.0 are included in the high category, values above 2.0 to 2.99 are categorized as a medium, while values between 1 and 1.99 are categorized as low. Then the value-weighted of 2.7 includes the medium category. Next for External Factor Analysis (EFAS) can be seen in table 2.

<table>
<thead>
<tr>
<th>Table 2: External Factor Analysis Summary (EFAS)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OPPORTUNITIES</strong></td>
</tr>
<tr>
<td>Weight</td>
</tr>
<tr>
<td>--------</td>
</tr>
<tr>
<td>Cooperation between related agencies in the city of Banda Aceh has been established</td>
</tr>
<tr>
<td>Officers have sufficient skills and abilities obtained from the selection and get regular science updates</td>
</tr>
<tr>
<td>Fire and Safety Department get direct assistance from the local government</td>
</tr>
<tr>
<td>The development of knowledge and technology related to fire outage and rescue facilities and infrastructure</td>
</tr>
<tr>
<td>The location of the post is on the border and close to the district of Aceh Besar.</td>
</tr>
<tr>
<td><strong>SUB TOTAL</strong></td>
</tr>
<tr>
<td><strong>Threats</strong></td>
</tr>
<tr>
<td>Weight</td>
</tr>
<tr>
<td>--------</td>
</tr>
<tr>
<td>There are still people who do not know the emergency phone number of the Fire and Safety Department</td>
</tr>
<tr>
<td>The community does not yet have the ability to reduce the risk of fire</td>
</tr>
<tr>
<td>The community does not yet have the awareness to behave in an orderly manner in the process of evacuation and fire suppression</td>
</tr>
<tr>
<td>Lack of budget for repairs to facilities</td>
</tr>
</tbody>
</table>
Public awareness is still lacking in giving the location of the incident and often deceiving officers

<table>
<thead>
<tr>
<th></th>
<th>0.07</th>
<th>3</th>
<th>0.21</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SUB TOTAL</strong></td>
<td>0.48</td>
<td></td>
<td>1.49</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>1.0</td>
<td></td>
<td>2.73</td>
</tr>
</tbody>
</table>

*Source: primary data (modified), 2019*

From table 2 can be seen that the weighted value is 2.73 with the assumption of the community towards the service of the Fire and Safety Department of Banda Aceh has high-tech facilities in dealing with fire disasters but the facilities are poorly maintained. Then the value of 2.73 is included in the medium category means that the firefighters of Fire and Safety Department of Banda Aceh have high skills and knowledge in dealing with fire, coupled with high technology so that the services of the department can improve in the future. The average value of IFE is 2.7 and the average value of the EFE is 2.73, so the total weighted value is 2.72. The assembly point of these two values is in quadrant V. For more details, see the following table 3.

Table 3: Matrix IE

<table>
<thead>
<tr>
<th></th>
<th>Strong</th>
<th>Average</th>
<th>Weak</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strong</td>
<td>3.0-4.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>V</td>
<td>IV</td>
<td>VI</td>
</tr>
<tr>
<td>Weak</td>
<td>VII</td>
<td>VIII</td>
<td>IX</td>
</tr>
</tbody>
</table>

### 3.3 Subtitle

From table 3 can be seen that the assembly point of the two axes is in the cell or the V quadrant. It shows that the strategy needed to strengthen the service of the Fire and Safety Department of Banda Aceh currently is a growth strategy. The growth strategy shows that the service of the Fire and Safety Department of Banda Aceh requires a strategy that can improve or develop the services of the department. The strategy that can be applied to the service of the department is the organizational development strategy by making management improvements. Based on the results of the analysis above, a SWOT matrix was created which contained analysis of strength and opportunity (SO) strategies, analysis of weaknesses and opportunities (WO), strength and threat strategy analysis (ST) and weakness and threat strategy (WT) analysis, for more details, see in table 4.

Table 4: SWOT Matrix

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimizing organizational planning and development by improving management, placing the human resource in the right position and effectiveness of budget use that is right on the target</td>
<td>Increasing mitigation efforts by conducting periodic inspection programs on building, facilities, and facilities such as hydrants and water suppression engine so that ready to use anytime</td>
<td>Increasing community preparedness in facing fires through the formation of community working groups, environmental security systems, training and the use of mass media for publication</td>
<td>1. Cooperating with telecommunications companies, so that the fire emergency number is free of charge and no disturbances 2. Submit a special request to the Government for the protection policy of the Fire and Safety Department officers</td>
</tr>
</tbody>
</table>

*Source: primary data (modified), 2019*
Based on the SWOT matrix in table 4, can be seen that an analysis of internal and external factors that support improving services at the Fire and Safety Department of Banda Aceh. So the alternative strategies can be developed to improve the level of services provided to the community and improve current mitigation efforts prepared by the department. The alternative strategies are compiled through the SWOT matrix. The results of the SWOT matrix analysis are 5 alternative service improvement strategies, namely as follows.

The SO strategy to improve services at the Fire and Safety Department of Banda Aceh City was arranged using the power to take advantage of opportunities.

1. Optimizing organizational planning and development by improving management, placing human resources in the right position and the effectiveness of using the right budget. So the programs that have been prepared by the department can be implemented well in terms of water supply, periodic maintenance of facilities such as hydrants that started to damage and fire extinguishers owned by the department and also a water supply facility.

The WO strategy to improve services at the Fire and Safety Department of Banda Aceh was prepared by minimizing weaknesses to take advantage of opportunities.

1. Increasing mitigation efforts by conducting periodic inspection programs on buildings and facilities and infrastructure that are available so that it will ready to be used any time and improving employee performances of the department with socialization programs to increase knowledge and skills in handling fire cases, as well as adding equipment in accordance with the development of knowledge that has been improved previously to face the advances in modern technology today.

The strategy of ST to improve services at the Fire and Safety Department of Banda Aceh City was compiled by utilizing the power to overcome threats.

1. Increasing community preparedness in facing fires through programs to form community working groups, environmental security systems, training and using of mass media for publications to improve community preparedness. Conducting fire education for communities, especially residents of dense settlements. Coordinating with peace officers and order with security officers. If the community has been resilient, surely when a fire disaster occurs, the community can anticipate the risks that will arise before waiting for the firefighters to arrive at the location.

WT’s strategy to improve services at the Fire and Safety Department of Banda Aceh City was prepared by minimizing weaknesses to face threats.

1. Collaborating with telecommunication companies so that fire emergency number is free of charge and no disruption so that people can easily contact the department when a disaster occurs and during an emergency. Conducted a routine simulation program in collaboration with the POLRI (Indonesian National Police) and TNI (Indonesian National Armed Forces) to improve the preparedness and orderliness of employees and the community if a fire disaster occurs.

2. Submitting an application to the Government so that special legislation or qanun is made to the public that often disrupts Disdamkar officers when working on location such as taking over the duties of employees without being asked and do things that can harm the firefighters and the community themselves. Also, for the people who often do a fake phone call. This is very detrimental to the department in terms of operations, personnel, and
others. Because until now, there has been no policy or punishment from the Government to the people who did it. If the policies and penalties have been set for the people who make such crimes, surely such problems will not happen again in the future.

4 Conclusion

1. Judging from the Firefighting Service Delivery System at the Fire and Safety Department of Banda Aceh, for the time being, is quite good. The administration system that is in accordance with the SOP, facilities, and infrastructure that have begun to be adequate in response, response and attitudes of the firefighters who are fast, responsive, kind and professional. It is just that there are a number of factors that have not been maximized such as the lack of regular maintenance of facilities owned.

2. From the SWOT analysis, four alternative strategies were obtained to improve the service of the Fire and Safety Department Banda Aceh that are (1) optimizing organizational planning and development by improving management, (2) Increasing mitigation efforts by conducting periodic maintenance on buildings, facilities and infrastructure owned (3) Increasing community preparedness through routine socialization programs, (4) Cooperating with telecommunications companies so that fire emergency numbers are free of charge and no disturbances, (5) Submit special requests to the Government for legal policies for protection of the firefighters.

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Authors' Instructions: Strategy to Improve The Potential of Aceh Regional Bureau of Logistic in Disaster Emergency Response As Support of Humanity Logistic Distribution in Aceh Using Swot and QSPM Analysis Methods

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Abstract. Logistic Bureau has one of many vital functions in supporting logistical distribution during a disaster emergency period, especially in disaster-prone countries such as Indonesia. This study was aimed to find out the roles and functions of Logistic Bureau in Aceh Regional as a supporter of humanitarian logistical distribution during the emergency response period and to develop alternative strategies to improve their roles and functions. This research was a descriptive study embracing qualitative and quantitative design. The data used in this study included primary data and secondary data. Samples were determined by the triangulation method. The research samples were Logistic Bureau of Aceh Regional, Aceh Provincial Social Service, Aceh Disaster Management Agency, and Headman of Dayah Timu Village, Pidie Jaya Regency. Data were collected by participatory observation, in-depth interviews, and documentation for the same data source simultaneously. These results then were analyzed descriptively based on the information in the study so they could be used to develop alternative strategies. The results of the research show that the Logistic Bureau of Aceh Regional only has the role and function as the logistics manager at the moment. Aceh Provincial Social Service, commanded by Aceh Disaster Management Agency, is the one that is responsible for distributing the logistics during the emergency response. People affected by the Pidie Jaya earthquake in 2016 reported that the logistics distribution system was unfair between one village and another so that the community hoped that the distribution system could be improved. Alternative strategies compiled based on the results of the SWOT and QSPM analysis are: Logistic Bureau of Aceh Regional should collaborate with other government agencies, make a program, utilize strong ties with the local government, and increase the efficiency of facilities in distributing logistics by using Government Rice Reserves which are owned and warehouses owned by the Logistics Bureau that are spread in several Aceh Districts. If this is carried out, it is expected that the logistics distribution can be quickly and precisely distributed to disaster victims.

Keywords: Strategy, Emergency Response, Potential Distribution, and Logistics.
1 Introduction

Data National Disaster Management Agency [1] mentions that Indonesia is a natural disaster-prone country so that disaster can occur anywhere and anytime. Indonesians are familiar with the incidents of forest fires, droughts, landslides, hurricanes, floods, volcanic eruptions, earthquakes and tsunamis that have a detrimental effect both in terms of material and mental aspects.

The most potential disasters that hit Indonesia were earthquake and tsunami. During 2004 to 2011, there have been at least five earthquakes followed by tsunamis in Indonesia including Aceh-Nias, Pengandaran, Bengkulu, Mentawai Islands, northern Papua Island, and Padang. The most devastating earthquake and tsunami that occurred in Aceh and Nias on December 26th, 2004 caused around 220,000 fatalities and more than 1 million people lost their homes [2].

Preparedness is an important component in preventing disaster risk. In preparedness, there are nine components of activities that need to be carried out: (1) risk assessment, (2) contingency planning, (3) resource mobilization, (4) training and education, (5) coordination, (6) response mechanism, (7) early warning, (8) information systems, and (9) drilling/simulation.

To ensure the achievement of preparedness, the focus of the program should be on the development of early warning systems, the increase of evacuation capacity, the maintenance of infrastructure facilities for disaster preparedness and simulation. In addition, preparedness to meet basic disaster relief needs is very important to be performed to prevent more casualties. Accurate and efficient information is needed in distributing the needs of disaster humanitarian aid materials. It aims to achieve the right targets in a timely manner so that the survivors do not experience suffering because of waiting for long life assistance.

The timely logistical distribution system is required by the community affected by the disaster. Processes and mechanisms are regulated based on PERKA BNPB No 2 (2012) [3] concerning logistical assistance in the state of emergency response. Management of logistical assistance in the state of an emergency is an integrated activity to manage disaster relief items. The integrated approach includes resource search, logistics procurement, quality assurance, packaging, transportation, warehouse storage, and logistics inventory management. The supply process activities, distribution to the community involve various stakeholders.

Public Company Logistics Agency (Perum Bulog) is a state-owned public company engaged in the food logistics field. Perum Bulog has a program called CBP (Government Rice Reserve) which aims to strengthen the pillars of food stability. CBP is needed to strengthen household food security in emergency situations, such as natural disasters (floods/droughts, pest/disease attacks, volcanic eruptions, earthquakes, tsunamis, etc.) and human-made disasters (social conflicts). To maximize logistical assistance is not enough with this CBP program only, but it also needs the location of logistics warehouses that are safe from disasters and other roles are needed to optimize logistical assistance during the disaster response period.

Kovacs, Tatham, & Paul [4] mentions that logistics plays an important role in disaster management. Logistics provides services between disaster and preparedness, between providing and distributing humanitarian assistance and equipment, between National Board for Disaster Management (BNPB) and regional disaster management agency (BPBD), and logistics also plays an important role in determining the effectiveness and responsiveness in almost all humanitarian assistance programs, such as health, food, shelter, water, and sanitation. Caroline [5] note that serious efforts in coordination are carried out by humanitarian logistic agents continuously, which involve complex interactions and adaptations. If the modeling concept on humanitarian logistics can be properly simulated and applied, involves many humanitarian
logistical supply chain actors, then the appropriate and effective policies can be taken against the problems commonly faced in supplying chain operations.

Ichsa [6] in his research on the management of distribution of logistical assistance for natural disasters victims (a flood disaster case study in Bojonegoro Regency) concluded that the victims of the Bengawan Solo river overflow were forced to beg from highway users in Bojonegoro-Cepu because they had not received assistance from the Government, while the supply in the regional disaster management agency (BPBD) of Bojonegoro Regency was still sufficient. This happened because of the weak governance of the aid distribution during emergencies performed by the State Logistics Agency and other Government Offices. The importance of the aid management distribution demands coordination from various actors. The aid distribution mechanism must also meet the standard of operating procedures. In that research, the concern that has not been achieved is creating alternative strategies to improve the role and function of good logistics distribution so that assistance can be channeled appropriately to disaster victims.

2 Research Methodology

The type of this research was descriptive qualitative research embracing in-depth interview techniques to obtain data through perspective with strategies that are interactive and flexible. Data-sources of this study consisted of primary data (field research) and secondary data (library research). The primary data were obtained through participant observation (in-depth observation) and in-depth interviews, while secondary data were gathered by collecting social-related research references and other supporting data.

This research was conducted at the Logistic Bureau of Aceh Regional, Aceh Provincial Social Service, Aceh Disaster Management Agency, and Dayah Timu Village, Pidie Jaya Regency. The determination of the Logistic Bureau of Aceh Regional as the research location was based on the consideration that this institution has the potency to become a supporting center for humanitarian logistical distribution in Banda Aceh. The selection of Aceh Provincial Social Service and Aceh Disaster Management Agency was based on the consideration that Aceh Disaster Management Agency was the logistics distribution command center during the disaster emergency period and the Aceh Provincial Social Service is the Department that cooperates with the Logistics Bureau to distribute rice both during disasters and other community assistance. The study also examined the beneficiary communities represented by Headman of Dayah Timu Village, with the aim to find out community satisfaction with the assistance provided by the Government during the 2016 Pidie Jaya earthquake emergency.

Samples were determined by using the triangulation method. The samples in this study were 4 people: section chief of the Logistic Bureau of Aceh Regional, the head of Prevention and Preparedness section of the Aceh Disaster Management Agency, the head of the Natural Disaster Social Protection section of the Aceh Provincial Social Service, and the Headman of Dayah Timu Village, Pidie Jaya Regency.

The data were analyzed by descriptive qualitative and quantitative methods, using a SWOT analysis (Strengths, Weaknesses, Opportunities, Threats) and QSPM (Qualitative Strategic Planning Matrix) analysis to design alternative strategies in order to optimize the potential of Logistic Bureau as a logistics distribution center in the emergency response disaster.

3 Discussion

The amount of rice available at Logistic Bureau of Aceh Regional greatly influences the process of rice distribution to the people of Aceh. Rice supplies managed by the Logistic Bureau
of Aceh Regional are intended to anticipate uncertainty in demand and maintain the possibility of crop failure. When a disaster strikes, the Logistic Bureau of Aceh Regional do not participate directly at the location of the accident, but they only provide Government Rice Reserve (CBP) owned through the Social Service which is commanded by the Aceh Disaster Management Agency (BPBA) as requested by the Government. CBP is distributed by the Aceh Provincial Social Service by the requests from the Government with a process of an administrative system controlled by the Aceh Government.

3.1 The Role of Logistic Bureau of Aceh Regional in Logistics Distribution during Disaster Emergency Response

The Logistic Bureau of Aceh Regional does not have specific staff with backgrounds and experts in the field of disaster, and there is no organizational structure to distribute humanitarian logistical assistance. Logistic Bureau of Aceh Regional had never conducted training for employees related to disaster mitigation and logistics distribution during the disaster emergency response period. The warehouse facilities were not used as a logistics warehouses during the emergency response period. The warehouses were only used as needed if they are requested directly by the governor to the Logistics Bureau. During the earthquake emergency response in Pidie Jaya in 2016, the Governor wrote to the National Logistics Agency in attempt to request a logistics warehouse of Logistic Bureau the Pidie Jaya Regional located in Dayah Timu Village to be used as a public kitchen instead of as a humanitarian logistical center.

The Logistic Bureau has 100 tons Government Rice Reserve (CBP) for the district and 200 tons for the province. During the emergency response, CBP can only be issued on the condition that there must be a state of disaster emergency by the government and it should be requested directly from the regent where the disaster occurred with the approval from the governor.

The community response represented by the village head of one of the villages affected by the Pidie Jaya earthquake in 2016 stated that the logistics distribution system at that time was not distributed equitably. Many villages did not receive assistance in a timely manner and the type of assistance was only in the form of patch-up food such as noodle, little rice, and other basic necessities, even though the logistic bureau’s warehouse was located in the village.

3.2 Alternatives Strategy

From the results of the research that has been gathered, starting from knowing the role of Logistics Bureau of Aceh Regional as a support of logistical distribution during the emergency response period to knowing the response of the Pidie Jaya community, as well as from previous research [6]–[9], it can be concluded that there are internal and external potential factors of Bulog Corporation through IFAS and EFAS matrix
Table 1. Internal Factor Analysis Summary (IFAS)

<table>
<thead>
<tr>
<th>Internal Factors</th>
<th>Quality Rating value</th>
<th>Weighted value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>STRENGTHS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The logistic bureau has government rice reserves of up to 200 tons per year</td>
<td>0,17</td>
<td>0,68</td>
</tr>
<tr>
<td>The logistic bureau has a warehouse with a large logistical capacity</td>
<td>0,16</td>
<td>0,64</td>
</tr>
<tr>
<td>The logistic bureau has a large number of supporting staffs throughout Aceh</td>
<td>0,08</td>
<td>0,16</td>
</tr>
<tr>
<td>The logistic bureau has strong ties with the Government</td>
<td>0,07</td>
<td>0,14</td>
</tr>
<tr>
<td>Logistics quality check is performed before and after distribution</td>
<td>0,07</td>
<td>0,14</td>
</tr>
<tr>
<td><strong>SUB TOTAL</strong></td>
<td><strong>0,55</strong></td>
<td><strong>1,76</strong></td>
</tr>
<tr>
<td><strong>WEAKNESSES</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The logistic bureau does not have a specific staff or organizational structures in emergency response logistics distribution</td>
<td>0,10</td>
<td>0,2</td>
</tr>
<tr>
<td>The logistic bureau has never been involved directly in logistics distribution during the disaster emergency period</td>
<td>0,13</td>
<td>0,39</td>
</tr>
<tr>
<td>The logistic bureau does not have an SOP as a logistics distributor during the disaster emergency period</td>
<td>0,11</td>
<td>0,33</td>
</tr>
<tr>
<td>The logistic bureau does not cooperate beside with other agreed partners or government agencies</td>
<td>0,11</td>
<td>0,33</td>
</tr>
<tr>
<td><strong>SUB TOTAL</strong></td>
<td><strong>0,45</strong></td>
<td><strong>1,25</strong></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>1,00</strong></td>
<td><strong>3,01</strong></td>
</tr>
</tbody>
</table>

Source: primary data (modified), 2018

3.3 Subtitle

From Table 1 above, it can be seen that the maximum possible value is four, which means maximum strength and the lowest value is zero, which means full weakness. The value above 3.0 is included in the high category, values around 2.0 to 2.99 are categorized as a medium, while values between 1 and 1.99 are categorized as low. Then, the 3.01 weighted value is included in the high category. Furthermore, the External Factor Analysis (EFAS) can be seen in Table 2 below.

Table 2. External Factor Analysis Summary (EFAS)

<table>
<thead>
<tr>
<th>External Factors</th>
<th>Quality Rating value</th>
<th>Weighted value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opportunities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Logistic bureau has 15 logistics warehouses spread across 8 Aceh Districts</td>
<td>0,16</td>
<td>0,64</td>
</tr>
</tbody>
</table>
The logistic bureau has a supporting facility for distributing logistics from small to large-sized cars

<table>
<thead>
<tr>
<th></th>
<th>0,12</th>
<th>3</th>
<th>0,36</th>
</tr>
</thead>
<tbody>
<tr>
<td>Periodic socialization to villages in distributing affordable rice</td>
<td>0,08</td>
<td>2</td>
<td>0,16</td>
</tr>
<tr>
<td><strong>SUB TOTAL</strong></td>
<td>0,48</td>
<td>1,52</td>
<td></td>
</tr>
</tbody>
</table>

**Threats**

| Lack of coordination between the logistic bureau and related agencies in terms of logistics distribution | 0,16 | 3    | 0,48 |
| The logistic bureau has not yet developed, only focusing on rice distribution with a program like affordable rice | 0,14 | 3    | 0,42 |
| **SUB TOTAL**            | 0,42 | 1,28 |
| **TOTAL**                | 1,00 | 2,81 |

Source: primary data (modified), 2018

From Table 2, it can be seen that the weighted value figure is 2.81 with the assumption that the potential of the Logistics Bureau in supporting logistic distribution during the disaster emergency period is strongly supported by the facilities currently owned. The value of 2.81 belongs to a medium category, which means that the Bulog Corporation has the opportunity in supporting facilities to support logistics distribution such as logistics warehouses that are spread across several regions of Aceh with a large holding capacity.

The threat in the form of lack of coordination and collaboration with other agencies in the distribution of logistical assistance during disaster emergency response has a lower value than the opportunity so that opportunities for development are greater.

The average value of IFE is 3.01 and the average value of the EFE is 2.81 so the total weighted value is 2.91. The meeting point of the two values is in quadrant II which can be seen in Table 3 below

<table>
<thead>
<tr>
<th>Table 3. Matrix Internal-External (IE)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strong</strong></td>
</tr>
<tr>
<td>3,0-4,0</td>
</tr>
</tbody>
</table>

| Strong 3,0-4,0 | I Growth strategy | II Growth strategy | III Contraction strategy |
|               |                  |                 |                           |
| Middle 2-2,99 | IV Stability strategy | V Stability strategy | VI Contraction strategy |
| Weak 1-1,99   | VII Growth strategy | VIII Growth strategy | IX Contraction strategy |

Source: primary data (modified), 2018
From Table 3 above, it can be seen that the meeting points of the two axes are in the cell or the second quadrant which shows the strategy needed to strengthen the potential of Logistic bureau as a supporter of logistics distribution during the emergency response strategy is growth.

By determining the right weight and strategy, it is found that there are five key strategies to strengthen the potential of the logistic bureau as a logistics distribution distributor during the emergency response period through the stages in the SWOT analysis which can be seen in Table 4 below.

<table>
<thead>
<tr>
<th>Strategi S-O</th>
<th>Strategi W-O</th>
<th>Strategi S-T</th>
<th>Strategi W-T</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Logistic bureau created a program by cooperating with the Government Agency in utilizing the facilities owned. Utilizing a periodic quality check logistics program at CBP to arrange preparations in advance if a threat occurs.</td>
<td>1. Logistics Bureau makes a program for logistics distribution during the disaster emergency period by utilizing the workforce it had.</td>
<td>1. Utilizing the Government network for logistics distribution during the emergency response period and responding to requests for assistance from the Office relating to submitting to the Government.</td>
<td>1. Creating an organizational structure for the emergency response period in logistics distribution and cooperating with partners by utilizing Government access.</td>
</tr>
</tbody>
</table>

After getting a reinforcement strategy to increase the role and function of the Regional Division of Logistics Bureau as a supporter of logistical distribution during the disaster emergency period, it is crucial to get the most important strategy from the five strategies using QSPM analysis with the stages of determining weight and Attractiveness scores (US) by discussing with one expert respondent from logistic bureau and calculating Total Attractiveness scores (TAS). To be clearer, the sequence of strategies needed to improve the role and function of the logistic bureau of Aceh Regional Division as a supporter of logistics distribution during the disaster emergency response period can be seen in the alternative strategy table 5 using QSPM analysis as follows.

<table>
<thead>
<tr>
<th>Strategic alternatives</th>
<th>Quality</th>
<th>AS</th>
<th>TAS</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Create a cooperation program with the Government Office by utilizing the facilities owned</td>
<td>0,20</td>
<td>3,8</td>
<td>0,76</td>
<td>1</td>
</tr>
<tr>
<td>2. Create a cooperation program with the Government Office by utilizing the facilities owned</td>
<td>0,20</td>
<td>3,1</td>
<td>0,62</td>
<td>3</td>
</tr>
</tbody>
</table>
Table 5 shows strategies needed to strengthen the role and function of the Logistics Bureau of Aceh Regional Division as a supporter of logistical distribution during the disaster emergency response period. Alternative strategies with the highest value are the strategies that need to be implemented first. The results of the QSPM analysis show five alternative strategies based on the results of the SWOT analysis and QSPM, the alternative strategies were obtained to improve the role and function of the Bureau of Logistics as support for logistics distribution.

a. The main alternative strategy is to create a cooperation program with other government agencies (TAS Value 0.76) by utilizing the facilities owned by the Bureau of Logistics in the distribution of logistical assistance, by utilizing CBP owned up to 200 tons per year and by spreading Bulog Perum warehouses in several districts of Aceh Province.

b. Utilizing the Government network (TAS Value 0.72) for logistical distribution of the emergency response period and responding to requests for assistance from related agencies, non-governmental institutions, and the business world by submitting to the government.

c. Utilizing a logistic quality checking program to anticipate an earlier threat (TAS Value 0.62).

d. Creating an organizational structure for emergency response periods in logistics distribution and collaborating with partners by utilizing government access (TAS Value 0.58)

e. Making a program for logistics distribution by utilizing the workforce that is owned (TAS Value 0.54).

The strategy chosen is only one with the highest TAS value of 0.76: Aceh regional Logistic bureau establishing cooperation with government agencies by utilizing strong ties with the local Government and facilities in distribution logistics, by utilizing CBP up to 200 tons per year as
well as by spreading warehouses owned by Public Logistics Agency in several Aceh Districts. Respondent experts have an interest in these alternative strategies because they consider that by cooperating with the Government Service and other institutions with agreements known by the central government and utilizing the maximum CBP by the logistic bureau, the distribution of humanitarian logistics during the emergency response period disasters will be more precise and quick to the disaster victims.

The results of previous research conducted by Reza [10] revealed that the organizational structure of the National Logistics Agency is very formal and they already have a clear division of their respective work tasks which are not too complex. The type of work within the logistic bureau is not too much division, so it will not cause more organizational problems. And of course, it becomes a supporting factor. However, the organizational structure of Bulog is also centralistic in nature, as a consequence, it can be an obstacle and result in slowing down the State Logistics Agency in following up on various problems, also Bulog Corporation does not have work bond with the Government Service other than Social Affairs in distributing humanitarian logistics distribution in the event of a disaster.

4 Conclusions

From the research results and discussion, the following conclusions can be taken.

1. Based on the role of the logistic bureau of Aceh regional, the cooperation only has a role as CBP manager so that the quality should be maintained when it is distributing to disaster victims. The Social Service has the role to distribute CBP to disaster victims during the disaster response period. Aceh Disaster Management Agency (BPBA) gets a role as a commander. The Logistics Bureau facilities are only utilized in emergency situations, such as the logistic bureau warehouse which could be used for public kitchens in the Pidie Jaya earthquake case in 2016. From the interviews with Pidie Jaya 2016 earthquake victims, the Government and other Institutions, logistics were still not distributed equitably.

2. From SWOT analysis and QSPM method, alternative strategies were obtained to improve the role and function of the logistic bureau as supporting logistics distribution and the main alternative strategy with the highest TAS value of 0.76 is to conduct a collaborate program with other Government Offices by utilizing strong relationship with the local government.

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Darwanis, Muhammad Arfan, Irshadi
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Abstract. This study aims to examine the effect of teamwork and clarity of the budget goal on managerial performance which has implications on the performance of district working units (Satuan Kerja Perangkat Kabupaten/SKPK) in the municipality of Sabang, Aceh, Indonesia, both simultaneously and partially. The population of this study comprises of district working units in Sabang municipality as many as 34 SKPK. The hypotheses were tested based on the primary data sources in the form of questionnaires which were distributed to heads of 34 SKPK. The data were analyzed using path analysis. The results showed that teamwork and clarity of budget goal had an effect on the managerial performance of SKPK in the Sabang municipality, both simultaneously and partially. Furthermore, teamwork, budget goal clarity and managerial performance simultaneously and partially influence the SKPK performance of the Sabang Municipality. Furthermore, the test performed using mediation variables showed that managerial performance partially mediates the effect of teamwork and clarity of the budget goal on SKPK performance in the Sabang Municipality.

Keywords: Teamwork, Budget Goal Clarity, Managerial Performance and SKPK Performance

1 Introduction

The main objective of implementing regional autonomy is to improve public services and advance the regional economy. The implementation of regional autonomy encompasses three main purposes, 1) improving the quality and quantity of services and welfare of the people, 2) creating efficiency and effectiveness of regional resource management, and 3) empowering and creating space for people to participate in the development process [1]. The performance conditions of local governments throughout Indonesia are still far from expectations, this is evident based on the results of the previous study stated that the national average performance of governance of all local governments only reached a value of 5.70 from the maximum value of 10 [2]. As a result, the demands from the community towards the government are intensely carried out, which aims at making the government have a good performance in carrying out its duties and responsibilities as an embodiment of regional autonomy.

Mahsun [3] highlights that "performance is the ability of work shown by work result". In the Regulation of the Minister of Home Affairs (PERMENDAGRI) Number 21 the Year 2011 article 1 paragraph, 37 stated that performance is the output or outcome of activities that will or have been achieved in connection with the use of the budget with measurable quality and quantity [4].

The good or bad performance of the local government is due to the performance of the SKPK. SKPK performance can be influenced by managerial performance, teamwork, and clarity of budget goal. The managerial role is very important in government organizations, in carrying out SKPK activities. The research results of Rediono & Ujianto [5] indicate that improvement in organizational performance is strongly influenced by managerial performance.

Furthermore, Mahmudi [6] elaborates that teamwork is basically a combination of individual performance in teams, individual performance and team performance will affect overall organizational performance. Some research results show that teamwork has a positive and significant influence on organizational performance [5], [7].

In the context of local government, the clarity of the budget objectives has implications for performance, to prepare a budget in accordance with the objectives of government institutions [8]. In the research conducted by
Emilia, Abdillah, & Abdullah [9], it was found that clarity of budget goals had a significant effect on SKPD performance.

In addition to influencing SKPK performance, teamwork and clarity of budget goals are also expected to affect managerial performance. Balance theory states that teamwork is directly related to the performance of managers [10]. The theory is supported by the results of research by Rediono & Ujian [5], Zincirkiran [7] stating that teamwork influences managerial performance. Managerial performance can also be influenced by the clarity of budget goals, as stated by Kenis [11], that managers react positively and are relatively very strong to improve the clarity of budget goals. The results of previous research[8], [9], [12], [13] shows that the clarity of budget goals has a positive effect on managerial performance.

Based on the above background, this study aims to examine the effect of teamwork and clarity of the budget goal on managerial performance which has implications for the regional working unit (SKPK) performance on the Sabang Municipality, both simultaneously and partially.

2 Literature Review

2.1 SKPK Performance

Performance is a description of the level of achievement of an activity/program/policy in realizing the goals, objectives, mission, and vision of the organization contained in the formulation of a strategic scheme (strategic planning) of an organization [14]. In PP No. 58 of 2005 Article 1 paragraph 35 states "performance is the output or outcome of activities /programs that will be or has been achieved in connection with the use of the budget with measurable quantity and quality" [15].

In addition, [1] emphasized that the measurement of public sector performance is carried out to fulfill three objectives. First, the measurement of public sector performance aims to help improving government performance that focuses on the goals and objectives of the work unit program. This can ultimately improve the efficiency and effectiveness of public sector organizations in providing public services. Second, measures of public sector performance are used to resources allocation and decision making purposes. Third, a measure of public sector performance is intended to realize public accountability and improve institutional communication in public sector organizations in providing public services.

2.2 The Effect of Teamwork on Managerial Performance

Good teamwork must be founded on a strong moral and ethical foundation. This moral and ethical foundation must be the integrity of the team in contributing to the organization [16]. Meidiyana, Rutiyaningsih, & Immanuella [17] in their research about the application of TQM found that teamwork had a significant effect on managerial performance. Some studies [5], [7], [10] conclude that teamwork influences managerial performance. Based on this explanation, it can be stated that teamwork has an effect on SKPK managerial performance.

2.3 The Effect of Budget Goal Clarity on Managerial Performance

Clarity of budget goals is the extent to which the objectives of the budget are clearly defined and flexible with the aim that the budget can be understood by people who are responsible for achieving these goals [11]. Furthermore, Kenis [11] states that "the budget is not only a tool for planning and controlling costs and income within the organization, but also as managerial budget to coordinate, communicate and evaluate performance and motivate subordinates." towards managerial performance. This is supported by the results of previous research [8], [9], [12], [13], which highlight that clarity of budget goal has a positive effect on managerial performance.

2.4 The Effect of Teamwork on SKPK Performance

According to Robbins & Timothy [18], teamwork is a group whose individual efforts produce higher performance than the number of individual inputs. Based on this relationship, it is explained that effective teamwork is teamwork that has the same goal, high enthusiasm, clear roles and responsibilities, effective communication, political resolution, shared power, expertise, appreciation, positive attitudes and thoughts, and evaluation [19]. Teamwork is very important for the division of tasks within the organization so that planned programs or activities can be completed on time and subsequently improve organizational performance. The
results of the research by Rediono & Ujianto [5] demonstrated that teamwork has a positive and significant influence on organizational performance. Zincirkiran [7] also signified that there is a positive relationship between teamwork and organizational performance. Based on the above description, it can be stated that teamwork has an effect on the performance of SKPK.

2.5 The Effect of Teamwork on SKPK Performance Mediated by Managerial Performance

Managerial is the process of influencing the behavior of others to take steps or actions towards a common goal [20]. In forming an effective teamwork to achieve organizational goals, leadership or managerial is needed to provide focus and direction. Therefore it can be illuminated that managerial performance can mediate the effect of teamwork on SKPK performance. This is supported by Rediono & Ujianto [5] stating that teamwork has an effect both directly and indirectly on organizational performance through managerial performance variables.

2.6 The Effect of Budget Goal Clarity on SKPK Performance Mediated by Managerial Performance

From a managerial point of view, a budget is a management tool for a government entity or public sector agency. To ensure that the budget prepared reflects precisely as an activity expressed in numbers as an effort to deliver the goals, mission, and objectives of a government organization. Aside from being a budget management tool, it is also an activity control tool [21].

It is clear that a managerial role is significant in directing budget targets to improve organizational performance. Kenis [11] suggests that managers give positive and very strong reactions to improve the clarity of budget goals. As a consequence, the clarity of budget goals has a positive effect on organizational performance. Thus it can be stated that managerial performance mediates the effect of clarity of budget goals on SKPK performance.

3 Research Methods

This research is hypothesis testing and causality type of study because besides measuring the strength of the relationship between two or more variables, this study also shows the direction of the relationship between independent variables and dependent variables. Based on the environmental conditions, this study utilizes field experiments with moderate levels of intervention but still in a natural environment (not manipulated). The time used in data collection is a one-shot study with an organizational analysis unit, known as District Working Unit (SKPK) within the Sabang Municipality, which amounts to 34 SKPK consisting of agencies, departments, and offices. Meanwhile, the respondents in this study were the Heads of respective SKPK.

This study uses the census method because the entire population is used as a unit of research analysis. This study utilizes primary data in the form of questionnaires, which were given directly to the intended respondents.

3.1 Operationalization of Variables

This study uses three variables, 1) the dependent variable, namely the performance of SKPK (Z), 2) intervening/mediator variable, namely managerial performance (Y), and 3) independent variables which consist of teamwork (X1) and budget goal clarity (X2). Operationalization of the variables used in this study is as follow:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
<th>Indicator</th>
<th>Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent Variable: SKPK Performance(Z)</td>
<td>The description of the level of achievement of the goals or objectives of government agencies as a description of the vision, mission and strategies of government agencies that indicate the level of success and failure in the implementation of activities in accordance with the programs and stipulated policies [22].</td>
<td>1. Input 2. Output 3. Result</td>
<td>Interval</td>
</tr>
</tbody>
</table>
Managerial performance is the performance of individuals in managerial activities such as planning, investigation, coordination, evaluation, supervision and staffing arrangements, negotiation and representation [23].

Group of individuals with specific expertise who work together and interact to achieve common goals (Ilyas, 2006:1).

Budget goal clarity is the extent to which the budget goals are clearly and specifically set with the aim that the budget can be understood by people who are responsible for achieving these goals [11].

3.2 Data Analysis

Data analysis was performed using path analysis which is a method that analyzes the pattern of relationships between variables [25]. Questionnaires that were filled up by the respondents were processed using SPSS version 21. Then the data quality test is carried out, namely validity and reliability test, classic assumption test, and correlation test.

According to Baron & Kenny [26], a variable functions as a mediator when fulfilling the following conditions: (a) Variable variations in the independent variables significantly account for variations in the presumed mediator, (b) variations in the mediator, significant accounts for variations in the dependent variable, and (c) when Paths a and b are controlled, a significant number between the independent and dependent variables is significant, with the strongest demonstration of mediation occurring when Path c is zero. We may envisage a continuum. When Path is reduced to zero, we have strong evidence for a single, dominant mediator.

There are two possibilities that occur from the results of tests put forward by Preacher & Hayes [27], namely: 1) Perfect or full mediation, meaning that the independent variable does not have an influence on the dependent variable after entering the mediator variable, 2) Partially Mediation, meaning the influence of independent variables the dependent variable decreases but is not zero after entering the mediator variable.

The design of this research hypothesis testing, as in the following figure:

**Figure 1. Design of Hypothesis Testing**
The substructure models I and II can be formulated as follows:

\[ Y = P_1X_1 + P_2X_2 + \varepsilon_1 \]  
\[ Z = P_3X_1 + P_4X_2 + P_5Y + \varepsilon_2 \]

Explanation:
- \( Y \): Managerial Performance
- \( Z \): SKPK Performance
- \( X_1 \): Teamwork
- \( X_2 \): Budget Goal Clarity
- \( \rho \): Path Coefficient
- \( \rho \varepsilon_1 \): Other Variables that affect \( Y \)
- \( \rho \varepsilon_2 \): Other Variables that affect \( Z \)

4 Results and Discussion

The test results based on path coefficients show that all path coefficients of independent variables, intervening, and dependent is not equal to zero. This finding indicates that all hypotheses in this study are acceptable. The research path equation is as follows:

**Figure 2. Scheme of Research Results**

\[ Y = 0.502X_1 + 0.419X_2 + 0.457\varepsilon_1 \]
\[ Z = 0.144X_1 + 0.448X_2 + 0.407Y + 0.302\varepsilon_2 \]

4.1 The Effect of Teamwork and Budget Target Clarity on Managerial Performance at SKPK

The results of hypothesis testing indicate that teamwork and clarity of budget targets simultaneously influence managerial performance in the Sabang Municipality environment. This means that the high/low managerial performance can be influenced simultaneously by the work team and the clarity of the budget goals. Simultaneously, the magnitude of the effect of teamwork and the clarity of the budget target on managerial performance in SKPK in the Sabang Municipality environment is 79.1%, the remaining 20.9% is influenced by other factors not included in this research model. The simultaneous effect can be said to be a very strong influence.

**Table 2. Strong Category Effect of Sub-structure I**

<table>
<thead>
<tr>
<th>No.</th>
<th>Variable</th>
<th>Path Coefficient</th>
<th>Direct</th>
<th>Indirect</th>
<th>Total</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>( X_1 ) to ( Y )</td>
<td>0.502</td>
<td>0.252</td>
<td>-</td>
<td>0.252</td>
<td>Strong effect</td>
</tr>
<tr>
<td>2.</td>
<td>( X_2 ) to ( Y )</td>
<td>0.419</td>
<td>0.176</td>
<td>-</td>
<td>0.176</td>
<td>Moderate effect</td>
</tr>
<tr>
<td>3.</td>
<td>( X_1 ) to ( Y ) through ( X_2 )</td>
<td>0.865*</td>
<td>-</td>
<td>( 2(0.502 \times 0.419 \times 0.865) )</td>
<td>0.363</td>
<td>Very strong effect</td>
</tr>
</tbody>
</table>

Simultaneous Effect 0.791  Very strong effect

Effect of Other Variables (\( \varepsilon_1 \)) 0.209
4.2 The Effect of Teamwork on Managerial Performance at SKPK

The results of hypothesis testing indicate that teamwork has an effect on managerial performance in SKPK within the Sabang Municipality. The path coefficient is 0.502 and has a positive direction, meaning that if teamwork goes up one unit then managerial performance will increase by 0.502 units at the interval scale. That is, the high/low managerial performance is influenced by the teamwork built by SKPK. The magnitude of the influence of teamwork on managerial performance is 25.2% which is categorized as a strong effect.

The results of this study are in line with the results of previous research[5], [7], [10], [17] which shows that teamwork has a positive effect on managerial performance. Thus it can be concluded that in implementing the SKPK activity program there must be teamwork, good teamwork can improve managerial performance in the SKPK in the Sabang Municipality.

4.3 The Effect of Budget Goal Clarity on Managerial Performance at SKPK

The results of hypothesis testing indicate that the clarity of the budget goal influences managerial performance in the SKPK of the Municipality of Sabang. The path coefficient of 0.419 and positive direction means that if the clarity of the budget goal rises by one unit, managerial performance will increase by 0.419 units at the interval scale. This means that managerial performance is effected by the budget goal clarity for each SKPK. The magnitude of the effect of the clarity of the budget goal on managerial performance in the SKPK of the Sabang Municipality is 17.6%. The effect of budget goal clarity on managerial performance can be said to have a moderate effect.

The results of this study are in accordance with the results of previous studies [8], [9], [12], [13] which states that the clarity of budget targets has a positive effect on managerial performance. Thus it can be concluded that improving managerial performance in each SKPK within the Sabang Municipality can be done by setting a clear budget goal.

4.4 The Effects of Teamwork, Budget Goal Clarity, and Managerial Performance on SKPK Performance

<table>
<thead>
<tr>
<th>No.</th>
<th>Variable</th>
<th>Path Coefficient</th>
<th>Direct</th>
<th>Indirect</th>
<th>Total</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>X1 to Z</td>
<td>0.144</td>
<td>0.020</td>
<td>-</td>
<td>0.020</td>
<td>Weak Effect</td>
</tr>
<tr>
<td>2.</td>
<td>X2 to Z</td>
<td>0.448</td>
<td>0.200</td>
<td>-</td>
<td>0.200</td>
<td>Moderate Effect</td>
</tr>
<tr>
<td>3.</td>
<td>Y to Z</td>
<td>0.407</td>
<td>0.166</td>
<td>-</td>
<td>0.166</td>
<td>Moderate Effect</td>
</tr>
<tr>
<td>4.</td>
<td>X1 to Z through X2</td>
<td>0.865*)</td>
<td>-</td>
<td>2(0.144 x 0.448 x 0.865)</td>
<td>0.111</td>
<td>Moderate Effect</td>
</tr>
<tr>
<td>5.</td>
<td>X1 to Z through Y</td>
<td>0.864*)</td>
<td>-</td>
<td>2(0.144 x 0.407 x 0.864)</td>
<td>0.101</td>
<td>Moderate Effect</td>
</tr>
<tr>
<td>6.</td>
<td>X2 to Z through Y</td>
<td>0.853*)</td>
<td>-</td>
<td>2(0.448 x 0.407 x 0.853)</td>
<td>0.311</td>
<td>Strong Effect</td>
</tr>
</tbody>
</table>
The results of testing the hypothesis of the substructure II equation show that teamwork, clarity of budget goals, and managerial performance simultaneously affect the performance of SKPK. The magnitude of the effect is 90.9% while the remaining 9.1% is influenced by other factors that are not included in this research model. The simultaneous effect can be said to have a very strong influence.

4.5 The Effect of Teamwork on SKPK Performance

The results of hypothesis testing on the substructure II equation show that teamwork has an effect on the performance of SKPK in the Sabang Municipality environment. The path coefficient of 0.144 and the positive direction means that if teamwork increases by one unit, the SKPK performance will increase by 0.144 units at the interval scale. This means that the high/low performance of SKPK is influenced by the work of the team formed by each SKPK. The magnitude of the effect of teamwork on SKPK performance is 2%. The influence of teamwork on SKPK performance can be said to have a weak influence. This can be interpreted that teamwork is still weak in positively influencing SKPK performance of the Sabang Municipality. The results of this study support the results of research by Rediono & Ujiarto [5] which show that teamwork has a positive influence on organizational performance.

4.6 The Effect of Budget Goal Clarity on SKPK Performance

The results of the hypothesis testing of the substructure II equation show that the clarity of the budget goals influences the SKPK performance in the Sabang Municipality environment. The path coefficient of 0.448 and positive direction means that if the clarity of the budget goals rises by one unit, the SKPK performance will increase by 0.448 units at the interval scale. This means that the high/low SKPK performance in the Sabang Municipality can be influenced by the clarity of the budget goals in each work unit. The magnitude of the effect of the clarity of the budget goals on the performance of SKPK in the Municipality of Sabang is 20%. The effect of the clarity of the budget goals on SKPK performance can be said to have a moderate effect. The results of this study are in accordance with the results of previous studies [9], [24] which showed that the clarity of the budget goals had a positive effect on SKPK performance. Research by Kenis [11] also found that budget goal clarity had a positive effect on performance.

4.7 The Effect of Managerial Performance on SKPK Performance

The results of the hypothesis testing of the Structure II equation show that managerial performance has an effect on the SKPK performance in the Sabang Municipality. The path coefficient of 0.407 and positive direction means that if managerial performance rises by one unit the SKPK performance will increase by 0.407 units at the interval scale. This means that the high/low performance of SKPK is influenced by the managerial performance of the Sabang Municipality SKPK itself. The magnitude of the influence of managerial performance on SKPK performance in the Sabang Municipality is 16.6%. The effect of managerial performance on SKPK performance can be said to have a moderate influence. This is in accordance with the
results of previous studies conducted by Rediono & Ujianto [5] stating that to improve organizational performance is strongly affected by managerial performance.

4.8 Managerial Performance Mediates The Effect of Teamwork on SKPK Performance

Table 4. Mediation Test Results

<table>
<thead>
<tr>
<th>Regression</th>
<th>Coefficient $X_1$</th>
<th>Coefficient $X_2$</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td>0.348</td>
<td>0.618</td>
<td>Mediation applies (Baron dan Kenny, 1986)</td>
</tr>
<tr>
<td>III</td>
<td>0.144</td>
<td>0.448</td>
<td></td>
</tr>
</tbody>
</table>

Explanation:
- Regression II is a regression of the effect of independent variables ($X_1$ and $X_2$) on the dependent variable ($Z$) without intervening variables ($Y$).
- Regression III is a regression of the effect of independent variables ($X_1$ and $X_2$) and intervening variables ($Y$) on the dependent variable ($Z$).

The results of hypothesis testing indicate that the direct effect of teamwork variables on the SKPK performance variable is 0.348. After entering managerial performance variables as mediator variables, the regression coefficient value of teamwork variables is reduced but ($\neq 0$) that is equal to 0.144, so that it can be stated that there is partial mediation. This means that managerial performance partially mediates the effect of teamwork on SKPK performance on the Sabang Municipality.

This condition, known as partial mediation, means that teamwork can directly influence SKPK performance and also teamwork can influence SKPK's performance mediated by the performance of the serial number on SKPK in the Sabang Municipality. The results of this research are in line with the research of Rediono & Ujianto [5] which states that managerial performance mediates the effect of teamwork on organizational performance.

4.9 Managerial Performance Mediates the effect of Budget Goal Clarity on SKPK Performance

The results of hypothesis testing indicate that the direct effect of the budget goal clarity variable on the SKPK performance variable is 0.618. After entering managerial performance as a mediator variable, the regression coefficient variable budget goal clarity will be reduced but ($\neq 0$) that is equal to 0.448, so that it can be declared partial mediation. This means that managerial performance partially mediates the influence of the clarity of the budget target on SKPK performance on the Sabang Municipality. This condition, called the partial mediation, means that the clarity of the budget goal can be directly or indirectly through managerial performance affecting the performance of the SKPK in the Sabang Municipality.

5 Conclusion

The results of this research indicated that teamwork and budget goal clarity simultaneously or partially affect managerial performance. Additionally, teamwork, budget goal clarity, and
managerial performance simultaneously or partially influence the performance of SKPK. This study also found that managerial performance partially mediates the influence of teamwork and budget goal clarity on SKPK performance in the Sabang Municipality. The Sabang Municipality needs to build solid teamwork on each SKPK, the budget goal in the SKPK must be clear and in detail so that the performance target is easily achieved, in appointing the SKPK head must consider managerial capabilities, because managerial capabilities play a significant role in improving SKPK performance.

To further strengthen the findings of this study, future research may utilize more than primary data in the form of questionnaires by possibly undertaking direct interviews not only with one respondent in the study in one SKPK but also with employees who understand well the problem under study. Furthermore, it is recommended to expand the scope of the study by adding other relevant variables beyond the variables used in this study.

REFERENCES


Study of Channel Efficiency and Water Requirements of Cubo Irrigation

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Abstract. The study aimed to determine the channel efficiency and water requirements of existing irrigation of Cubo in Pidie Jaya District, Indonesia. The descriptive method is used in the research by observing the efficiency of primary and secondary channels. The average channel efficiency value is used to estimate irrigation water requirements. The results showed the efficiency of the primary channel is 59.41%, the efficiency of the secondary channel is 56.04%, and the average channel efficiency is 57.73%. Net farm requirement (NFR) is 1.04 l/s/ha, diversion requirement (DR) is 1.81 l/s/ha and irrigation water requirement of 1,090 ha is 1.97 m³/s. When compared with channel efficiency in general, channel efficiency in this irrigation area is relatively low due to lack of maintenance of channels and the presence of water losses due to illegal tapping of water.

Keywords: Water availability, water requirements, irrigation efficiency

1 Introduction

The irrigation Cubo, Trienggadeng, that was included in Pidie Jaya district started built since the fiscal year 1975-1976. The irrigation was a simple network until the fiscal year 1980-1983 and completed in the fiscal year 1989-1990. The irrigation area has a potential area as wide as 1,545 ha, whereas functional area as wide as 1,090 ha. The water resource used for the irrigation comes from Krueng Inong that is one of the upstream of Krueng Panteraja that located at river area in Aceh. Currently, farmers at the Cubo, Trienggadeng, irrigation face several problems. In the first planting season that is October, the farmers can irrigate the whole functional area as wide as 1,090 ha. While in the second planting season that is May, water shortage occurred that only 50% of the functional area can be planted. To cover the water shortage, there are several retention basins around the irrigation area which is utilized to accommodate excess water during the rainy season.

The availability, effectivity, and efficiency of the irrigation network infrastructure in the region are needed. This is due to the abundant amount of water in the wet season because of high rainfall and vice versa in the dry season. The availability of water is the main factor in the success of irrigation. Even though the amount of water available is sufficient, but if the consistency of water distribution efficiency is not maintained will cause the available water will not cover the entire area. One of the successes of the performance of the irrigation networks can be seen from the consistency of the value of irrigation efficiency itself.

Ajnn.net (2017) [1] assess that the irrigation project of Cubo in Bandar Baru sub-district in Pidie Jaya must be evaluated. The decline in efficiency may be due to the bad management of the irrigation area. Bad and irregular operations and maintenance that result in a decrease in the
amount of water due to increased water loss. Young [2] said that bad of irrigation management can increase the loss of water because seepage, percolation and inappropriate distribution of water, the increasing of rice field development associated with consumption rice and increased the number of residents.

Therefore, the main point on improving paddy field resources is to increase the productivity result. The result of the productivity is still classified as low and still had a chance to be improved because based on the research of Suharno, Djasmi, & Kartono [3] showed that several varieties of rice can give results that reach 6 t/ha by applying technology of irrigation systems and Suharno, Djasmi, & Kartono [3] reported that through improvements in technology cultivation, proper planting time and pest control, by planting superior varieties the results obtained can reach 4.4–7.2 t/ha. The difference in scores between the results of the research with the production at the farm induced by the use of low quality seed, the use of not recommended technology, and the existence of the restricting factors that is the low soil fertility.

The drainage of water from upstream to downstream need adequate infrastructure of irrigation such as dam, the primary and secondary channel, division boxes, measurement building, tertiary channels, and a farming level channel. The whole facilities of irrigation are a unity, if there are damages in certain parts it will affect the performance of the existing system, resulting in decreased irrigation efficiency and effectiveness, the availability of potential water resources and agricultural land is increasingly scarce and limited. The limited water resources in Cubo while the need for water for various uses is increased causing water demand to increase.

The more limited and competitive availability of water resources not only will have a negative influence on the lives of the community but also in the social and economic aspect. Most of the water needs outside the agricultural sector are to meet household and industrial consumption which tends to increase in line with economic progress.

According to Rachman [4] irrigation management is an effort to distribute water fair and evenly, but in its implementation often face on some problem, namely: 1) the growth of water group area without any control, 2) the location of the rice field is not taken into account in the distribution of water and downstream technology recommendation, 3) wild tapping of water in the flowing process continues without sanctions, 5) rice productivity is varied between parts upstream and downstream. It can be said that this problem cannot be separated from institutional capacity or element of the policy that has not been functioning effectively in raising awareness of the importance of water management to the community. The assumption that irrigation water is public good tends to lead to inefficient in using water. Economically, obscurity regarding the rights in the use of water and obligations in water management cause water user association organizations are less effective, institutional mechanisms in the allocation of water resources do not function, giving rise to inefficiency water usage.

The needs of irrigation water decided by the age and the types of crops will be planted, and also the current weather, so that the management of the irrigation channel will follow the cropping pattern. The management of the irrigation network will be adjusted to the availability of irrigation water. If the demand is bigger than the availability of water, so that optimize analysis is needed to maximize the functional area or maximum advantage in one-year planting.

2 Method

The research carried out in irrigation of Cubo farming areas in three sun-districts that are Bandar Baru with an area of 1,365 ha, Panteraja with an area of 222.25 ha, and Triengjadeng
with an area of 1,376 ha. This research carried out in December 2017. The mapping was done in Remote Sensing Laboratory and Faculty of Agriculture of the University of Syiah Kuala.

Based on Central Bureau of Statistics BPS of Pidie Jaya (2016) [5], the geographical area of Pidie Jaya is 1,162.84 km² in width consisting of 952 km² of land area, sea area as wide as 210.84 km². This region in astronomically is on coordinates 4.91- 5.30 northern latitudes and 96.02-96.36 east longitude.

The research used the descriptive method by collecting primary and secondary data. The primary data was obtained by doing direct field observation and interview with the farmers. The implementation of this study consisted of the preparation of research, the preparation of land, the water supply for the land, the water demand for the land preparation, retrieval needs and withdrawal discharge of water, data analyzed was precipitation data, regional discharge plan of Cubo irrigation water channel, the speed of water channel, the needs of irrigation water, water withdrawal discharge, water loss and efficiency of channel.

3 Result And Discussion

3.1 Primary Channels

Based on the observation, the primary channel discharge data in the Cubo irrigation area in Pidie Jaya can be seen in Table 1.

<table>
<thead>
<tr>
<th>No</th>
<th>Building</th>
<th>Discharge channels (m³/s)</th>
<th>Efficiency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Inlet</td>
<td>Outlet</td>
</tr>
<tr>
<td>1</td>
<td>BCB.1</td>
<td>0.900</td>
<td>0.432</td>
</tr>
<tr>
<td>2</td>
<td>BCB.2</td>
<td>0.540</td>
<td>0.432</td>
</tr>
<tr>
<td>3</td>
<td>BCB.3</td>
<td>0.432</td>
<td>0.270</td>
</tr>
<tr>
<td>4</td>
<td>BCB.4</td>
<td>0.360</td>
<td>0.236</td>
</tr>
<tr>
<td>5</td>
<td>BCB.5</td>
<td>0.315</td>
<td>0.195</td>
</tr>
<tr>
<td>6</td>
<td>BCB.6</td>
<td>0.260</td>
<td>0.165</td>
</tr>
<tr>
<td>7</td>
<td>BCB.7</td>
<td>0.220</td>
<td>0.180</td>
</tr>
<tr>
<td>8</td>
<td>BCB.8</td>
<td>0.090</td>
<td>0.060</td>
</tr>
<tr>
<td>9</td>
<td>BCB.9</td>
<td>0.090</td>
<td>0.036</td>
</tr>
<tr>
<td>10</td>
<td>BCB.10</td>
<td>0.054</td>
<td>0.013</td>
</tr>
<tr>
<td></td>
<td>Average</td>
<td>59.41</td>
<td></td>
</tr>
</tbody>
</table>

Note: BCB = Building of Cubo

Based on primary channels discharge data (Table 1), the channel with 14,522.5 m in length and an average of percent efficiency was 59.41% indicates that the highest efficiency is at the BCB.7 that is 81.82 % with the condition of the building was in a good and efficient. The lowest is on BCB.10, that is 24.07%. It is suspected that this caused by high evaporation and wild percolation. It is also related to lack of maintenance of channels and the presence of water losses due to illegal tapping of water.
3.2 Secondary Channels

Based on the observation discharge data, the secondary irrigation channel in Cubo of Pidie Jaya can be seen in Table 2.

Table 2. Efficiency secondary channel

<table>
<thead>
<tr>
<th>No</th>
<th>Building</th>
<th>Discharge channels (m³/s)</th>
<th>Efficiency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Inlet</td>
<td>Outlet</td>
</tr>
<tr>
<td>1</td>
<td>BPS.1</td>
<td>0.020</td>
<td>0.011</td>
</tr>
<tr>
<td>2</td>
<td>BPS.2</td>
<td>0.016</td>
<td>0.008</td>
</tr>
<tr>
<td>3</td>
<td>BPS.3</td>
<td>0.011</td>
<td>0.008</td>
</tr>
<tr>
<td></td>
<td>Average</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

BPS = Building of Paya Sepat

Based on secondary channels discharge data (Table 2), the channel with 2,370 m in length and an average of percent efficiency was 56.04% indicates that the highest efficiency is at the BPS.3 that is 66.67%. With the condition of the buildings of the secondary channel is still in a good state. The lowest efficiency is at BPS.2 that is 47.62%. It is because of the condition of the buildings at the secondary channel is in poor condition and wild percolation or seepage vertically that resulted in the loss of water is increasing.

3.3 Irrigation Water Need Analysis

Irrigation water is the amount of water generally took out of the river or reservoir and streamed through the irrigation systems to keep the balance amount of water on farmland [6].

The amount of water demand in order to meet the needs of water irrigation taken from a dam in Jiem-Jiem is as follows:

3.4 The Rice Crop Consumption Analysis

From the measurement, the coefficient of rice field growth in every phase can be seen in Table 3.

Table 3. The measurement of the value of a rice plant

<table>
<thead>
<tr>
<th>Growth phase</th>
<th>Puddle 5 cm</th>
<th>Puddle 10 cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetative Phase</td>
<td>0.96</td>
<td>1.03</td>
</tr>
<tr>
<td>Vegetative Phase</td>
<td>0.88</td>
<td>1.10</td>
</tr>
<tr>
<td>Reproductive Phase</td>
<td>0.84</td>
<td>1.03</td>
</tr>
<tr>
<td>Maturation Phase</td>
<td>0.56</td>
<td>0.71</td>
</tr>
<tr>
<td>Average</td>
<td>0.81</td>
<td>0.71</td>
</tr>
</tbody>
</table>

Table 1 shows that the coefficients of the rice crop were bigger, either on 5 cm and in 10 cm puddle, during the vegetative grow, and the smallest was during the maturation phase that was 0.71 and 0.56. This is in accordance with literature Dep.PU (1987) in Soewarno (2000) that the
coefficient of the rice crop according to FAO, in the initial growth and reproduction phase as much as 1.10 and the maturation phase (harvest) as much as 0.95.

3.5 Analysis Net Water Requirement in the Rice Field (NFR)

The plant nurseries usually coincide with tillage, but due to lack of labor, it is sometimes was done about 5 days after tillage. Seedling nurseries usually require 20-25 days, the area needed is 5% of the total area. While the water needed for seedlings were approximately 6 mm/day. The net of water needs in the rice fields to plant rice based on the calculation results is 1.04 mm/day.

3.6 Water Need Analysis in Forming Land for Planting Rice (IR)

For rice cultivation, the ground must first be processed. The land needs to be watered so that the land became flaccid. The amount of water needed in this period ranged from 150-250 mm. The irrigation water was needed most during this process, moreover, if there was no rainfall and insufficient time for tillage. The village was generally carried out 20 to 30 days before planting started. The tillage was done in two stages, namely plowing and raking. A large amount of water, high demand for water for the preparation of the land generally very determines the needs of maximum irrigation water. The result of high demand measurement for water during the preparation was 9,89 mm/day.

3.7 The Demand for Diversion Water (DR)

High demand for water in the door of the irrigation much related to the high demand for water in the rice fields. The results of the calculation to meet the amount of water that must be available at the take-up gate to irrigate agricultural land are 1.61 l/sec/ha.

3.8 Irrigation water requirement of Cubo Irrigation

Irrigation water needs for an irrigation area of 1090 hectares based on the values of NFR, IR, and DR values are 1.97 m³/s. Field observation results indicate that the availability of water has not been able to meet the water needs for irrigation in this area. It is due to the low of channel efficiency and the presence of water losses due to illegal tapping of water.

4 Conclusion and Suggestion

4.1 Conclusion

Based on the analysis and measurement have mentioned in this research, it can be concluded that:
1. The average channel efficiency is 57.73 % consisted of the primary channel efficiency (59.41 %) and the secondary channel efficiency (56.04 %).
2. Net farm requirement (NFR) is 1.04 l/s/ha, diversion requirement (DR) is 1.81 l/s/ha and irrigation water requirement of 1,090 ha is 1.97 m³/s. When compared with channel efficiency in general, channel efficiency in this irrigation area is relatively low due to lack of maintenance of channels and the presence of water losses due to illegal tapping of water.
4.2 Suggestion

Some important things that need to be done to overcome the shortage of irrigation water are repairing irrigation canals. Furthermore, providing counseling to farmers not to take water illegally from primary and secondary channels.

REFERENCES

Level of Knowledge And Skill of Banda Aceh SAR Office Staff on Flood Handling Prosperity in Aceh Province

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Abstract. This study addresses the level of knowledge and skills of the Banda Aceh SAR Office staff towards preparedness for handling flood victims in Aceh. Knowledge and skills are the main factors and are key to SAR staff preparedness in carrying out relief actions during disaster emergencies. The purpose of this study was to determine the level of knowledge and skills of the staff of the Banda Aceh SAR Office on preparedness in handling flood victims in Aceh Province. The method used is quantitative research methods. The data in this study consisted of primary data (field research) and secondary data (library research). The results of data analysis showed that the level of knowledge and skills of the Banda Aceh SAR Office staff still did not reach 50% with a good level of knowledge. The preparedness level of the Banda Aceh SAR Office staff was reviewed from the knowledge and skills parameters into the prepared category with 67 preparedness index values. For this reason, adequate SAR training / training with an integrated curriculum tailored to the needs in the field was needed. The training / training methods were participatory, applicable, it is expected to improve skills and influence the attitudes and mindsets of every Banda Aceh SAR Office staff.

Keywords: Knowledge, Skills, Preparedness, Search and Rescuer (SAR)

1 Introduction

Disasters that occur often have an impact on the pattern of life of the people so that it takes an action to help, and save victims of the disaster. The main factors that can lead to such disasters lead to large casualties and losses, namely a lack of understanding of the characteristics of hazards, attitudes or behavior that result in a decrease in natural resources, lack of early warning information that results in unpreparedness and disability or inability to deal with disasters [1].

For this reason, proper and fast handling is needed so that the number of victims can be minimized. Based on this, there is a need for a volunteer group to handle this. Office staff Search And Rescue Banda Aceh City involved in handling and minimizing victims of natural disasters must have the ability to master skills to provide Basic Life Support and recognize trauma and non-trauma emergencies that are often encountered in disaster victims.

Erratic field conditions require good knowledge and skills from each Banda Aceh SAR Office staff in carrying out their duties. So that as early as possible can seek the right and fast action, how to do it and what equipment is effective to use in the face of disasters. Based on the results of research conducted by Hamidi [2] stated that the Aceh SAR team preparedness index in terms of knowledge, attitudes, training effectiveness and resources owned by the SAR team...
are in the ready category and still need to continue to improve preparedness by increasing knowledge and intensity of training in facing disaster.

Preparedness management in RI Law No. 24 of 2007 focuses on 5 aspects, namely planning, organizing, action, control, evaluation [4]. According to Turban & Volonino [5] the knowledge management framework consists of creating knowledge, capture knowledge, refining knowledge, store knowledge, managing knowledge and disseminate knowledge. While the goal of education globally must be specified as more specific and conical goals, so as to further clarify educational goals such as the ability to read, the ability to interpret and skills to distinguish facts from hypotheses [6].

PERKA BASARNAS nomor 1 tahun 2018 stated that the target response time for disaster management was 1 hour and the percentage of victims that could be saved was 90%. To achieve this target every Basarnas staff must have a good level of knowledge and skills in carrying out assistance to disaster victims. Regulation of the Head of National Search and Rescue Agency Number PK. 2 of 2017 defines competency as the ability and characteristics possessed by an employee in the form of knowledge, skills, and behavioral attitudes needed in carrying out tasks professionally, effectively, and efficiently.

Based on the foregoing, the purpose of this study was to determine the level of knowledge and skills of staff at the Banda Aceh SAR Office on preparedness in handling flood victims in Aceh Province.

2 Methods

This study uses a method quantitative based on survey / questionnaire activities with a closed list of questions. The population in this study were all staff / employees of the Banda Aceh SAR Office, with a population of 62 people. The sampling technique was carried out using the cluster sampling method, namely in determining the sample the researcher took from each field / division in the Banda Aceh SAR Office. In this study the data collected consisted of two types, namely primary data and secondary data.

An assessment of the level of preparedness of the Banda Aceh SAR Office staff in handling flood victims in Aceh using index analysis. The index number in this study follows the parameter index made by LIPI - UNESCO / ISD (2006) [8], the higher the index number means the higher the level of preparedness of the subject under study. The index categories can be seen in Table 1 below:

<table>
<thead>
<tr>
<th>No.</th>
<th>Index value</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>81 - 100</td>
<td>Very Ready</td>
</tr>
<tr>
<td>2</td>
<td>66 - 80</td>
<td>Ready</td>
</tr>
<tr>
<td>3</td>
<td>40 - 65</td>
<td>Poorly prepared</td>
</tr>
<tr>
<td>4</td>
<td>Less than 40 (0 - 39)</td>
<td>Not ready</td>
</tr>
</tbody>
</table>

(source: LIPI - UNESCO / ISDR, 2006)

Assessment for each question item using a Likert scale Sugiyono[9] by giving the highest value 5 for a very good answer, the value 4 for the answer is good, the value 3 for the answer is enough, the value 2 for the answer is not good, and the value 1 for the answer is not good. To get the preparedness index value use the following formula:
For the maximum number of scores (N) or criteria (if all statements get the highest score) each aspect is obtained by using the following equation;

\[ P_n = \frac{I}{N} \times 100 \]  
\[ \text{(1)} \]

Total maximum score = \( k \times l \times m \)  
\[ \text{(2)} \]

3 Result and Discussion

3.1 Knowledge level

Knowledge level is always used as the beginning of an action in carrying out SAR tasks, so that the capacity of knowledge is expected to be the basis of actions taken by every staff of the Banda Aceh SAR Office in the field. A helper must have the knowledge and training in carrying out relief actions for disaster victims to sustain life when patients experience life-threatening conditions. The results of the study on the level of knowledge of Banda Aceh SAR Office staff in dealing with floods can be seen in Figure 1 below:

![Knowledge level](image)

Figure 1. Knowledge level (%)

Based on Figure 1 above shows that as many as 14 people (23%) SAR Office staff in Banda Aceh had the level of knowledge is very good, as many as 13 people (21%) staff of the Banda Aceh SAR Office have a good level of knowledge, 16 people (26%) Banda Aceh SAR Office staff have sufficient level of knowledge, 12 people (19%) Banda SAR Office staff Aceh has a poor level of knowledge and as many as 7 people (11%), the Banda Aceh SAR Office staff has a level of knowledge that is not good and very bad because this staff does not know about disaster characteristics, disaster management and does not know about mass rescue operation. Ignorance is because some of the respondents have not received socialization about it. Individuals who have good disaster knowledge tend to have better preparedness than individuals who have bad knowledge of disaster [10].

3.2 Skills

In carrying out SAR operational activities require SAR technical knowledge and skills as well as several disciplines as support/support. Every staff of the Banda Aceh SAR Office is required to have good skills in every SAR operation. The results of the study on the skill level of Banda Aceh SAR Office staff in dealing with floods can be seen in Figure 2 below:
Based on Figure 2 above shows that as many as 14 people (23%) Banda Aceh SAR Office staff have had very good skills in carrying out efforts to save flood victims, as many as 14 people (23%) Banda Aceh SAR Office staff have good skills, as many as 15 people (24%) Banda Aceh SAR Office staff have sufficient skills, as much as 12 people (19%) Banda Aceh SAR Office staff had bad skills and as many as 7 people (11%) Banda Aceh SAR Office staff had very bad skills. This difference in the skill level of the Banda Aceh SAR Office staff was greatly influenced by the training that was followed. The more often or the more training that is followed, the more one's skills will increase.

According to Widyatun[11] Widyatun (2005) a person's skills are influenced by motivation which encourages a person to take action in accordance with the procedures that have been taught, experiences that will strengthen one's ability to carry out an action (skill) and expertise possessed by someone will make skilled in certain skills.

3.3 Preparedness

To determine the level of preparedness in this study it is necessary to calculate the number of maximum scores (N) or criteria (if all statements get the highest score) each aspect is obtained by using the following equation:

\[
N = k \times l \times m
\]

\[
= 5 \times 90 \times 62
\]

\[
= 27900
\]

With the total score score obtained by each aspect (f) of 18663 then to get the preparedness index value use the following formula:

\[
P_n = \frac{f}{N} \times 100
\]

\[
P_n = \frac{18663}{27900} \times 100
\]

\[
= 0.67 \times 100
\]

\[
= 67
\]
Based on the results of the above calculations, it can be concluded that the preparedness level of the Banda Aceh SAR Office staff is reviewed from the knowledge and skills parameters into the category prepared with 67 preparedness index values. This is in line with the results of research conducted by Hamidi[2] on Team preparedness Search and Rescue (SAR) Aceh in the face of earthquake and tsunami disasters with a preparedness index value of 67.87 with ready categories.

The results of Hely[12] study state that training has a significant relationship to disaster management preparedness, meaning that the more often training is followed by someone it will improve skills and preparedness in the face of disasters. Dewi & Wawan [13] states that training that is followed will improve expertise that will provide benefits to the organization quickly.

To improve the knowledge and skills of Banda Aceh SAR Office staff in carrying out SAR Operations must have life skill a good. To achieve a good life skill, the implementation of the learning system and the SAR training curriculum must be based on the development of needs in the field by using participatory and applicative methods. Life skill distribution according to Dikmenum (2005) is as follows:

![Figure 3](image)

**Figure 3.** Distribution Life skill according to Dikmenum (2005)

Based on Figure 3 above every Banda Aceh SAR Office staff in handling flood victims must have personal skills, thinking skills, socials skills, academic skills, and vocational skills. Vocational life skills are special skills or expertise related to a particular field of work. The development of these skills is a part of life skills that is very important for a rescuer, both for now and in the future. Life skills are in accordance with the four pillars of education launched by Unesco namely learning to know (learning to know), learning to do or work (learning to do), learning to become self (learning to be) and learning to live in a community (learning to live together).

To support the achievement of the four pillars above, a learning approach is needed that develops life skills. This can be done by facilitating the Banda Aceh SAR Office staff with contextual learning activities, namely by linking local potentials around. Life skills bring every Banda Aceh SAR Office staff to the actual events that occurred on the field when the flood struck and provided staff from the Banda Aceh SAR Office to be able to find alternative solutions to overcome the problems faced in the field without being depressed as skills that every must possess rescuer.

### 4 Conclusion

The level of knowledge of the Banda Aceh SAR Office staff still has not reached 50% with a good level of knowledge, so that ongoing activities or training are needed to improve disaster knowledge. While the skill level of the Banda Aceh SAR Office staff also still has not reached 50%, having a good level of skill is needed for strategic efforts to improve skills, especially in efforts to save victims of disaster.
The preparedness level of the Banda Aceh SAR Office staff was reviewed from the knowledge and skills parameters into the prepared category with 67 preparedness index values. For this reason, adequate SAR training/training with an integrated curriculum tailored to the needs in the field was needed. The training/training methods were participatory, applicable, it is expected to improve skills and influence the attitudes and mindsets of every Banda Aceh SAR Office staff.

REFERENCES

The Strategy of Regional Disaster Management Agency in Disaster Risk Reduction in Banda Aceh

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Abstract. According to the Government Regulations Number 21, 2008, a regional disaster management agency (BPBD) (2008) is a regional government agency that organizes the disaster management at a regional level. This agency organizes disaster management which aims to ensure the implementation of disaster management in a planned, integrated, coordinated and comprehensive manner in order to provide protection for the community from threats, risks, and impacts of disasters. The goal of this study is to find out and analyze the community perceptions of the role of the regional disaster management agency (BPBD) in disaster risk reduction and the inhibiting and supporting factors faced by BPBD in Disaster Risk Reduction in Banda Aceh. The method used in this research is the descriptive analysis method, by using library and field research techniques. The techniques of data collections are through observation, interviews, and documentation. The results of this study indicate that (1) there were no major disasters in 2011 in Banda Aceh. However, the role of BPBD in disaster risk reduction is very important. During this time, BPBD conducted training, socialization and disaster mitigation. Disaster preparation for resilient villages is executed by BPBD, starting from simulations, training, outreach, and mitigation; (2) the inhibiting factor faced by BPBD in DRR in Banda Aceh is lack of budget and lack of community participation in the activities that carried out by the BPBD, and the supporting factor is that BPBD cooperates with the Department of Public Works, Health and the community, as well as the business world (hotel).

Keywords: Community Perception, BPBD, and DRR

1 Introduction

Indonesia is one of the areas prone to disasters, both caused by nature and humans. These disasters include earthquakes, tsunamis, volcanic eruptions, floods, droughts, landslides, fires, damage, conflicts, etc.

Based on the records of the Directorate of Volcanology and Geological Disaster Mitigation (DVMBG) of the Department of Energy and Mineral Resources, Aceh is in the list of 28 regions in Indonesia that are declared prone to earthquakes and tsunamis. After the 2004 tsunami disaster occurred Aceh, Indonesia has begun to show its seriousness in dealing with disasters that often occur in this country. It is proven by the existence of the Indonesian Republic Law, specifically discussing disaster management. By the existence of the law, the National Disaster Management Agency (BNPB) and the Regional Disaster Management Agency (BPBD) were formed. BNPB and BPBD are the institutions given responsibility as the directors and the implementers of disaster management.
According to the regulation of the Head of the National Disaster Management Agency Number 3 of 2008 [1] on the guidelines for the establishment of the Regional Disaster Management Agency, in this case, the Aceh Disaster Management Agency (BPBA) was formed. BPBA has the authority to formulate the concept of disaster management policies, monitor and evaluate the implementation of disaster management. As explained in the SKPA BPBA work plan in 2018, where BPBA has the task of carrying out disaster management services including of the phase of the disaster / when there is no disaster, the phase of disaster/emergency response, the phase of disaster emergency transition and the rehabilitation phase and disaster reconstruction phase. After 14 years of earthquake and tsunami, many programs and activities are implemented by BPBD, such as socialization, disaster simulation, training, workshops, and disaster mitigation. All of those programs and activities are expected can trigger the community becomes resilient to disasters.

2 Data and Methods

This research was conducted in Banda Aceh that had experienced the effects of the earthquake and tsunami disasters. The data needed in this study are primary data and secondary data. Primary data are collected by means of observation and in-depth interviews. Secondary data were collected from the media and BPBD. The populations of this study were the citizen of Banda Aceh, while the samples taken were groups of people living in areas that experienced an earthquake and tsunami disasters, like the Village of Deah Glumpang, Meuraxa Sub-District and Ie Masen Kayee Adang Village, Ulee Kareng. The approach used in this study is a qualitative approach with descriptive analysis method. The descriptive analysis method is a design that makes researcher easy to record, monitor and follow the process of an event or activity of an organization in a certain period of time, then interpreted to answer the research problems.

As explained by Locke, Spridudo, and Silferman in Creswell [2]: "Quality research is interpretative research. as such the biases of values and judgment of research have become explicit in the research report. openness is considered to be useful and positive". Then, the descriptive analysis method as suggested by Sugiyono [3] is a method used to describe or analyze a research result but not used to make broader conclusions.

3 Result and Discussion

Disaster is an event that threatens and disrupts people's lives and livelihoods, caused by natural or non-natural factors and human factors, resulting in fatalities, damage, property losses, and psychological impacts. Banda Aceh as one of the second level regions in Aceh Province also suffered from the impact of the disaster. Therefore, an important strategy must be carried out before a disaster occurs. The strategy is risk reduction efforts, including hazard prevention, reducing vulnerability and increasing capacity. In this case, the duties and functions of the BPBD in carrying out its role are highly expected by the community.

According to Law Number 24 of 2007 [4] in article 4 states that disaster management aims to:
1) Providing protection to the community from the threat of disaster;
2) Align existing laws and regulations;
3) Ensure the implementation of disaster management in a planned, integrated, coordinated and comprehensive manner;
4) Respect local culture;
5) Building public and private participation and partnerships;
6) Encouraging the spirit of mutual cooperation, solidarity and generosity; and
7) Creating peace in the life of the community, nation, and state.

Furthermore, the Indonesian Government issued PP No. 21 Tahun 2008 [5] concerning the implementation of Disaster Management carried out in 3 (three) stages, namely pre-disaster, emergency and post-disaster response. Government Regulation No. 22 concerning Funding and Management of Disaster Assistance [6], Government Regulation No. 23 concerning the Participation of International Institutions and Foreign Non-Government Institutions in the DRR [7], Domestic Minister’s Regulation (Permendagri) Number 46 in 2008 [8] and Regulation of the Head of BNPB Number 3 in 2008 [1] concerning the Establishment of Regional Disaster Management Agencies (BPBD), and the Banda Aceh Mayor Qanun Kota Banda Aceh Number 46 in 2011 [9] concerning the Establishment of BPBD of Banda Aceh City.

The Government of the Republic of Indonesia through RI Presidential Regulation No. 8 in 2008 [10] concerning the National Disaster Management Agency (BNPB) that the establishment was mandated by Law Number 24 in 2007 concerning Disaster Management [4]. BNPB is a ministerial non-departmental government institution that has the following duties:
1) Provide guidance and direction on disaster management efforts that include disaster prevention, handling the emergency response, rehabilitation and reconstruction fairly and equally;
2) Establish standards and requirements in implementing disaster management based on legislation;
3) Delivering information on disaster management activities to the community;
4) Report the implementation of disaster management to the president every month in normal conditions and at all times in disaster emergency conditions;
5) Use an account for national and international donations/assistance;
6) To account for the use of the budget received from the state revenue and expenditure budget;
7) Carry out other obligations in accordance with laws and regulations; and
8) Develop guidelines for the establishment of regional disaster management agencies.

In its implementation, in Aceh Provincial level, disaster management was coordinated by the Aceh Disaster Management Agency (BPBA) and in the District / City level by the local Disaster Management Agency (BPBD). The establishment of the Banda Aceh BPBD is based on the Banda Aceh City Qanun Number 03 in 2011 [9] concerning the Organizational Structure and Work Procedure of the Regional Disaster Management Agency of Banda Aceh City with the following tasks:
1) Establish guidelines and directives in accordance with the policies of the City Government, the Government of Aceh and the National Disaster Management Agency for disaster management efforts that cover disaster prevention, emergency management, rehabilitation, and reconstruction fairly and equally;
2) Establish standardization and the need to carry out disaster management based on legislation;
3) Arrange, determine, and inform disaster-prone maps;
4) Arrange and establish a fixed procedure for handling disasters;
5) Carry out disaster management in its territory;
6) Reporting the implementation of disaster management to the Mayor once a month in normal conditions and at all times in disaster emergency conditions;
7) Controlling the collection and distribution of money and goods;
8) To account for the use of the budget received from the City Revenue and Expenditure Budget and other sources of revenue; and
9) Carry out other obligations in accordance with the laws and regulations.

Since 2011 there was no major disaster occurred Banda Aceh. However, the role of BPBD in disaster risk reduction is very important. During this time, BPBD conducted training, socialization and disaster mitigation. Disaster preparation for disaster resilient villages is implemented by BPBD, starting from simulations, training, outreach, and mitigation. However, the BPBD has not done this to all villages affected by the tsunami due to lack of budget. This preparation is carried out by BPBD only for disaster-prone areas. Then, the community also did not participate in the disaster preparation, neither during training, nor outreach and mitigation. In addition, the BPBD cooperates with the Department of Public Works, Health and community, as well as the business world (hotels) [11].

Basri added that disaster simulation training had been conducted in 2018, but not all affected communities participated in the activity. There are even some people who do not follow the advice and direction given by the BPBD. This is due to the reflexes of the people themselves who want to escape far from the sea [11].

The disaster-affected villages in Banda Aceh also had carried out the activities related to disaster awareness. In this activity, only young children followed the activity. The activity was carried out twice a year. This activity was implemented by village government because what the BPBD conducted was not fully exposed by the community. So there were still many people who did not know about disaster information. During this time, there have been three villages that have become the focus of activities, such as, Deah Glumpang, Alu Pande and Gampong Jawa [11].

Besides to the community not being so enthusiastic in participating in the activities of the BPBD on disaster preparedness, BPBD also does not have sufficient budget to carry out the activities, including training, socialization and disaster mitigation. This becomes the obstacles experienced by BPBD in implementing their duties and roles in disaster risk reduction [11].

4 Conclusion

Since 2011 there was no major disaster occurred Banda Aceh. However, the role of BPBD in disaster risk reduction is very important. During this time, BPBD conducted training, socialization and disaster mitigation. Disaster preparation for disaster resilient villages is carried out by BPBD, starting from simulations, training, outreach, and mitigation. The inhibiting factor faced by BPBD in DRR in Banda Aceh is the lack of budget and lack of community participation in activities implemented by BPBD. The supporting factor is that BPBD cooperates with the Department of Public Works, Health and community, as well as the business world.

REFERENCES


Analysis of Budgetary Participation, Budget Target Clarity and Budgetary Function on SKPK Managerial Performance of Aceh Jaya District Government

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Abstract. The purpose of this study is to find out budgetary participation, budget target clarity and budgetary functions on SKPK Managerial performance of Aceh Jaya District Government. The analysis model in this study is to use measurement tools of multiple linear regression. The results show that budgeting participation, budget target clarity, and budgetary functions simultaneously have a significant influence on SKPK Managerial performance of Aceh Jaya District Government. Budgetary participation, budget target clarity, and budgetary functions partially also significantly influence on SKPK Managerial performance of Aceh Jaya District Government. Budgetary participation, budget target clarity, and budgetary functions can influence on SKPK Managerial performance of Aceh Jaya District Government.

Keywords: Budgetary Participation, Budget Target Clarity and Budgetary Function on Managerial Performance

1 Introduction

The budget system of regional government performance-based is required to include indicators that will be a reference in improving performance so that what is expected from the implementation of this budget can be achieved. The indicators that guide the implementation of this budget are input indicators, output indicators, and outcomes. The results of the three indicators which are listed must be measurable rather than how much money has been spent but based on the performance that has been produced, as it is explained in PP number 58 in 2005 concerning Regional Financial Management that the budget with a performance approach is a budget system that prioritizes efforts to achieve work results or output of the specified cost allocation or input.

Performance is basically the work result of quality and quantity that an employee achieves in carrying out his duties according to the responsibilities which are given to him. In this case, employees can learn how much they perform through the means of information such as good comments from work partners. However, performance assessment refers to a formal and structured system that measures, assesses and influences traits that are related to work behavior and results including the level of absence. The focus of performance assessment is to find out how productive an employee is and whether he can perform more effectively in the future.
To find out the performance of Aceh Jaya District Government in the last five periods which is seen from the use of the budget can be seen in Table 1.

**Table 1.** The Performance of Aceh Jaya District Government in the Period of 2012-2016

<table>
<thead>
<tr>
<th>Year</th>
<th>Target</th>
<th>Realization</th>
<th>Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>1,110,496,000,000</td>
<td>1,000,615,560,017.91</td>
<td>0.90</td>
</tr>
<tr>
<td>2013</td>
<td>1,245,963,000,000</td>
<td>1,009,543,796,484.99</td>
<td>0.81</td>
</tr>
<tr>
<td>2014</td>
<td>1,444,028,000,000</td>
<td>1,018,798,795,197.66</td>
<td>0.71</td>
</tr>
<tr>
<td>2015</td>
<td>1,632,124,211,100</td>
<td>1,315,624,256,147.24</td>
<td>0.81</td>
</tr>
<tr>
<td>2016</td>
<td>1,924,365,147,000</td>
<td>1,521,654,214,654.06</td>
<td>0.79</td>
</tr>
</tbody>
</table>

Average: 0.832

Source: BPS (2017)

Table 1 shows the performance of Aceh Jaya District Government during the period of 2012-2016, from 2012 the average performance is 0.9 and in 2013 it drops to 0.81 until 2014 it continues to decline to 0.71 and in 2016 it is at 0.79. Based on this phenomenon, it can be explained that the performance of Aceh Jaya District Government which is seen from the realization in the budget of 2010-2016 has decreased.

There are factors that influence performance, including budgetary participation. Budgetary participation is a budgeting approach that focuses on efforts to increase employee motivation in achieving organizational goals. The concept of budgeting has developed rapidly in the private sector (business), but it is not the same in the public sector. In the public sector, budgetary participation does not have an established system yet so that its implementation is not optimal yet. Budget is a plan for future actions to achieve organizational goals. In private sector organizations (business), the purpose is intended to seek profit (profit oriented), while in public sector/non-business organizations, it is not (non-profit oriented). Because of the different purpose, the work plan that is arranged is also different. Thus, the approach to budgeting in both types of organizations is also different [1]–[5]. On the other hand, it is found the opposite results such as the studies [6]–[8], and several other studies that find budgetary participation is not related to organizational performance.

Another factor that also influences performance is budget target clarity. Budget target clarity shows the extent of budget targets that are stated specifically and clearly, and it is understood by anyone who is responsible. Kennis [2] finds that managers give positive reactions and are relatively very strong to improve budget target clarity. Top management can improve job satisfaction, reduce work tension, and improve budgets which are associated with attitudes, budget performance, and cost efficiency of lower-level managers to significantly improve the clarity and firmness of their budget targets.

Locke [2] shows that the relationship between budget target clarity has a significant influence on SKPK performance. This is supported by the research which is conducted by Kennis[2] on the influence of budget goal characteristics on attitudes and performance for 169 department managers at the factory level who have budget responsibilities. The results show that budgetary participation and budget target clarity tend to have a positive and significant influence on the attitudes of managers related to work and budget. Participation and clarity of targets, then, are known to have a significant influence on the budget performance of managers.

Aceh Jaya District as a newly formed District requires good management in advancing its region, especially in terms of the formation of activities and programs in the purpose of a budget.
Participation in budgeting will be very much needed from the community and the people who are involved, both in terms of giving ideas or others so that the networking which is done can be in accordance with the wishes of the community. Budget target clarity must also be considered, it is the understanding that shows the extent to which budget targets are stated to be more specific and clear. After the budget has been planned, there must be feedback in the form of a report on the realization of the budget that has been achieved. The level of difficulty and evaluation of the budget must also be done in order to create effective and efficient budget targets. The problems which are related to performance have become the focus of many researchers, especially in the behavioral accounting domain. These studies are carried out by Kennis [2], Brownell & McInnes [4], and Indriantoro [9]. Several other researchers who examine the budget by adopting a contingency approach are Brownell [3], Subramaniam & Mia [10], and Chong & Chong [11].

2 Literature Study

2.1 Understanding of Performance

Prawirosentono [12] mentions performance is the work result that can be achieved by a person or group of people in an organization, according to their respective responsibilities and authorities in an effort to achieve organizational goals. There is a close relationship between individual performance and organizational performance, in other words, if employee performance is good then it is possible that organizational performance is also good. On the other hand, Mulyadi [13] says that performance is the level of achievement from the implementation of activity in realizing targeted goals.

As‘ad [14] writes that job performance or business performance is the result which is achieved by someone according to the size that applies to the respective work, as a level which employees meet/achieve specified work requirements. According to Dessler [15], performance analysis is to verify that there is a decline in performance and it determines whether the decline should be improved through training or other means.

2.2 Budgetary function

Management functions consist of functions of planning, implementation, and supervision. So does budgetary function. This is because the budget is a management tool in carrying out its functions. The following are some of the budgetary functions[16]:

a. Planning function
Budget is a written plan that requires careful thinking and will give a more realistic picture of the unit and money.

b. Implementation function
Budget is a guideline in carrying out work so that the work can be done in harmony in achieving goals

c. Supervision function
A budget is a monitoring tool that serves as an evaluation of the work implementation. The implementers are by:
1. Comparing the realization with the plan
2. Making corrective actions if it is necessary

Mokoginta [17] budgeting can be seen from several functions:
1. Political Instruments, budget is one of the formal instruments that embody executive bids (bargain) with the demands of public needs which are represented by the legislature.

2. Fiscal Policy Instruments, by changing priorities for the number of allocated funds, the budget can be used to encourage the provision of facilities and coordinate the economic activities of the community in order to accelerate economic growth and even the result distribution.

3. Planning Instruments, in the budget, it is stated the goals to be achieved, costs and results which is expected from each activity in each work unit.

4. Control Instruments, in the budget, it contains plans for real income and expenditure for each work unit.

2.3 Budgetary Participation

Budgetary participation is the involvement and influence of individuals (managers) in determining and planning financial activities in their divisions or departments [2]. Franklin & Ebdon [18] argues that budgetary participation shows the extent of participation for regional government apparatus in understanding the proposed budget by their work units and the influence from the central goals of their budgeting accountability. On the other hand, Franklin & Ebdon [18] find input mechanisms of citizens have a direct influence on budget decisions.

Maryanti [1] finds that budgetary participation does not have an influence on behavior, attitudes, and performance. It shows that behavior, attitudes, and performance of regional government apparatus are not influenced by budgetary participation both in preparing budget proposals, in implementing budget and in budget accountability.

2.4 Budgetary Target Clarity

Budget target clarity shows the extent of budget goals that are stated specifically and clearly, and it is understood by anyone who is responsible. Kennis[2] finds that managers give positive reactions and are relatively very strong to improve budget target clarity. Top management can improve job satisfaction, reduce work tension, and improve budgets that are associated with attitudes, budget performance, and cost efficiency of lower-level managers to significantly improve the clarity and firmness of their budget goals.

Maryanti [1] finds that regional government apparatus could find out the results of their efforts through effective evaluations to find out the budget target clarity which they have made and they are satisfied that is beneficial to the interests of the community.

2.5 Framework

2.5.1 The Influence Budgetary

Budgetary participation is one of the independent variables that is thought to influence managerial performance in an organization. Alfär [19] in his research states that there is a significant influence of budgetary participation on managerial performance both directly and through intervening variables. [20] states that there are a positive and significant influence of budgetary participation on managerial performance. Manurung [21] also argues that there is an influence of budgetary participation in managerial performance.
2.5.2 The Influence Budgetary

Budget target clarity shows the extent of budget targets that are stated specifically, clearly, and understood by anyone who is responsible. Maryanti [1] finds that regional government apparatus could find out the results of their efforts through effective evaluations to find out budget target clarity which they have made and they are satisfied that it is beneficial to the interests of the community. Syahputra [2] research results, budget target clarity significantly influence the performance of the government. This shows that the characteristics of the overall budget targets have a strong influence on government performance in the budget plan.

Regional budgets must be a benchmark for expected performance so that regional planning must be able to clearly describe performance targets. According to Munawar [23] budget target clarity is the extent to which the budget goals are clearly and specifically set with the aim that the budget can be understood by people who are responsible for achieving the budget goals. Therefore, the target of the regional budget must be stated clearly, specifically and can be understood by those who are responsible for compiling and implementing budget activities. Putra [24] and Solina [25] budget target clarity has a significant positive influence on the managerial performance of the Regional Work Unit/SKPD.

2.5.3 The Influence Budgetary

In accordance with its function, budgetary functions as a tool for planning, implementation, and supervision, therefore budgetary function plays a role and influences on performance. Maryanti [1] in her research states that budgetary functions have a positive influence on performance. It means that the better the budgetary function, the higher the performance and conversely the lower the budgetary function, the lower the performance. Another study which is conducted by Yusfaningrum & Ghozali [26] find that there is a positive and significant relation between budgetary functions and managerial performance, the higher the budgetary function, the higher the managerial performance of the company. Therefore budgetary function is a top priority by every institution to improve performance. Based on the opinion above, it can be concluded that budgeting function has a significant and positive influence on performance.

The schematic framework in this study can be seen in Figure 1.

2.6 Hypothesis

The hypothesis is a temporary assumption that will be verified in a study. Based on the framework that has been stated before, a statistical hypothesis can be stated:

Ha1: Budgetary participation, budget target clarity, and budgetary functions have a significant influence on SKPK managerial performance of Aceh Jaya District Government.

Ha2: Budgetary participation has a significant and positive influence on SKPK managerial performance of Aceh Jaya District Government.

Ha3: Budget target clarity has a significant and positive influence on SKPK managerial performance of Aceh Jaya District Government.

Ha4: Budget functions have a significant and positive influence on SKPK managerial performance of Aceh Jaya District Government.
3 Research Methods

To see the influence of budgetary participation, budget target clarity and budgetary functions on SKPK managerial performance of Aceh Jaya District Government, it is carried out by using measurement tools of multiple linear regressions. Mathematically the measurement tools of multiple linear regressions are formulated as follows Gujarati & Porter [27]:

\[ Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + e \]

of which:
- \( Y \) = SKPK Managerial Performance
- \( \alpha \) = Constants
- \( \beta_1 \) = Coefficient of budgetary participation
- \( \beta_2 \) = Coefficient of budget target clarity
- \( \beta_3 \) = Coefficient of budgetary functions
- \( X_1 \) = Variable of budgetary participation
- \( X_2 \) = Variable of budget target clarity
- \( X_3 \) = Variable of budgetary functions
- \( e \) = error terms

4 Results And Discussion

4.1 Results of Estimation

To find out the influence of budgetary participation, budget target clarity and budgetary functions on SKPK Managerial Performance of Aceh Jaya District Government, a Multiple Linear Regression is calculated, of which the final calculation results are obtained as the budgetary function in Table 2.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficients of Regression</th>
<th>T-Count</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Constant)</td>
<td>0.159</td>
<td>1.982</td>
<td>0.050</td>
</tr>
<tr>
<td>Budgetary participation</td>
<td>0.693</td>
<td>5.601</td>
<td>0.000</td>
</tr>
<tr>
<td>Budget target clarity</td>
<td>0.060</td>
<td>2.635</td>
<td>0.007</td>
</tr>
<tr>
<td>Budgetary functions</td>
<td>0.388</td>
<td>3.551</td>
<td>0.001</td>
</tr>
</tbody>
</table>

R-square : 0.967
R : 0.984

Source: Data Processing Result, (processed data, 2018)

From the research results, the equation is obtained \( Y = 0.159 + 0.693 X_1 + 0.060 X_2 + 0.388 X_3 \)

Constants of 0.159 mean that if budgetary participation, budget target clarity, and budgetary functions are considered constant, the value of SKPK managerial performance of Aceh Jaya District Government reaches 0.159 percent.

The regression coefficient for budgetary participation is obtained at 0.693, which means that every change of 1 percent that occurs in budgetary participation will influence the increase in SKPK managerial performance of Aceh Jaya District Government by 0.693 percent, assuming budgetary functions and budget target clarity are considered constant.
The regression coefficient for budget target clarity is obtained at 0.060, which means that every change of 1 percent that occurs in budget target clarity will influence the increase in managerial performance of Aceh Jaya District Government SKPK by 0.060 percent, assuming budgetary functions and budgetary participation are considered constant.

Regression coefficients for budgetary functions are obtained at 0.388, which means that every change of 1 percent that occurs in budgetary functions will influence the increasing in SKPK managerial performance of Aceh Jaya District Government by 0.388 percent, assuming budgetary participation and budget target clarity are considered constant.

From the results of the above research, budgetary participation has the greatest regression coefficient. Then it can be concluded that budgetary participation has the greatest influence on SKPK managerial performance of Aceh Jaya District Government.

SKPK Managerial Performance of Aceh Jaya District Government is strongly influenced by budgetary participation, budget target clarity, and budgetary functions. It can be seen from the determinant coefficient value ($R^2$) of 0.967 which means budgetary participation, budget target clarity and budgetary functions can influence on SKPK managerial performance of Aceh Jaya District Government Jaya by 96.7 percent and the remaining 3.3 percent is influenced by other variables outside of this research model.

4.2 Hypothesis Testing

**Simultaneous Testing (F Test)**

Simultaneous tests are conducted to determine the influence of independent variables on dependent variables altogether. From the results of the study, it is obtained $F_{\text{count}}$ value of 1239 with a probability value of 0.00 below 0.05, which means that budgetary participation, budget target clarity, and budgetary functions have a significant influence on SKPK Managerial performance of Aceh Jaya District Government.

**Partial Hypothesis Testing Results (t-Test)**

Verification in variables of budgetary participation, budget target clarity, and budgetary functions influence on SKPK managerial performance of Aceh Jaya District Government so that partial tests are carried out separately. The results obtained are as follows:

- For budgetary participation, the $t_{\text{count}}$ value is 5.601 with a probability value of 0.00 below 0.05, which means that budgetary participation partially has a significant influence on SKPK managerial performance of Aceh Jaya District Government.
- For budget target clarity, the $t_{\text{count}}$ value is 2.635 with a probability value of 0.00 below 0.05, which means that budget target clarity partially has a significant influence on SKPK managerial performance of Aceh Jaya District Government.
- For budgetary function, the $t_{\text{count}}$ value is 3.551 with a probability value of 0.00 below 0.05, which means that budgetary participation partially has a significant influence on SKPK managerial performance of Aceh Jaya District Government.

4.3 Discussion

The hypothesis testing is done to test the hypothesis formulation based on the regression analysis model that has been analyzed in this study with the aim of whether the test results are appropriate or not in accordance with the hypothesis formulation that has been formulated.
The Influence of Budgetary Participation on SKPK Managerial Performance of Aceh Jaya District Government

The results of this study indicate that budgetary participation partially has a significant influence on SKPK managerial performance of Aceh Jaya District Government. This finding is in line with the research that is conducted by Alfar[19] who states that there is a significant influence of budgetary participation on managerial performance. Then also in accordance with the research which is conducted by Noor [20] and Manurung [21] who state that there is a positive and significant influence of budgetary participation on the performance of Government Apparatus, the higher the budgetary participation, the higher the performance, and conversely the lower the budgetary participation the lower the performance.

The results of this study are also in line with the research which is conducted by Arifin & Rohman [28] and Sawitri, Purnamawati, & Herawati [29] who states that there is a positive influence of budgetary participation on the performance of Government Apparatus. This means that the better the budgetary participation, the more managerial performance will be and the lower the budgetary participation will be, the lower the performance. Participation in budgetary participation will create an increasing performance. This identifies how important participation in budgetary participation is to create better performance.

The Influence of Budget Target Clarity on SKPK Managerial Performance of Aceh Jaya District Government

The results of this study indicate that budget target clarity partially has a significant influence on SKPK managerial performance of Aceh Jaya District Government. This finding is in line with the research which is conducted by Syahputra [22], budget target clarity has a significant influence on government performance. This shows that the characteristics of the overall budget goals have a strong influence on government performance in the budget plan.

It is also in line with Munawar [23], budget target clarity is the extent to which the budget goals are clearly and specifically set with the aim that the budget can be understood by the person who is responsible for achieving budget goals. Therefore, the target of the regional budget must be stated clearly, specifically and can be understood by those who are responsible for compiling and implementing budget activities. Putra [24] and Solina [25], budget target clarity has a significant positive influence on the managerial performance of Regional Work Unit/SKPD.

The Influence of Budgetary Functions on SKPK Managerial Performance of Aceh Jaya District Government

The results of this study indicate that budgetary function partially has a significant influence on SKPK managerial performance of Aceh Jaya District Government, this finding is in line with the research which is conducted by Maryanti [1], that budgetary function has a positive influence on performance, meaning that the better the budgetary function the higher the performance and conversely the lower the budgetary function, the lower the performance. Other studies are also in line with those which are carried out by Yusfaningrum & Ghozali[26] find that there is a positive and significant relation between budgetary functions and managerial performance, the higher the budgetary function, the higher the managerial performance of the company. Therefore budgetary function is a top priority by every institution to improve performance. Based on the opinion above, it can be concluded that budgeting function has a significant and positive influence on performance.
5 Conclusion

1. There is the influence of budgetary participation, budget target clarity, and budgetary functions simultaneously on SKPK Managerial performance of Aceh Jaya District Government.
2. There is a positive and significant influence of budgetary participation on SKPK managerial performance of Aceh Jaya District Government.
3. There is a positive and significant influence of budgetary target participation on SKPK managerial performance of Aceh Jaya District Government.
4. There is a positive and significant influence of budgetary functions on SKPK managerial performance of Aceh Jaya District Government.

6 Suggestion

1. To improve SKPK managerial performance of Aceh Jaya District Government, the Apparatus leaders of Aceh Jaya District Government can continue to improve budgetary function, participation in budgeting and budgetary functions.
2. For further researchers, it is recommended to add various other variables outside of this research model to re-examine the performance of Aceh Jaya District Government Apparatus.
3. The variable that has the greatest influence on managerial performance is budgetary participation, therefore it is expected that the apparatus leader of Aceh Jaya District Government can maintain and increase participation in budgeting so that it can improve the performance of Aceh Jaya District Government Apparatus.

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University of Kentucky, 1993.


How Big is The Role of Micro Small Enterprises(Mses) and Medium-Large Enterprises (Mles) in Overcoming Community Income Gaps in Aceh Province ?: Data Analysis of 2016 Economic Census

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Abstract. This study aims to analyze the role of Micro Small Enterprises (MSEs) and Medium-Large Enterprises (MLEs) in addressing income inequality in all districts/cities in Aceh Province and also analyze the most dominant variables that reduce the community income gap. This study uses 2016 Economic Census of BPS province of Aceh for 23 districts/cities and Gini Ratio for community income gap variables. The results showed that the number of MSEs units, the average MSEs workers, the total wages received by the SMEs workers, the SMEs wage average, and the district/city economic growth in 2016 had a significant effect on the income inequality in the districts/cities of Aceh Province. While the number of MSEs workers, the number of MLEs units, the number of MLEs workers, the average of MLEs workers, the total wages of MLEs workers, and the average wage of MLEs workers have not significantly influence to the community income gap. The only factor that has a significant influence in reducing the gap in community income is the total remuneration (wages) received by MSEs workers. The recommendation that can be given to be implemented immediately for the Aceh government is to strengthen MSEs, including cooperatives as the drivers of Aceh's economic which can absorb more labor and compensation or wages received by workers also increases. Furthermore, the Government of Aceh, in this case, the Provincial Manpower Office and the Office that manages labors all districts/cities must monitor the application of the Provincial Minimum Wage (PMW) for MSEs which have been under-emphasized for various reasons and consider.

Keywords: Micro Small Enterprises, Medium Large Enterprises, Gini Ratio

1 Introduction

Aceh's economy is currently influenced by the activities of Micro Small Enterprises (MSEs) and Medium-Large Enterprises (MLEs). Both of these business scales are able to absorb more than one million labors in the agricultural category, even though the agricultural sector still plays an important role. Data based on the 2016 Economic Census makes the initial step to measure the strength of Aceh's economy outside the agricultural sector.

The results of the 2016 Economic Census (EC) recorded that the number of Micro Small Enterprises (MSEs) and Medium-Large Enterprises (MLEs) in Aceh Province is 432,819 business units. This figure has increased by 17.54 percent when compared with the results of the 2006 EC which amounted to 368,244 business units. North Aceh District has 48,023 units in 2006 and 50,392 units in 2016.

Micro Small Enterprises (MSEs) in Aceh are currently dominating the economic activities with a proportion of 98.74 percent. While MLEs only reached 1.26 percent (5.5 thousand units) which was concentrated only in Banda Aceh City, Lhokseumawe City, Aceh Besar Regency, Bireuen Regency, and North Aceh Regency (52.75 percent). The contribution of MSEs and MLEs activities is a fundamental strength for the Acehnese economy. According to the Central Bank of Indonesia publications in May 2018, MSEs and MLEs in Aceh are one of the largest coffee production in Indonesia. Both Robusta and Arabica coffee [1].

Strengthening Aceh's economy is inseparable from the improved social conditions of the community and various economic activities that show rapid development. The construction sector, education services, and financial activities in 2016 became a barometer of the sustainability of Aceh's economic growth. The achievement of economic growth based on this sector is very high and always above Aceh's economic growth recorded at 4.31 percent (non-oil and gas) in 2016. This shows an encouraging achievement to sustain Aceh's economic growth on an ongoing basis (BPS Provinsi Aceh, 2017).

In contrast to the growth rate, in terms of quantity, the most widely run business fields are wholesale and retail trade, repair and maintenance of cars and motorbikes (category G) reaching 44.82 percent. While the manufacturing
industry (category C), and the provision of accommodation and food supply (category I) are the second and third largest economic activities each 20.16 percent and 15.59 percent respectively.

Business with category G (wholesale and retail trade, repair and maintenance of cars, and motorbikes), categories P (Education), C (processing industry), and category I (providing accommodation and providing food and beverage) absorb more than three-quarters of the workforce non-agricultural employment in the Province of Aceh (76.10 percent). While other business categories have contributed below seven percent each (BPS Provinsi Aceh, 2017).

Although the average units number of MSEs and MLEs businesses in each district and city in Aceh Province has increased, there are four regencies that have experienced a decline in the units number of businesses, including Southeast Aceh District, down 7.47 percent, Pidie 8.45 percent, Nagan Raya 10, 37 percent and Aceh Jaya amounted to 16.62 percent. The comparison of the units number of businesses in 2006 and 2016 can be seen in Figure 1 below.

![Figure 1. Comparison of the number of MSEs and MLEs in Aceh province](http://se2016.bps.go.id/)

Basically, the trend of MSEs and MLEs units in each region will probably increase from year to year. This is in line with the GRDP target of each region every year which tends to increase. Decreasing the number of MSEs and MLEs in an area can reduce the regional income itself. The number of business units/companies can also be a barometer of the successful of the government in building the economic infrastructure of a region.

The facts show that the MSEs and MLEs are believed to be able to overcome the income gap in the community, of course, it affects the economy in every district and city of Aceh Province. Based on the above conditions, this research aims to:

1. Analyzing MSEs and MLEs components (number of business units, number of workers, average workers, total wages, and average wages) play a role in overcoming the income gap in Aceh Province
2. Explain the MSEs and MLEs variables that are dominant in reducing the community income gap in Aceh Province.
2 Literature Study

There are many concepts and definitions that explain businesses and companies and the factors that influence them. This study refers to the concept described by Law No. 20 of 2008 [3] concerning micro, small and medium enterprises as follows:

1. **Micro Enterprises** are productive businesses owned by individuals and/or individual business entities, having a net worth of at most 50 million rupiahs, not including land and buildings and having annual sales of at most 300 million rupiahs.

2. **Small Enterprises** is a stand-alone productive economic business carried out by an individual or business entity that is not a subsidiary or not a branch of a company that is owned, controlled or becomes a direct or indirect part of a medium or large business. Having a net worth of more than 50 million rupiahs up to a maximum of 500 million rupiahs, not including land and buildings or having annual sales of more than 300 million rupiahs up to a maximum of 2.5 billion rupiahs.

3. **Medium Enterprises** is a stand-alone productive economic business carried out by an individual or business entity that is not a subsidiary or branch of a company that is owned, controlled or directly or indirectly part of a small business or large business with a net wealth or annual sales revenue. Having a net worth of more than 500 million rupiahs up to a maximum of 10 billion rupiahs, not including land and buildings or having an annual sales of more than 2.5 billion rupiahs up to a maximum of 50 billion rupiahs.

Likewise, studies on MSEs and MLEs in relation to economic activities have been widely carried out by experts. J.A Schumpeter's theory emphasizes the importance of entrepreneurs role in creating economic growth. In his theory, entrepreneurs are groups that will continue to make renewal or innovation in economic activities. According to Schumpeter, the higher the level of economic progress, the more limited is to carry out innovations, economic growth becomes slower which will eventually reach "stationary state" [4]. Furthermore, Harrod-Domar's growth theory states that if you want to grow, the economy must save and invest a certain proportion of the total output. The more savings and then invested, the faster the economy will grow [5].

In general, Community empowerment policy can be divided into three groups. First, a policy that does not directly lead to targets but provides a basis for achieving an atmosphere that supports community socio-economic activities. Second, policies that directly lead to increased target economic activities. Third, specific policies that reach the poor and then invested, the faster the economy will grow [5].

Fred & Dominick [7] revealed that the study of income distribution is a topic that has been neglected in economics studies. Likewise [8] states that economic growth has consequences on high inequality because it provides obstacles to mobility between regions. This is in line with Kuznets [9] which states that in the early stages of economic growth, income distribution tends to deteriorate, but in later stages, income distribution will improve. This observation is then identified as the Kuznets curve "inverted U" due to longitudinal changes in income distribution [10].

Many studies have covered a lot about Micro, Small and Medium Enterprises (MSMEs) or Small and Medium Enterprises (SMEs) as the subject of research. There is also a link between the number of MSMEs or MSME growth in economic growth in their respective regions. The study conducted by Supriyanto [11] revealed that poverty alleviation by developing MSMEs has good potential. It turns out that the MSME sector has a large contribution to employment, which absorbs more than 99.45 percent of the workforce and contributes to GDP of around 30 percent. Efforts to promote and develop the MSME sector that absorbs more workers can improve the welfare of the workers involved in it, thereby reducing unemployment and poverty.

According to Sudiyarti & Irwansyah [12] the growing number of Micro, Small and Medium Enterprises (MSMEs) in Sumbawa regency, West Nusa Tenggara Province, is increasingly influencing the regional economic growth so that in the long run MSMEs can spur increased economic growth in the area.

Reswary [13] examines the "analysis of the factors influencing the unit number of industries in Surabaya" using the variables of labor, foreign exchange rates, investment, and inflation. The results of the research show that labor has a significant effect on the unit number of industries in Surabaya. While partially foreign exchange rates, investment, inflation, and industry have no influence or insignificance on the unit number of industries in Surabaya.

Tambunan [14] presents the results of research that MSEs have an important role as one of the ways to reduce poverty in regions (provinces), but their roles vary by the province which is determined by differences in access to MSEs to important inputs, such as education, technical assistance, raw materials, and capital. Likewise, Abduh [15] analyzed the determinants of the growth of micro, small and medium enterprises in Indonesia. The result shows that
per capita income and government spending have a positive and significant impact on the growth of MSMEs in Indonesia.

In addition, Bustam [16] mentions that the number of Micro, Small and Medium Enterprises (MSMEs), GDP of Micro, Small and Medium Enterprises (MSMEs) and investments simultaneously affect employment. Variations in factors that affect labor absorption are explained by the variable number MSME units, MSME GDP and investment which together affect 99.7 percent while the remaining 0.3 percent is explained by other variables outside of research.

Hapsari, Hakim, & Soeaidy [17] in his research explained that SMEs play an important role in the regional economy, especially in creating employment opportunities. This is based on the fact that on the one hand if the number of unemployed increases following the number of population growth each year, it must be balanced with the creation of new jobs support, like MSEs. The type of MSEs which is relatively labor intensive makes it possible to assist the absorption of unabsorbed labor. From supporting natural potential, Batu city has criteria for the growth of the MSEs business climate.

Furthermore, the number of companies/businesses from various business sectors can influence other variables, such as employment, GRDP, etc. Various studies conducted by several researchers explained the link between the number of businesses/companies from various sectors to the variables they influence. According to [18] there is an influence of industrial sector growth on employment in Sidoarjo regency in 2009-2015. The results of this study indicate that the growth of the industrial sector has a significant effect on employment (positive sign). That is, when the growth of the industrial sector increases, employment also can be increased.

Contrary to Herawati and Yoyok which revealed that industrialization activities also had an inverse relationship to the employment in Blitar Regency, Mahendra [19] examined the relationship between the number of industries and the absorption of labor having a negative relationship. The more the increase in the number of industries, the less labor absorbed, on the contrary, the less increase in the number of industries, the more labor is absorbed. This is also evidenced by the regression results that the influence of the number of industries on labor absorption in the wood lathe industry is not elastic. With the decline in the number of industries means that there is an additional employment opportunity so that there will be an increasing demand for new labor.

Inequality is a broader concept of poverty because it is defined based on the entire population, not only on the part of the population that is below a certain poverty line. Most measures of inequality do not depend on distribution averages, measures of inequality are often calculated for distributions other than expenditure, e.g income, land, assets, tax payments, and other basic variables [20].

Other studies related to income inequality are relatively large. Abdulah [21] conducted research on the factors that influence income inequality in Central Java. The results show that there are only two significant variables that cause inequality, namely the economic output share received by employers and wages. While the other two are insignificant namely urbanization and dependency ratio.

While Ramakrishnan & Cerisola [22] studied regional economic disparities in Australia. The results show that increases in real wages, productivity, and increases in state subsidy spending can reduce the unemployment rate so that it can slowly reduce economic disparities between regions in Australia.

Furthermore, Meliciani [23] examines income disparities between regions of the European Union which produce two main conclusions. First, the gap in the EU region has declined since the last 1990s. Second, the gap can decrease if using labor productivity variables rather than per capita income.

Likewise, Azwar, Hamzah, Masbar, & Syahnur [24] conducted an analysis of the economic growth gap between regions in the province of Aceh using panel data 2000–2010. The results showed that the only significant variable that could reduce the gap was the Human Development Index. While the cumulative effect of the region (cumulative causation effect) and per capita GRDP significantly but positively.

This research is explanatory which aims to explain the relationship between variables, is assumed to have a linear causality relationship that is a relationship (causation) involving 2 types of variables, namely independent variables that affect the dependent variable.

Based on the objectives of the research submitted and literature studies that have been presented and related research results, this research has the following theoretical framework:
3 Analysis Model

This study covers 23 regencies and cities in the province of Aceh. In addition, this study is limited by the number of variables studied, chosen based on studies/literature studies conducted on the basis of limitations and availability of data. Other studies will make it possible to get different results if you use different variables.

The data presented are a cross section, sourced from BPS data from the 2016 Economic Census activities and several other BPS data. This study uses 12 (twelve) variables, among others; community income gap (Y), number of MSEs units (X1), number of SMEs workers (X2), average MSEs workers (X3), total MSEs workers wages (X4), average MSEs wages (X5), the number of MLEs units (X6), the number of MLEs workers (X7), the average MLEs workers (X8), the total MLEs workers wage (X9), the MLEs average wage (X10), and the district/city economic growth (X11)

The next stage is to analyze the relationships between variables as well as to examine the MSEs and MLEs independent variables that predominantly affect the income gap of the community as the dependent variable. This study uses a multiple regression model, to analyze the influence of MSEs and MLEs variables on the income gap of district/city communities in Aceh province. Furthermore, it also examines the variables that can reduce the income gap.

Furthermore, the pattern of relationships that occur is assumed to follow a straight line pattern with one dependent variable and several independent variables. The relationship between variables in multiple linear regression models is formulated into the equation as follows:

\[ Y = \alpha + \sum_{i=1}^{n} (\beta_i X_i + \epsilon_i) \]  \hspace{1cm} \text{(1)}
\[ Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_n X_n + \epsilon_1 + \epsilon_2 + \ldots + \epsilon_n \]  \hspace{1cm} \text{(2)}

Note:
- \( Y \) : Dependent variable/response variable
- \( \alpha \) : Intercept (constant values obtained when all regression coefficients are "zero")
- \( \beta_i \) : The regression coefficient on the variable to i/slope
- \( X_i \) : Independent variable/predictor i
- \( \epsilon_i \) : Residual (the amount of value obtained outside of the independent variables studied)

The model is a model for parameters, so it is necessary to observe the value of the entire population in order to get the value. There are limitations in taking the population observation value and the difficulty of calculating the value of each residual and coefficient. It is necessary to estimate the magnitude of each coefficient.
There are several methods to estimate the regression coefficients of the model, the simplest is to use the Ordinary Least Squares method (least squares equation). This method is used because it meets the requirements in estimating a model and is also a "BLUE" or Best Linear Unbiased Estimator. That is mean, the OLS method is the best estimation method for estimating linear models and this method is also unbiased.

Based on the models formulated in equations (1) and (2), the following models are produced:

\[ Y = \hat{\alpha} + \sum_{i=1}^{n} \hat{\beta}_i X_i \]  
\[ \bar{Y} = \hat{\alpha} + \hat{\beta}_1 X_1 + \hat{\beta}_2 X_2 + \cdots + \hat{\beta}_n X_n \]

Note:
- \( Y \): The estimated value of the dependent variable / response variable
- \( \hat{\alpha} \): Intercept estimation value
- \( \hat{\beta}_i \): The estimated value of the regression coefficient on the variable \( i \)
- \( X_i \): Independent variables / predictors to \( i \)

If equation (4) we substitute into the variables to be studied, produce the following models:

\[ Y = \hat{\alpha} + \hat{\beta}_1 X_1 + \hat{\beta}_2 X_2 + \hat{\beta}_3 X_3 + \hat{\beta}_4 X_4 + \hat{\beta}_5 X_5 + \hat{\beta}_6 X_6 + \hat{\beta}_7 X_7 + \cdots + \hat{\beta}_9 X_9 + \hat{\beta}_{10} X_{10} + \hat{\beta}_{11} X_{11} \]

Note:
- \( Y \): District / city community income gap 2016
- \( \hat{\alpha} \): Intercept estimation value
- \( \hat{\beta}_i \): The estimated value of the regression coefficient on the variable \( i \)
- \( X_1 \): Number of MSEs units in 2016
- \( X_2 \): Number of MSEs workers in 2016
- \( X_3 \): The average of MSEs workers in 2016
- \( X_4 \): Total labor wages of MSEs in 2016
- \( X_5 \): Wages Average of MSEs in 2016
- \( X_6 \): Number of MLEs units in 2016
- \( X_7 \): Number of MLEs workers in 2016
- \( X_8 \): The average of MLEs worker in 2016
- \( X_9 \): Total workers wages of MLEs in 2016
- \( X_{10} \): Wages Average of MLEs in 2016
- \( X_{11} \): Regency / city economic growth in 2016

4 Result and Discussion

To analyze the influence of MSEs and MLEs variables (the number of MSEs units, the number of MSEs workers, the average MSEs workers, the total wages of MSEs workers, the average wages of MSEs, the number of MLEs units, the number of MLEs workers, the average workers of MLEs, the total wage of MLEs workers, the average wages of MLEs), and the economic growth of the regency and city against the income gap of the regencies and cities in Aceh Province, as previously described using the analysis model as follows:

\[ Y = \hat{\alpha} + \hat{\beta}_1 X_1 + \hat{\beta}_2 X_2 + \hat{\beta}_3 X_3 + \hat{\beta}_4 X_4 + \hat{\beta}_5 X_5 + \hat{\beta}_6 X_6 + \hat{\beta}_7 X_7 + \cdots + \hat{\beta}_9 X_9 + \hat{\beta}_{10} X_{10} + \hat{\beta}_{11} X_{11} \]

Note:
- \( Y \): District / city community income gap 2016
- \( \hat{\alpha} \): Intercept estimation value
- \( \hat{\beta}_i \): The estimated value of the regression coefficient on the variable \( i \)
- \( X_1 \): Number of MSEs units in 2016
- \( X_2 \): Number of MSEs workers in 2016
- \( X_3 \): The average of MSEs workers in 2016
- \( X_4 \): Total labor wages of MSEs in 2016
- \( X_5 \): Wages Average of MSEs in 2016
- \( X_6 \): Number of MLEs units in 2016
- \( X_7 \): Number of MLEs workers in 2016
- \( X_8 \): The average of MLEs worker in 2016
- \( X_{10} \): Wages Average of MLEs in 2016
- \( X_{11} \): Regency / city economic growth in 2016
Based on the data processing that has been carried out, the results obtained are as shown in Tables 1, 2 and 3 below.

### Table 1. Model Summary

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Std. The error of the Estimate</th>
<th>Durbin-Watson</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.888a</td>
<td>.789</td>
<td>.01825</td>
<td>1.936</td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), the number of MSEs units, the number of MSEs workers, the average MSEs workers, the total wages of MSEs workers, the average wages of MSEs, the number of MLEs units, the number of MLEs workers, the average MLEs workers, the total wage of MLEs workers, the average wages of MLEs

b. Dependent Variable: Income gap

The test of the coefficient of determination (R Square) is used to measure the goodness of fit of a model, which gives the proportion of total variation in the dependent variable explained by the independent variable (Gujarati, 2004). The amount of R Square ranges from 0 ≤ R Square ≤ 1, where if R Square gets closer to one, a model is said to be good because the higher the variation of the dependent variable can be explained by the independent variable.

From Table 1 above shows that the size of R Square is 0.789 or 78.90 percent. This means that the dependent variable (community income gap) can be explained by variations in the independent variables (number of MSEs units, number of MSEs workers, average MSEs workers, total wages of MSEs workers, average wage of MSEs workers, number of MLEs units, the number of MLEs workers, the average of MLEs workers, the total wage of MLEs workers, the average wage of MLEs workers, and the economic growth of regencies / cities) of 0.789 or 78.9 percent. While the remaining 0.212 or 21.1 percent is caused by other variables outside the model (outside of research).

### Table 2. Simultaneously Test (ANOVA Table)

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of Squares</th>
<th>Df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>.014</td>
<td>11</td>
<td>.001</td>
<td>3.740</td>
<td>.019b</td>
</tr>
<tr>
<td>Residual</td>
<td>.004</td>
<td>11</td>
<td>.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>.017</td>
<td>22</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Dependent Variable: Income gap

b. Predictors: (Constant), the number of MSEs units, the number of MSEs workers, the average MSEs workers, the total wages of MSEs workers, average wage of MSEs workers, number of MLEs units, the number of MLEs workers, the average of MLEs workers, the total wage of MLEs workers, the average wage of MLEs workers, and the economic growth of regencies / cities

The F test is basically used to prove the simultaneous effect of all independent variables of MSEs and MLEs (number of MSEs units, number of MSEs workers, average MSEs workers, total wages of MSEs workers, average wage of MSEs workers, number of MLEs units, number of MLEs workers, the average of MLEs workers, the total wage of MLEs workers, the average wage of MLEs workers, and the economic growth of regencies / cities) against the variable income gap.

Based on Table 2 above, it can be seen that the F count is 3.740 with a probability of 0.019. With a probability of 0.019 (less than the degree of error), it means that the MSEs and MLEs variables (number of MSEs units, number of MSEs workers, average MSEs workers, total wages of MSEs workers, average wage of MSEs workers, number of MLEs units, number of MLEs workers, the average of MLEs workers, the total wage of MLEs workers, the average wage of MLEs workers, and the economic growth of regencies / cities) simultaneously have a significant effect on the variable income gap.
Table 3. Partial test (t-test)

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Constant)</td>
<td>.063</td>
<td>.077</td>
<td>.821</td>
<td>.429</td>
</tr>
<tr>
<td>MSEs units</td>
<td>2.423E-005</td>
<td>.000</td>
<td>9.112</td>
<td>2.077</td>
</tr>
<tr>
<td>MSEs workers</td>
<td>-6.428E-006</td>
<td>.000</td>
<td>-6.028</td>
<td>-1.385</td>
</tr>
<tr>
<td>Ave wages MSEs</td>
<td>.048</td>
<td>.020</td>
<td>.859</td>
<td>2.401</td>
</tr>
<tr>
<td>Ave MLEs units</td>
<td>.000</td>
<td>.001</td>
<td>-.499</td>
<td>-.248</td>
</tr>
<tr>
<td>Ave MLEs workers</td>
<td>1.133E-005</td>
<td>.000</td>
<td>1.540</td>
<td>.558</td>
</tr>
<tr>
<td>Wage of MLEs</td>
<td>5.400E-012</td>
<td>.000</td>
<td>-.231</td>
<td>-.577</td>
</tr>
<tr>
<td>Ave wage MLEs</td>
<td>6.271E-007</td>
<td>.000</td>
<td>.299</td>
<td>.879</td>
</tr>
<tr>
<td>Economic growth</td>
<td>.007</td>
<td>.003</td>
<td>.474</td>
<td>2.584</td>
</tr>
</tbody>
</table>

The partial test (t-test) aims to analyze the independent variables have a partial significant effect on the dependent variable. Based on Table 3, it shows that the number of MSEs units, the average MSEs workers, the total remuneration (wages) received by the MSEs workers, the average wage of MSEs workers, and the economic growth of regencies/cities in 2016 significantly affected the income gap community in the provincial district/city of Aceh. While the number of MSEs workers, the number of MLEs units, the number of MLEs workers, the average of MLEs workers, the total wages of MLEs workers, and the average wage of MLEs workers did not significantly influence on the community income gap. The only variable that has a significant effect on reducing the income gap in the community is the total remuneration (wages) received by MSEs workers. That is, the greater the total wages received by laborers, the more prosperous workers who receive income, even more equally the distribution of community income, so that the disparity in the income of the people of Aceh province can be suppressed.

The number of MSEs workers does not significantly influence the income gap due to many MSEs workers not being paid because they employ family members as workers, including business owners who do not count on wages.

The number of MLEs units, the number of MLEs workers, the average of MLEs workers, the total wages of MLEs workers, and the average wage of MLEs workers does not significantly influence to the community income gap. This is because the number of MLEs units only has a proportion of 1.26 percent (5.5 thousand units) of business when compared to MSEs recorded 98.74 percent of the total 432.8 thousand businesses. Another cause, MLEs is concentrated only in five districts/cities, including the City of Banda Aceh, Kota Lhokseumawe, Kabupaten Aceh Besar, Bireuen District, and North Aceh Regency (52.75 percent). The uneven scale of the MLEs business in the province of Aceh is believed to be a trigger for not being able to overcome the community income gap because it is concentrated in five districts/cities. In addition, because the number of business units is relatively limited, of course, the labor absorbed is also small so that unemployment continues to increase.
5 Conclusions And Recommendations

5.1 Conclusion

The number of MSEs units, the average MSEs workers, the total wages of MSEs workers, the average wage of MSEs workers, and the economic growth of regencies/cities in 2016 significantly affected the community income gap in the provincial districts/cities of Aceh. While the number of MSEs workers, the number of MLEs units, the number of MLEs workers, the average of MLEs workers, the total wages of MLEs workers, and the average wage of MLEs workers did not significantly influence the community income gap. The only factor that has a significant influence in reducing the income gap is the total compensation (wages) received by MSEs workers.

5.2 Recommendation

Based on the conclusions above which stated that the only variable that significantly affected the community income gap was the total remuneration (wages) received by MSEs workers. Based on these conclusions, this study provides some recommendations to the Aceh government as policy-holder authorities to be implemented immediately. Recommendations that can be given are to strengthen Micro Small Enterprises (MSEs), including cooperatives as a driver of the Aceh economy, increasing the number of MSE units that can absorb labor so that rewards/wages received by workers also increase, automatically reducing community income gaps in all district/city of Aceh province. Furthermore, the Government of Aceh and district/city governments, especially the Manpower Office, encouraged all MSEs to provide wages in accordance with the Aceh UMP (provincial minimum wages ) in 2018 amounting to 2,7 million rupiah . Because all MLEs variables are not significant in overcoming community income gaps, the Aceh and Regency / CityInvestment Services immediately pushed the number of MLEs to increase its growth and focused more on 18 (eighteen) other regencies/cities. The uneven scale of MLEs business in Aceh province is believed to be a trigger of not being able to overcome the community income gap because it is only concentrated in five district/city.

REFERENCES


Development of Student Worksheets Based on Problem Based Learning in Static Fluid

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Abstract. This study aims to describe the feasibility level of worksheet-based PBL on static fluid material in MAN 2 Meulaboh, Aceh. This research is development research with ADDIE type. Data collection is done through the validity sheet of content, presentation and language experts. The research data obtained were analyzed by descriptive percentage. The module feasibility test results by content experts reached 84.10\%, presentation experts reached 88.21\%, and linguists reached 89.17\%. Based on the results of data analysis, it can be concluded that the development of worksheet-based PBL is feasible to apply to the level of SMA / MA.

Keywords: Worksheet, model PBL.

1 Introduction

Physics is one of the lessons at the high school level that must be studied by science students, who study learning and natural phenomena. According to [1], that the core of physics learning itself includes the processes of science which in learning requires interaction with real objects and interactions with the learning environment. So that students in addition to gaining knowledge and mastering concepts that are learned also increase motivation in learning, then learning physics comes alive. But in reality, this is not the case in MAN 2 Meulaboh, learning that should be dominated by students (student center) but still dominated by teachers (teacher center).

MAN 2 Meulaboh is a madrasa that has a strategic location, close to the city and easily accessible by the community. Even so, the Meulaboh MAN 2 students have a different character from the madrasa/school in the city center, where they seem to be indifferent and not accustomed to digging up their own information from books in the library and the internet.

Physics material has a very prominent characteristic, namely the concepts that are interrelated, meaning that to be able to master a new or certain concept, students must already understand other concepts that are related directly or indirectly to the concepts being studied. This is often encountered by students' complaints about physics lessons. The students always assume that physics is difficult and scary. Apart from the students themselves, the teacher also in the delivery of material cannot be understood by students. This condition is due to physics learning that still applies to learn models that are not in accordance with the concept, not yet
linking the concepts with the experience of students so that the learning motivation of students is low.

Based on the above problems, it is necessary to have changes and innovations in learning, one of which is the application of appropriate media. One of the learning media to activate students in class is with the student worksheet (LKPD). According to Prastowo [2], LKPD is a printed teaching material in the form of sheets of paper containing material, summaries, and instructions for implementing learning tasks that must be done by students, which refers to the basic competencies that must be achieved. Students gain knowledge and understanding of the concepts learned by conducting activities according to the LKPD instructions, not from teacher explanations. This is in accordance with the demands in the 2013 curriculum.

The type of LKPD that is often encountered so far is only the completion of questions, and many of them are not in accordance with the character and environment of students, so students have no motivation in learning which results in low understanding of physics concepts, therefore the appropriate LKPD needs to be developed by innovating with the learning model. The aim is to innovate the LKPD with a model so that learning is more interesting and students have increased learning motivation so that students are able to master the concept.

Learning so far is still teacher-based, and there have not been two directions. The teacher is still the center of learning (teacher center), so students are less involved and do not understand the material delivered by the teacher. This happens because they have to pursue material so that it is completed when it is approaching the final school exam (UAS). Even though physics is a basic knowledge that is needed by students to support the next level of education. Learning with LKPD accompanied by a problem-based learning (PBL) method provides opportunities for students to be more exploratory based on their abilities so as to create more independent learning and this will change the learning orientation that was initially teacher-centered, then change to center on student activities.

According to Atasoy in Celikler [3] LKPD is a basic tool that consists of steps and processes needed by students and helps students to shape knowledge and participate fully in all class activities at the same time. Yasir, Susantini, & Isnawati (2013) development of student worksheets based on metacognitive learning strategies to improve student learning outcomes, that worksheets based on metacognitive learning strategies have theoretically feasible limits with a percentage of 91% (category: very feasible) and empirically based on completeness of outcome indicators learn 99.31%. The learning outcomes are in accordance with KKM standards, namely 75% can be said to be suitable for use. Wijayanti [5] that the quality of LKS greatly influences students' learning motivation.

Various development studies have been carried out before, that LKPD affects the creativity of students. [6], that LKPD influences students' competencies. Yildirim, Sevil, & Alipasa (2011) that learning by using LKS can improve student learning achievement. The results of the Pariska, Elniati & Syafriandi [8] study, that the application of learning using PBL-based worksheets can encourage students to think creatively. The research of [9], the results of the study showed that learning using LKS was more effective in improving student learning outcomes than learning with conventional models. Research conducted by Indriani, Murtiani & Gusnaedi[10] states that learning by using LKS can improve student learning outcomes.

Based on the background of the problem and the definition above, to solve the problem of the difficulties of students in static fluid material at Meulaboh MAN 2 it is necessary to develop PBL based LKPD because PBL is one of the learning models that can be used to develop students' mindsets and make students active. In accordance with the opinion of Nata [11], problem-solving learning is a continuation of learning understanding, learning is directed at helping students restructure the situation they face in order to solve problems.
2 Methods

This research is an ADDIE type of development research, namely the development of PBL-based LKPD on static fluid material. The steps of research and development through the ADDIE model Sugiyono[12] are as follows:

a) The analysis is a process of defining what students will learn. So to know or determine what must be learned, we must do several activities, including:
   1) Conducting needs assessment analysis, namely to determine the abilities or competencies that students need to learn, the analysis referred to in this study is an analysis of increasing understanding of concepts and learning motivation of students that is influenced by the application of PBL-based LKPD.
   2) Analyze task analysis (task analysis) which is to find out and clarify whether the problem faced requires a solution in the form of learning devices. Therefore, the output to be produced is in the form of characteristics or profiles of prospective participants, identification of gaps, identification of needs and detailed task analysis based on needs.

b) Design, this stage is also known as the term making a design by formulating a design including:
   1) Determine learning objectives.
   2) Prepare a test, where the test must be based on the learning objectives that have been formulated.
   3) Determine the right learning strategy by using the discussion method to achieve that goal.
   4) Making PBL based LKPD.

c) Development is the process of realizing design into reality, then the development of PBL-based LKPD is carried out. One important step in the development phase is a trial before implementing limited class trials (small classes). This trial phase is indeed part of one of the ADDIE steps, namely evaluation. More precisely formative evaluation, because the results are used to improve the learning system that we are developing.

d) Implementation is a real step to implement PBL-based LKPD. At this stage PBL-based, LKPDs that have been developed are arranged in such a way according to their roles or functions that they can be implemented according to the initial design. The implementation referred to in this study is to conduct a limited-scale trial in the classroom and even apply it to learning with the aim of improving students' conceptual understanding.

e) Evaluation, the process to see whether the PBL-based LKPD that is being developed is successful or not and whether it is in accordance with initial expectations or not. Evaluations that occur in each of the four stages above are called formative evaluations because the purpose is for revision needs. For example, at the design stage, maybe we need one form of formative evaluation such as an expert revision to provide input to the design we are making. At the development stage, it may be necessary to try out a product that we have developed or maybe need a small group evaluation and others.

The flow of research and development through the ADDIE model is as Figure 1:
3 Result and Discussion

Phase I validation obtained 100% positive answers for all assessment points from all experts. Based on these results it can be said that the developed LKPD passed the stage I validation and was reassessed in stage II validation. Phase II validation can be carried out with the requirements for stage I validation, the percentage obtained is 100% or all experts give a positive assessment. The recapitulation of the results of Phase I expert assessment of the module can be seen in Table 1.

LKPD that have passed stage I are reassessed more deeply in stage II validation which was carried out 2 times, namely before limited scale trials and before large-scale trials. Based on the results of the validation before the limited scale trial it can be seen that the LKPD developed shows the results of the Content (Content) expert validation of 71.48% included in the criteria of "feasible", structural experts showed 83.75% included in the criteria "very feasible" and linguists show results of 84.03% included in the criteria of "very decent".

Figure 1. Step in Development Research
(Source: Sugiyono, 2006) [12]
Table 1. Data Recapitulation of Phase I Validation Results by Experts on LKPD

<table>
<thead>
<tr>
<th>No</th>
<th>Validation</th>
<th>Percentage of Assessment</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Content Expert (Content)</td>
<td>100</td>
<td>Get away</td>
</tr>
<tr>
<td>2</td>
<td>Structural Specialist</td>
<td>100</td>
<td>Get away</td>
</tr>
<tr>
<td>3</td>
<td>Language Specialist</td>
<td>79, 100</td>
<td>Get away</td>
</tr>
</tbody>
</table>

Based on these results it can be said that the static fluid LKPD that has been developed is declared feasible and can be tested on a limited scale trial. Data recapitulation from the results of stage II expert validation on LKPD can be seen in Table 2.

Table 2. Recapitulation of Data on Phase II Validation Results by Experts on LKPD

<table>
<thead>
<tr>
<th>No</th>
<th>Validation</th>
<th>Percentage</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Stage I</td>
<td>Stage II</td>
</tr>
<tr>
<td>1</td>
<td>Content Expert (Content)</td>
<td>71,48</td>
<td>Worthy</td>
</tr>
<tr>
<td>2</td>
<td>Structural Specialist</td>
<td>83,75</td>
<td>Very Worthy</td>
</tr>
<tr>
<td>3</td>
<td>Language Specialist</td>
<td>62,50</td>
<td>Very Worthy</td>
</tr>
</tbody>
</table>

After a limited scale trial was carried out, re-validation was carried out before a large-scale trial was made known that the LKPD developed showed positive results of content expert validation (content) of 85.09 and 95.74 included in the criteria of "very feasible" structural experts., 03 and 96.53 included in the criteria of "very decent" and linguists showed the results of 94.58 included in the criteria of "very feasible". Recapitulation of data from expert validation results before a large-scale trial of LKPD can be seen in Table 3.

Table 3. Recapitulation of Data on Phase II Validation Results by Experts on LKPD before Trial Extensive Scale

<table>
<thead>
<tr>
<th>No</th>
<th>Validation</th>
<th>Percentage</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Stage I</td>
<td>Stage II</td>
</tr>
<tr>
<td>1</td>
<td>Content Expert (Content)</td>
<td>85,09</td>
<td>95,74</td>
</tr>
<tr>
<td>2</td>
<td>Structural Specialist</td>
<td>84,03</td>
<td>96,58</td>
</tr>
<tr>
<td>3</td>
<td>Language Specialist</td>
<td>94,58</td>
<td>-</td>
</tr>
</tbody>
</table>

During the validation process, suggestions and comments are given by experts. The several improvements to the LKPD that have been carried out are presented in Table 4.
Table 4. LKPD Evaluation and Revision Results

<table>
<thead>
<tr>
<th>No</th>
<th>Suggestions / Comments</th>
<th>Repair</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Images need to be clarified again and based on facts in the field in accordance with the Aceh region.</td>
<td>Reviewing the images on the LKPD that need to be repaired, clarifying the images, and adding images that are appropriate to the environment around Aceh.</td>
</tr>
<tr>
<td>2.</td>
<td>The image display must be colored and large</td>
<td>Review the images and replace them with large, colorful images to make them clearer</td>
</tr>
<tr>
<td>3.</td>
<td>Procedure for writing that is not in accordance with EYD</td>
<td>Reread and correct writing that is not yet standard and not in accordance with EYD, by referring to the dictionary of the Indonesian language dictionary.</td>
</tr>
<tr>
<td>4.</td>
<td>Combine color and writing well so that it is eye-catching.</td>
<td>Review the colors on the LKPD and consult with experts to create a good color combination.</td>
</tr>
<tr>
<td>5.</td>
<td>Latest literature</td>
<td>Search for and add the latest literature.</td>
</tr>
<tr>
<td>6.</td>
<td>Re-check the LKPD steps and suitability with the PBL model steps</td>
<td>Check the LPKD steps and adjust the steps of the PBL model.</td>
</tr>
<tr>
<td>7.</td>
<td>Material needs to be added and sample questions.</td>
<td>Add static fluid material along with sample questions.</td>
</tr>
<tr>
<td>8.</td>
<td>Cases must be contextual</td>
<td>Revise the case of contextual static fluid material.</td>
</tr>
</tbody>
</table>

4 Conclusion

Based on the problems of data analysis the results of the study can be concluded that PBL-based LKPD developed is suitable for physics learning at the high school level.

REFERENCES

Coffee Berry Borer (Hypothenemus Hampei Ferr.) Attacks in Organic and Conventional Arabica Coffee Plantations

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Abstract. We have conducted a series of studies on Arabica coffee plantations in Aceh Tengah Regency, Aceh Province, Indonesia to study the effect of organic and conventional coffee plantation systems on the level of attack by coffee berry borer (CBB), Hypothenemus hampei. The results showed that at each observation the level of CBB attacks on coffee plants cultivated organically was lower than those cultivated conventionally. The level of CBB attack on organic and conventional coffee plantations is between 7.9 - 12.1% and 13.2 - 22.2% respectively. From the results of this study, it is suspected that in coffee plantations that are cultured organically there are more diverse or more abundant organisms that act as natural enemies, so they can suppress CBB population development. Meanwhile, conventional coffee cultivation is suspected to have decreased the natural enemy population of CBB, because on these lands synthetic pesticides have been used continuously to control various disturbing organisms in coffee plants. The results of this study indicate that organic coffee farming systems have played an important role in maintaining the biodiversity of various organisms in coffee plantations, so that the population development of various coffee plant pests, i.e. CBB can be balanced by the development of their natural enemy population.

Keywords: Arabica coffee, organic and conventional coffee plantation, Hypothenemus hampei

1 Introduction

Data Coffee berry borer (CCB) is the most dangerous insect pest in coffee plants [1]–[5]. The coffee berry borer (CBB), Hypothenemus hampei, is the most significant insect pest of coffee worldwide. CCB (Hypothenemus hampei) originated in Central Africa, was first discovered in a coffee plantation on the island of Java in 1909 [1]. As a result of this pest, attack has caused a decrease in the production of coffee beans both in quantity and quality. Due to this pest attack, coffee production can decrease by up to 50% [6]. Barrera (2008) reports that loss of results due to CCB attacks can reach 30-35%, even in the harvest season can reach 100%.

This pest attack from year to year continues to increase, even these pests are reported to have attacked coffee plants planted at an altitude of 1500 m above sea level. The effects of global warming are thought to have triggered an increase in insect pest attacks on various crops grown in the highlands, including coffee plants. The use of synthetic insecticides to control these pests is not recommended, because in addition to being ineffective it can also adversely affect humans and the surrounding environment. Therefore, it is necessary to look for other alternatives to control these pests.
One alternative that is very possible is to empower the natural enemies of CCB pests that are inside the coffee plantation area. These domestic natural enemies can be predators, parasitoid insects, or entomopathogens. These biocontrol agents will be able to suppress the development of pest populations if supported by good environmental conditions, namely the environment that is free from the contamination of harmful chemical compounds, especially those derived from pesticides. The only system that allows for the preservation of biocontrol agents on agricultural land is the organic farming system. The organic farming system is an agricultural system that does not use harmful chemicals at all, either from pesticides or synthetic fertilizers. Human awareness of the importance of applying organic farming systems is triggered by their awareness of the dangers of synthetic chemical compounds to humans and the environment. Now there are several agricultural commodities that apply organic farming systems, one of which is coffee plants.

One area of an organic coffee plantation that is quite extensive is in Aceh Tengah District, Aceh Province, Indonesia. In the area, it has been cultivated more than 13,000 Ha of Arabica coffee plants organically (Disbunhut Kab.Aceh Tengah, 2015). One reason farmers in this area grow coffee organically is because the selling price of organic coffee beans is much higher than conventional ones. Arabica coffee is the main export commodity in this region. The reason for the higher selling price of organic coffee is because organic coffee is considered safer to consume, especially by consumers abroad.

Organic coffee cultivation is not only economically beneficial but also ecologically, because the organic farming system does not negatively affect the environment. Conversely, conventional farming systems are thought to have triggered environmental damage, both biotic and abiotic. Quite a lot of research reports on the occurrence of pest explosion cases that occur more often in agricultural areas that are routinely sprayed with pesticides, because of the occurrence of pest resurgence and resistance.

In connection with this, we have conducted a series of observations to see a comparison of the level of CBB pest attacks between Arabica coffee plantations that are managed organically with conventional ones.

2 Material and Methods

2.1 Selection of Research Plot Location

In determining the research plot, the general conditions of the research location and environmental factors, such as the altitude of the sea level, shade plants, and the age of the sample plants are as homogeneous as possible. Therefore, mapping of the area was carried out by measuring the altitude of each research location using GPS. The sampling location was selected for coffee plantations that were managed conventionally and organically at an altitude of 1,100 - 1,300 m above sea level with an area of at least 10 Ha. Generally, the coffee plantation area in Aceh Tengah Regency is at this altitude, which is the most ideal condition for the growth of Gayo arabica coffee. The area of each research plot is 1 Ha with a total of 20 sample plants per plots randomly zigzagged, so there are 20 organic and 20 non-organic sample plants respectively.

2.2 Observation

The observation period is carried out 3 (three) times, namely before the harvest period, during the harvest and after the harvest, with a number of observations each period of 2 (two)
times. To calculate the level of CBB attack from each sample tree 200 pieces of coffee were taken randomly from each sample tree. The level (percentage) of an attack is calculated using the formula:

\[ P = \frac{a}{b} \times 100\% \]

**Figure 1.** Coffee berry borer attack in conventional and organic coffee plantation

- **P:** Percentage of infected fruit
- **a:** The amount of sample fruit attacked
- **b:** The total number of samples

### 3 Results and Discussion

The results showed that in general the percentage of coffee berry attacked by CBB on organic coffee plantations was lower than conventional ones. The level of CBB attack on organic and conventional coffee plantations is between 7.9 - 12.1% and 13.2 - 22.2% respectively (Fig. 1). In organically managed coffee plantations, it is suspected that there are many organisms that act as biological control agents that can suppress CBB pest populations so that the level of CBB attacks is lower than conventional coffee plantations. Research conducted by Hamdi, Sapdi, & Husni (2015) on Arabica coffee plantations in Aceh Tengah Regency, also showed that the level of diversity of various species of Hymenoptera parasitoid was much higher in coffee plantations that were managed organically than coffee plantations that were managed inorganically. Individual abundance, number of families and higher wealth of Hymenoptera species are found in coffee cultivation practices organically compared to conventional coffee plantations. The composition of Hymenoptera parasitoid in coffee plantations that are managed organically consists of 13 families, while in coffee gardens conventionally managed only consists of 7 families [9]. Various studies reviewed related to
the influence of organic and conventional farming systems on insect populations. The results of the review show that in organic farmland species richness and abundance of insect populations are higher compared to conventional agricultural land [10]. The research conducted by Chau & Heong (2005) on rice plants also shows that organically grown rice plants have a lower rate of pest and disease attack than rice plants grown conventionally, and their productivity was not significantly different from those planted conventionally.

In our preliminary experiments also shows that in coffee plantations that are managed organically the level of diversity and number of Arthropod species that act as predators and parasitoids is much higher than conventional coffee plantations [9]. This indicates that the application of various synthetic pesticides in conventional coffee plantations has a negative impact on Arthropods which acts as a natural enemy in coffee plants. Quite a lot of broad spectrum pesticides such as organophosphate have disrupted the existence of various beneficial species, such as natural enemies and have also caused secondary pest outbreaks [12]. In our previous study Hamdi et al., (2015) we found a parasitoid species that was once released in a coffee plantation in Aceh Tengah Regency, namely Phoroponasusta (Hymenoptera: Bethylidae). This parasitoid was released by the Aceh Tengah Regency Plantation and Forestry Service (Disbunhut Kab.Aceh Tengah, 2015) several years ago to control CBB pests. It is suspected that the presence of this parasitoid in coffee plantations in Aceh Tengah Regency has helped suppress CBB pest population. Of course, further research is needed to find the most potential domestic natural enemies to control this CBB pest. The results of this study have also been able to answer the benefits of organic coffee cultivation, which is in addition to ensuring the avoidance of coffee beans from the contamination of harmful chemical compounds, is also able to reduce the level of CBB pest attacks.

REFERENCES


Abstract. In implementing leadership style programs to improve teacher performance, this program is very important for both students and students. The purpose of this study is to find out: formulation programs, implementation of strategies, and improvement programs. This study uses a descriptive method with a qualitative approach. Data collection techniques: observation, interviews, and documentation studies. The subjects of this study were principals, supervisors, and teachers. (1) Leadership style in improving teacher performance, the formulation begins with monitoring or analysis carried out by the principal, the supervisor. Applicable KEMENDIKBUD regulations and curriculum regulations guide programs that are compiled, long-term programs, all programs. The competencies are possessed by the principle which is contained in the leadership style of the principal to improve teacher performance; (2) The principal implements leadership style programs in improving teacher performance; (3) What are the obstacles that are faced in implementing leadership style in improving teacher performance rather than the personality rather than the teacher itself.

Keywords: Leadership Style, Principal, and Teacher Performance.

1 Introduction

Indonesia's national education aims to develop the potential of students to become human beings who believe and devote to God Almighty, have noble character, are healthy, knowledgeable, capable, creative, independent and become citizens of a democratic and responsible state as stated in the Law No. 20 of 2003 [1] concerning the national education system in article 1. To achieve this goal an Indonesian national education system was established which was carried out to the nation's cultural and philosophical roots with an orientation towards global competition in the progress of world civilization through national education management.

Mulyasa[2] said: "The occurrence of various community changes and the multidimensional crisis that has long hit Indonesia has made it difficult to find the ideal leader who has a high commitment to his duties and responsibilities. Many fields of life are met by leaders who are less qualified to carry out the mandate of their leadership. Likewise in education, not a few amateur, educational leaders who do not have a clear vision and mission about the educational institutions or schools they lead. This, of course, needs serious handling because educational leadership is very important in building effective schools". To improve the quality of education as expected, not only the role of the teacher is demanded, but the principal is also very instrumental in it. The principal is as a leader or top manager at his school. He is the driving force of all available resources in schools, both teacher resources, administrative staff, and
students. Thus the teacher, the principal must be able to influence, encourage, direct the teacher so that they carry out their duties optimally. Thus, the role that is highly expected from the principal is effectiveness or management of the school principal in moving the teachers.

Effective principals are principals who have a variety of abilities and competencies that are adequate. Karwati & Priansa [3] said that principals’ leadership was constructed on five dimensions that are important for each school principal: (a) Educational capabilities (educational capabilities; (b) Personal capabilities; (c) Relational abilities (relational capabilities); (d) intellectual capabilities; and (e) organizational capabilities. Sagala [4] said that the characteristic of the principal's leadership was to have a high work morale and was visionary characterized by (1) correctly understanding the various aspects of school activities by using cognitive and reasoning power regularly and intensively; (2) responsive to various changes in knowledge and technology; (3) effective communication skills; (4) looking at school interests as a whole; (5) thinking and acting rationally and objectively; and (6) able to determine priorities sharply. With the management of the principal's leadership, it will be able to improve teacher professionalism.

From some of the above meanings, it can be concluded that the leadership of the principal is related to the ability and competence of the head as if both hard skills and soft skills to influence all school resources to be able to achieve the goals and objectives set by the school. Principal leadership that can be said to be effective is leadership that can empower all the potential that exists in the school, and the purpose of this study is to find out: program formulation, implementation of strategies, and barriers faced by principals in implementing staffing service improvement programs.

2 Method

The approach used in this study is a qualitative approach using descriptive. Descriptive research methods in research methods that aim to describe the condition of the research field at present or when the research was conducted. Data collected is analyzed qualitatively to get meaning from observed phenomena. Cresswell [5] says that; "Qualitative research is the process of exploring and understanding the meaning of individual and group behavior, describing social problems or humanitarian problems." The whole qualitative purpose is to reach an understanding of how people feel in the process of life, mem gives meaning, and describes how people Installs interpreted experience. Data collection can be done in various settings, various sources, and various ways.

When viewed from the settings the data can be collected in natural settings, in laboratories with experimental methods, in schools with education and education personnel, at home with various respondents, at a seminar, discussion, on the road and others. Data and information that have been obtained by the next researcher are analyzed and interpreted from the beginning of the study until the end of the study by referring to the theoretical foundation that relates to the problem under study. Data analysis in qualitative research is done by classifying, directing, removing unnecessary, and organizing data (reducing data), summarizing the main points (display data) and drawing conclusions (data verification).
3 Result and Discussion

3.1 Principal Style

The results showed that the principal’s program to improve teacher performance used leadership with a style of openness between subordinates and superiors and if there were things that needed to be discussed then deliberations or discussions would be held to get a way out deliberately with subordinates and superiors at school that is.

3.2 Implementation of Teacher Performance Improvement Program

Based on the results of the study it can be concluded that the implementation of teacher performance improvement programs is certainly done by deliberating on what steps will be taken in the future in order to improve teacher performance, and one of them by holding a KKG meeting, guiding teachers to prepare lesson plans, supervise teachers and evaluate teacher performance.

3.3 Barriers to Implementation of Principal Management

Obstacles faced in improving teacher performance certainly exist such as the low ability to use electronic devices that can support teacher performance to more powerful things, such as the use of laptops, internet, so that teachers are constrained in getting knowledge or i, you about education that current national and international level.

4 Conclusion

With the existence of an appropriate leadership style for the principal, the teacher is more comfortable discussing with the principal. With the principal's program to improve teacher performance, almost all the teachers in the school have improved their performance both in terms of knowledge and from the aspect of awareness in complying with the agreed-upon rules. By knowing the obstacles faced, the principal can evaluate and plan for the future what should be done to improve the quality of learning continuously.

REFERENCES

Science, Technology, and Society (STS) Learning in Senior High School Chemistry Class

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Abstract. This research is started by developed STS student-worksheet, validated and applied in senior high school chemistry class. The student worksheet was developed by using R & D with the ADDIE model following the STS syntaxes. The worksheet was designed based on popular issue in everyday life and provide solutions according to science and technology. The students were given a problem statement and asked to plan and to run experiments to solve the problem. They have to videotape their work and reported their finding to the teachers. The student worksheet was considered valid by the experts before being applied. The validation score was 93.90% with a very feasible and valid category. The score of student worksheet was 86.25% of expectation. The main students’ score on students’ activities in class 95.31. Teacher and students gave positive responses to STS learning as shown score of positive respond reaching nearly maximum (94.50%). Nearly all agree that the student worksheet can be used as teaching material in chemistry learning.

Keywords. Worksheet, STS, learning.

1 Introduction

The knowledge development in the modern world goes very fast and has an impact on social change [1], [2]. Since information on science and technology can be accessed easily, then often students prefer to memorize data instead of to learn to think and to solve the problem. Ideally, the role of the teacher is to guide student to choose an essential concept and to train students to think, to analyze and to solve the problems in their daily life [3]. Teachers need to look for technology-related issues or relevant problems in everyday life, and then ask the student to creatively solve the problems using relevant concepts either independently or with teacher guidance [4]. STS learning is contextual learning and the application of science and technology in the context of human life. STS learning means integrating understanding and utilization of science, technology, and society. The application of science and technology is implemented as human skills that are beneficial for the students and society [5].

Some previous studies reported that STS learning significantly improved students’ understanding of science concepts [6], [7] Students also mastered better the concept of chemical equilibrium [8]. After STS learning, student has more motivation to learn chemistry. They learn it in the context of real life by exploring how science and technology can contribute to society and led them to develop their skills [9], [10]. In this learning model, students expressed their
ideas by identifying, analyzing and finding solutions to issues or problems faced in daily life [11], [12].

Following the STS model, the student worksheet is deal to the issues or problems that are often found in the community. The problem statement in this worksheet are concerning issue in the Indonesian community, which are how to differentiate pure honey from manipulated ones. How to determine the contamination of poly-acetylene resin (plastic) in fried food and how to identified borax contaminating food. The students are expected to solve this problem by using chemistry concept which is not common in regular high school regular chemistry curriculum. Asking the student to videotape of their report is part of the agenda to motivate them to run the project [13].

2 Methods

This study uses Research and Development (R & D) methods with model Analysis, Design, Development, Implementation, and Evaluation (ADDIE). This research model verified the previous reports [14], [15]. The procedure was started by need assessment for STS worksheet, analysis of curriculum and school supporting facilities, design the STS worksheet based on the syntax, composing the worksheet and related teaching material, implementation in small group and finally evaluation. The STS worksheet quality is validated by experts based on the format, the STS syntax and the content, language, and layout, illustration and completeness of components. All of the aspects have a score of 93.90% and is feasible to apply in chemistry class. Two high schools that are SMAN 3 Banda Aceh (31 students) representing an accredited high school and SMAN 14 Iskandar Muda (21 students) as a moderate accredited school. The school was chosen by using a disproportionate stratified random sampling technique. Data were collected by using student assessment worksheets, observation worksheets of student activities and questionnaire for teacher and student responses on STS worksheet implementation.

3 Result and Discussion

Four groups of student were conducted each project that was developing scientific methods on (1) analysis the purity sold honey, (2) analysis of fried foods that containing plastic, (3) analysis of foods that containing borax, and (4) purification of used cooking oil by using charcoal. Each of these projects was narrated as a problem statement in the student worksheet. Represent STS student worksheet format as follow:

Name : 
Project title : 
Group :

1. Initial stage
…theoretical background to introduce the problem to be solve ...(provided by teacher in order to write problem statement)
(a) Problem statement : .......
(b) Hypothesis : .......

2. Concept Formulation stage
(a) material and equipment needed to run Experiment : .......
(b) experimental procedure : ....
(c) observation sheet/table : ....

3. Concept Application stage
write 3 examples the application of science you just learnt in community!

.............
.............

4. Consolidation of Concept Stage
Did your experiment data answer your hypothesis ?
.............................................................
.............................................................
compare your hypothesis with you experimental finding
Conclusion :
.............................................................
.............................................................
........
The students carried out their project by following several steps according to STS syntax Primastuti & Atun (2018) as follows: (1) initiation stage; the students read and comprehend the problems statement in the worksheet, discussed within their peer to formulate hypotheses. (2) The concept formation stage, students, looked for an alternative solution and conducting experiments. Students process all data, recorded in the form of observation tables and analyzed it. Students search and record as much as possible information to obtain new findings. The students documented their work by videotaping. (3) Concept application phase, the students answered how chemistry contributed to manufacturing goof (food) and how chemistry solve the community concern issue (analysis in food contamination). Students are given the opportunity to look for answers from various sources and literature. (4) Concept stabilization phase, students reviewed their hypothesis in accordance experiment finding, before formulated the conclusions. (5) The evaluation phase, the students must present their work including playing the video made. Student activities and representative of their work report are shown in Figures 1.
3.1 Student Activity Scores

Observation of student activities is a very important thing to see the success of the learning process. Activities observed from the preliminary stage to the closing of learning. Student activities during the implementation of STS learning are observed based on the observation sheet rubrics. Student activity score is shown in Table 1.

Table 1. Student Activity Scores.

<table>
<thead>
<tr>
<th>Aspect of assessment</th>
<th>Assessment of students’ activity (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Good high school</td>
</tr>
<tr>
<td>Listen to the explanation of STS based learning</td>
<td>93.75</td>
</tr>
<tr>
<td>Understand the worksheet and discuss the formulation of the</td>
<td>87.50</td>
</tr>
<tr>
<td>problem and hypothesis</td>
<td></td>
</tr>
<tr>
<td>Prepare experimental tools and materials</td>
<td>93.75</td>
</tr>
<tr>
<td>Prepare recording equipment to make video documentation</td>
<td>100.00</td>
</tr>
<tr>
<td>Do experiment</td>
<td>100.00</td>
</tr>
<tr>
<td>Working on the worksheet</td>
<td>93.75</td>
</tr>
<tr>
<td>Presenting the results of the experiment with video</td>
<td>93.75</td>
</tr>
<tr>
<td>documentation</td>
<td></td>
</tr>
<tr>
<td>Fill the response questionnaire</td>
<td>100.00</td>
</tr>
<tr>
<td>Average</td>
<td>95.31</td>
</tr>
</tbody>
</table>

During implementation STS in class, the student activities score were very high that was 95.31% and 89.06% for high and moderate accredited schools. This suggested that STS worksheet can be implemented even in regular high school. The existence of this approach makes students more active independently or in groups to conduct experiments, make observations, collect data and process data [16], [17]

This finding might correlate with STS worksheet systematically that helps students in the active learning process. Providing problems in life context would have motivated the student to learn science with the scientific method. The STS student worksheet guide students to learn the problems related to science concepts and apply them in their daily life [18].
3.2 Student Capacity Score on Completing STS Worksheet

The student capacity to complete the STS worksheet was reviewed by the teacher on several aspects by using an assessment rubrics. The student capacity score is shown in Table 2. It shows that all aspect gave high score both in moderate and good high school.

Table 2. Result of worksheet assessment at SMAN 3 Banda Aceh and SMAN 14 Iskandar Muda.

<table>
<thead>
<tr>
<th>Aspect of assessment</th>
<th>Assessment of worksheet content (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Good high school</td>
</tr>
<tr>
<td>Formulation of the Problem</td>
<td>93.75</td>
</tr>
<tr>
<td>Hypothesis</td>
<td>87.50</td>
</tr>
<tr>
<td>Observation data</td>
<td>100.00</td>
</tr>
<tr>
<td>Task concept application</td>
<td>81.25</td>
</tr>
<tr>
<td>Conclusion</td>
<td>87.50</td>
</tr>
<tr>
<td>Average</td>
<td>90.00</td>
</tr>
</tbody>
</table>

Table 2 shows that the average student capacity completing a worksheet in good high school is not much different from the moderate one that was 90.00 and 86.25%. This is due to STS learning can foster the interest and motivation of the students in learning chemistry. This finding is in line with the research of Abualrob & Shah [19] that the use of STS based teaching materials can increase the students’ interest in learning science and can help them apply the knowledge to their lives. It also encouraged the student to explain natural phenomena and attempted to use science and technology to solve problems in society [20].

3.3 Assessment on Students’ Video Documentation

Asking the student to present their experiment by using video is an agenda to encourage students to use such technology in their life. Students learn several skills such as story (manuscript) making, shooting, editing, and reporting. Students’ work was assessed by using rubrics on several aspects as shown in Table 3. Video assessment documentation can be seen in Table 3.

Table 3. Video Documentation Assessment.

<table>
<thead>
<tr>
<th>Aspect of assessment</th>
<th>Video assessment (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Good high school</td>
</tr>
<tr>
<td>Video display</td>
<td>93.75</td>
</tr>
<tr>
<td>Video content</td>
<td>87.50</td>
</tr>
<tr>
<td>Creativity</td>
<td>87.50</td>
</tr>
<tr>
<td>Duration time</td>
<td>87.50</td>
</tr>
<tr>
<td>Average</td>
<td>89.06</td>
</tr>
</tbody>
</table>

Table 3 shows that almost all aspects of the video were well prepared by students and students from the good high school have a higher score. This difference might correlate with student intelligence, their skill in using technology and creativity. Good high school has many
smart students since it has a higher competitive entrance exam. Video making provides opportunities for students to be able to use their abilities and creativity in creating works [21].

3.4 Student Responds on STS Worksheet Implementation

Data on students’ and teacher’s response to STS worksheet were obtained by giving a questionnaire containing ten questions to teachers from both schools. The questions were on the accomplishment of learning objectives, the understanding of the STS syntax, etc. as shown in Table 3. The results obtained were all teachers giving a response of 100%. This is by the research of Amirshokoohi [22] that the importance of a teacher applying STS learning so that it can increase the knowledge and interests of students in learning. Furthermore, students were also given a questionnaire containing questions to find out their responses to the student worksheet that had been applied. The responses of students to STS learning are presented in Table 4.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Percentage of “agree” responses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Good high school</td>
</tr>
<tr>
<td>The accomplishment of learning objectives</td>
<td>100.00</td>
</tr>
<tr>
<td>Broadening vision in science</td>
<td>100.00</td>
</tr>
<tr>
<td>Providing good reading material</td>
<td>80.65</td>
</tr>
<tr>
<td>Ease in understanding the STS syntax</td>
<td>100.00</td>
</tr>
<tr>
<td>Ease in understanding practicum procedures</td>
<td>96.77</td>
</tr>
<tr>
<td>Ease in understanding question</td>
<td>100.00</td>
</tr>
<tr>
<td>Interesting student worksheet</td>
<td>100.00</td>
</tr>
<tr>
<td>Motivating in learning chemistry</td>
<td>90.32</td>
</tr>
<tr>
<td>Awareness of the use of chemicals</td>
<td>100.00</td>
</tr>
<tr>
<td>Making videos documentation is an interesting task</td>
<td>93.55</td>
</tr>
<tr>
<td>Average</td>
<td>96.13</td>
</tr>
</tbody>
</table>

Table 4 shows that all indicator in STS worksheet implementation were responding positively by students in both types of high schools. The percentage of positive respond is only much different in making a video where the moderate high school show less antistatic as shown by a score of 71.43%. This consistent with their capacity in video documentation preparation. The students from this school acquired a lower score in making a video. This finding is consistent with the previous research conducted by Rachmawati & Admoko [23] which shows that students gave a positive response to STS based learning because it stimulated motivation in science learning.

4 Conclusion

Based on need assessment, STS worksheet has not been familiar among the teacher in the city of Banda Aceh. Respondent suggested to develop it and implemented in a high school class. STS worksheet has been developed, and it has been validated by experts with a high score before implemented in the classroom. Four themes of STS worksheet has been applied in good (high accredited) and moderate high school). Student activity during implementation was high. Student completed the worksheet by following the STS syntax. Students’ capacity in completing the worksheet was very high in both types of schools. Student score in reporting their work by
videotaping was higher in good higher school than in the moderate one. Students gave positive respond on the implementation of STS worksheet. Their enthusiastic on this model was more in good high school. The teacher recommended this worksheet to be a part of the active learning material.

5 ACKNOWLEDGEMENT

I would like to thank all the teachers and student of SMAN 3 Banda Aceh and SMAN 14 Iskandar Muda for assistance and participation during the study.

REFERENCES


Spatial Analysis of Distribution Patterns of Dengue Hemorrhagic Fever Cases in Banda Aceh

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Abstract. Dengue Hemorrhagic Fever (DHF) is an infectious disease that became the leading cause of death in the tropics and subtropics Countries. Banda Aceh is one of the regions in Indonesia with the high incidence of DHF and the distribution of events per sub-district is still fluctuating, so a study of the spatial relationship of DHF distribution patterns in Banda Aceh is needed. The aim of this study is to determine the spatial relationship of the DHF distribution pattern in Banda Aceh from 2014 to 2016. The study uses the Geographic Information System method with a case study approach. The object of this research is the entire administrative area of Banda Aceh with an analysis unit for all villages in Banda Aceh. The Moran Index Analysis was used to the identification of distribution pattern by means of the Geoda application. The results showed that during the 2014 to 2016 period, the global spatial relationship of DHF incidence among Villages was only found in October and November 2014, while in other months it did not show a spatial relationship at the 95% significance level. The z value calculation for October is 2.27 November is 3.80. The local spatial association of DHF was found the villages where are 6 villages in the high-high cluster, 10 villages in the low-low cluster, 2 villages in the low-high cluster, and 2 villages in the high-low cluster in the year 2014. Beside that, in the year 2015 there was 1 village in the high-high cluster, 8 villages in the low-low cluster, 5 villages in the low-high cluster, and none in the high-low cluster. Furthermore, in the year 2016 which are 3 villages in the high-high cluster, 4 villages in the low-low cluster, 5 villages in the low-high cluster, and that 1 village in the high-low cluster. The local spatial analysis found that villages in the hotspot cluster vary annually.

Keywords: DHF, Spatial Patterns, Geographic Information Systems, Moran’s Index.

1 Introduction

Dengue Hemorrhagic Fever (DHF) is a threat to one-third of the world's population in the tropics and subtropics countries since it's become one of the main causes of death in that area and its occurrence in the last 50 years continues to increase to 30 times [1], [2].

Indonesia is the country with the highest number of DHF Cases in Southeast Asia since 1968 and based on DHF incidence data up to 201, it shows three epidemics peaks, hence it is estimated that the DHF epidemic will happen repeatedly within 9 to 10 years [3].

Banda Aceh is one of the areas that is endemic to DHF with a high DHF cases number. Based on DHF from the year 2012 to 2016, the cases incidence trend fluctuated each year, even though there is a decrease in cases in 2013, yet it shows an increase in 2014, while in 2015 it’s decreased and increased again in 2016[4].
Research on the distribution of DHF cases conducted by Castillo, et al. Using the Moran Index analysis found that the spatial distribution of the distribution of dengue in Guayaquil City, Ecuador was very high. This shows that the possibility of the spread of dengue infection is higher in areas that have contracted dengue infection [5].

The study conducted by Hermansyah [6] found differences in the dispersion patterns of DHF in severely affected tsunami areas with mildly affected tsunami areas. In areas with severely affected was clustered which was allegedly due to the process of residential areas reconstruction.

The mapping of DHF distribution incidence is compulsory in order to perceive the variation in DHF incidence among Villages in Banda Aceh hence the disaster risk reduction can be done by areas. The aim of this study is to determine the spatial relationship of the DHF distribution pattern in Banda Aceh from 2014 to 2016, globally and locally, since there is no many research regarding spatial relationship of village-based DHF distribution in Banda Aceh

2 Methods

This study uses the Geographic Information System method with a case study approach, which is to study the dynamics of spatial autocorrelation of DHF events in Villages of Banda Aceh from 2014 to 2016.

The object of this research is the entire administrative area of Banda Aceh which is located between 05°16’15”– 05°36’16” North Latitude dan 95°16’15”– 95°22’35” East Longitude with the unit of analysis is 90 Villages in Banda Aceh. The data used in this study are secondary data obtained from the Banda Aceh Health Office. The data are the incidence of DHF in Banda Aceh in each villages in the year 2014, 2015 and 2016.

Data analysis uses the statistics of Moran’s Index autocorrelation and Local Indicator of Spatial Association (LISA). Analysis of Moran’s Index which is to determine the existence of a spatial relationship between DHF cases globally. The equation of the Moran’s index is as follows the equation 1;

\[
I = \frac{\sum_i \sum_j w_{ij}(X_i - \bar{X})(X_j - \bar{X})}{s^2 \sum_i \sum_j w_{ij}} \quad \ldots \ldots (1)
\]

\[
s^2 = \frac{\sum_{i=1}^{n}(X_i - \bar{X})^2}{n} \quad \ldots \ldots (2)
\]

\[
\bar{X} = \frac{\sum_{i=1}^{n}X_i}{n} \quad \ldots \ldots (3)
\]

Where:
- \(n\): the number of observation locations
- \(X\): Mean of \(X_i\)
- \(X_i\): Variable value in area \(i\)
- \(X_j\): Variable value in area \(j\)
- \(W_{ij}\): spatial weighting matrix elements, worth 1 if \(i\) and \(j\) are neighbors, and 0 if not neighboring.

LISA analysis aims to detect the presence of local spatial autocorrelations in aggregate by describing Moran’s index statistics that contribute to each study area. Operationally, the LISA analysis has two criteria namely first giving an indication of the extent to significant spatial grouping with similar values around the observations and both the total number of LISA values as a proportional global indicator of spatial relations [7].
Hypothesis testing uses a z score, which means if the z value is greater than 1.96 or smaller than -1.96 indicating that the null hypothesis is rejected at the 95% significance level. While the distribution pattern can be seen by comparing the index value of Moran (I) with its expected value (E(I)), that is if \( I > E(I) \), then the pattern of distribution is clustered. If \( I < E(I) \), then the distribution pattern is spread (dispersed), and if \( I = E(I) \), then the pattern of random distribution. The equation to obtain the z score and expected value are as follows the equation 4 and 5 [8], [9].

\[
z = \frac{I - E(I)}{\sqrt{V(I)}} \quad (4)
\]

\[
E(I) = \frac{-1}{(n - 1)} \quad (5)
\]

Disease distribution clusters are determined using Moran Scatterplot, which is a linear relationship between the value of the observation area and the value of the neighboring area that is standardized. This relationship is calculated by using the z score in the area observed on the horizontal axis (x) and the z score in the neighboring area on the vertical axis. Moran scatterplot shows the classification of DHF distribution clusters, including the high-rise cluster (HH) / hotspot, low-low cluster (LL) / cold spot, low-high (LH) cluster and high-low (HL) cluster.

![Figure 1. The trend of DHF Cases from 2014 to 2016](image-url)
Figure 2. Map of distribution of dengue events in Banda Aceh from 2014 to 2016

The spatial weighting matrix used was queen contiguity and a 95% confidence interval. The spatial weighting matrix is a matrix that describes the Closeness level between observed areas [8]. Data Processing is done by using the Geoda application.
3 Result and Discussion

DHF events from 2014 to 2016 shows varied fluctuations as illustrated in figure 1. Distribution of dengue incidence based on the number of times the incidence of DHF in the city of Banda Aceh is shown in figure 2.

Based on figure 1, it is known that the number of DHF events has increased from August to November and there has been a significant decline in December, except in December 2016. The distribution of dengue events shown in figure 3 shows that villages that are directly adjacent to the coast are generally below average.

a. Global distribution pattern

The results of the Moran index calculation can be observed in table 1. The Moran index value is compared with the value of Expectation E (I) shows a clustered, dispersed or random dispersion pattern. While the statistical test uses the z value to determine whether H0 is rejected or not rejected.

Table 1 shows that in October and November 2014 the z value is greater than 1.96, namely in October z value is 2.272 and in November the z value is 3.804. which means that in this month H0 was rejected or there was a spatial relationship in the distribution of DHF cases in Banda Aceh in October and November 2014. There was a spatial relationship of DHF dispersion in Banda Aceh in October and November 2014 indicating the possibility of a high correlation of DHF cases among Villages in October and November 2014.

The research conducted by [10] in Pekalongan district also shows the results of spatial analysis of the distribution of DHF that is similar, namely there are spatial relationships in certain months, including January, February, July, October, and December. Spatial relationships vary in each sub-district, namely some sub-districts have positive autocorrelation and others have negative autocorrelation.

The high correlation between the incidence of DHF among village is thought to be due to high rainfall rates. Banda Aceh statistical data shows that rainfall rates in October and November 2014 is the highest compared to rainfall rates in other months of the period 2014 to 2016 [11].

Kemenkes RI [12] states that rainfall rates are one of the risk factors for disease transmission that has the potential to cause DHF outbreaks. The high rate of transmission when the rain occurs because during high rainfall rates the places that become breeding places for Aedes Aegypti mosquitoes that were previously not filled with water and cause mosquito eggs to hatch. This will increase the population of the Aedes Aegypti mosquito which will have an impact on increasing transmission and spread of DHF disease.

The study by Perwitasari, Ariati, & Puspita [13] also concluded that climate change such as rainfall and rainy days affected the incidence of DHF which happen during rainfall which will cause an increase in the amount of standing water hence the mosquito breeding grounds increase.

The distribution pattern of DHF is found by comparing the value of the Moran Index (I) with its expected value (E (I)). If I value is greater than E(I), then the distribution pattern of DHF is clustered and if the value of I is smaller than E (I) the distribution pattern of DHF dispersed. The distribution pattern of DHF is random if the value of I is equal to E (I).

Table 1 explains that the distribution pattern of DHF in January, August, September, October, November and December 2014 tends to be clustered and the rest tends to disperse. The distribution pattern of DHF in 2015 is tended to be in February, April, June, and December, while in January, March, August and September tend to disperse and the rest tend to be random.
The distribution pattern of DHF in 2016 is tended to cluster in March, April, May, June, and July, and the rest tends to disperse.

The distribution pattern of DHF when calculated with the Moran index value is varied each month, namely, in 2014 it tends to disperse more often, 2015 tends to be random and 2016 tends to be in Clustered more often.

The research on the dispersion of DHF was conducted by Hermansyah [6], in Banda Aceh who used the Closest Neighbor Analysis concluded that the distribution pattern of DHF in Banda Aceh for mild tsunami-affected and non-tsunami affected areas had a random dispersion pattern and only heavy tsunami regions in Clustered.

The distribution pattern of DHF in Jaya Baru Subdistrict, Banda Aceh in 2014 also showed varied dispersion distance of DHF, namely, there were villages that the distance of patients spots is below 100 meters, while in some villages the distance of patients spots is above 1000 meters [14].

Based on the description above it is concluded that the dispersion pattern of DHF in Banda Aceh is not related between one village and another village, but there is a tendency of spatial relationships between villages when rainfall rates are high.

### Local distribution pattern

Analysis of the local Moran index of the distribution of DHF in Banda Aceh shows that the number of villages in the hotspot cluster is in 2014 as many as 6 villages, in 2015 as many as 1 village and in 2016 as many as 3 villages. The classification of local DHF distribution patterns can be seen in Figure 3.

Based on Figure 3, villages in the coldspot cluster are in the Meuraxa District area. The Meuraxa sub-district is a region with low population density and settlement density [11], this is thought to be the reason why the Meuraxa Subdistrict area has a low DBD incidence with a low-Low distribution cluster.

Villages in the hotspot cluster vary each year. This is presumably due to the DHF countermeasures carried out in villages with a high incidence of DHF. The Health Office will eradicate and control dengue through “pemberantasan Sarang Nyamuk (PSN)”, the “3 M” movement, monitoring larva free numbers and fogging [15].

---

**Table 1. The results of the Moran index**

<table>
<thead>
<tr>
<th>No</th>
<th>Month</th>
<th>E(I)</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>January</td>
<td>-0.011</td>
<td>0.027</td>
<td>0.70</td>
<td>-0.068</td>
</tr>
<tr>
<td>2</td>
<td>February</td>
<td>0.011</td>
<td>-0.069</td>
<td>-1.006</td>
<td>0.101</td>
</tr>
<tr>
<td>3</td>
<td>March</td>
<td>0.011</td>
<td>-0.049</td>
<td>-0.647</td>
<td>-0.059</td>
</tr>
<tr>
<td>4</td>
<td>April</td>
<td>0.011</td>
<td>-0.010</td>
<td>0.042</td>
<td>0.382</td>
</tr>
<tr>
<td>5</td>
<td>May</td>
<td>0.011</td>
<td>-0.001</td>
<td>0.019</td>
<td>0.003</td>
</tr>
<tr>
<td>6</td>
<td>June</td>
<td>0.011</td>
<td>-0.013</td>
<td>0.007</td>
<td>0.022</td>
</tr>
<tr>
<td>7</td>
<td>July</td>
<td>0.011</td>
<td>-0.043</td>
<td>-0.521</td>
<td>0.007</td>
</tr>
<tr>
<td>8</td>
<td>August</td>
<td>0.011</td>
<td>0.081</td>
<td>1.407</td>
<td>-0.045</td>
</tr>
<tr>
<td>9</td>
<td>September</td>
<td>0.011</td>
<td>0.069</td>
<td>1.241</td>
<td>-0.101</td>
</tr>
<tr>
<td>10</td>
<td>October</td>
<td>0.011</td>
<td>0.128</td>
<td>2.272</td>
<td>-0.006</td>
</tr>
<tr>
<td>11</td>
<td>November</td>
<td>0.011</td>
<td>0.227</td>
<td>3.804</td>
<td>0.017</td>
</tr>
<tr>
<td>12</td>
<td>December</td>
<td>0.011</td>
<td>0.067</td>
<td>1.287</td>
<td>0.014</td>
</tr>
</tbody>
</table>
Villages located in hotspot clusters are generally located in sub-districts that have a low percentage of households with clean and healthy behavior. In 2014, two villages in Kuta Alam and Baiturrahman Subdistricts were in the hotspot cluster, where based on the health profile of Banda Aceh in 2014, the number of households with clean and healthy behavior was 37% and 49% respectively [15]. Whereas in 2016, two villages in Kuta Raja District were in the Hotspot...
cluster, where the number of households with clean and healthy behavior in the sub-district in 2016 was 27.86 [16].

From the description above, it can be concluded that the population density and population density and the low density of settlements there is a tendency for the number of DHF to be low with a cluster of disease distribution in the cluster of cold spots. While the high population density and households with clean and healthy behavior have contributed to the high incidence of DHF with cluster distribution of hotspot diseases.

4 Conclusion

There is a significant spatial relationship in the dispersion pattern of DHF in Banda Aceh in October and November 2014, which was caused by high rainfall rates. Based on the cluster of DHF cases in Banda Aceh in 2014 to 2016, there were two villages that were consistently in the coldspot cluster, one village was consistently located in the low-high cluster and villages in the hotspot cluster vary each year.

REFERENCES


The Preparedness of Class III Port Health Office workers in Facing Ebola Virus in the Work Area of Ulee Lheue Sea Port, Banda Aceh

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Abstract. Health workers are a group at high risk of transmission of Ebola virus outbreak. Health workers are often infected with Ebola virus during the diagnosis, isolation or service process on the patients suspected of Ebola virus. On December 6th, 2018, Banda Aceh’s class III port health office in the Working Area of Ulee Lheue Port carried out an evacuation plan against the Maersk Mutotsu crews with Panama-flagged sailing from Mozambique to Singapore. From the results of the port doctor's examination, the patients were suspected of the Ebola virus. However, due to the lack of personal protective equipment and officers’ preparedness, the crews were not evacuated to land. This incident shows that the preparedness of the Banda Aceh’s Class III Port Health Office in dealing with Ebola virus disease is still very low. Descriptive analysis of the research data is an analysis of data obtained from the results of a Focus Group Discussion (FGD) with 10 people. The design of this study was a qualitative approach. The populations in this study were Class III Port Health Office workers in the Work Area of Ulee Lheue Port and government institutions as disaster management agencies (cross-sectoral). Based on the results of the research on the preparedness of Banda Aceh’s class III port health office in the Working Area of Ulee Lheue Port in dealing with Ebola virus disease, it can be concluded that the Banda Aceh’s class III port health office in the Working Area of Ulee Lheue Port has not yet had trained human resources for the preparedness to deal with Ebola virus disease. The Class III of Banda Aceh’s port health office has not yet had a Quick Response Team (TGC), they were not trained to handle Ebola cases and has never stimulated the Ebola case.

Keywords: Tsunami, Evacuation Route, and Building Tree Method

1 Introduction

Ebola virus is one of the diseases with clinical symptoms of fever accompanied by a lot of bleeding, resulting in deaths of humans and primates (such as monkeys, gorillas, and chimpanzees) with The Fatality Rate Case (CFR) reaching 90% [1]. symptoms of Ebola can be headaches, joint and muscle pain, weakness, diarrhea, vomiting, abdominal pain, lack of appetite, and unusual bleeding [2].

Health workers are a group at high risk of transmission of the Ebola virus outbreak In March 2014, several health workers in West Africa were contracted the Ebola virus [3]. Health workers are often infected with the Ebola virus during the diagnosis, isolation or service process on
patients suspected of Ebola virus. The preparedness in acting and giving a correct response can control the spread of the Ebola virus threat to health workers [4].

On April 9th, 2015, the Class III of Banda Aceh’s Health Office in the Working Area of Ulee Lheue Port carried out an evacuation plan against the Maersk Mutotsu crews with Panama-flagged sailing from Mozambique to Singapore. From the results of the port doctor's examination, the patients were suspected of the Ebola virus. However, due to the lack of personal protective equipment and the preparedness of officers, the crews were not evacuated to land. This incident shows that the preparedness of the Banda Aceh’s Class III Port Health Office in dealing with Ebola virus disease is still very low[5].

The health sector forms an important part of the preparedness and response to disasters. Regulatory mechanisms and responses require very careful planning, and the vulnerability of a particular country or region, health policies, and regulations regarding disasters, and administrative and technical organizations from health sector institutions must be taken into account. The consideration must also include coordination, mechanisms, development of plans and technical programs, training and research, logistical and financial support. Although health institutions can develop plans and preparedness in facing disasters, each country is expected to have a clear policy regarding disaster prevention and management. Legislation must require health institutions to develop preparedness plans and responses, to ratify the plan as part of the institution's normal activities, to use simulations to test the plan and to determine the source of funds for the development and maintenance of the plan [6].

2 Literature Review

The design of this study was a qualitative approach. The populations in this study were Class III Port Health Office workers in the Work Area of Ulee Lheue Port and government institutions as disaster management agencies (cross-sectoral). The key informants in this study were 4 people representing the Banda Aceh’s Class III Port Health Office and each person represent a government institution (cross-sector), namely RSUD dr. Zainoel Abidin, Aceh Provincial Health Office, Immigration Office, Customs Office, BPBA Office, and Syahbandar Office.

This study used primary data and secondary data. Primary data were obtained directly through focus group discussions (FGD) to get an overall picture of preparedness against the Ebola virus at Banda Aceh’s Class III Port Health Office and Related Agencies in Working Area of Ulee Lheue Port from the beginning to the end. Secondary data were supporting data obtained from Banda Aceh’s Class III Port Health Office in Working Area of Ulee Lheue Port. Data presentation can be done in brief descriptions, charts, relationships between categories, flowcharts and the like. The most frequently used data to present in qualitative research were narrative texts.

3 Result and Discussion

3.1 Preparedness Analysis in Facing Ebola Virus

Descriptive analysis of the research data is an analysis of data obtained from the results of a Focus Group Discussion (FGD) with 10 people. Overall, the informants in this study were people who were authorized or had the information needed in this study. The informants of this study were the head office of the Port Health Office which had full authority in the work program, the Head of PRL in charge of health across sectors, the coordinator of the working
area who had the authority over the coordination unit of work, especially the working area of Ulee Lheue and the port doctor as the executor if there is a case in the field.

Human resources are human groups consisting of humans who have the ability to provide services. The ability in this study is to have sufficient knowledge that is appropriate from the training obtained, field practice through case stimulation and eventually there will be a special team formed namely the Quick Reaction Team (TGC). The Class III Port Health Office employees in Banda Aceh were divided into 2 functional position groups which are 48 Functional Functions (JFU) and 13 Functional Functions (JFT).

To handling Ebola cases, particularly in terms of the efforts to prevent the spread of the virus, it is necessary to check thoroughly, not just limited to the evacuation of patients (who are suspected of Ebola). The educational background that takes an important role in dealing with virus-based cases, especially the Ebola virus, is a medical scholar as an expert in the effort to evacuate patients, nurses as doctor's companion and environmental health as responsible staff in the efforts to prevent transmission of the virus. The level of education of Banda Aceh’s Class III Port Health Office employees is shown in Table 1.

Table 1. Distribution Table of Class III Port Health Office employees in Banda Aceh Based on Education

<table>
<thead>
<tr>
<th>No.</th>
<th>Education</th>
<th>total</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>S2 Public Health</td>
<td>4</td>
<td>6.6</td>
</tr>
<tr>
<td>2.</td>
<td>General Medicine</td>
<td>5</td>
<td>8.2</td>
</tr>
<tr>
<td>3.</td>
<td>S1 Public Health</td>
<td>24</td>
<td>39.3</td>
</tr>
<tr>
<td>4.</td>
<td>S1 Pharmacy</td>
<td>1</td>
<td>1.6</td>
</tr>
<tr>
<td>5.</td>
<td>D3 Environmental Health</td>
<td>8</td>
<td>13.1</td>
</tr>
<tr>
<td>6.</td>
<td>D3 Nurse</td>
<td>8</td>
<td>13.1</td>
</tr>
<tr>
<td>7.</td>
<td>D3 Pharmacy</td>
<td>2</td>
<td>3.3</td>
</tr>
<tr>
<td>8.</td>
<td>D3 Health Analyst</td>
<td>1</td>
<td>1.6</td>
</tr>
<tr>
<td>9.</td>
<td>D3 Midwifery</td>
<td>1</td>
<td>1.6</td>
</tr>
<tr>
<td>10.</td>
<td>D3 Information Management</td>
<td>1</td>
<td>1.6</td>
</tr>
<tr>
<td>11.</td>
<td>D3 in Accounting Economics</td>
<td>1</td>
<td>1.6</td>
</tr>
<tr>
<td>12.</td>
<td>Health Nursing School (SPK)</td>
<td>1</td>
<td>1.6</td>
</tr>
<tr>
<td>13.</td>
<td>Pharmacy Middle School (SMF)</td>
<td>1</td>
<td>1.6</td>
</tr>
<tr>
<td>14.</td>
<td>High School (SMA)</td>
<td>3</td>
<td>4.9</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>61</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 1 shows that the number of Class III Port Health Office employees in Banda Aceh is mostly undergraduate education in Public Health with 24 people (39.3%), while the number of employees is at least derived from S1 Pharmacy education, D3 Health Analyst, D3 Midwifery, D3 Information Management, D3 Economic Accounting, SPK and SMF respectively of 1 person (1.6%). The number of D3 for Environmental Health and D3 Nursing is 8 people (13.1%), General Physicians as many as 5 people (8.2%), S2 Public Health are 4 people (6.6%), SMA as many as 3 people (4.9%) and 2 people with D3 Pharmacy Education background (3.3%).
Table 2. FGD results About Quick Reaction Team in Dealing with Ebola Virus Disease reviewed from the Formation of the Quick Reaction Team in the Work Area of Ulee Lheue Sea Port in Banda Aceh.

<table>
<thead>
<tr>
<th>KKP</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Informant 1</td>
<td>&quot;So far, there has been no special team for Ebola disease. However, the Port Health Office has told all its staffs about the vigilance of infectious diseases, and for that reason, training has been carried out on infectious diseases in 2015.&quot;</td>
</tr>
</tbody>
</table>
| Informant 2 | "Not yet, there has never been a quick reaction team that has been specialized in dealing with virus diseases such as Ebola."
| Informant 3 | "There has not been a quick reaction team as asked."
| Informant 4 | "No sir, so far there has been no team formation like you said before"

Based on Table 2, it can be shown that for now, Class III Port Health Office at Ulee Lheue Port does not yet have a special quick reaction team to deal with the Ebola case.

The next question is to examine the extent to which human resources in the Port Health Office at Ulee Lheue Port are prepared to deal with cases of Ebola virus. The results of Focus Group Discussion (FGD) about training on Ebola, can be seen in Table 3 below.

Table 3. Results of FGD on Human Resources in Dealing with Ebola Cases Related to Facing Ebola Virus in Review of Special Training on the Spread of the Ebola Virus in the Working Area of Ulee Lheue Sea Port, Banda Aceh

<table>
<thead>
<tr>
<th>KKP</th>
<th>Statement</th>
</tr>
</thead>
</table>
| Informant 1 | "We did training on infectious diseases in 2015, but it was still general. There has never been a special training in Ebola."
| Informant 2 | "Not yet, there is no special training in Ebola, it has never existed. But we have participated in training on infectious diseases, but it's been a long time and it's also not specific to how we have to make patient outs from the ship."
| Informant 3 | "There has never been any special training in Ebola, as far as I remember there was training on infectious diseases but in general."
| Informant 4 | "I have never received training in Ebola, once there was an infectious disease...but at that time I was unable to join"

The next question is to examine the efforts to improve the abilities and competencies of health workers in facing Ebola case as outlined in the form of stimulation. The results of Focus Group Discussion (FGD) about the stimulation of the Ebola virus, can be seen in table 4.
Based on Table 4, it can be seen that to the present, there is stimulation of the handling of Ebola virus cases performed or carried out by Class III Port Health Office employees in the working area of Ulee Lheue Port, Banda Aceh.

**Table 4.** Results of FGD on Human Resources in Dealing with Ebola Cases Associated with Facing Ebola Virus in Stimulation at the Working Area of Ulee Lheue Sea Port, Banda Aceh.

<table>
<thead>
<tr>
<th>KKP</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Informant 1</td>
<td>&quot;Until now the Class III KKP Banda Aceh has never carried out Ebola disaster crisis response simulation activities. Stimulation is planned to be carried out in 2018&quot;</td>
</tr>
<tr>
<td>Informant 2</td>
<td>&quot;There has not been any stimulation this year, indeed I have heard that there will be disaster stimulation this year, but until today there is no one. I also don't know whether the stimulation will be carried out about the Ebola virus.&quot;</td>
</tr>
<tr>
<td>Informant 3</td>
<td>&quot;There has never been stimulation about the Ebola virus&quot;.</td>
</tr>
<tr>
<td>Informant 4</td>
<td>&quot;To my knowledge, there has never been stimulation about Ebola. This year there has not been any stimulation either.&quot;</td>
</tr>
</tbody>
</table>

Based on Table 2-4, it can be concluded that the human resources possessed by Class III Port Health Office employees in the working area of Ulee Lheue Port, Banda Aceh do not yet have resources that are trained to deal with Ebola cases, as it is seen in the lack of specialized training acquired Ebola, no quick reaction team and lack of stimulation in an effort to increase the capability and competence of health workers, in a case of Ebola.

The effort that can be done to improve employees’ performance is through training. Training is an effort to improve the employee’s performance on the job. The training aims to help employees master skills in their jobs. The main purpose of the training is to achieve the improvement in knowledge, skills, and attitudes of employees [7]. According to research conducted by Busro [8], training aims to improve human resources(HR) through renewing individual skills, helping to solve operational problems quickly and precisely, providing higher ability to carry out tasks in work so that the results achieved will be maximized and improve the professionalism of employees in doing their jobs.

According to the direction of Ministry of Health through the Directorate Simkarkesma, DG P2PL continues to compose strategy and action plan for the control of alertness and preparedness of potential transmission of infectious disease outbreaks or outbreaks of infectious diseases that are emerging infection diseases (EIDs) such as: H5N1, H7N9, Ebola, Ebola Virus and others. One of the efforts made was to increase the capacity of the Quick Reaction Team (TGC). At the moment, 34 provinces in Indonesia have had TGC consists of officers from surveillance, health service, livestock service, referral hospital officers, laboratory clerks, KKP and BTKL [9].

The results of this study are in accordance with the theory proposed by [10], who said that human security is an issue of health security that has a level of urgency which is as important as the issue of defense and security used as the concept of national defense. The security approach in the health sector emphasizes that health is a public need that can be accessed evenly consisting of 2 fundamental components, namely Empowerment and Protection. Empowerment aims more at the ability of human resources to increase the capacity of both individuals and communities in responding to health. Protection places more emphasis on the pillars of society including preventing, checking and anticipating threats to health. The results of research conducted by Agnew and Snyder [11], discovered that Indonesia already has readiness for the opportunity of entry into Ebola, which can be seen with the support of health facilities,
especially tourist areas. Where the results of Agita's research are not in line with the results of this study.

From the results explanation above, the researchers saw that Class III Port Health Office employees in the working area of Ulee Lheue Port did not yet have human resources who were ready to deal with the situation related to the Ebola virus. This is illustrated from not having the implementation of the formation of a quick reaction team (TGC), which is very important in disease prevention especially Ebola disease. Furthermore, the Port Health Office has not conducted training about facing the Ebola virus, as well as implementing a simulation of the Ebola virus TGC and stimulation have a very important role to play in increasing the capacity, capability, and management of human resources (HR) in the Banda Aceh’s Port Health Office in facing Ebola disease. With an increase in the ability of human resources, it is expected that the Port Health Office of Banda Aceh can improve the preparedness of reducing the impact of Ebola epidemics infection risk to the public.

3.2 Facilities and infrastructure

The available four wheels vehicle in Ulee Lheue's area is the 1-unit car. This is still not yet sufficient to face Ebola case considering that ambulance is the main transportation in evacuating patient, and it should isolate or prevent the spread of the virus. The health equipment owned is shown in table 5 below.

<table>
<thead>
<tr>
<th>No</th>
<th>Name of Medical Device</th>
<th>Condition</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Good</td>
<td>Broken</td>
</tr>
<tr>
<td>1.</td>
<td>Infra Red Thermometer</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>2.</td>
<td>Tabung O2 (Medium)</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>3.</td>
<td>Tabung O2 (Small)</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>4.</td>
<td>Wheelchair</td>
<td>5</td>
<td>-</td>
</tr>
<tr>
<td>5.</td>
<td>Stethoscope</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>6.</td>
<td>Minor Set</td>
<td>7</td>
<td>-</td>
</tr>
<tr>
<td>7.</td>
<td>Tensimeter</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>8.</td>
<td>Trolly Alkes</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>9.</td>
<td>Handscoons</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>10.</td>
<td>N95 Mask</td>
<td>10</td>
<td>-</td>
</tr>
<tr>
<td>11.</td>
<td>Google Glasses</td>
<td>20</td>
<td>-</td>
</tr>
<tr>
<td>12.</td>
<td>Boat shoes</td>
<td>15</td>
<td>-</td>
</tr>
<tr>
<td>13.</td>
<td>Wear Pack shirts /APD</td>
<td>20</td>
<td>-</td>
</tr>
</tbody>
</table>

Related to the facilities and infrastructure completeness, researchers prepared 3 things that were submitted on group discussion, first: whether the Class III Ulee Lheue Port Health Office Banda Aceh has room isolation. Results Focus Group Discussion (FGD) could be seen in table 6, as follow.
Table 6. Results of FGD on the availability of Ebola Isolation room in addressing the Ebola Virus Disease at Seaport Work Area in Ulee Lheue, Banda Aceh

<table>
<thead>
<tr>
<th>KKP</th>
<th>Statement</th>
</tr>
</thead>
</table>
| Informant 1  | "The KKP does not yet have a special isolation room to treat patients with infectious diseases, especially Ebola. The room that we have is only a simple medical treatment room."
| Informant 2  | "We don't have a special isolation room for infectious diseases such as the Ebola virus"
| Informant 3  | "It is not yet, there is a medical service room to handle ordinary cases as if there were patients who fainted. There is no completed one yet"
| Informant 4  | "There is no isolation space with international standards. I think this is also related to this KKP class, meaning that we are still a class III port, so the facilities are not international standard."

From the results of Focus Group Discussion (FGD), it could be concluded that facilities and infrastructure owned by the Port Health Office are still very minimal and this is very unfortunate, remembering Ebola virus could happen anytime.

Precautions which are necessary to be prepared for anticipating Ebola disease’s entry through the port is by preparing health service facilities covering the availability of special room insulation that can be modified fast to help patients with temporary ill (before being referenced to the referral hospital province/appointed). The detection of passages from the contracted country who experienced fever through the use of a thermal scanner at the arrival terminal examination was done directly to the health of the passengers and the crew of the ship by a team of Port Health Office officers [2].

From the results Focus Group Discussion (FGD) above, researchers drawn conclusion that facilities and infrastructure owned by the Port Health Office are still very minim. Lack of means and infrastructure owned by the Port Health Office will make the virus carried by foreigners spread easily particularly Ulee Lheue’s Port Health Office. If this happens, then it could have an impact on health, economy, tourism, politics and social culture.

3.3 Coordination

Based on the results of FGD conducted, the Port Health Office has already had good coordination with cross-sector parties, but it is still general while coordination regarding Ebola cases has not been established. This can be seen from 6 institutions, only RSUDZA has had coordination about Ebola plague. The FGD results are shown in Table 7.

The results of Focus Group Discussion (FGD) activities above note that the Port Health Office party has good coordination with a related party. However, coordination about Ebola case has not yet intertwined in a maximum manner. Coordination regarding Ebola virus is only on schedule with RSUDZA parties and Aceh Health Office. Nonetheless, other parties (Immigration, Customs, and Excise) and BPBA) informed that they are ready to help if it is needed.
Table 7. FGD Results About Cross-Sector Coordination in Dealing with Ebola Cases Related to Facing Ebola Virus in the Working Area of Ulee Lheue Sea Port, Banda Aceh

<table>
<thead>
<tr>
<th>Agency</th>
<th>Statement</th>
</tr>
</thead>
</table>
| KKP                         | "We have never done Special Coordination regarding Ebola. However, for infectious diseases, we have coordinated with the RSUZA and health office in Aceh."
| RSUZA                       | "Coordination in the field has already been intertwined a long time between RSUZA party with the KKP. This can be seen from KKP parties that always include us in every time activities, not only in Ebola problem."
| Aceh Health Office          | "Coordination between service and KKP has already been established, for example, KKP surveillant visit to the health officials. I think this describes coordination between both sides."
| BPBA                        | "We always coordinate circumstances with the parties concerned. There is none for Ebola problem but for other activities, we coordinate well."
| Immigration                 | "Immigration always have good coordination, not only to the KKP party but also with another party. We hope in the future we can form special team about certain circumstances such as Ebola."
| customs                     | "The coordination in the field is always established. But for Ebola problem, it is not available yet."
| Syahbandar                  | "Coordination about the virus has been done... we made banner and pamphlet for delivering the information around Ulee Lheue."

3.4 Funding

Class III Port Health Office in Banda Aceh received DIPA budget in 2014 of Rp. 14,191,113,000. The allocation and realization of the budget room and capital expenditures in the DIPA intended for shopping employee, shopping goods and capital expenditure. While the disaster fund budget in especially contagious disease case is not budgeted in big amount. But for the transportation budget and small cases incidents could be realized although it is not yet sufficient for all needs to disaster problem, as for details of DIPA budget can be seen on attachment [12].

As which is known that in every implemented activity need fund allocation, at plague case and virus-like Ebola need adequate funding. For that reason, it is important to further review the funding.

The budget owned by the KKP party is only enough for normal routine operational activities, whereas activities in big scale or special funds are not yet available. Government role is very important especially the Ministry of Health for giving emergency funds supports if this case happens.

The results of Focus Group Discussion (FGD) above reveal that funding is the main point in the implementation of prevention effort especially the prevention of Ebola virus. To have skilled resources (especially in Ebola virus transmission), facilities and infrastructure which are appropriate with international standard (logistics, medical equipment, transportation, fees care, medicine, lodging while the crew of the ship is suspected and others) as well as important stimulation to residents around port need big funds and Port Health Office should have its own budget.
4 Conclusion

Based on the results of the research on the preparedness of Banda Aceh’s class III port health office in the Working Area of Ulee Lheue Port in dealing with Ebola virus disease, it can be concluded that the Banda Aceh’s class III port health office in the Working Area of Ulee Lheue Port has not yet had trained human resources for the preparedness to deal with Ebola virus disease. The Class III of Banda Aceh’s port health office has not yet had a Quick Response Team (TGC), they were not trained to handle Ebola cases and has never stimulated the Ebola case. The Port health office does not yet have adequate facilities and infrastructure to cope with Ebola cases such as special isolation rooms for caring for passengers/crew suffering from infectious diseases, thermal scanner body temperature devices are broken, and there is no ambulance. The Port health office has established good coordination with relevant parties (stakeholders), but the coordination has not yet been established regarding the handling of Ebola cases, especially in the Immigration, Customs, and BPBA agencies. The Port health office still lacks funding for operational anticipation of Ebola disease, the Zainoel Abidin Hospital, and the Aceh Health Office have had unexpected funds.

REFERENCES

The Effect of Earthquake Disaster Evacuation Simulation on Preparedness of The Imam Syafii Islamic Boarding School Community in Aceh Besar

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Abstract. School as one of the most effective media of science transformation which is expected to be able to absorb and apply knowledge on preparedness to face disasters by using the right and correct methods. In addition, schools also need to make disaster prevention as an important activity. Imam Syafii Islamic Boarding School Suka Makmur District is an Islamic boarding school with an area of ± 3 ha, there are various facilities for study rooms, prayer rooms, students dormitories, teacher dormitories, public toilets, libraries, and a number of sports facilities. This sturdy building made of concrete shows the vulnerability for students and teachers found in Islamic boarding schools because of their daily lives there. Moreover, the three levels students dormitory shows that they are very vulnerable to the earthquake disaster so that the preparedness of the students needs to be trained and more specifically the intensity of the earthquake that we cannot predict. This study uses experimental research methods. The population in this study were all students who studied in the Imam Syafii Sibreh boarding school, which consisted of 216 students. The sampling technique in this study was conducted by random sampling. The instruments used in this study were tests and non-tests. The test instruments were in the form of pretest and posttest questions, non-tests in the form of questionnaire sheets, and recording devices in carrying out earthquake disaster evacuation simulation studies. The results of this research can be concluded that the application of simulation methods is effective in increasing the preparedness of the school community in the face of earthquake disasters. The influence is based on the results of preparedness posttest which includes aspects of knowledge, attitudes, and preparedness actions, where each of these aspects increased by 79.6%, 75.87%, and 85.0%.

Keywords: School, Simulation, Preparedness.

I Introduction

By mitigating and increasing community preparedness, it is hoped that humans can reduce the risk of disasters. Given the extraordinary impact, natural disaster management must be carried out using the right principles and methods. In addition, natural disaster management must also be comprehensive not only in the event of a disaster but prevention before a disaster and rehabilitation and reconstruction occur after a disaster occurs.
One of the factors causing many fatalities due to disasters such as earthquakes is due to the lack of knowledge of the community including formal and non-formal educational institutions about disasters and their readiness to anticipate the disaster. Especially for earthquakes, many of the victims who died were caused by rubble due to collapsed buildings and the majority of fatalities were children and old age. This is because the elderly are the age most vulnerable to the risk of becoming a victim in a disaster [1].

Efforts to increase disaster preparedness must continue to be carried out to see that there are still many casualties and damage caused by earthquakes, such as earthquakes that occurred in Central Aceh, Bener Meriah and Pidie Jaya in August 2016. In addition to the Government, the community is also responsible and must be involved in efforts to reduce disaster risk, especially those in the disaster-prone areas, so as to increase the resilience of a nation in the face of disasters.

School as one of the most effective media of transformation of science which is expected to be able to absorb and apply knowledge on preparedness to face disasters by using the right and correct methods. In addition, schools also need to make disaster prevention as an important activity. This is an important first step in building disaster resilience throughout the community [2].

After the earthquake and tsunami in Aceh, many institutions have been involved in providing training both through schools and communities to increase awareness and preparedness in the face of disasters. The students need to be guided not only to know and understand disasters but more important is how they can deal with disasters with an alert and responsive attitude so as to minimize disaster risk.

The young at the Middle School level is one part of the community that can be prepared, nurtured and trained to become human resources ready to face disasters. In order to build a culture of safety and resilience especially for the younger generation, one of them needs to be carried out further disaster preparedness training starting from elementary, secondary and so on. Learning from the experience of natural disasters and various disasters that occur in Indonesia, the training is very much needed which is related to the right way to save yourself when a disaster occurs and also how to prevent unnecessary accidents in everyday life.

In Aceh, especially Aceh Besar, there are 133 Educational Institutions in Salafiyah Islamic boarding schools with a total number of students reaching 14,054 people and teachers reaching 3,627 people [3]. One of them is Imam Syafii Islamic Boarding School, which is a religion-based educational institution that combines religion and general science. The schedule combines the school curriculum and the boarding school curriculum so that it makes the Islamic Boarding School have two levels of formal schools, the junior secondary and MA levels.

Imam Syafii Islamic Boarding School Suka Makmur District has an area of ± 3 ha, there are various facilities for study rooms, prayer rooms, santri dormitories, teacher dormitories, public toilets, libraries, and a number of sports facilities. This sturdy building concretely shows the vulnerability for students and teachers found in Islamic boarding schools because of their daily lives in boarding schools. Moreover, the three levels of students dormitory shows that they are very vulnerable to the earthquake, so the preparedness of the students needs to be trained and increased especially the earthquake intensity that we cannot predict such as the twin earthquakes that occurred on February 16, 2017, at 02.47 WIB with a scale of 5.6 SR and continued at 02.53 WIB on a scale of 5 SR.
2 Methods

This study uses experimental research methods. The population in this study were all students who studied in the Imam Syafii Sibreh boarding school, which consisted of 216 students. The sampling technique in this study was conducted by random sampling. Sampling in this study was carried out with a minimum sample formulation using the Slovin [4]. The instruments used in this study were tests and non-tests. The test instruments were in the form of pretest and posttest questions, non-tests in the form of questionnaire sheets, and recording devices in carrying out earthquake disaster evacuation simulation research in improving students preparedness in facing earthquakes in Imam Syafii Sibreh Islamic Boarding School, Aceh Besar.

The knowledgeability test in this study consisted of 10 multiple choice questions given at the beginning and end of the study. To get the criteria for good test questions, the question must be assessed for reliability, validity, level of difficulty and differentiation. Validity testing and construction validity aim to determine the suitability between the problem and the teaching material.

Every Pretest and Posttest is almost identical and has the same quality. The pre-test aims to find out the initial abilities of the students before getting treatment, while the Posttest aims to determine whether or not there is an increase in the students’ knowledgeability after getting the learning treatment.

The data analysis technique used in this study is quantitative data analysis in the form of the test results of the knowledgeability of students preparedness and qualitative data in the form of attitudes and actions questionnaire on students preparedness in the face of earthquakes. Data processing is used SPSS and Microsoft Office Excel.

Test by using multiple choice has a value, that is answering questions correctly given a value of 1 (one), and for the wrong answer given 0 (zero) with the maximum value for each question is 140.

Based on the results of the test questions, it can be seen the knowledge level category of the Imam Syafii Sibreh Islamic Boarding School community in Aceh Besar in the face of the earthquake in the following table

<table>
<thead>
<tr>
<th>Knowledge Percentage (%)</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 -20</td>
<td>Very Low</td>
</tr>
<tr>
<td>21-40</td>
<td>Low</td>
</tr>
<tr>
<td>41-60</td>
<td>Adequate</td>
</tr>
<tr>
<td>61-80</td>
<td>High</td>
</tr>
<tr>
<td>81-100</td>
<td>Very High</td>
</tr>
</tbody>
</table>

Questions and statements to find out attitudes, preparedness actions and the effectiveness of implementing simulations are arranged in the form of questionnaires by answering odd tiered scales according to the Likert scale. In scoring on each question for aspects of attitudes and preparedness actions based on the number of respondents x each choice of answers (1–5), then divided by the highest number of scores (5x30 = 150) x100%.

While calculating the effectiveness of the implementation of the simulation also uses the same method, but based on the number of observers x each answer choice (1-5), then divided by the highest number of scores (5x10) x100%.
Based on the results of the questionnaire, it can be seen the categories of attitudes, actions, and effectiveness of the implementation of earthquake disaster simulations in the following table:

<table>
<thead>
<tr>
<th>No</th>
<th>Value (%)</th>
<th>Preparedness Attitudes</th>
<th>Preparedness Action</th>
<th>Effectivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>80-100</td>
<td>Very Good</td>
<td>Very Ready</td>
<td>Very Effective</td>
</tr>
<tr>
<td>2</td>
<td>65-79</td>
<td>Good</td>
<td>Ready</td>
<td>Effective</td>
</tr>
<tr>
<td>3</td>
<td>55-64</td>
<td>Adequate</td>
<td>Relatively Ready</td>
<td>Adequate</td>
</tr>
<tr>
<td>4</td>
<td>40-54</td>
<td>Bad</td>
<td>Less Ready</td>
<td>Ineffective</td>
</tr>
<tr>
<td>5</td>
<td>0-39</td>
<td>Very Bad</td>
<td>Not Ready</td>
<td>Very ineffective</td>
</tr>
</tbody>
</table>

The research was taken by conducting disaster simulations. Based on Priambodo[6] preparation was carried out by disseminating activities, coordinating related parties, installing disaster signs, making simulation scenarios, rehearsals, and implementing simulations.

3 Result And Discussion

School Community Knowledge About Earthquake Disasters and Preparedness. Based on the answers to the disaster and preparedness (pretest and posttest) knowledge questions, then recapitulated according to the test stages, the level of knowledge of the disaster and preparedness of the Imam Syafii Sibreh Islamic Boarding School, Aceh Besar, before and after the simulation based on the results of the pretest and posttest can be explained as follows:

a. Analysis and Discussion of Pretest Results and Postest of Disaster and Preparedness Knowledge

Based on the overall pretest questions, it can be said that the community’s knowledge of earthquake disasters is classified as adequate, where all the questions answered correctly by the community are 60.3%. It illustrates that in general the knowledge of the disaster and preparedness of the Imam Syafii Sibreh Islamic boarding school community is not satisfactory and requires efforts to increase knowledge of disaster and preparedness in the face of earthquake disasters. In general, the posttest results for aspects of earthquake disaster knowledge and preparedness were 79.6% or relatively high.

After the implementation of the simulation, the level of knowledge of earthquake disaster and preparedness, the knowledge of the school community has been very good. This is obtained from the average who answered correctly for each question increased from pretest 60.3% to 79.6% in the posttest. Therefore, it can be concluded that the knowledge of disaster in each community is very high so that it is expected to reduce the risks that occur when an earthquake strikes.

The analysis of these results illustrates the increase in knowledge of the Sibreh Imam Syafii Islamic Boarding School community which was obtained after a comparison of the results of the pretest and posttest. This increase in yield is also influenced by the effectiveness of the simulation itself, which means that after the treatment of the community, namely socialization and simulation, the community can absorb various information on disaster preparedness and preparedness.
b. Hypothesis Test of Differences in Disaster Knowledge and Community Preparedness

Based on the results of the study, it was found that there was a significant difference in the knowledge of the Imam Syafii Sibreh Islamic Boarding School community in Aceh Besar after the implementation of the earthquake disaster simulation.

c. Analysis and Discussion of Pretest and Posttest Attitudes Result of School Community Preparedness in Earthquake Disasters

Based on the overall pretest questions, it can be said that the community's attitude about earthquake disasters is classified as sufficient, where all the questions answered correctly by the community are 62.4%. This attitude value is still considered risky because 62% is a value that is not yet in the good or very good category for preparedness.

The posttest results for aspects of earthquake disaster preparedness were 75.87% or relatively good. After the implementation of the simulation, the level of preparedness in dealing with earthquake disasters in the school community has been very good. Therefore, it can be concluded that the preparedness attitude of each community is in a good category, so it is expected to reduce the risks that occur when an earthquake strikes.

After the implementation of the simulation, the assessment of the level of preparedness in dealing with earthquake disasters in the school community has been very good. This is obtained from the average who answered precisely for each question increased from pretest 62.4% to 75.87% at posttest. Therefore, it can be concluded that the preparedness attitude of each community is in a good category, so it is expected to reduce the risks that occur when an earthquake strikes.

From the comparison of the results of the pretest and posttest preparedness attitudes, the change in attitude will invite friends to find a safe place when aftershocks occur, which is the highest attitude change, which is 59.3%.

The final results were achieved by the Imam Syafii Sibreh Islamic Boarding School community, Aceh Besar, in the aspect of preparedness attitude that was classified as high (75.87%), this was expected to influence the attitude of each individual in the future school environment in facing earthquake preparedness.

A similar study conducted by Daud et.al.[7] and Finzia [8] in primary schools, found that after students and the school community were given treatment or learning after the pretest, it turned out that the attitudes of students and school communities were increasing towards more
positive in the face of an earthquake. Research on attitudes in the face of disasters conducted by Lena Wida[9] concluded that knowledge, attitudes, and support of family members significantly influence household preparedness in the face of earthquake disasters. This can occur because the attitude variable is a major factor in preparedness in the face of disasters, especially earthquakes. Based on the results of previous studies it was found that the attitudes of school community preparedness can be improved if there are treatments applied to the school community, both in the form of training, learning, and simulation.

d. Hypothesis Test of Differences in Attitudes of Community Preparedness

Testing the hypothesis to see whether there is a significant difference in the preparedness attitude of the Imam Syafii Sibreh Islamic boarding school after the implementation of the earthquake simulation, the t-test was used, where the values of community preparedness attitudes obtained from the pretest and posttest were then compared.

The results obtained for testing preparedness attitudes proved that the probability value or p-value is obtained = 0.000, which means there are differences in preparedness attitudes before and after the implementation of the simulation because the p-value is <0.05. For the comparison of $t_{count}$ with $t_{table}$ value, the $t_{count}$ obtained is -23.557 and $t_{table}$ -1.977, thus it is accepted $H_0$, because of $t_{count} \leq t_{table}$ which means there are differences in community preparedness attitudes before and after the implementation of earthquake disaster simulation. The $t_{count}$ is compared with the $t_{table}$ value on the degree of freedom $df = 139$.

e. School Community Preparedness Actions in the Face of Earthquake Disasters

On the aspect of preparedness, action testing is carried out as aspects of knowledge and attitudes, namely testing the pretest and posttest using the same questionnaire. A total of 140 respondents answered questions on this aspect and there were no missing answers.

f. Analysis and Discussion of Pretest and Posttest Result of School Community Preparedness Measures in Earthquake Disasters

Based on the overall pretest questions, it can be said that the community’s actions regarding earthquake disasters are classified as sufficient, where all the questions answered correctly by the community are 58.0%. The value of this attitude is still relatively ready when viewed from his preparedness. This happened because before this research was conducted, there had never been an earthquake disaster simulation in Imam Syafii Sibreh Islamic Boarding School, while the learning of earthquake material was very limited. In general, the posttest results for aspects of earthquake disaster preparedness measures were 85.0% or classified as very good. Thus the percentage of aspects of school community preparedness attitudes at the pretest is $(5952 : 7000) \times 100\% = 85.0\%$, meaning that it is classified as very good (80% - 100%).

After the implementation of the simulation, the level of preparedness in dealing with earthquake disasters in the school community has been very good. This is obtained from the average who answered correctly for each question increased from pretest 58.0% to 85.0% in the posttest. Therefore, it can be concluded that the preparedness actions of each community are in a very good category, so it is expected that actions to reduce the risks that occur during an earthquake.

Based on the results examined in the preparedness aspect of the Imam Syafii Sibreh Islamic boarding school community can be described and becomes an important reason that these results
are obtained when the community has gotten socialization of prior knowledge and attitude so that at the stage of taking practice/simulation, the community can be more understand so that you can practice preparedness correctly, not panic and be effective.

g. Hypothesis Test of Differences in Community Preparedness Measures

The results obtained for testing preparedness measures proved that the probability value or p-value is obtained = 0.000, which means there are significant differences because the p-value is <0.05. The t_count is compared with the t_table value on the degrees of freedom df = 29. For the comparison of t_count with t_table, then the t_count obtained is -48.605 and t_table = -1.977, thus H0 accepts due to t_count ≤t_table, which means that there are significant and significant differences in community preparedness actions before and after the simulation.

4 Conclusion

Based on the research that has been done at the Imam Syafii Sibreh Islamic Boarding School community in Aceh Besar, it can be concluded that the application of the simulation method is effective in increasing the preparedness of the school community in the face of earthquake disasters. The influence is based on the results of preparedness posttest which includes aspects of knowledge, attitudes, and preparedness actions, where each of these aspects increased by 79.6%, 75.87%, and 85.0%.

REFERENCES

Participatory Evaluation of Facilities and Infrastructure at Public Hospital of Sabang City in Facing a Fire Disaster

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Abstract. Fire is the occurrence of unwanted fire or fire that is not in place, the disaster is formed by three elements, namely fuel or combustible materials, oxygen, and heat sources. This study aimed to evaluate the facilities and infrastructure of Sabang hospital in preparedness against fire. This study used descriptive methods with a qualitative approach through observation. The results of the study found that there are still aspects of the facilities for fire disaster management at Sabang hospital which are not yet available such as fire alarms; fire hydrant; emergency telephone line; evacuation route; exit sign; emergency exit door; sloping path; and gathering points. Meanwhile, aspects that have been available include prohibited smoking signs and also light fire extinguishers. It can be concluded that the facilities and infrastructure of Sabang hospital in fire preparedness are not eligible. Thus, there must be an improvement to the management of Sabang Hospital in order to meet all aspects of infrastructure facilities for fire disaster management systems in accordance with the Technical Guidelines for Hospital Infrastructure, Active Fire Protection System by the Ministry of Health of the Republic of Indonesia.

Keywords: Preparedness, Fire, Infrastructure, Hospital.

1 Introduction

Fire disaster can occur anywhere and anytime, one of which is in a building in an area. Indonesia is one of the countries prone to fires. According to the office of Fire and Disaster Management (DPK-PB), it was found as many as 8243 cases of fires in Jakarta, Indonesia starting from 1998 to 2008 by making losses up to Rp. 1,255,091,940,080. Meanwhile, the data gathered by the Aceh Disaster Management Agency (BPBD) of Aceh Province in 2012, show the incidence of fires in Aceh Province reached 412 cases with loss of Rp. 33,230,213,000. Therefore, the building developer must provide a fire protection system. Government has been made rule that is PERMEN PU No. 20 of 2009 concerning Technical Guidelines for Fire Protection Management in Buildings and every building owner/user must utilize the building in accordance with the functions stipulated in the building permit including fire risk management starting from the periodic maintenance, maintenance and inspection activities of the system fire protection and preparation of trained personnel in fire control [1], when the fire occurs in the building, it is mentioned that each building has an area of at least 5,000 m² and especially hospital building that has more than 40 places of hospitalization, required to implement the MPK (Fire Protection Management).

Hospital is one of the buildings that have a high risk of the fire incident. This can be seen from the many potential sources of danger and its inhabitants. Thus, the presence of extinguishing equipment such as sprinklers, APARs, hydrants, and smoke or temperature detectors is very important. Besides that, the existence of fire
management is needed when a fire disaster has occurred [2]. So that based on previous researches, it was found that the things that have the potential to cause fires in hospitals included the use of several types of chemicals that are at risk of exploding and burning such as flammable chemicals; ethanol, alcohol, propanol. These types of chemical are very flammable. In addition, the types of oxidizing chemicals such as benzoyl peroxide will cause a fire if they react with other chemicals.

Facilities and infrastructure preparedness is a preventive effort carried out to anticipate unwanted incident. Facilities may be understood as any kinds of means, equipment, and other facilities that serve as the main too/auxiliary in the execution of the work, and social functioning in the framework of the interests of those who are associated with the organization [3]. While infrastructure means that all facilities that complement the needs of the facilities owned and are permanent or cannot be moved [4]. Based on that definition, then it can be said that basically the facilities are related to tools that are directly used for certain purposes, while the infrastructure is in the use of a means of supporting such facilities. A hospital could be said well once it corresponds with PERMEN PU No. 20 of 2009 [1] concerning Technical Guidelines for Management of Fire Protection in Buildings including necessary means such as APAR, Sprinkler/Hydrant, Fire Alarm and Channel telephone special circumstances emergency. While infrastructure needed among others are track evacuation fire, stairs emergency, ramps, signs instructions out, sign location gathers together and sign banned smoking.

Within 4 years to behind, the Regional Public Hospital (RSUD) of Sabang used as the object of the study had no history of fire disaster occurrence. However, preparedness efforts remain necessary to fire continuously. The authors’ consideration is to take the location of research in the Sabang Hospital, including the potential for fires to occur at any time in Sabang Hospital because of limited infrastructure, especially fire prevention, limited access to assistance (because of the island area) in the building and Sabang which is often visited by local tourists and foreign tourists so that with this situation of Sabang RSUD is ideally ready to provide maximum service to the community including the availability of infrastructure facilities for fire disasters. Therefore, that aim from this research is to evaluate the infrastructure facilities of the Sabang Hospital in fire preparedness.

2 Method

This research was descriptive qualitative research. The data were obtained through observation, observation, and direct examination, and literature reviews reference of relevant theory with cases or problems. Theoretical references obtained through literature studies will serve as a basis for conducting research in the field which was in Sabang Hospital. Data of the research were divided into two sources namely primary data and secondary data. Primary data regarding facilities and infrastructure were gathered through observation directly on research location. While secondary data were based on studies literature related to previous research from Sabang RSUD and Service Health of Sabang

3 Result and Discussion

3.1 Facilities at Sabang Hospital

The results of the study found that there were still a number of fire disaster management facilities at Sabang Hospital that were not yet available and those that were available but did not meet the requirements set by the "Directorate of Medical Support Services and Health Facilities of the PER.04/MEN/1980 [2] concerning the Guidelines of Hospital Technical Infrastructure, Active Fire Protection System ".

The findings through observation on the facilities of the Sabang Hospital in fire preparedness showed that some aspects of the Hospital's facilities are not available. These aspects are like a fire alarm; fire hydrant; emergency telephone line; evacuation route; exit sign; emergency exit door; sloping path; and gathering points. Meanwhile, aspects that are available are only limited to smoking signs and also light fire extinguishers. To be clearer, the completeness of the facilities can be seen in Table 3.1.

Table 3.1 shows that the data from observations found that the Sabang hospitals do not provide some vital means as follow:

Alarm; is a means that is actually very vital because it is a warning to notify people in the hospital to immediately evacuate themselves to a safe place in an emergency. If an alarm is not available, of course, it will be very difficult to notify everyone who is in the hospital at the Sabang if a fire incidence occurs. The alarm that does not emit a sound in the form of a heat, smoke and flame detector is a tool that is also important because this tool serves as an early detection if there is a potential for fire, both automatically and manually, to minimize the impact of losses in either material loss or loss of life.

Water hoses and/or hydrants; is also a must-have facility in every hospital. This is very clearly needed if there is a fire for the initial steps to prevent the fire from escalating before the fire department arrives at the location. If
there is no water hose and/or fire hydrant, then, it is possible that the fire will quickly enlarge and burn all existing rooms and hospital equipment.

Special telephone line in an emergency; is an actual supporting facility that must be provided in the hospital. For this particular telephone line, if there is a fire disaster and the usual communication lines become off, this particular telephone line can function optimally to call for help.

The facilities studied through observation refer to fire alarm, heat detector, smoke detectors, fire extinguisher, water hoses and/or hydrants, a special telephone line, emergency evacuation routes, door/path emergency exit, ramp, and gathering point. The type of APAR media owned by the Hospital of Sabang is powder or chemical powder, this media has several advantages such as it is easy to control and can be used to extinguish fires class A, B, and C. This is very suitable because the Hospital of Sabang City has the risk of this type of fire.

The results of the study found that there were still a number of aspects of fire disaster management facilities in the Sabang Hospital that were not yet available according to the standards regulated by the Directorate of Medical Support Services and Health Facilities of the Indonesian Ministry of Health in 2012 [3] concerning Technical Guidelines for Hospital Infrastructure, Active Fire Protection Systems.

3.2 Infrastructure at Sabang Hospital

Fire disaster management infrastructure is also an important aspect of the overall fire prevention system in the hospital. The following is a table that shows a summary of the results of observations of fire disaster management infrastructure in Sabang Hospital. Based on Table 3.2, it can be seen that this aspect of fire disaster management infrastructure at Sabang hospitals that have been provided are 1) the primary evacuation route as the main access lane at Sabang Hospital and liaison direction to self-evacuation when happening disaster; 2) alternative energy sources when the electricity goes out. The existence engine generator as function lighting reserve when Flow electricity goes out makes it easy to evacuate when disaster happens. 3) There are also no smoking signs.

Infrastructures that are not owned in Sabang City Hospital, namely:

Alternative evacuation routes; is an important infrastructure that is intended to prevent the main route experiences a deadlock due to fire and is impassable, so an alternative evacuation route is needed for the process of self-rescue. Signs/symbols towards the evacuation route; is also important, because to facilitate the evacuation process, if there is no sign, the residents or guests will experience confusion when saving themselves due to panic conditions.

Signs / symbols along the route; also need to be provided because if an exit cannot be seen directly by visitors or users of the building, a sign with an arrow indicates the direction should be provided in the corridor, the road leading to a large room, lobby and the like which gives an indication of direction to the required exit.

Lighting along the route; also needs to be concerned, because if there is a fire, the electricity will automatically turn off and the hospital will darken. Therefore, lighting is needed on the evacuation line that does not rely on electricity such as stickers or directions that are brightly colored if it is in a dark condition or it could also be a lamp that stores electrical energy which automatically turns on when the electricity goes out.

Signs/instructions OUT/EXIT; which serves as a guide for evacuation in the event of a fire disaster where all people in the hospital will mostly experience panic. The exit signs will help facilitate the evacuation process to find a safe place during a fire disaster.

Emergency doors/exits; are infrastructures that should be provided and these that aims to shorten the time when the evacuation process occurs in the event of a disaster.

Ramp; is a facility that should be included in every hospital. A sloping path will greatly help patients who are in wheelchairs or in bed to push when hospital employees and relatives of patients in evacuating patients who cannot get up from their beds.

Location points gathering as the end of the evacuation route; this infrastructure shows if the place which is the final point is a safe place from the catastrophic fire. However, at RSUD Sabang, such infrastructure does not seem to meet the terms as gathering point location because the open field at Sabang City Hospital is relatively small since areas have been filled for two and four-wheel vehicles parking areas.

4 Conclusion

Based on the results of research on the evaluation of facilities and infrastructure at Sabang Hospital in facing fire disasters, it can be concluded that "the facilities and infrastructure of the Sabang Hospital in fire preparedness do not meet the requirements".
### Table 1. The Completeness of Fire Disaster Management Facilities at Sabang City Hospital

<table>
<thead>
<tr>
<th>No</th>
<th>Aspect</th>
<th>Available</th>
<th>None</th>
<th>Fit the standard</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fire Alarm</td>
<td>√</td>
<td>No</td>
<td>Not available</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Heat detector</td>
<td>√</td>
<td>No</td>
<td>Not available</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Smoke detector</td>
<td>√</td>
<td>No</td>
<td>Not available</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Flame detector</td>
<td>√</td>
<td>No</td>
<td>Not available</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Light fire extinguishers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>a. In the inpatient room</td>
<td>√</td>
<td>No</td>
<td>There are no instructions for use and no regular maintenance</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b. In the vehicle parking area</td>
<td>√</td>
<td>No</td>
<td>There are no instructions for use and no periodic maintenance</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c. In the corridor/hallway to the exit</td>
<td>√</td>
<td>No</td>
<td>There are no instructions for use and no periodic maintenance</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Sprinkler / Fire Hydrant</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>a. Water hose inside the hospital</td>
<td>√</td>
<td>No</td>
<td>Not available</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b. Fire hydrant</td>
<td>√</td>
<td>No</td>
<td>Not available</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c. Water sprinkler</td>
<td>√</td>
<td>No</td>
<td>Not available</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Emergency telephone line</td>
<td>√</td>
<td>No</td>
<td>Not available</td>
<td></td>
</tr>
</tbody>
</table>

Source: Observation of lapngan (processed)

### Table 2. The Completeness of Fire Disaster Management Infrastructure at Sabang City Hospital

<table>
<thead>
<tr>
<th>No</th>
<th>Aspect</th>
<th>Available</th>
<th>None</th>
<th>Fit the standard</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Evacuation route</td>
<td>√</td>
<td>No</td>
<td>Yes</td>
<td>Corridor connecting blocks</td>
</tr>
<tr>
<td></td>
<td>a. Primary evacuation route</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b. Alternative evacuation routes</td>
<td>√</td>
<td>No</td>
<td>Not available</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c. Signs/symbol towards the route evacuation</td>
<td>√</td>
<td>No</td>
<td>Not available</td>
<td></td>
</tr>
<tr>
<td></td>
<td>d. Signs/symbols along the route</td>
<td>√</td>
<td>No</td>
<td>Not available</td>
<td></td>
</tr>
<tr>
<td></td>
<td>e. lighting along the route</td>
<td>√</td>
<td>No</td>
<td>Too decreased and slippery floors</td>
<td></td>
</tr>
<tr>
<td></td>
<td>f. Alternative energy sources when</td>
<td>√</td>
<td>No</td>
<td>Using a generator</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Signs / instructions OUT / EXIT</td>
<td>√</td>
<td>No</td>
<td>Not available</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Emergency door/exit (only during an emergency)</td>
<td>√</td>
<td>No</td>
<td>Not available</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Ramp</td>
<td>√</td>
<td>No</td>
<td>Not available</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Location points gather as the end of the evacuation route</td>
<td>√</td>
<td>No</td>
<td>Not available</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>No smoking sign a. Around the ICU</td>
<td>√</td>
<td>No</td>
<td>Striking placement</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b. Around the emergency room emergency</td>
<td>√</td>
<td>Yes</td>
<td>Striking placement</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c. Around the laboratory</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>d. Around the surgery room</td>
<td>√</td>
<td>Yes</td>
<td>Striking placement</td>
<td></td>
</tr>
</tbody>
</table>

Source: Field Observation (processed)

**REFERENCES**


The Preparedness of the Rapid Reaction Team (TRC) of Aceh Disaster Management Agency in Facing Natural Disasters

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Abstract. The research entitled "The Preparedness of The Rapid Reaction Team (TRC) of Aceh Disaster Management Agency in Facing Natural Disasters" aimed to describe the level of preparedness of quick reaction team in facing natural disaster and also to figure out the effect of knowledge, attitudes, the effectiveness of exercise, and human resources on the preparedness of the quick respond team in facing natural disasters. The type of research used is a cross-sectional study design. The populations of this study were the all Aceh Disaster Management Agency (TRC) Team, which amounted to 107 people. The numbers of samples were taken by using a simple random sampling; thus, the numbers of samples taken were fewer than the populations. The data used were primary data collected in the form of questionnaires and secondary data were obtained through reports and books. The results of this study show that (1) The preparedness index of Aceh Quick Reaction Team (TRC) with a value of 95.94 belonged to very prepared category, (2) knowledge, attitudes, training effectiveness significantly influenced the preparedness of TRC personnel in responding to disasters in Aceh Province, (3) human resources consisting of age, sex and years of work did not significantly influence the preparedness of TRC personnel in dealing with disasters in the Province Aceh.

Keywords: Quick Reaction Team, Preparedness.

1 Introduction

Indonesia has areas prone to various disasters and if a disaster occurs, the affected people have the right to receive services and protection based on minimum service standards ranging from search, rescue, evacuation, emergency relief, fulfillment of basic needs for disaster victims including food, clothing, water clean and sanitation, health services, and temporary shelter. For this reason, a quick assessment of death victims, injuries, refugees, damage to housing/office/religious facilities/educational facilities, other vital facilities and infrastructure (Perka BNPB Nomor 9 of 2008) is needed [1].

The assignment of the Quick Reaction Team from various agencies/ institutions that works based on the BNPB Quick Reaction Team Procedure during disaster response due to various problems including limitation of time, urgent needs and various difficulties of coordination which may be due to the many institutions involved in handling disaster emergencies,
competition in resource mobilization, excessive autonomy and distrust of government agencies. This requires more intensive coordination in order to facilitate the implementation of disaster emergency management (Perka BNPB Nomor 9 of 2008) [1].

BNPB/BPBD Quick Reaction Team (TRC) is a team assigned by the Head of BNP/BPBD in accordance with their authority to carry out quick disaster and disaster impact assessment activities and to provide assistance in the context of handling disaster emergencies. TRC BNPB/BPBD consists of several cross-sectoral elements.

Aceh Disaster Management Agency (BPBA) also formed a quick reaction team (TRC) on May 7th, 2018 based on the Decree of the BPBA No. 360/758 of 2018 [2] concerning the Establishment of a Task Force for the Quick Reaction Team of Aceh Disaster Management Agency. After the existence of the Aceh Disaster Management Agency since its establishment on June 22, 2010, it has made maximal effort to carry out its main tasks and functions in carrying out disaster management services. However, there are still many things to concern in order to make improvements, one of which is the preparedness of the Aceh Disaster Management Agency's Quick Reaction Team prepared in 2018.

2 Method

This study used a quantitative research approach that emphasized the numerical assessment of phenomena learned through descriptive analysis methods that started by collecting data, analyzing data, and interpreting data with the type of descriptive correlation research design that is research to determine the level of relationship between two or more variables. This study used the Cross-Sectional approach, which was a type of research carried out at the same time to the independent and dependent variables.

In this quantitative research, researchers would measure the relationship of knowledge; attitude; effectiveness of training; and human resources to the preparedness of Aceh Disaster Management Agency's (BPBA) Quick Reaction Team (TRC) in dealing with natural disasters.

3 Result and Discussion

Quick reaction team (TRC) must be able to determine the actions to be taken when facing a disaster situation. This can be done at the time before the disaster happens which is usually called disaster preparedness. Preparedness in this study consisted of parameters of knowledge, attitudes, emergency response plans and resource mobility. These parameters are divided into variables consisting of knowledge, attitudes, training effectiveness and human resources. To determine the picture of the preparedness level in this study, it is necessary to calculate the weighting and preparedness index. Weighting is obtained from the number of questions from each parameter divided by the total number of questions. While the index is obtained by dividing the total real score divided by the maximum score then multiplied by 100. Weighting and parameter index can be seen in Table 1.

Table 1 shows the knowledge parameter index of 82 from 9 questions, attitudes of 97 from 9 questions, emergency response parameter index of 98 from 17 questions and resource mobility parameter index of 97 from 3 questions.
Table 1. The Influence of Human Resources Toward Preparedness

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Variable</th>
<th>Weight</th>
<th>IP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge</td>
<td>Knowledge</td>
<td>9</td>
<td>82</td>
</tr>
<tr>
<td>Attitude</td>
<td>Attitude</td>
<td>9</td>
<td>97</td>
</tr>
<tr>
<td>Emergency Response Plan</td>
<td>Exercise</td>
<td>17</td>
<td>98</td>
</tr>
<tr>
<td>Resource Mobility</td>
<td>Effectiveness</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Human Resources</td>
<td>3</td>
<td>97</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>38</td>
<td></td>
</tr>
</tbody>
</table>

Source: Primary data, processed (2019)

The index of each parameter is calculated using the parameter index formula as follows:

\[ \text{index} = \frac{\text{Total rill parameter}}{\text{Maximum of parameters}} \times 100 \]

Information:
Total rill parameter: The total number of real values for all questions in parameters concerned with the total question in the parameter
Maximum of parameters: The maximum number of values in the question indexed.

The parameter index of knowledge, attitudes, emergency response plans and human resource mobility is included in the very prepared category. This is because TRC has an important task such as having a task to study quickly and precisely in disaster locations within a certain time in order to identify the scope of the disaster location, the number of victims, the damage to infrastructure and facilities, the disruption to the functions of public services and government, as well as natural resource capabilities and artificial and also appropriate advice in disaster management efforts.

Based on the weight and parameter index, TRC personnel preparedness index can be calculated by the formula below:

\[
= \left( \frac{9}{38} \right) \times IP1 + \left( \frac{9}{38} \right) \times IP2 + \left( \frac{17}{38} \right) \times IP3 + \left( \frac{3}{38} \right) \times IP4 \\
= \left( 0.23 \times 82 \right) + \left( 0.23 \times 97 \right) + \left( 0.45 \times 98 \right) + \left( 0.11 \times 97 \right) \\
= 18.86 + 22.31 + 44.1 + 10.67 \\
= 95.94
\]

Based on the calculation of the TRC members' preparedness index values, it can be concluded that the preparedness of TRC members in terms of the knowledge, attitudes,
emergency response plans and mobility of human resources parameters belongs to very prepared category. Basically, TRC is indeed required to be very prepared because TRC is the front guard when a disaster occurs. TRC has the function of carrying out preliminary assessments immediately after a disaster and during emergency response; facilitating coordination with all sectors involved in disaster management; submitting appropriate suggestions for disaster relief efforts; and reporting the results of periodical implementation of tasks to the Head of BNPB with copies of members’ direct supervisors teams from related sectors and SATKORLAK PB / Provincial BPBD/SATLAK PB/BPBD District / City, initial reports after arriving at the disaster site, periodical/developmental reports and full/final assignment reports. So basically, the TRC members must have preparedness that is very prepared in the event of a disaster.

The TRC Aceh members are parts of the BPBA which were formed with the main goal of being the first team to enter the field at the time of the disaster to carry out preliminary data on victims and to provide initial assistance to disaster victims in Aceh Province. As the earthquake in Aceh Province mostly occurs, TRC is required to maintain its preparedness in facing all possible disasters that happen in Aceh Province.

4 Conclusion

Based on the research results and discussion, it can be concluded as follows:

a. The preparedness index of TRC Aceh personnel is viewed from the knowledge, attitudes, emergency response plans and resource mobility parameters consisting of variables of knowledge, attitudes, training effectiveness and human resources amounted to 95.94, which means that they belong to the very prepared category.

b. The chi-square test results showed a partial variable of knowledge that has a value (assymp. sig of 0.012), attitude variable that has a value (assymp. sig of 0.041), and exercise effectiveness variable that has a value (assymp. sig of 0.034) significantly influenced the preparedness of TRC personnel in handling disasters in Aceh Province. Meanwhile, the human resource variable consisting of age that has a value (assymp. Sig of 0.747), gender that has a value (assymp. Sig of 0.430), and work period that has a value (assymp. Sig of 0.595) did not significantly influence the preparedness of TRC personnel in dealing with disasters in Aceh Province.

REFERENCES


The Tsunami Evacuation Route Planning by Using Tree Building Method

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Abstract. The use of the main road had caused the traffic and accident during the process of evacuation. Therefore, it is necessary to design some evacuation routes as an alternative to distributing the people. The study aimed to design the tsunami evacuation route by using tree building method for the people in Meuraxa sub-district, Banda Aceh, Aceh, Indonesia. To identify the appropriate evacuation method, about 377 questionnaires were distributed to the people in the region by using stratified random sampling. The road map published by Bappeda Aceh was used to study the road network. Results showed that the best evacuation method for the community was a vertical evacuation method. Since there were about 4 tsunami evacuation buildings (TEBs), the road networks were clustered into 4 and the destination node of each cluster was the TEB. A Dijkstra algorithm was built by using Ms.Excel application following the tree building method to find the shortest pathway of evacuations. The program was easy to run and could find the evacuation route quickly from any nodes. Then, the results of calculations were drawn as tree building of tsunami evacuation route.

Keywords: Tsunami, Evacuation Route, and Building Tree.

1 Introduction

The sub-district Meuraxa is located in Aceh Province, Indonesia. The region was totally destroyed by mega-tsunami in 2004. It can be influenced by the geographical location of the area along the coastal area where the Great Sumatran Fault or Semangko Fault occurred. Leone et.al [1] had reported that about 3 minutes after the first wave, the second high tsunami wave of 14.1m had attacked the sub-district Meuraxa; its speed about 30 km/h but as turbulent flow which was responsible to cause extreme destruction.

The population in this area has increased significantly after some years. Barus [2] provided that there was traffic during evacuation on 11th April 2012, concentrated to the main road in this region, i.e. Sultan Iskandar Muda St., with the volume and capacity ratio of 0.54. Therefore, they recommended to enlarge the road and to keep the road in a one-way direction during the evacuation. Recently, the number of population in sub-district Meuraxa is approximately 19,770; this number will increase every year, provided by (Central Bureau of Statistics Banda Aceh, 2017)[3]. The obstacle of evacuation should be solved. The objective of evacuation is to evacuate people in the right time, [4]. Sarusuk [5] stated that sufficient information about evacuation is necessary to guide the people during evacuation. To reduce the victim in the future, the tsunami evacuation route should be analyzed so that the people can evacuate quickly in a short time. The basic idea is that some evacuation routes to the tsunami evacuation buildings (TEBs) will distribute the people and reduce the traffic. Therefore, the objective of this study is to calculate the tsunami evacuation route for the people in sub-district Meuraxa by using the tree building method under the Dijkstra algorithm built up in Ms. Excel.
2 Method

About 377 questionnaires were distributed to the people in Meuraxa sub-district following the stratified random sampling. This sub-district has 16 villages and the total population was approximately 19,770 people. The number of samples was determined by using Krejcie and Morgan table at the level significance of 5%. A questionnaire consisted of 7 questions was designed to identify the best evacuation method for the people in the region. The mapped road published by BAPPEDA Aceh was used to draw the road network. The road chosen was the road with a minimum width of 3m.

3 Result And Discussion

3.1 The Proposed Evacuation Method

Based on questionnaire analysis, it is showed that approximately 5% of the people had no knowledge about tsunami disaster, even about 50% of the people did not have experience with this disaster. The past tsunami in 2004 had caused a high number of death people and most of the residents today had changed due to natural increase and migration. Dramatically, about 20% of these people had no knowledge about the tsunami evacuation route.

Results also showed that about 48% of people would evacuate horizontally, 48% would evacuate vertically, and about 4% would stay at home for specific reasons. These specific reasons such as provided by Tuite & Wolshon[6], elderly and homebound individuals called careless evacuation; their number was between 6-10%. Results also showed that about 73% of people were vulnerable to tsunami consisted of children, women and elder people.

Considering the location of this region, the vertical evacuation method is better than the horizontal method. It is because the time needed to reach the safe area by the horizontal evacuation method was at least 22 minutes [7]. In addition, there were possibilities to have delayed reaction time up to 10 minutes due to (1) recognition and information level, (2) individual characteristic in taking immediate action, (3) infrastructure to provide warning, and (4) desire to collect items [8]. It is important to consider that the Acehnese people had a high desire to collect gold and money before evacuation. The mitigation efforts of tsunami disaster should appoint this situation to improve the people knowledge. Therefore, the proposed tsunami evacuation was designed as vertical evacuation method to tsunami evacuation building (TEB).

3.2 Algorithm Dijkstra For Tsunami Evacuation Route

The conventional calculation method for the shortest pathway seems to be not comfortable because it takes longer time and as the number of nodes increases, the calculation becomes more complicated. To solve this problem, a Dijkstra algorithm was constructed under Ms. Excel application to calculate the shortest route for tsunami evacuation route friendly and quickly. At this moment, the maximum number of nodes to be analyzed was 40 nodes notated with the capital alphabet from A to NA.
Table 1. The Logical Functions of Dijkstra Algorithm

<table>
<thead>
<tr>
<th>Commands</th>
<th>Formulas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Find the next shortest route</td>
<td>=IF(OR(I10=&quot;&quot;;I11=&quot;stop&quot;);J6;IF(MIN(IFERROR(IF(K10:AX10<em>AZ10:CM10=0;&quot;&quot;;AX10</em>AZ10:CM10);&quot;&quot;))=0;&quot;&quot; ; MIN (IFERROR(IF(K10:AX10<em>AZ10:CM10=0;&quot;&quot;;K10:AX10</em>AZ10:CM10);&quot;&quot;)))))</td>
</tr>
<tr>
<td>Read the matrix</td>
<td>=IF(K13=&quot;&quot;;K10;MIN(K10;$J10+VLOOKUP($I14;matriks!$C$4:$AQ$43;K$7+1;FALSE)))</td>
</tr>
<tr>
<td>Read the addition of distance</td>
<td>=IF($I14=&quot;&quot;;&quot;&quot; ; IF(AZ14=0;&quot;&quot;;IF(VLOOKUP($I14;matriks!$C$4:$AQ$43;K$7+1;FALSE)=&quot;&quot;;&quot;&quot;;&quot;&quot;;IFERROR(IF(K10:AX10<em>AZ10:CM10=0;&quot;&quot;;K10:AX10</em>AZ10:CM10);&quot;&quot;))))</td>
</tr>
<tr>
<td>Show the total distance of selected route</td>
<td>=IF(AZ14=0;&quot;&quot;;IF(K14=$J14;IF(COUNT($I16:I16)=0;$J14;&quot;&quot;);&quot;&quot;))</td>
</tr>
<tr>
<td>Find the evacuation route</td>
<td>=IF(OR(G3=&quot;&quot;;G3=&quot;&quot;);&quot;Tidak ditemukan rute jalur terpendek&quot; ; LEFT(G166;LEN(G166)-3))</td>
</tr>
<tr>
<td>Show the total distance of evacuation route</td>
<td>=IF(OR(I166=&quot;&quot;;I167=&quot;stop&quot;);J162;IF(MIN(IFERROR(IF(K166:AX166<em>AZ166:CM166=0;&quot;&quot;;K166:AX166</em>AZ166:CM166=0;&quot;&quot;;K166:AX166<em>AZ166:CM166=0;&quot;&quot;;K166:AX166</em>AZ166:CM166=0;&quot;&quot;))))</td>
</tr>
</tbody>
</table>

To start the calculation, the first step is to fill the tabulated data of distance between nodes according to the road network. Then, this information should be moved to the layout worksheet under the syntax: copy-paste special-value. By filling the number of nodes and the origin node, the result of the calculation can be seen as the total distance and the route. The layout of the designed Dijkstra algorithm is shown in Figure 1 and the combination of logical functions used were listed in Table 1. The algorithm was modified by using the Eq. (1).

\[
S_p = \sum_{y \in L_p} S_y
\]  

(1)

Where \(S_p\) is the distance from the origin node to the destination node (TEB) and \(L_p\) is the distance between nodes in the network.

Recently, this approach is not considered multiple constraints that could affect the situation such as travel time, etc. However, the results of this analysis should be used as the basic
information for the evacuation planning since the evacuation distance is one of the important parameters in a tsunami evacuation plan [4].

Figure 1. The worksheet layout of Algorithm Dijkstra

3.3 The Determination of Road Cluster

The determination of road cluster was done based on the road map published by Bappeda Aceh and the number of TEBs.

Table 2. The Distance Between Nodes in Cluster 1 and 2

<table>
<thead>
<tr>
<th>Cluster 1</th>
<th>Cluster 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>21 nodes</td>
<td>33 nodes</td>
</tr>
<tr>
<td>A B 75</td>
<td>A B 45</td>
</tr>
<tr>
<td>B C 60</td>
<td>B C 222</td>
</tr>
<tr>
<td>C D 96</td>
<td>C D 56</td>
</tr>
<tr>
<td>D E 13</td>
<td>D E 56</td>
</tr>
<tr>
<td>E F 43</td>
<td>E L 17</td>
</tr>
<tr>
<td>D M 57</td>
<td>K L 61</td>
</tr>
<tr>
<td>N M 12</td>
<td>E F 133</td>
</tr>
<tr>
<td>O N 58</td>
<td>F G 35</td>
</tr>
<tr>
<td>O P 63</td>
<td>G H 95</td>
</tr>
<tr>
<td>Q O 18</td>
<td>C H 61</td>
</tr>
<tr>
<td>B H 26</td>
<td>H I 5</td>
</tr>
<tr>
<td>H I 39</td>
<td>J 58</td>
</tr>
<tr>
<td>H J 94</td>
<td>D J 61</td>
</tr>
<tr>
<td>J K 39</td>
<td>F M 28</td>
</tr>
<tr>
<td>J L 5</td>
<td>M N 18</td>
</tr>
<tr>
<td>L Q 30</td>
<td>G O 36</td>
</tr>
<tr>
<td>L R 29</td>
<td>L U 110</td>
</tr>
<tr>
<td>Q S 12</td>
<td>K R 98</td>
</tr>
<tr>
<td>R S 64</td>
<td>R S 14</td>
</tr>
<tr>
<td>S T 30</td>
<td>P Q 67</td>
</tr>
<tr>
<td>R U 15</td>
<td>Q S 36</td>
</tr>
<tr>
<td>S T 15</td>
<td>T U 45</td>
</tr>
<tr>
<td>T U 45</td>
<td>U V 17</td>
</tr>
<tr>
<td>V W 48</td>
<td>W X 21</td>
</tr>
</tbody>
</table>
Meuraxa sub-district has 4 TEBs i.e. TEB1 in Gampong Alue Deah Teungoh, TEB2 in Gampong Deah Glumpang, TEB3 in Gampong Lambung, and TEB4 in Gampong Pie. Therefore, the road networks were clustered into 4 clusters.

The road network was built following the graph design with the characteristics of having a node name (A-NA) and having the distance information in term of a metre (m). The example of the cluster is shown in Figure 2. The destinations of cluster 1, 2, 3, and 4 were TEB1, TEB2, TEB3, and TEB4, respectively.

### Table 3. The Distance Between Nodes in Cluster 3 and 4

<table>
<thead>
<tr>
<th></th>
<th>Cluster 3</th>
<th>Cluster 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>27 nodes</td>
<td>25 nodes</td>
</tr>
<tr>
<td>A</td>
<td>B</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>203</td>
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</tr>
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<td>B</td>
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<td>53</td>
<td>16</td>
</tr>
<tr>
<td>C</td>
<td>D</td>
<td>G</td>
</tr>
<tr>
<td></td>
<td>39</td>
<td>69</td>
</tr>
<tr>
<td>B</td>
<td>E</td>
<td>B</td>
</tr>
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<td></td>
<td>48</td>
<td>H</td>
</tr>
<tr>
<td>E</td>
<td>F</td>
<td>E</td>
</tr>
<tr>
<td></td>
<td>59</td>
<td>F</td>
</tr>
<tr>
<td>F</td>
<td>G</td>
<td>G</td>
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<td></td>
<td>54</td>
<td>78</td>
</tr>
<tr>
<td>G</td>
<td>H</td>
<td>H</td>
</tr>
<tr>
<td></td>
<td>36</td>
<td>73</td>
</tr>
<tr>
<td>H</td>
<td>I</td>
<td>I</td>
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<td></td>
<td>58</td>
<td>21</td>
</tr>
<tr>
<td>A</td>
<td>I</td>
<td>J</td>
</tr>
<tr>
<td></td>
<td>47</td>
<td>J</td>
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<tr>
<td>J</td>
<td>K</td>
<td>K</td>
</tr>
<tr>
<td></td>
<td>23</td>
<td>23</td>
</tr>
<tr>
<td>J</td>
<td>L</td>
<td>K</td>
</tr>
<tr>
<td></td>
<td>302</td>
<td>L</td>
</tr>
<tr>
<td>J</td>
<td>K</td>
<td>L</td>
</tr>
<tr>
<td></td>
<td>45</td>
<td>42</td>
</tr>
<tr>
<td>K</td>
<td>M</td>
<td>L</td>
</tr>
<tr>
<td></td>
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<td>Q</td>
</tr>
<tr>
<td>K</td>
<td>M</td>
<td>L</td>
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<td>113</td>
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<tr>
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<td>W</td>
<td>M</td>
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<td>M</td>
<td>U</td>
<td>M</td>
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<tr>
<td></td>
<td>68</td>
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</tr>
<tr>
<td>M</td>
<td>U</td>
<td>N</td>
</tr>
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<td></td>
<td>83</td>
<td>31</td>
</tr>
<tr>
<td>U</td>
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<td>S</td>
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<td></td>
<td>33</td>
<td>T</td>
</tr>
<tr>
<td>W</td>
<td>Z</td>
<td>S</td>
</tr>
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<tr>
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<td>U</td>
<td>U</td>
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<td></td>
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<td>T</td>
<td>W</td>
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<tr>
<td>R</td>
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<td>V</td>
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<td>R</td>
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<td>Q</td>
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<td>R</td>
<td>142</td>
</tr>
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<td>F</td>
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<td>155</td>
</tr>
<tr>
<td>E</td>
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<td>D</td>
<td>O</td>
<td>151</td>
</tr>
<tr>
<td>D</td>
<td>N</td>
<td>147</td>
</tr>
<tr>
<td>T</td>
<td>X</td>
<td>124</td>
</tr>
<tr>
<td>X</td>
<td>Y</td>
<td>42</td>
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<tr>
<td>V</td>
<td>Y</td>
<td>124</td>
</tr>
<tr>
<td>Y</td>
<td>AA</td>
<td>69</td>
</tr>
<tr>
<td>Z</td>
<td>AA</td>
<td>20</td>
</tr>
</tbody>
</table>

**Figure 2.** The road network in cluster 1
After drawing the road network as can be seen in Figure 2, the data of distance between nodes were tabulated as it can be seen in Table 2 and 3. Results of alternative evacuation routes by using the Dijkstra Algorithm program designed is performed as the tree building in Figure 3. The users could change the origin node depended on their home location or work place. [9] mentioned that the origin of the people probably from two places i.e. home or work place. So it explains also that it is a need to determine the shortest tsunami evacuation route from any possible nodes.

3.4 The Tsunami Evacuation Route

Results of recommended pathways for all clusters are shown in Table 4. These results were matched to the results of the conventional calculation method. However, the use of the conventional method has many disadvantageous such as takes longer time and causes boring or mistake. Lastly, the tree building in Figure 3 can be used to determine the evacuation routes.

The results of the shortest pathway for tsunami evacuation should be implemented to the evacuation map. As it was suggested by Scheer & Varela [4] creating additional routes was one solution for an evacuation plan. The other solutions were enlarging existing route, increasing the capacity of existing shelter, and creating additional shelters. However, Shahabi & Wilson [10] argued that it was not only enough for the routing algorithm to return a plan with small evacuation time but it should also assure that the prediction was realistic and the evacuation time was feasible. Therefore, a further study evacuation algorithm should work with multiple traffic models to optimize the solution.

<table>
<thead>
<tr>
<th>ON</th>
<th>DN</th>
<th>Route</th>
<th>( S_p ) (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cluster 1</td>
<td>A</td>
<td>U</td>
<td>A-B-H-J-L-R-U</td>
</tr>
<tr>
<td></td>
<td>G</td>
<td>U</td>
<td>G-C-B-H-J-L-R-U</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>U</td>
<td>F-E-D-M-O-Q-L-R-U</td>
</tr>
<tr>
<td></td>
<td>T</td>
<td>U</td>
<td>T-S-R-U</td>
</tr>
<tr>
<td>Cluster 2</td>
<td>A</td>
<td>GA</td>
<td>A-K-R-S-T-CA-DA-EA-GA</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>GA</td>
<td>B-E-L-U-V-W-X-BA-GA</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>GA</td>
<td>C-H-I-Z-AA-BA-GA</td>
</tr>
<tr>
<td></td>
<td>D</td>
<td>GA</td>
<td>D-J-I-Z-AA-BA-GA</td>
</tr>
<tr>
<td></td>
<td>Y</td>
<td>GA</td>
<td>Y-Z-AA-BA-GA</td>
</tr>
<tr>
<td></td>
<td>O</td>
<td>GA</td>
<td>O-G-H-I-Z-AA-BA-GA</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>GA</td>
<td>N-M-F-G-H-I-Z-AA-BA-GA</td>
</tr>
<tr>
<td></td>
<td>CA</td>
<td>GA</td>
<td>CA-DA-EA-GA</td>
</tr>
<tr>
<td></td>
<td>V</td>
<td>GA</td>
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<td>D</td>
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<td>D-C-B-E-F-G-H-S-T-X-Y-AA</td>
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<tr>
<td></td>
<td>N</td>
<td>AA</td>
<td>N-O-P-Q-R-S-T-X-Y-AA</td>
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</table>
Figure 3. The tree building in cluster 1
4 Conclusion

The new approaching of using Dijkstra algorithm built in Ms. Excel had offered comfortable way for the users to find the tsunami evacuation route easily and quickly. The simulation of changing of origin nodes (ON), as well as destination nodes (DN), can be run as many as possible. It is expected to provide some alternative tsunami evacuation routes for the residents of sub-distric Meuraxa that will build up into a tsunami evacuation map.

REFERENCES

The Effect of Competence and Organizational Climate on Employee Productivity and Its Implications in Employee Performance Setda Aceh

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Abstract. Research on support for competencies and organizations on employee productivity and their implications for the performance of Aceh Regional Secretariat employees. The population in this study are all employees of the Aceh Regional Secretariat who currently approve 596 people, Determination of the sample using the "Stratisified Random Sampling" method. The sample was obtained 119 respondents or twenty percent of the population. Relating to competence to increase the productivity of the Aceh Regional Secretariat. Regarding the efficiency of the organization Good for increasing the productivity of the Aceh Regional Secretariat. Relating to competence towards the performance of employees of the Aceh Regional Secretariat. Relating to the organization of the performance of employees of the Aceh Regional Secretariat. Relating to improving employee performance towards the performance of employees of the Aceh Regional Secretariat. The Aceh Regional Secretariat remains and continues to improve its organizational climate and make its competencies higher and system to improve employees to increase this will make Aceh Regional Secretariat staff increase.

Keywords: Competence, Organizational Climate, Productivity and Performance

1 Introduction

Improving performance and productivity can be done by increasing competency, with the existence of competencies will encourage the work ability of employees, and with the existence of competencies will also improve skills in working increasingly skilled.

The competency shows the various forms of work performed by each employee by providing a great opportunity to create a higher quality job. Increasing level of experience, illustrates that employees will be more skilled in doing work (Puspaningsih, 2004).

Competence is the basic foundation of people's characteristics and indicates how to behave or think, equate situations and support for a long period of time. Competency is defined as the personal aspects of a worker which makes it possible to achieve superior performance. These personal aspects include the nature, motives, value systems, attitudes, knowledge and skills where competence will direct behavior, while behavior will produce performance (Lasmahadi, 2002). The reality that often happens now is that the level of knowledge of employees is not in accordance with the standards, the skills and expertise of employees are still low and a lot of work is done is not the same as the target.

Increased performance and work productivity are also influenced by organizational climate. The organizational climate can change from pleasant to unpleasant conditions. But in general,
leaders and employees want the organization's climate to be pleasant because it involves increasing productivity and performance.

Organizational climate is the arena of decision making regarding performance. If the organizational climate is useful for individual needs (for example: paying attention to the interests of workers and performance-oriented), it can be expected that behavioral change towards a better goal.

The low organizational climate can be seen from the atmosphere of the work environment not yet fully supporting to work better, the relationship between subordinates and superiors has not been harmoniously established, relationships between fellow workers have not been harmonious, the atmosphere of my work environment is still far from expectations.

Organizational climate creates a strength in the work environment that can motivate the organization. The quality of the organizational climate can be seen from the behavior of employees, the cooperation of each member, the neatness of the organizational structure.

The purpose of this study is:

a. To test the effect of competency on the productivity of Aceh Regional Secretariat staff.
b. To examine the influence of organizational climate both on the productivity of Aceh Regional Secretariat employees.
c. To test the effect of competency on the performance of Aceh Regional Secretariat employees.
d. To examine the influence of organizational climate on the performance of Aceh Regional Secretariat employees.
e. To test the effect of employee productivity on the performance of Aceh Regional Secretariat employees.
f. To examine the influence of competencies and organizational climate through productivity on the performance of Aceh Regional Secretariat staff.

2 Literature Review

2.1 Understanding Competence

Competence is the qualification needed by employees to carry out work properly.

In conducting an audit, an employee must have good personal quality, adequate knowledge, and special expertise in his field. Competence is related to professional expertise possessed by employees as a result of formal education, professional examinations and participation in training, seminars and symposia (Suraida, 2005). If individual competencies are in line with organizational competencies, effective organizational goals can be achieved (Ley, 2008).


2.2 Understanding Organizational Climate

Experts interpret the organizational climate as a physical condition, which reflects the attribution of the organization itself. Kamuli (2012) says that organizational climate is something that is real experienced by people in an organization.
Pines quoted by Barkah (2002) the work climate of an organization can be measured through four dimensions, namely:

a. Psychological dimensions, which include variables such as workload, lack of autonomy, lack of self-fulfillment and lack of innovation.

b. Structural dimensions, which include variables such as physical, sound and the degree of harmony between work requirements and physical structure.

c. Social dimensions, which include aspects of interaction with clients (in terms of quantity and characteristics of the problem), colleagues (level of support and cooperation), and supervisors (support and rewards), and

d. The bureaucratic dimension, which includes laws and regulations on role conflict and role obscurity.

2.3 Understanding Productivity

Productivity in a philosophical sense according to Hidayat (2002:5) is the ability to create tomorrow better than today and make today better than yesterday. In this context the essence of understanding of productivity is pessimists who tend to see difficulties in seeing every opportunity available and compared to optimistic people who actually have other people's perspective, which tends to see opportunities in every attitude “.

2.4 Understanding of Performance

Prawirosentono (2007:120) performance, or performance is the result of work that can be achieved by a person or group of people in an organization, in accordance with their respective responsibilities and authorities in an effort to achieve organizational goals. There is a close relationship between individual performance and organizational performance, in other words, if employee performance is good then the possibility of organizational performance is also good.

Lowe & Porter (2011:48) write that performance is the work achieved in a certain size. Dessler (2011) performance becomes an evaluation of the deterioration achieved so that evaluation is needed.

2.5 Performance Measurement

Common causes that often lead to failure in performance measurement are mentioned by Dessler, 2011:102 as follows:

1. Absence of standards
   If the standard does not exist then it is not objective in assessing existing performance only subjectively.

2. Inconsistent standards
   Standards are determined by a job / job analysis process to determine output according to standards.

3. Unrealistic standards
   Standards are potentially stimulating and motivating goals.

4. Measures of improper achievements
   Objectivity and comparison require progress on standards and achievement of standards can be measured easily and transparently.

5. Errors in Assessment
   The tendency to choose middle values and fear to face subordinates.
6. Giving bad feedback
The entire assessment process and the results of the assessment must also be communicated to them in accordance with the principles and objectives of the program, especially the performance management program.

7. Communication is negative
The evaluation process is disturbed by communication based on negative attitudes such as arrogance and selfishness on the part of the assessor and self-defense and closeness on the party being assessed.

2.6 Conceptual Framework

2.6.1 Effect of Competence on Productivity
Susanti (2013) states that competence has a significant effect on salesperson's performance with a fairly strong category. Ningwidhi (2014) that competence has a significant and direct impact on employee work productivity, competency turns out to play an important role in improving employee capabilities so that employees always have the ability to increase work productivity with competency levels that are always competitive.

2.6.2 Effect of Organizational Climate on Productivity
Darsono (2010) states that organizational climate has a strong and direct influence on work productivity. The increasing organizational climate will increase work productivity and, conversely, the lower the organizational climate, the lower the work productivity.
Karyana (2012) states that the organizational climate influences the work productivity at the UPTK. The unidirectional influence states that organizational climate has an important role in the efficiency and effectiveness of work productivity. Kamuli (2012) also said that the organizational climate significantly and unequivocally influenced the work productivity of employees in the Regional Secretariat of Gorontalo City.

2.6.3 Effect of Competence on Performance
Inneke & Fadli (2011) say that employee competency is a factor in the success of a work team in an organization. Competence creates unidirectional synergies within a group Arifin (2013) and Sanjaya & Indrawati (2014) state that simultaneously competencies have a significant and direct effect on employee performance.

2.6.4 Effect of Organizational Climate on Performance
Euis (2012) and Kamuli (2012) state that organizational climate has important consequences for employee turnover and years of service in the organization. the direction of the organizational climate tends to improve and support commitment to the organization. The organizational climate has a direct and significant effect on performance. Aso said that the importance of the organizational imate made Kopelman, Brief and Guzzo make a hypothesis that said that ultimately the organizational climate would affect employee performance (Pace & Faules, 1998). Moderate performance is a work achievement or work that has been achieved by employees of an organization in a certain period.
2.6.5 Effect of Productivity on Performance

Taiwo (2010) states that labor productivity has a positive and significant effect on performance, increasing work productivity, thereby increasing performance and vice versa. Alinaitwe, Mwakali, & Hansson (2010) states that productivity is one of the determining factors that influence performance, where productivity is the ratio between the results and inputs used.

2.7 Hypothesis

H1: Political culture, work discipline and education and training have an impact on employee performance at the Secretariat of the Aceh Parliament.
H2: Political culture, work discipline, training and employee performance influence the performance of the Secretariat of the Aceh Parliament.
H3: Political culture, work discipline and training through employee performance affect the performance of the Aceh Legislative Assembly Secretariat.

3 Method

The number of samples obtained was 119 respondents from 20 percent of the population, namely 596.

Data analysis tool uses path analysis model (path analysis), with the equation as follows:

\[
Y = PX1Y + PX2Y + e
\]

\[
Z = PX1Z + PX2Z + PZ + e
\]

Where:
X1 = Competence
X2 = Organizational Climate
Y = Work Productivity
Z = Performance
e = error item
P = Coefficient Path

4 Result And Discussion

4.1 Effect of Competency and Organizational Climate on Productivity of SETDA Aceh employees

The results of the equation in Structure 1 are:

\[
Y = PYX1X1 + PYX2X2 + PY e e 1
\]

\[
= 0.70X1 + 0.120X2 + 0.38 e 1
\]

\[
R2yx1x2 = 0.620
\]

The results of the analysis are as follows:
- The magnitude of the influence of competence (X1) directly influences the productivity of SETDA Aceh employees (Y) is (0.70) 2 = 49 percent.
- The magnitude of the influence of organizational climate (X2) directly influences the productivity of SETDA Aceh employees (Y) is $(0.12)^2 = 1.44$ percent.
- The magnitude of the influence of competency (X1) and organizational climate (X2) simultaneously influences the productivity of SETDA Aceh employees (Y) is $0.620^2 = 62.0$ percent.

**4.2 Effect of Competency, Organizational Climate and Productivity on SETDA Aceh Employee Performance**

The results of the equation in Structure 2 are:

$$Z = PZX1X1 + PZX2X2 + PZYY + PE2$$

$$= 0.243X1 + 0.425X2 + 0.286Y + 0.278e1$$

$$R_{yx1x2}^2 = 0.722$$

The results of the analysis are as follows:
- The magnitude of the influence of competence (X1) directly influences the SETDA Aceh (Z) employee performance is $(0.243)^2 = 5.90$ percent.
- The magnitude of the influence of organizational climate (X2) directly influences the SETDA Aceh (Z) employee performance is $(0.425)^2 = 18.06$ percent.
- The magnitude of the effect of employee productivity (Y) directly influences the SETDA Aceh (Z) employee performance is $(0.286)^2 = 8.17$ percent.
- The magnitude of the influence of competence (X1) which indirectly or through employee productivity affects SETDA Aceh's employee performance is $37.8$ percent.
- The magnitude of the influence of the organizational climate (X2) which indirectly or through employee productivity influences SETDA Aceh's employee performance is $0.11$ percent.
- The magnitude of the influence of competency (X1), organizational climate (X2) and employee productivity (Y) simultaneously affect the performance (Y) of SETDA Aceh (Z) is $0.722^2 = 72.2$ percent.

**4.3 Managerial Implications**

The Aceh Regional Government must continue to improve competence, organizational climate, productivity and performance of employees, especially for some indicators that are still considered low, namely employee skills not in line with their occupations, the ability of employees to do work are not all skilled or skilled, and training is still low. These indicators must be considered so that in the future it will be better. But that does not mean that the other indicators will be improved but continue to be maintained and improved in the future, this is done to improve the performance of Aceh Regional Secretariat.

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Effect of E-Government Implementation Policy on Work Morale And It’s Impact on The Employee Performance of Aceh Financial Management Agency

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Abstract. The study mainly investigates the influence of the implementation of e-government policy on work morale and it’s implication on the employee performance of Aceh Financial Management Agency. The study conducted of 289 employees of the public institution. The open questionnaire is utilized to collect empirical data. And then, the data is analyzed by statistical means of structural equation model (SEM). The study found that the implementation of e-government policy has a positive and significant effect on work morale and employee performance. The work morale mediates the effect of the implementation of e-government policy on employee performance. The mediation effect of work morale as an intervening variable is partial mediating.

Keywords: Employee’s Performance, Work Spirit, Implementation of e-government policy

1 Introduction

Data The recent development of information and communication technology has had an impact on the implementation of the regional government in Indonesia. The use of these technologies can encourage the implementation of the principles of good governance in order to create good governance. The application of the principles of good governance has implications for improving the quality of public services to the public. Information technology has provided many facilities for local governments to implement e-government in the regions. The legality of implementing e-government is based on President Instruction [1] concerning the National Policy and Strategy for the Development of e-government for every region in Indonesia.

Basically, e-government is an application of internet-based information technology and other digital devices. Information technology is managed by the government to deliver information about public services to the public online [2]. The emergence of internet-based information technology offers many conveniences for users including government agencies in their operational activities oriented to public services [3].

In addition through the support of internet technology, the implementation of e-government can help the government in interacting with all parties who have interests in government services such as the business world, employees of government agencies, and government institutions. The application of e-government policy is expected to be able to improve the performance of the apparatus in the service environment. This is based on the reason that the implementation of the policy basically reflects the government's awareness to use information technology in
carrying out public services [4]. Internet information technology support as one of the important requirements for implementing e-government can help government officials to work better. In addition, the implementation of e-government can also improve the accuracy and speed of information flow. The ease for employees of government agencies as providers of “public services”, the presence of internet technology and computerized systems can improve the effectiveness and efficiency of the implementation of work.

Online or online systems are increasingly popular and are part of the implementation of e-government, and this can not only facilitate employees in carrying out work but also can make the work done by employees in different fields become integrated each other. The effect of the implementation of e-government on employee performance in improving the quality of public services in government agencies certainly does not only occur directly. This is due to the application of information technology in supporting the operational activities of government agencies that have an impact on many things including employee morale. Work morale is an inner impulse that is in a person to realize planned work [5]. Work morale is usually reflected through attitudes and behaviors that manifest themselves in the form of the desire to complete work [6].

The influence of the implementation of e-government on increasing work morale empirically has also been proven in the studies of Afriani & Wahid [7] and Kurniasih, Tatik, & Sukaesih [8] that the implementation of e-government has a positive and significant impact on morale and morale which ultimately has an impact on improving employee performance. This indicates that work morale can be an intermediary variable between the implementation of e-government and employee performance.

Regarding the implementation of e-government in the Aceh Financial Management Agency, the results of surveys and interviews with several government officials working at the agency obtained empirical information that the implementation of e-government was relatively good. This is indicated by the availability of work facilities, facilities, and infrastructure that support the implementation of the program. The support of officials for the implementation of e-government in these institutions has also been very good, considering that the Aceh Financial Management Agency is one of the institutions that have a very strategic role in supporting government operational activities in Aceh. The existence of a computerized network system between one part to another part and with other agencies outside the Aceh Financial Management Agency is strong evidence that the implementation of e-government is relatively good. In addition, the ability of government officials to use information technology as an important condition for implementing e-government has also been relatively good.

The implementation of e-government in government agencies such as the Aceh Financial Management Agency is expected to be able to improve the performance of the apparatus and improve the quality of public services at the agency. The survey results on employee performance indicate that there are still employees who have poor performance. In addition, the survey results relating to employee morale indicate that employees of these agencies also have different work morals. On the one hand, there are employees with relatively good morale and on the other hand, there are also those with low work morale. Therefore, it is necessary to study the impact of the implementation of e-government on work morale and the performance of employees of the agency considered important to do.
2 Literature Review

2.1 Effect of e-government on work morale

Employee morale can be influenced by various factors including the work environment both physically and non-physically [9]. Employees will have high work morale when the goals they want to achieve are in line with the organization's goals.

The work environment can also have an impact on employee morale. The work environment is related to the employee's assessment of the physical and non-physical work environment in the organization where they work. The application of e-government to government agencies can certainly improve the work environment of the agency. So that the application of e-government can actually affect the work morale of employees. That is, the better the implementation of e-government, the better the impact will be on improving the work environment, which in turn can improve employee morale.

The influence of the implementation of e-government on increasing work morale empirically has also been proven in the studies of Afriani & Wahid [7] and Kurniasih [8] that the implementation of e-government has a positive and significant impact on employee morale and morale which in turn can improve employee performance.

2.2 Effect of e-government on employee performance

The implementation of e-government principles has implications for the realization of work efficiently and participative. In addition, the implementation of e-government can encourage public services that meet the principles of justice, democratic, transparent and responsible. Especially if the implementation of e-government is supported by the existence of a modern state apparatus system and based on high rationality. In addition, e-government can also have an impact on the performance of employees of government agencies.

There is a link between the implementation of e-government and the performance of government agencies, as stated by Elysia, Wihadanto, & Sumartono [10] that the support of internet information technology as one of the important requirements for the implementation of e-government can help government officials to work better. In addition, the implementation of e-government can also encourage the flow of information and communication to be carried out quickly, precisely, and accurately. Online or online systems are increasingly popular and are part of the implementation of e-government, and this can not only facilitate employees in carrying out work but also can make the work done by employees in different fields become integrated each other.

2.3 Effect of work morale on employee performance

Empirically there are a number of factors that can affect employee performance such as compensation and work motivation [11] work culture and work motivation [12], and work motivation and organizational culture [13]. Other factors that affect performance include leadership, motivation and work morale [14]. The relationship between employee performance and work morale has been the concern of several previous researchers. Harris & Mossholder [15] states that workplace morale is positively related to employee performance. The higher the morale of work will be the higher the performance of employees. This is in accordance with the opinion of Drafke & Kossen [16] saying there is a direct relationship between work morale and
employee performance. Employees with good moral work will be encouraged to work better so that their performance increases.

The relationship between work morale and employee performance was also stated by Gellerman [17] who stated that based on a number of surveys, most of them reported that empirical information that high work morale was significantly related to work productivity and high performance. On the contrary, only a small part of empirical research concludes that morals are not related to employee work productivity.

2.4 Effect of e-government on employee performance through the work morale

The application of e-Government requires the support of employees who are skilled in using information technology. At the very least, e-government demands the existence of government officials who are willing to learn and are able to adapt to the advancement of information technology. Moreover, information and communication technology is changing rapidly.

Improving the performance of government agency apparatus can be done by utilizing information technology through an information system, for example, regional information management systems that are mutually integrated, fast and responsive. This assumption is built on the assumption that the smooth functioning of the local government is determined by the performance of its employees. Moreover, employees are elements of the government that are directly assigned to carry out public services.

Improving the performance of government employees in improving the quality of public services as a result of the implementation of e-government certainly does not occur directly, but indirectly through several variables including work morale. The application of e-government can make employees work more comfortably because it is supported by the existence of information technology. A sense of comfort and pleasure in work and work environment indicates an increase in work morale so that employees are enthusiastic in carrying out the work assigned to them. These conditions, in turn, have an impact on improving employee performance.

3 Research Methods

This research was conducted at the Aceh Financial Management Agency (BPKA). The object of the research focused on the causality relationship between the performance of agency employees with work morale and the implementation of e-government. In this case, work morale is placed as a mediating variable between employee performance and the implementation of e-government.

The research sample was 289 civil servants who worked for the agency. Data was collected through questionnaires containing closed questions. In order to sharpen the analysis and get better information about the interrelationships between variables, structural equation model (SEM) Amos 21 is used as a data analysis equipment.

4 Result And Discussion

Structural Equation Model (SEM) as a data analysis tool is to carry out structural tests of the entire model. In this case, the researcher directly tests the relationship between all variables (constructs) studied by involving all indicators in each construct. The implementation of e-government affects the intervening variables (work morale) and also towards endogenous constructs (employee performance). So that the existence of work morale can be interpreted as
an intervening variable (intermediary) between the implementation of e-government on the one hand with the performance of employees on the other side. In other words, the effect of implementing e-government on employee performance does not only occur directly (direct effect) but also can occur indirectly (indirect effect) through work morale as an intermediary variable.

The estimated e-government implementation coefficient on employee morale is 0.453. Statistically, the magnitude of the direct effect of e-government on employee performance is sought by squaring the estimated coefficient value so that it can be interpreted that the direct effect of implementing e-government on the work morale of Aceh Financial Management Agency employees is 20.52 percent. Furthermore, the estimated coefficient values of e-government implementation and work morale on employee performance are 0.579 and 0.387 respectively. The direct influence of these two variables on the performance of employees of the Aceh Financial Management Agency was 33.52 percent and 14.98 percent respectively.

The implementation of e-government policies has a positive and significant effect on the work morale of employees of the Aceh Financial Management Agency, indicated by an estimated coefficient of 0.453 with a p-value of 0.001. This means that the better the implementation of e-government policy the better the morale of work. Conversely, when the implementation of e-government policies is considered poor by employees, then these conditions have an impact on decreasing employee morale. In other words, there is a unidirectional relationship between the implementation of e-government policies on the one hand and the morale of employees on the other.

The implementation of e-government policies has a positive and significant effect on the performance of employees of the Aceh Financial Management Agency, indicated by an estimated coefficient of 0.579 with a p-value of 0.001. This means that the better implementation of e-government policies, the better the performance of employees. Conversely, when the implementation of e-government policies is judged to be poor by employees, these conditions have an impact on decreasing employee performance. In other words, there is a unidirectional relationship between the implementation of e-government policies on the one hand and the performance of employees on the other.

Work morale has a positive and significant effect on the performance of employees of the Aceh Financial Management Agency, indicated by an estimated coefficient of 0.387 with a p-value of 0.001. This means that the better the work morale, the better the employee's performance. Conversely when the morale of work is not good by employees, then the condition has an impact on the decline in employee performance. In other words, there is a unidirectional relationship between employee morale on the one hand and employee performance on the other.

The estimated coefficient of e-government policy implementation on work morale is 0.453 and the work moral estimation coefficient on employee performance is 0.387. Thus the indirect effect of implementing e-government policy on employee performance through work morale is 17.53 percent, smaller than the direct influence of e-government policy implementation on employee performance by 33.52 percent. Thus it can be interpreted that the existence of work morale does not strengthen the influence of the implementation of e-government policy on the performance of employees of the Aceh Financial Management Agency.

**Research Implication**

The findings of this study which indicate a positive and significant influence on the implementation of e-government towards increasing work morale are consistent with the findings of the research by Afriani & Wahid [7] and Kurniasih [8] who also concluded that the
implementation of e-government had a positive and significant impact on employee morale and morale which in turn could improve employee performance. Implementation of e-government policies also has a significant impact on employee performance. This is due to the application of e-government to the Aceh Financial Management Agency supported by internet technology which can directly encourage the efficiency of the work carried out by employees. The findings of this study are in accordance with the opinion of Elysia [10] who suggested that the support of internet information technology as one of the important conditions for implementing e-government can help government officials to work better.

Research findings that indicate the influence of work morale on employee performance in accordance with [15] states that there is a consistent relationship between the level of work morale that is specific to employee performance. The higher the morale of work will be the higher the performance of employees. Previously Drafke & Kossen [16] also suggested that there was a direct relationship between work morale and employee performance. Employees with good moral work will be encouraged to work better so that their performance increases.

The practical implications relating to the implications of research findings for related parties, especially for the heads of the Aceh Financial Management Agency. Research findings that indicate the influence of the implementation of e-government policies and work morale on employee performance have implications that efforts to improve the performance of agency employees can be done through policy interventions oriented to increasing the intensity of implementation of e-government policies and employee moral improvement.

The existence of work morale in mediating the effect of implementing e-government policy on employee performance has implications that efforts to improve employee morale are also very important when the intensity of the implementation of e-government policies is intended to encourage employee performance in supporting public service delivery. So that work morale has a central role in determining the success of the implementation of e-government in encouraging employee performance improvement.

5 Conclusion and Recommendation

The implementation of e-government policy in the Aceh Financial Management Agency can have a significant impact on improving the work morale of the agency's employees. The better the application of e-government policies to these agencies, the better the work morale of employees. Conversely, when the implementation of e-government is not good, then these conditions have an impact on decreasing employee morale. Implementation of e-government policies has significantly increased the performance of employees of the Aceh Financial Management Agency. The better the implementation of e-government policies, the better the performance of employees. Conversely when the implementation of e-government is not good, then these conditions have an impact on the decline in employee performance.

The work morale positively and significantly affects the performance of employees of the Aceh Financial Management Agency. Improved work morale can significantly improve employee performance. Conversely, the decline in work morale can also significantly reduce employee performance. The implementation of e-government policies influences the performance of employees of the Aceh Financial Management Agency through work morale as an intervening variable. Even though the existence of work morale does not strengthen the influence of the implementation of e-government policy on employee performance, the effect of work moral mediation between the two variables is partial mediation.

Referring to the conclusions explained above, the recommendation of the research are: (1). The head of the Aceh Financial Management Agency is deemed necessary to increase the
intensity of the implementation of e-government policies at the agency. Referring to the research findings, the real step that must be taken is to encourage the implementation of good e-government. Increasing the availability of technological infrastructure in supporting the implementation of e-government policies must be used as a strategic policy to improve the quality of public services; and (2) For future researchers who are interested in examining the relevance of the implementation of e-government policies and the performance of employees, they should be able to include other variables besides work morale as an intervening variable. Thus it will be better known for other factors that can mediate the influence of the implementation of e-government policy on employee performance, especially in the environment of the Aceh Financial Management Agency.

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The Effect of Work Stress, Work Load and Work Environment on Job Satisfaction And It’s Implication on The Employee Performance of Aceh Investment And One Stop Services Agency

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Abstract. The purpose of the study is to investigate the effect of work stress, workload and work environment on job satisfaction and its impact on the employee performance of DPMPTSP Aceh. The sample of the study is 138 civil servants of the institution. Data collected by questionnaire, and structural equation model (SEM) is operationalized to analyze the data. The study found that work stress has a negative and significant effect on job satisfaction and employee performance. On the contrary, both workload and work environment have a positive and significant effect on job satisfaction and employee performance. Furthermore, job satisfaction has a positive and significant impact on employee performance. The existence of job satisfaction mediates the effect of workload and work environment on employee performance. Conversely, the variable doesn’t mediate the effect of work stress on employee performance.

Keywords: Employee’s Performance, Job Satisfaction, Work Stress, Work Load, and Work Environment

1 Introduction

Aceh Investment and One Stop Services Agency (whereby; DPMPTSP Aceh) is one of the Aceh’s government work units which is expected to contribute positively to the development of Aceh. The existence of these institutions is very important for Aceh's development due to its function is directly related to licensing and investment which in turn is expected to have an impact on economic growth in this area. The important role of investment in encouraging the regional economy has been proven by a number of researchers [1]. Without the ease of investment, economic development in the regions will experience difficulties [1].

The importance of the role of investment in encouraging the progress of investment in the province implies that the Aceh government must be able to improve the performance of the DPMPTSP Aceh in carrying out its duties and functions in accordance with what has been determined. Therefore, in carrying out its operational activities, it needs to be supported by employees who not only have the ability and work skills that are truly in accordance with their fields, but also have the desire to achieve better performance. This is due to the increase in the performance of the institution which is largely determined by the improvement in the performance of its employees.
Given the importance of employee performance in improving the performance of government agencies in the province such as the Aceh DPMPTSP, improving employee performance is one of the important parts in achieving the objectives of HR management in the agency. Until now, there have been various ways that government agencies have done to improve the performance of their employees, including through education and training, short courses and other activities that are oriented towards improving performance. However, employee performance is basically related to a number of factors. The factors intended in this case are limited only to job satisfaction, work stress, workload, and work environment.

Job satisfaction is related to satisfaction and dissatisfaction in an employee's self towards everything related to his job. The relationship between employee performance and satisfaction logically can be explained that employees find satisfaction in work, tend to carry out work seriously and ultimately have an impact on their performance in carrying out their duties. Satisfaction felt by employees in the workplace will improve the performance of the employees concerned [2], [3] also informed that escort performance was influenced by job satisfaction.

Furthermore, work stress reflects a dynamic condition that causes employees to be faced with opportunities, constraints, and demands which are then related to the difference between conditions that are considered ideal (desired conditions) on the one hand and perceived results on the other. The difference between the two makes employees faced with uncertainty [4].

As explained above, employee performance can be influenced by workload. The workload is related to the employee's assessment of the workload that they must complete in accordance with the target and the predetermined work time [5], [6] states, the workload is a task that must be performed by an employee in a certain period of time. Workloads that are too large can cause performance to decline [7]. This means that the workload can have an impact on employee performance. The higher the workload, especially when the workload creates difficulties for employees to solve it, then the employee's performance will tend to decline.

Finally, the work environment refers to everything physical and non-physical that exists around employees that can affect their ability to carry out their tasks [8]. The work environment needs special attention from the management because it can directly affect the ability of employees to carry out their duties. The link between the work environment and employee performance is stated by Abdul & Awan [9] that a good working environment will be able to encourage employee performance improvement. This is supported by the findings of Mathews & Khann [10] that the environment has a significant effect on employee performance. Not only affects employee performance, but the work environment can also have an impact on the formation of job satisfaction. This was revealed by Bakotic & Babic [11] that employee job satisfaction is closely related to their perception of the work environment.

The results of a survey of employees of the Aceh DPMPTSP indicate that they have a relatively different performance from each other. As stated earlier, theoretically job satisfaction and employee performance can be influenced by work stress, workload, and perception of the work environment. This study is intended to highlight the influence of work stress, workload and work environment on job satisfaction and its implications for the performance of the agency's employees.

2 Literature Review

Effect of the job stress on job satisfaction

Handoko [12] states that work stress has a "functional" role and a "dysfunctional" role in encouraging the formation of job satisfaction. When the intensity of work stress increases, the
condition can cause work discomfort. Employees with relatively high-stress levels are usually indicated by a number of indicators such as insomnia, frequent dizziness and may lose motivation to carry out their work. So that these conditions have an impact on satisfaction and dissatisfaction in surveying employees of the Aceh DPMPTSP indicating that they have a relatively different performance from each other. As stated earlier, theoretically job satisfaction and employee performance can be influenced by work stress, workload, and perception of the work environment. This study is intended to highlight the influence of work stress, workload and work environment on job satisfaction and its implications for the performance of the agency's employees.

2.1 Effect of the workload on job satisfaction

The workload that is too large is too heavy can have a negative impact on job satisfaction. Workload refers to the employee's assessment of the work they do [5]. Manuaba [6] states, workloads reflect the views of employees on the work they complete in a certain period of time. High workloads cause performance to decline [7].

Job satisfaction perceived by an employee can be a determinant or determinant of the success of the employee in completing the workload given. The perceived workload is too heavy and can have a negative impact on the formation of job satisfaction. Likewise, vice versa, workloads that are too light can also affect employee satisfaction at work. Moreover, some employees want to be faced with job challenges, and their success in completing these challenges becomes one of the forming factors of their job satisfaction. Thus, it can be explained that the assessment of workload can affect job satisfaction.

2.2 Effect of the work environment on job satisfaction

Assessment of the work environment can have an impact on employee job satisfaction. In general, every employee wants a good work environment. The better the assessment of the work environment the higher job satisfaction. So that an assessment of the work environment can have an impact on job satisfaction. Employees who have a good perception of their work environment will tend to maintain their existence in the work environment so that it has an impact on the formation of high work loyalty.

The influence of the work environment on job satisfaction is proposed by Bakotic & Babic [11] that there is a close relationship between the two variables. This is also reinforced by the research findings of Jain & Kaur [13] which concluded that the work environment can have an impact on job satisfaction. Research by Fachreza, Musnadi, & Majid [14] also proves the influence of the work environment on performance.

2.3 Effect of the job stress on the employee’s performance

Until now there have been a number of studies that have analyzed the relationship between stress and performance[4]. Stress can have a positive and negative impact on employee performance [15]. Suprihanto [16] argues that the relationship between performance and job stress levels can be explained that when employees experience stress levels too low or too, then these conditions can cause the performance of these employees to be low.
2.4 Effect of the workload on the employee's performance

Workload refers to a number of jobs that must be completed by employees based on the responsibility and authority that has been given to the employee [5]. Manuaba [6] states, workload reflects the task or work that must be done by a person or group of people within a certain time horizon.

High workloads cause performance to decline [7] This means that the intensity of the workload of an employee can have an impact on the performance of the employee. The higher the workload, especially when the workload creates difficulties for employees to solve it, then the employee's performance will tend to decline.

2.5 Effect of the work environment on the employee's performance

The work environment can affect employee performance. This is because the work environment is an integral part of the work that is charged to employees. Employees who are in a relatively good working environment will tend to feel happy and comfortable in carrying out their work compared to employees who are in an unfavorable work environment. The influence of the work environment on employee performance has been proven by previous researchers. Naharuddin & Sadegi [17] in their research in Malaysia found that the work environment has a significant influence on employee performance. Kiruja & Mukuru [18] research in Kenya and the results of empirical studies conducted by Mathews & Khann [10] in manufacturing companies in India also found that the work environment has a positive impact on employee performance.

The description above informs that basically, the work environment is a determinant of employee performance. The better an employee's assessment of his work environment, the better the performance of the employee concerned. Conversely, if the work environment is considered poor, it will adversely affect employee performance [19].

2.6 Effect of job satisfaction on the employee performance

Job satisfaction has a positive effect on employee performance and ultimately has a positive impact on organizational performance [3]. Research by Nasution, Musnadi, & Faisal [20] also provides empirical evidence that job satisfaction can affect performance.

3 Research Methods

The research was conducted on DPMPTSP Aceh. The main focus of the research relates to the causal relationship between job satisfaction and agency performance on the one hand which is then associated with work stress, workload and their perception of the work environment on the other. In this study, job satisfaction is not only used as an endogenous variable for work stress, workload, and assessment of the work environment but also used as an intervening variable between the three exogenous variables with employee performance.

The research sample consisted of 138 civil servants working in the public agency. Data was collected through questionnaires containing closed questions. Furthermore, SEM-Amos is used to analyze the causality relationship between variables.
4 Result and Discussion

4.1 Analysis of the effect of work stress, work load and work environment on job satisfaction

Job stress can significantly affect the job satisfaction of Aceh DPMPTSP employees. It is represented by an estimated coefficient of -0.274 and a p-value of 0.004 < 0.05. This means that increased job stress can have an impact on reducing employee job satisfaction. Employees with relatively high-stress levels will tend to have low job satisfaction. Conversely, when employees experience low-stress levels, job satisfaction will increase.

Furthermore, the workload can encourage increased job satisfaction with an estimated coefficient of 0.359 and p-value = 0.001 < 0.05. This indicates that the workload can encourage employees to work better. They are motivated to carry out tasks according to the workload given. When an employee has a workload relatively little or no workload at all, the employee's performance will be low. This is what makes the workload have a positive impact on employee performance. The work environment can also encourage an increase in employee performance with an estimated coefficient of 0.578 and a p-value of 0.001. Improving the quality of the work environment can directly improve employee performance.

4.2 Analysis of the Effect of Job Stress, Workload and Work Environment on Employee Performance

Job stress has a negative impact on the formation of the performance of Aceh DPMPTSP employees. This is indicated by the value of the work stress estimation coefficient on the negative performance value of -0.213. On the other hand, workload and work environment have a positive influence on the performance of the agency's employees with estimated coefficients of 0.248 for workload and 0.418 for the work environment. The value of the p-value of the two variables is 0.015 for work stress, 0.001 for workload and 0.001 for the work environment. Furthermore, the critical value (C.R) for the three variables is also greater than 2.00. This means that work stress can encourage a decrease in employee performance and conversely the workload and work environment have a positive impact on improving the performance of Aceh DPMPTSP employees. Increasing the intensity of work stress has an impact on decreasing employee performance. Conversely, an increase in workload and improvement in the work environment can encourage employee performance improvement.

4.3 Analysis of the Effect of Job Satisfaction on Employee Performance

Job satisfaction is positive and can significantly influence the performance of Aceh DPMPTSP employees. Statistically, the positive and significant influence is indicated by the estimated coefficient of job satisfaction on employee performance of 0.139 and p-value of 0.019 < 0.05 and the critical value (CR) of 2.321 > 2.00. This provides empirical evidence that job satisfaction in an employee has an impact on improving employee performance. Conversely, when employee job satisfaction decreases, the condition can cause a decrease in performance. So that it can be understood that between employee satisfaction and performance has a direct relationship.
4.4 Analysis of the Effect of Job Stress on Employee Performance Through Job Satisfaction

The influence of organizational commitment on employee performance can occur indirectly, also indirectly through job satisfaction. As explained earlier, the effect of work stress directly on employee performance is 4.54 percent (negative). Furthermore, the existence of job satisfaction in mediating the causality relationship between the two variables makes this effect greater, which is equal to 3.81 percent (negative). This means that the existence of job satisfaction strengthens the effect of work stress on the performance of Aceh DPMPTSP employees. So that implicitly can be interpreted that job satisfaction mediates the effect of stress on performance.

4.5 Analysis of the Effect of Workload on Employee Performance Through Job Satisfaction

The effect of workload on employee performance can occur directly, as well as indirectly through job satisfaction. As explained earlier, the workload directly affects employee performance by 6.15 percent. Furthermore, the indirect influence (by involving job satisfaction as an intermediary), the effect becomes smaller, amounting to 4.99 percent. This indicates that job satisfaction is not able to strengthen the influence of workload on the performance of Aceh DPMPTSP employees.

4.6 Analysis of the Effect of the Work Environment on Employee Performance Through Job Satisfaction

The effect of the perception of the work environment on employee performance, in addition, can occur directly, also indirectly through job satisfaction. As explained earlier, the influence of the work environment directly on the formation of employee performance is 17.47 percent. Furthermore, the indirect effect of these variables on employee performance with job satisfaction as an intermediary variable shows a smaller number of 8.03 percent. This means that job satisfaction cannot strengthen the influence of the work environment on employee performance Aceh DPMPTSP.

5 Research Implications

The results of this study that present empirical evidence about the negative effects of work stress on job satisfaction and employee performance are consistent with the theoretical foundation previously stated. Robbins [4] argues that, the relationship between work stress and inverted U-shaped performance. When work stress experienced by employees is relatively low, their satisfaction and performance increases. Furthermore, when stress levels are relatively high and after reaching a certain level, increased stress results in a decrease in employee satisfaction and performance. As explained earlier, the stress level of Aceh DPMPTSP employees is relatively high, and this has a negative effect on the satisfaction and performance of the agency's employees. This indicates that the findings of this study are consistent with Robbins's opinion above.

The findings of this study indicate a positive impact on the work environment on employee performance in accordance with the findings of research by Bakotic & Babic [11] and Jain & Kaur [13] which also concluded that there is a unidirectional relationship between
employee performance and the work environment. This finding is also consistent with the results of Kiruja & Mukuru [18] research in Kenya, and the results of empirical studies conducted by Mathews & Khann [10] in manufacturing companies in India also prove the positive influence of the work environment on employee performance.

6 Conclusion And Recommendations

6.1 Conclusion

Job stress is a determining factor for job satisfaction and performance of Aceh DPMPTSP employees. Increasing the intensity of work stress can significantly reduce job satisfaction and performance of the agency's employees. Furthermore, the assessment of workload and their work environment positively impacts on job satisfaction and performance of Aceh DPMPTSP employees. This finding implicitly informs that the workload given to employees is still at the limit of their ability to carry out their duties.

Job satisfaction encourages the increased performance of Aceh DPMPTSP employees. When employees satisfied with their job, their performance will increase. Conversely, a decrease in job satisfaction can have an impact on decreasing their performance in completing their tasks. Job satisfaction is not an intermediate variable between work stress and the performance of Aceh DPMPTSP employees. Even though the results of testing using SEM indicate that work stress directly impacts performance degradation, but by involving job satisfaction as an intermediate variable, work stress does not have a significant effect on employee performance. So that job satisfaction is not a mediating variable between these two variables.

Workload affects the performance of Aceh DPMPTSP employees indirectly through job satisfaction as an intermediary variable. The intervening effect of job satisfaction as an intervening variable between these two variables is partial intervening. Furthermore, the work environment also affects the performance of the agency's employees with job satisfaction as their "transmission channel." The mediating effect of job satisfaction as an intermediary between the two variables is partial mediation.

6.2 Recommendation

The Head of the Aceh DPMPTSP must be able to improve the performance of his employees. Efforts to improve employee performance must be oriented towards increasing the ability of employees to complete tasks assigned to them, the ability to cooperate in employees both in their relationships with fellow colleagues and between employees and superiors. Efforts to improve the ability to complete tasks can be done by improving work skills and abilities through education and training. Furthermore, efforts to increase the capacity of cooperation can be carried out through joint activities among employees, both formal and informal (outside working hours) so that intimacy among employees is built.

The head of the Aceh DPMPTSP must strive to improve employee job satisfaction. Referring to the research findings, an increase in employee job satisfaction should be emphasized in the efforts of superiors in interacting well with their employees. Bosses must acknowledge the success of employees in completing the tasks they are working on. Such recognition can be in the form of appreciation or praise so that employees feel their hard work is morally valued. In addition, increasing employee job satisfaction is important by increasing personal relationships among employees, especially between employees and superiors.
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The Effect of Self-Efficacy And Work Motivation on The Organizational Commitment and its Implication on The Employee Performance of Local Government in Aceh Jaya District

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Abstract. The paper analyzes the effect of self-efficacy and work motivation on the organizational commitment and its implication on the employee performance of local government in Aceh Jaya district. The samples are 287 civil servants that are selected by proportional sampling from a number of public institutions in the district. The data is collected by using a questionnaire and then it is analyzed by using statistical means of structural equation modeling AMOS to analyze functional relation among variables. The research finds that self-efficacy and work motivation have a positive and significant effect on the improvement of organizational commitment and employee performance. The existence of the organizational commitment is not only to improve the effect of self-efficacy and work motivation on employee performance but also it has been mediating variables among the variables.

Keywords: Employee performance, organizational commitment, self-efficacy, and work motivation.

1 Introduction

The performance of an employee, theoretically, is related to a number of factors such as organizational commitment, self-efficacy and work motivation \cite{1}. Organizational commitment reflects a sense of employee attachment to the organization where the employee works. The relationship between employee performance and organizational commitment is caused by the employees with high commitment or sense of attachment who have the desire to make extra contributions to the organization and want to carry out work beyond the workload which is given to them \cite{2}. Organizational commitment is also a determining factor for work behavior and employee performance \cite{3}. Organizational commitment is often reflected in the sincerity of employees in their work and the desire to make the best contribution to support operational activities of the organization. The conditions can have positive impact on employee performance. This implies that the higher the commitment of an employee to the institution where he works, the higher the performance of the employee.

Basically, self-efficacy is the claim of an employee about his ability to plan and to carry out an activity which is needed to achieve the performance targets that are previously made \cite{4}. The trust in the ability of oneself in completing a job, encouraging someone to work harder to realize
the work plan that has been made. This implicitly indicates that self-efficacy can have a positive impact on the formation of employee performance. Empirical studies which are conducted by Judge & Bono [5] have proven there is a positive relation between these two variables. Similar to the study of Erez & Judge [6] also concludes that there is a positive impact of self-efficacy on individual performance.

Furthermore, work motivation is the willingness of a person to direct his will, expertise, and skills at work [7]. Work motivation is also one of the important determinants of employee productivity and performance [8]. Even the differences in work motivation in an employee can be seen from the success of the employee in carrying out their duties in accordance with the workload and responsibilities that are given[9]. The research findings of Muogbo [10] also provide empirical evidence about the existence of unidirectional relation between the two variables.

In order to provide public services in the area, the government of Aceh Jaya district has a number of agencies in which their operational activities are directly responsible to the regent as the regional head. All Regional Government Work Units / Satuan Kerja Pemerintah Daerah (SKPD) are expected to be able to support the achievement of the district vision.

The results of interviews with several employees at one of the agencies within the government of Aceh Jaya district provides the initial fact that their performance is relatively different. On one hand, there are employees who have good performance, this is characterized by the ability to complete work on time, always strive to maintain discipline in work, and have good responsibility for all jobs that are charged. On the other hand, there are also some employees with poor performance. Those who are included in this group not only have problems with the completion of the workload that has been given, but are also less responsible for the problems that arise in relation to the field of work that is assigned to them.

As it is stated earlier, employee performance is theoretically and empirically related to organizational commitment. In addition, employee performance is also related to self-efficacy and work motivation. So the question is whether employee performance of the government in Aceh Jaya district is related to organizational commitment, self-efficacy and work motivation.

2 Literature Review

2.1 The Effect of Self-Efficacy on Organizational Commitment

Self-efficacy can be seen as a person claim to the ability he has to work on activities that must be carried out in order to realize predetermined work target [11]. A person with relatively good self-efficacy will tend to be more confident with himself that he is able to carry out the assigned work. This belief can have an impact on the desire to complete the work as well as possible, and he has a strong sense of attachment to the organization where he works. The relation between self-efficacy and organizational commitment as it is stated by Agarwal & Mishra [12] self-efficacy can have an impact on organizational commitment. Employees with good self-efficacy have the self-confidence that the work that is charged can be resolved properly. The emotional conditions have an impact on the seriousness in carrying out work and he desires that the work that is done can be beneficial for the organization where he works. Seriousness in work and the desire to provide the best for the organization are important indicators of organizational commitment.

Based on the description above, it is explicit and understandable that an employee attachment to the organization where he works is related to self-efficacy that is in him. The better the self-efficacy that is characterized by the confidence in completing the work that is charged, the better
the commitment or sense of attachment to the organization. Conversely, a person with less good self-efficacy usually lacks confidence in his ability to work, is easily broken up and saturated with work. Finally, the desire to provide the best for the organization is also lower.

2.2 The Effect of Work Motivation on Organizational Commitment

Work motivation can be one of the determinants in an organization. Employees with relatively good work motivation usually have relatively greater urge to complete the work that is charged so that it has a positive impact on the organization. Work motivation does not only make an employee feel closer to his job but also can increase the sense of attachment to the organization where he works.

The influence of work motivation on organizational commitment empirically has been proven by the research of Krishna, Herd, & Aydinoğlu [13] who conclude that work motivation has a significant impact on increasing organizational commitment. In line with the findings, the study results of Salleh, Zahari, Said, & Ali [14] and Al-Madi, Assal, Shrafat, & Zeglat [15]. Also, reveal that the increasing in work motivation can increase organizational commitment.

2.3 The Effect of Self-Efficacy on Employee Performance

Employee performance can be determined by several factors such as compensation and work motivation Akmal, Lubis., & Yunus [16] work culture and work motivation Kurniawan, Lubis, & Adam [17]; and work motivation and organizational culture [18]. Another factor that can influence employee performance is self-efficacy. Self-efficacy encourages the improvement of employee performance individually. The study results of Judge & Bono[5] by using a meta-analysis concluded that there is a positive relationship between these two variables. The findings are in line with the research of Erez & Judge [6] who also present the same conclusions in which self-efficacy has a positive impact on the formation of employee performance.

2.4 The Effect of Work Motivation on Employee Performance

The willingness of employees to do a job is usually driven by the willingness or desire that they want to get by doing the work. Employees hope that the work they do can meet their needs [19]. This is based on the logical reason that every employee is faced with a number of needs that they must fulfill. The efforts to fulfill the needs are one of the main reasons that they are willing and ready to carry out work [20]. The intensity of work motivation in an employee becomes a determinant of employee performance[9]. The unidirectional relation between employee performance and work motivation implicitly can be explained that work motivation can encourage the increase in effectiveness and work productivity and efficiency in carrying out work [20].

2.5 The Effect of Organizational Commitment on Employee Performance

Commitments reflect the sense of attachment from the employees to the organization in which they work. When employees have a high commitment, the tendency to seriously carry out each assigned job will also be high. So the opportunity to be able to complete all tasks will also increase. This forms the framework of thinking that commitment is in line with the work that can be achieved by employees. Conversely, when employees have the low commitment, the motivation and desire to work better will also be low. Even low commitment can have an
impact on the employee desire for turnover (changing jobs, or leaving the organization where he works).

This is in line with the opinion of [21] who reveals that commitment or a sense of attachment to the organization reflects the desire to provide the best for the organization. Wentzel [22] finds that employee performance is positively and significantly related to organizational commitment.

2.6 The Relation between Self-Efficacy and Work Motivation

Self-efficacy is related to self-confidence in a person that he can perform tasks well. One who believes that he is capable of working usually will tend to succeed in carrying out every task which is given. Conversely when one feels unsure of his abilities and even feels anxious about the failure in work, then the opportunity to succeed will be smaller [23].

Trust in work ability correlates with motivation and job satisfaction. This is because self-confidence can be a driving factor for work motivation. The relation between work motivation and self-efficacy has been proven in the research of Judge & Bono [5] who conclude that high work motivation is in line with the self-efficacy of employees.

2.7 The Effects of Self Efficacy on Employee Performance Through Organizational Commitment

The effect of self-efficacy on employee performance can occur through a number of factors including organizational commitment. This is because self-efficacy basically can be interpreted as a justification in a person related to his ability to carry out a series of activities which are needed to achieve predetermined work target [11]. A person with relatively good self-efficacy will tend to be committed to carrying out the work which is assigned to him because he is motivated by a sense of trust in his ability to complete tasks. In other words, self-efficacy can have an impact on employee commitment to the organization in which the employee works [12].

The increase in employee commitment as a result of good self-efficacy in him will have an impact on the seriousness in carrying out every job that is charged so that the achievement of the task or performance increases. This is consistent with the opinion of [22] who explicitly emphasizes that employee performance is positively and significantly influenced by organizational commitment.

2.8 The Effect of Work Motivation on Employee Performance of Organizational Commitment

The influence of work motivation on employee performance can also occur through several channels, including organizational commitment. As it is explained earlier, work motivation can have an impact on the formation of organizational commitment[14], [15]. The increase in organizational commitment as the result of work motivation can ultimately influence the work performance of an employee. This is due to the fact that the employees who have the relatively high commitment or sense of attachment to the organization in which they work for will usually make every effort to support the efforts to achieve the organization goals [22].

3 Research Methods

This study is conducted at the Government of Aceh Jaya District. The object of the study relates to the relation between employee performance within the district government and
organizational commitment, self-efficacy and work motivation. In this case, organizational commitment is positioned as an intermediate variable between employee performance and self-efficacy with work motivation.

The study sample consists of 287 civil servants working for a number of public agencies in the area. The data is collected through questionnaires which contain closed questions. Then it is analyzed by SEM-AMOS multivariate statistics.

4 Result and Discussion

Self-efficacy and work motivation influence organizational commitment and employee performance. In addition, organizational commitment also directly influences employee performance. It means organizational commitment can be interpreted as an intermediary between self-efficacy and work motivation on one hand, and employee performance on the other. In other words, self-efficacy and work motivation cannot only directly influence OCB, but can also be through organizational commitment as an intervening variable.

The estimated coefficient value of each exogenous construct for organizational commitment is 0.392 for self-efficacy and 0.326 for work motivation. This numbers can be interpreted that the direct effect of self-efficacy on organizational commitment is 15.37 percent, and the direct effect of work motivation on organizational commitment is 10.63 percent.

Furthermore, the estimated coefficient value of the two exogenous constructs on employee performance is 0.374 for self-efficacy and 0.299 for work motivation. Referring to the estimated coefficient value of the two variables, it can be interpreted that the direct effect of self-efficacy on employee performance is 13.99 percent, and the direct effect of work motivation on employee performance is 8.94 percent.

The estimated coefficient of organizational commitment to employee performance is 0.391. This number can be interpreted that the direct effect of organizational commitment on employee performance is 15.29 percent. Furthermore, the estimated coefficient of self-efficacy on organizational commitment is 0.392 and the path coefficient of organizational commitment to employee performance is 0.391. Thus the indirect effect of self-efficacy on employee performance through organizational commitment is 15.33 percent which is greater than the direct effect of self-efficacy on employee performance at 13.99 percent. Thus it can be interpreted that organizational commitment can strengthen the effect of self-efficacy on employee performance.

The estimated coefficient of working motivation on organizational commitment is 0.326 and the coefficient value of organizational commitment on employee performance is 0.391 so that the indirect effect of work motivation on employee performance through organizational commitment is 12.75 percent. This figure is also greater than the direct effect of work motivation on employee performance at 8.94 percent. So that it can be interpreted that organizational commitment does not strengthen the effect of work motivation on employee performance.

5 Research Implications

Theoretical implications are related to the comparison of research findings with theoretical foundations and empirical findings that are conducted by previous researchers. The research findings that provide empirical evidence of the effect of self-efficacy on organizational commitment are consistent with the findings of Agarwal & Mishra [12] who conclude that self-efficacy can have an impact on organizational commitment.
This study also provides strong evidence that work motivation can increase organizational commitment. This finding is consistent with the study results which are conducted by Krishna [13] who reveal empirical evidence that work motivation has positive and significant impact on organizational commitment. The study results of Salleh [14] and Al-Madi [15] also conclude that the increase in work motivation can increase organizational commitment.

As it is explained earlier, this study finds that self-efficacy has a positive and significant effect on employee performance. This finding supports the study results of Judge & Bono [5] who prove there is a positive relation between the two variables. The study of Erez & Judge [6] also proves that employee performance is positively related to self-efficacy.

Managerial implications relate to the implications of research findings for related parties, especially the Head of SKPD within the Government of Aceh Jaya District. The research findings indicate there is a positive and significant influence on self-efficacy and work motivation on commitment. It implies that the efforts to increase commitment or a sense of employee attachment to the agency which they lead can be done through policy interventions. They are related to increasing self-efficacy and work motivation within employees.

Organizational commitment can mediate the effect of self-efficacy and work motivation on employee performance. This implies that the efforts to increase commitment or a sense of attachment of employees to the institutions in which they work are very important for improving the performance of employees in carrying out their assigned tasks.

6 Conclusion and Recommendation

6.1 Conclusion

Self-efficacy has a positive and significant effect on organizational commitment of the employee to the Regional Government of Aceh Jaya District. Employees with relatively good self-efficacy have a commitment or a sense of attachment that is relatively strong towards the agency in which they work. Conversely, employees with less good self-efficacy, have low organizational commitment.

Work motivation has a positive and significant effect on organizational commitment of the employee to the Regional Government of Aceh Jaya District. The higher the work motivation in an employee, the higher the commitment or sense of attachment of the employee to the agency in which he is assigned. Conversely, employees with relatively low work motivation tend to have commitments that are also relatively low.

Self-efficacy has a positive and significant effect on employee performance in the Regional Government of Aceh Jaya District. The increasing of self-efficacy in an employee significantly influences the respective employee performance. Conversely, a decrease in self-efficacy can cause a decrease in employee performance.

Work motivation has a positive and significant effect on the employee performance in the Regional Government of Aceh Jaya District. The increase of work motivation can significantly improve employee performance in the government. Conversely, a decrease in work motivation has a negative impact on employee performance.

Self-efficacy influences employee performance in the Government of Aceh Jaya District through organizational commitment as an intervening variable. The role of organizational commitment as an intermediary variable between the two variables is partial mediation.

Work motivation influences employee performance in the Government of Aceh Jaya District through organizational commitment as an intervening variable. The mediating effect which is played by organizational commitment in mediating the two variables is partial mediation.
6.2 Recommendation

The head of SKPD in the Government of Aceh Jaya District needs to increase employee commitment to the agencies which he leads. In operation, the increase in commitment or feeling of employee attachment to the agencies which they work in is not only done by developing values and norms that must not be only obeyed by all employees but must also pay attention to the values and norms that are adopted by the employees in general. So that the employees feel the equality of values and norms that they adhere to the system of values and norms that exist in their work environment.

The head of SKPD in the Government of Aceh Jaya District needs to improve the self-efficacy of his subordinate employees. Increase the employee confidence in carrying out tasks and provide support for each of them in carrying out the responsibilities that are given to. When employees face problems in the workplace, employers must be able to generate employee confidence in overcoming the problems that they face.

The head of SKPD in the Government of Aceh Jaya District needs to increase the work motivation of his employees. The increase in work motivation must be done by encouraging the emergence of desires in employees to improve the quality of their work and increase their sense of responsibility towards the completion of the tasks that are assigned. In addition, provide understanding for each employee about the importance of achieving work targets in accordance with the work plan that they have made.

REFERENCES


Studi Literature Essential oil bioactivity of Curry leaves 
(*Murraya koeginii*) as slimming aromatherapy

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Abstract. Curry leaves is an aromatic plant that contained essential oil. The 
essential oil mostly has potential as aromatherapy. The aim of this research is to 
separate the compounds in the essential oil of Kari leaf through fractionation 
technique and to analyze the potential of the active compound as slimming 
aromatherapy. The sliming aromatherapy of the obtained each separated essential 
is evaluated *in vivo* in male Sprague-Dawley (SD) rats by aromatherapy and 
inhalation technique. Twenty four rats were used and divided into four groups, 
namely positive control, negative control, inhale the crude essential oil and inhale 
the active compound of essential oil. This article contains the research to be done.

Keywords: Aromatherapy, Curry, Essential Oil

1 Introduction

Curry leaves are aromatherapy plants that have a distinctive odor, so in this study, curry 
leaves were used as raw material for producing essential oils. Curry leaves essential oil has the 
potential as an anti-bacterial [1]. Curry leaves contain 0.12% essential oil [2], and 1.0% essential 
oils from dried samples of curry leaves [3].

Types of herbal plant-based aromatherapy slimming drugs are currently being developed. In 
Indonesia, aromatherapy is nothing new because it has been since ancient times among palace 
daughters using herbs derived from dried spices which were burned to scent the body. But 
research on aromatherapy as an inhalation slimming method tends to be very little.

Aromatherapy studies are currently being developed among others by [4] reported that the 
active compound β-element in ginger essential oil, red galangal essential oil [5] and grapefruit 
big with a limonene dominant content [6] potentially as aromatherapy slimming. The description 
above shows that the research on slimming aromatherapy with curry leaves essential oil has 
never been done.

2 Materials And Methods

2.1 Materials

The materials used include ovens, distillation, chromatographic vessels, capillary pipes, Gas 
Chromatography-Mass Spectrometry (GC-MS), and enclosures of test animals equipped with 
inhalator tubes. The ingredients used included curry leaves, aquades, ethyl acetate, chloroform, 
methanol, n-hexane, silica gel, silica gel G60F254 aluminum plates from Merck, kits (total
cholesterol, triglycerides, and total cholesterol) BIOLABO Reagent. Laboratory animals of Sprague-Dawley strain adult male rats, standard feed and high cholesterol feed are sourced from egg yolk and Barco® coconut oil.

2.2 Methods

This research is conducted in two steps. The initial stage includes the collection of materials, determination of water and ash content, isolation of essential oils using Dean-Stark destilator, fractionation of essential oils using column chromatography and identification of fractions by GC-MS. The next stage is the test of the potential of Curry leaves' essential oil and two fractions selected as aromatherapy slimming in vivo to 24 animals tested in adult male Sprague-Dawley strain rats.

3 Results And Discussion

Aromatherapy is produced from plants containing essential oils. This study used producer of essential oils. The determination of compounds in essential oils using GC-MS, and potential test as aromatherapy slimming by inhalation method, are used to determine the importance of essential oils, fractionation of essential oils in curry leaves essential oils. This Article contains about research to be done. so in this Article, the results of the research have not been presented. However, the researcher will submit a literature study that the researcher has done as a parameter and preparation for the research to be conducted

3.1 Curry leaves Sample Preparation

Curry leaves (Murraya koeligii) belong to the family group Rutaceae (orang-erukan tribe). Curry leaves are a typical plant in Southeast Asia. Curry plants have a height of 0.9 to 6 meters and a diameter of 15-40 cm. Curry leaves are commonly used as spices in cooking. Curry leaves have a very distinctive aroma and slightly bitter taste, oval shape with a pointed tip. This plant originates from the Indian and Sri Lankan regions and thrives in tropical climates. Curry plants have small yellowish-white flowers, small fruits are green when they are young and purple after they mature. This plant multiplies through seeds and derivatives growing through its roots [7].

Curry plants are classified into the kingdom Plantae, division Spermatophyta, subdivisions of angiosperms, class Dicotyledonae, orde Sapindales, family Rutaceae, genus binomial of Murraya koeligii (L) S preng [8]. Picture 1.
Water content and sample ash content are determined before distillation. Based on the results of the analysis of curry leaves water content was 54.2% while the ash content of curry leaves was 5.6%. The purpose of determining water content is to determine the resistance of sample storage. Determination of ash content aims to determine the content of metal minerals in the sample. The maximum ash content limit of herbal plants is 5% [9]. The results of the experiment to determine the ash content showed that curry leaves samples were suitable for use as medicine.

3.2 Isolation Essential oils

Isolation Essential oils can be done by various methods, but tend to be done using steam distillation and water distillation. Nguyen et al.[10] separated the essential oils of fresh curry leaves growing in southern Vietnam using two extraction methods, conventional hydrodistillation and microwave hydrodistillation with 0.83% and 0.3% (w / w) yield respectively. Jamil, Nasir, Ramli, Isha, & Ismail [11] reported the yield of essential oils of fresh curry leaves using steam distillation and hydrodistillation 0.25% and 0.09% (w / w) respectively

3.3 Composition of Chemical Compounds in Curry leaves Essential Oils

Table 1 shows the composition of curry leaves essential oils based on literature studies conducted by researchers. Table 1 shows that the area of origin and treatment of the distillation method of curry leaves samples affect the components of the chemical compounds contained in curry leaves essential oils. The data displayed is characterized using GC-MS.
3.4 Potential of Curry Leaves As Aromatherapy Slimming

The potential of curry leaves as slimming aromatherapy was carried out by in vivo test on test animals Sprague Dawley male rats. Damayanti [5] reported that red galangal essential oil which has the potential as aromatherapy slimming with the main compounds β-bisabolene (11.78%) and Trans- caryophyllene (9.10%). Clove essential oil with the main compounds eugenol and β- caryophyllene has the potential to be aromatherapy slimming but pure β-caryophyllene is not potential as aromatherapy slimming. Hasim, Batubara, & Suparto [12] The main compounds in curry leaves are trans-caryophyllene (29.19%) and caryophyllene oxide (21.94%) [1]. The main composition in essential oils of red galangal and curry leaves is trans-caryophyllene, so most likely curry leaves essential oils and pure trans-caryophyllene compounds have the potential as aromatherapy slimming.

4 Conclusion

This literature study is expected to direct researchers in conducting research on inhalation-based aromatherapy slimming. Furthermore, from the research that will be carried out this is expected to produce an active compound which acts as aromatherapy slimming.
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Synthesis and Characterization of Polylactic Acid / Local Clay Nanocomposite for Packaging Applications

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Abstract. Plastic has become one of the most influential material in human lives due to it being light and strong enough. However, because plastic is non-degradable, it will cause other environmental problem and it is not renewable. Therefore a material that can produce plastic, where it could easily be degradable and the source is renewable. One of these materials is Polylactid acid (PLA) which is derived from starchy plants, such as cassava. However the physical and mechanical of pure PLA still has its downsides, such as low attraction and limited thermal degradation. This research is focused on synthesis PLA from local cassava and addition local clay into PLA in order to improve the two characteristics mentioned previously. The results that the highest was obtained 1.9 kg for 6 hours of disposition and the highest lactic acid obtained 35 % for 5 days fermentation. Polymerization PLA from a lactic acid has been determined by FTIR results. Based on the data show PLA/clay 0.05 M with 2 hours has better tensile strength is 36 MPa and thermal stability compared to pure PLA to be applied as the raw material for packaging.

Keywords: PLA, clay, X-RD, FTIR, SEM, tensile strength, thermal, packaging

1 Introduction

Data Plastic packaging is a container that is commonly used in people’s daily activities. In this modern era, plastic packaging has its own advantages, some of them are flexibility, cheap, light, easily shaped and strong [1]. The consumption of plastic packaging in Indonesia is quite large, based on Aromatic Industry Association, Olefin and Plastic (Inaplas) on the year 2014, the number of usages reached 4,3 million tonnes or increased to 5-6% from the previous year [2]. In general, the current source of plastic material is from fossil raw materials which are non-renewable and not easily degradable, therefore its waste gave an enormous impact on the environment.

To cope with the limited raw materials issue and the environmental impact that arises with the usage of plastic consumption, there should be more usage of raw materials that are environmentally-friendly, which is commonly known as biodegradable plastic. One of the materials is Polyactic Acid (PLA), which is a polymer from lactate acid esterification that was produced from fermented starch substrate or simple sugar [3]–[5]. PLA can be made with three main methods, they are direct polycondensation, azeotropic dehydration condensation and ring-opening polymerization [6]–[8]. Ring-opening polymerization is a method that is mostly used to produce high molecules PLA; above 100,000 Da. Some catalysts are used in order to increase the PLA yield, such as Al, Zn, Ti dan Zr, the usage of catalyst is dependent on the mechanism used [9], [10]. Some researchers also compared the usage of the mentioned catalysts above with commonly used catalyst which is Sn(II)Ot with the result that particular catalyst produced a
lower poisonous characteristics compared to Sn(II)Ot. Catalyst Zn and Zr produce 70-90% PLA with the purity of 90-97% [11].

The success of lactate acid polymerization becoming PLA depends on the monomer purity that is used [12] so the production of lactate acid can be an important parameter in the production of PLA. The process of lactate acid production can be done through a biological or chemical process, almost 90% of lactate acid current production is through biological process or fermentation. This method is used because of its advantages, they are a low operational condition, cheaper energy consumption, and low cost as well as non-toxic [13]. Bacteria that is used in the fermentation process of glucose turning to lactate acid are Lactobacillus, Leuconostoc, Pediococcus and Streptococcus which are grouped into homofermentative and heterofermentative groups. Currently, the Lactobacillus bacteria are grouped as homofermentative is mostly used because the side-effects that it produces is lower compared to heterofermentative bacteria. [13]–[16].

Glucose as a source of lactate acid can be derived from starch conversion; a method that is commonly used to convert starch into glucose through acidic hydrolysis or enzyme hydrolysis. Acidic hydrolysis is commonly used compared to enzyme hydrolysis. Acidic hydrolysis needs catalyst, such as nitrate acid, hydrochloric acid, and sulphuric acid and it reacts in an acidic environment with pH 1.5 – 2.0 with the temperature of 140-160 °C. These supporting conditions have an important part in which the starch will hydrolyze into glucose [17].

The source of starch can be derived from plants such as corns, cassavas, bananas, sago, sweet potatoes and sorghum [18]. These plants are common in Indonesia, especially bananas, cassavas, and rice are plentiful in Aceh, therefore there is a potential in producing PLA.

PLA has the advantage of being the source of plastic material because its characteristics is almost the same with a plastic material that is sourced from fossil-based materials, such as polyethylene and polypropylene [19]. There are still disadvantages of the material, which are, brittles easily, low elongation and sensitive to water because it is hydrophobic, low tolerance to heat which leads to a modification to increase performance from PLA [6]. A number of scientists have made a filler to increase the physics and the mechanics of PLA.

The addition of filler can widen the area and increase the thermal stability of PLA. The addition of filler can also change the characteristics of the material, so it is possible to derive the material with the desired characteristics. Some fillers that can be used are carbon black, silica, clay, talc, and titanium oxide [7], [20]. Clay is used because of its abundance in Nisam Sub-district. This will also give an impact on the improvement of PLA characteristics.

Clay that is added in PLA sized under 100nm is commonly known as nanocomposite material that has new characteristics. The structure of nanocomposite that is produced depends on the level of dispersion into the polymer. In general, there is 3 nanocomposite structure formation, which is a conventional composite, intercalary and exfoliation. Each of the nanocomposite makings is hoped to be more structured by exfoliation so there will be a smoother later between the surfaces. In general, there are 4 methods of synthesizing nanocomposite to reach exfoliation structure; in-situ synthesis, intercalary solution, in-situ polymerization and melting intercalary.

Clay is hydrophobic just like PLA, so it is hard to interact. Therefore before the clay is mixed with PLA, it needs to be purified first, then modified with the addition of surfactant to make organophilic which will be suitable with the hydrophobic nature of PLA. A surfactant that is mostly used is alkylammonium or alkyl phosphonium to cation hydrate in between the layers of clay [21].
This research aims to make PLA qualitatively from cassava starch that is available in Aceh as well as to identify the influence of adding nano clay that is available in North Aceh towards the physics and mechanics from the formation of the nanocomposite material.

2 Material And Methodology

2.1 Material

The materials used in this research is cassava from the markets of North Aceh, Clay from Nisam Sub-district and other chemical materials which are: Chloride Acid, Phenol, Sodium Hydroxide, Cetyl Trimethyl Ammonium Bromide (CTAB), Iron (II) Oxide, agar Na as well as Lactobacillus bacteria.

2.2 Procedure

Generally, there are two stages that are conducted parallely, they are the production of PLA and preparation of organoclay, then mixed in between PLA and organoclay.

The production of PLA is started with the extraction of starch from cassava using the wet method, where 10 kg of cassava is peeled, cleaned using water then grated. The grated cassava is dissolved in water with 1:3 ratio then soak for an hour. Then, strain and let it sit to deposit. In this stage the variable of deposition is as long as 4, 6, and 8 hours, then the starch is dried for 24 hours. The starch that has hydrolyzed into glucose through the acidic hydrolysis process where about 25 grams of the starch is dissolved into 100 ml of distilled water then added with 1% HCl until the pH reached 2.0. Then it is heated to the temperature of 120 °C for 10 minutes and stirred with a speed of 300 rpm. The glucose produced is separated with water by distilling it with the temperature of 80-120 °C. The deposit that was produced is then neutralized using NaOH, then dried.

Glucose that is produced is fermented into lactate acid. This stage is started by preparing Na nutrients, then followed by planting the bacteria and incubating for 18 hours. 25 grams of glucose that is dissolved in 100 ml distilled water is then planted into Petri dishes that have the bacteria. In this stage, a variation of fermenting time of 4, 5, 6 days is used while the bubbles formed are observed. After the fermenting time is reached, therefore the deposition that has been produced is separated from water then added with 5% HCl and then rinsed, dried and weighed for the production of lactate acid.

Lactate acid that was formed then is polymerized into PLA with the method of ring-opening polymerization, where lactate acid is inserted into a reactor and then being kept within the reaction temperature 160-200 °C, on atm pressure and supplied with nitrogen. Lactate that was formed is then cooled to the temperature of 90 °C until there is solidification. Then the ZnO catalyst is added into the reactor with reaction temperatures of 230-240 °C. The formation of PLA is then observed. To prove the formation of PLA, characterization is conducted using FTIR.

Apart from that, the process of clay preparation is started with cleaned clay using Na, then it is mashed into powder with the size of 100 mesh, next the powder is centrifuged with the speed of 700 rpm. After that it is heated to the temperature of 60 °C. Pure clay that is formed is added surfactant 0.04 M and 0.05 M with the stirring time variation 1 to 2 hours of stirring then it is followed with 12-hour suspension. The results of the suspension that was produced and free from chloride and bromide is then dried in an oven on then temperature of 90 °C for 24 hours until organoclay is present.
3 Result and Discussion

3.1 Starch Extraction

Extraction of starch from cassava with the deposition time variation of 4, 6, and 8 hours can be seen in figure 1.

![Figure 1. The Effects of Deposition Time against Starch Extraction](image1)

From Figure 1 it can be seen that the highest starch extraction is gained from the deposition time of 6 hours with 1.9 kg of the starch extract, the formation of starch starts to decrease after 6 hours, as seen in the deposition time of 8 hours where the starch extract formulated is 1,7 kg. Then there was also fungus present that is why the best deposition time is 6 hours.

3.2 Glucose Fermentation

The determination of fermented glucose is done by testing the concentrates of lactate acid formation. The concentrates of lactate acid formed can be seen in Figure 2.

![Figure 2. The Effects of Fermentation Time Towards Lactate Acid Concentrates](image2)

From Figure 2 it can be seen that the highest lactate acid concentrates is gained during the fermenting time of 5 (five) days as high as 35%, while for the sample fermenting time of 6 (six) days there was lactate acid concentrate as much as 33 %, which is lower compared to the 5-day fermenting time. It was also higher during the 4-day fermenting time which is 30%. According to the research conducted by [22]; the more fermenting time conducted, therefore, the amount of bacteria increases, so it is predicted that the lactate acid concentrates formed become higher, however in this research it was also shown that a different thing, which is a decrease after a 5-day fermenting time. This may be caused by the lactobacillus bacteria had a decrease inbreeding which is caused by the substrate condition that made it impossible for a continuous metabolism.
3.3 Synthesis of PLA

The synthesis of PLA is conducted qualitatively proven through analyzing using FTIR, where the analysis results can be seen in Image 3.3 below. The infrared spectrum for lactate acid is clearly showing some stretch on the O-H hydroxyl groups with a strong indication that hydrogen bonds were formed. This can be seen in the wide tip in the area with the waves of 3502.72 cm\(^{-1}\). Carbonyl groups as C=O stretch are shown in the waves of 1759.08 cm\(^{-1}\). Methylene groups as stretches in C-H groups are seen in the waves of 3000 cm\(^{-1}\). The three spectrums prove that what was formed from lactate acid polymerization is PLA. This is in accordance to the research that was conducted by [23] with the results of absorption bands that were close to 3605.57 cm\(^{-1}\), this shows that the absorption bands that are closer to 3605.57 cm\(^{-1}\) have OH groups. The absorption bands closing into 2930 cm\(^{-1}\) shows that there are C-H groups.

![Figure 3. PLA Spectra Graph](image)

3.4 Synthesis of Clay

Before clay was mixed with PLA, the local clay that was obtained must be prepared by adding CTAB surfactant. This is to prove that the clay has become organoclay, therefore, it will be analyzed by identifying the d-spacing layer from that particular material. Figure 4 shows the obtained measurements of the d-spacing layer from that material.

![Figure 4. Clay Diffractogram clay](image)

Figure 4 shows clay d-spacing layer of 0.04 m for 1 hour of stirring (d-spacing 2.571 nm), clay 0.04 m for 2 hour stirring 7.08° (d-spacing 2.798 nm), clay 0.05 for 1 hour stirring 3.06° (3.055 nm), clay 0.05m for 2 hour stirring 4.46° (3.386 nm) while layer from pure clay is 2.24° (1.142 = nm).
With the results from X-RD test, it can be concluded that the bigger concentration that was used, the longer the stirring time used, therefore the d-spacing layer that is formed will also be bigger. However pure clay that was not synthesized with CTAB surfactant has the smaller d-spacing layer. From the results above therefore, it is sure that CTAB surfactant has successfully enlarged the d-spacing layer from clay.

3.5 Tensile Strength Characterization

The nanocomposite material that was formed can be shaped according to ASTM D 638, then a tensile strength test was conducted and the results can be seen in Figure 5.

![Figure 5. Tensile Strength Characterization](image)

Figure 5 shows that by adding clay, it can increase the tensile strength, where for PLA/clay 0.04 M 1 hour, has the tensile strength of 24 MPa. However the highest tensile strength is obtained from PLA/clay 0.05 2 hours stirring. From the image above it can be concluded that by adding clay, the tensile strength can be increased.

3.6 Thermal Characterization

The thermal characterization is conducted on all samples to identify the stability of the thermal material produced by using the thermal degradation testing technique, with TGA tools. The test results are obtained as seen in Figure 6.

![Figure 6. Nanocomposite Thermal Characterization](image)

Figure 6 shows the pure PLA thermal stability is lower which is decomposing at the temperature of 317,61 °C. For sample PLA/clay 0.04 M 1 hour and 0.04 M 2 hour was decomposing at the temperature of 328.45 °C and 351.12 °C. This suggests that the thermal
stability is better than pure PLA. For samples, PLA/clay 0.05 M 1 hour and 0.05 M 2 hour were decomposing at the temperature of 353.79 °C dan 365.04 °C, which are higher compared to the PLA 0.04 M 1 hour and 0.04 M 2 hour samples.

CTAB concentration within the clay can influence the thermal stability from the nanocomposites that were produced. This is seen from the decomposition of PLA/clay 0.05 M 2 hour stirring sample on a higher temperature compared to the temperature sample of PLA/clay 0.04 M 2 hours stirring. Thus, it is shown that adding clay to PLA can increase the thermal stability for the nanocomposites that were produced. The opening of the d-spacing layer in the clay is directly proportional to the number of surfactants concentrates within the clay.

4 Conclusion

Based on the research conducted, it can be concluded that:
1. The most optimal starch extract is 1.9 kg produced from 6 hours of deposition.
2. The highest formation of lactate acid is 35% produced from 5 (five) days deposition time.
3. Based on FTIR testing, there were: hydroxyl groups present in the wave of 3502.72 cm⁻¹, carbonyl groups present in the wave of 1759.08 cm⁻¹ as well as methylene on the wave 3000 cm⁻¹, these have proven that PLA was successfully made from Northern Aceh’s cassava.
4. The tensile strength test data showed that the tensile strength of pure PLA is 19 MPa, PLA/clay 0.04 M 1 hour is 24 MPa, PLA/clay 0.04 M 2 hour is 29 MPa, PLA/clay 0.05 M 1 hour is 33 MPa dan PLA/clay 0.05 M 2 hour is 36 MPa,. Their results show that increasing clay within PLA will increase the tensile strength compared to pure PLA as well as the CTAB concentration within the clay can increase the tensile strength of that material.
5. The thermal test data were pure PLA decomposition temperatures on 317.16 °C, PLA/clay 0.04 M 1 hour, on 328.45 °C, PLA/clay 0.04 M 2 hour, on 351.12 °C, PLA/clay 0.05 M 1 hour, on 353.79 °C dan PLA/clay 0.05 M 2 hour, om 365.04 °C. These results shown that increasing clay can increase the stability of the nanocomposite of that material, and the amount of CTAB surfactant concentrate also influenced the stability of thermal nanocomposite PLA/clay.

The structure of PLA/clay 0.05 M 2 hour looked smoother compared to pure PLA.

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Industry and Strategic Analysis of Lamno Robusta Coffee; An Application of Multicriteria Decision Analysis (MCDA) Techniques to Analyze A Small Scale Farming Group

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Abstract. According to the United States Department of Agriculture (USDA), the world coffee consumption is projected to reach 9,792,000 ton in 2018. Indonesia as one of the largest coffee producers is predicted by USDA to produce 666,000 ton of coffee in 2018. Among many areas that produce coffee in Indonesia, Aceh Jaya District that is famous with its Lamno Robusta Coffee contribute to 0,02% of the total national coffee production. Regardless its small share in the national coffee market, Lamno Robusta coffee has played a key role in the local market for the last 70 years. This research will apply descriptive qualitative approach to uncover the strategic positioning of Lamno Robusta Coffee. Three multicriteria decision analysis techniques such as Porter’s Five Forces Analysis, SWOT Analysis and GE/ McKinsey Matrix will be applied subsequently to analyze the internal and external factors as well as the industry and business attractiveness of Lamno Robusta Coffee. The research will use both primary and secondary data. The primary data will be collected from direct observation in field, interviews and FGD with the stakeholders. While the secondary data will be get from other the credible resources. The research shows that Lamno Robusta Coffee is not vulnerable to the bargaining power of buyers, bargaining power of suppliers, and threat of substitution products. However, the threat of the new entrants will play a key role in the increase of potential competition among the existing players in the industry. Concerning to the internal and external factors as well as the business and the industry attractiveness, the Lamno Robusta Coffee is considered in medium position. The results enable stakeholders to formulate strategy to increase the value for the farmers and consumers of Lamno Robusta Coffee.

Keywords: Coffee, MCDA, Porter’s Five Forces Analysis, SWOT Analysis, GE/ McKinsey Matrix

1 Introduction

According to the United States Department of Agriculture [1], the amount of coffee consumption in 2018 is projected to be 9,792,000 ton with the quantity of production approximately 10,272,000 ton. The data from the International Coffee Organization (ICO) shows that the growth average of coffee consumption was 1,3% for the last five years. Moreover ICO stated that the emerging market country will be the driver of the world coffee demand [2].

USDA predicted that the total amount of Indonesia coffee production will increase as much as 3000 tons so that the total amount of coffee production will be 666,000 tons in 2018.Consequently, the total export of coffee from Indonesia will increase to reach the amount of 432,000 in 2018 that counted for [1]. It is counted for 64,86% of the total amount of Indonesia coffee production in 2018. Moreover, the average growth of coffee consumption in Indonesia was 12,15% for the last 7 years. While at the same period of time the growth of Indonesia coffee production only 1,32%. As a result to keep its position as one of the largest coffee exporters and to fulfill the domestic consumption at the same time, Indonesia need to increase its coffee production.Below is the table that shows the data of coffee production and consumption in Indonesia:
Table 1. Total Coffee Production and Consumption in Indonesia 2010-2018 (in tons)

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</thead>
<tbody>
<tr>
<td>Robusta Coffee Production</td>
<td>477,000</td>
<td>420,000</td>
<td>594,000</td>
<td>600,000</td>
<td>552,000</td>
<td>636,000</td>
<td>558,000</td>
<td>564,000</td>
</tr>
<tr>
<td>Arabica Coffee Production</td>
<td>82,500</td>
<td>78,000</td>
<td>120,000</td>
<td>114,000</td>
<td>76,200</td>
<td>90,000</td>
<td>78,000</td>
<td>72,000</td>
</tr>
<tr>
<td>Total Coffee Production</td>
<td>559,500</td>
<td>498,000</td>
<td>714,000</td>
<td>714,000</td>
<td>628,200</td>
<td>726,000</td>
<td>636,000</td>
<td>636,000</td>
</tr>
<tr>
<td>Total Domestic Coffee Consumption</td>
<td>101,400</td>
<td>142,800</td>
<td>168,900</td>
<td>152,400</td>
<td>190,500</td>
<td>192,180</td>
<td>213,600</td>
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</tbody>
</table>

Resources: USDA 2010-2018

Aceh is one of the provinces that produce coffee in Indonesia. According to the data published by Directorate General of Estate Crops, in 2015 Aceh produce 47,444 tons of coffee. It account for 7.88% of Indonesia coffee production. 88.13% of the total coffee production in Aceh is Arabica Coffee. It contributes to 25.96% of Indonesia’s Arabica Coffee export.

While Arabica Arabica Coffee mostly grows in District Aceh Tengah and Bener Meriah, Robusta Coffee is widespread. According to the official report by Secretariate General of Estate Crops coffee plantations in Aceh Jaya are run by 2,125 families covering total area of 1,561 acres. Hence, each family manages around 0.74 hectares of land. Until 2015, productive area was 524 hectares, with a total production of 245 tons annually, or an average production of 0.468 ton per hectares [3].

Compared to the national production average of Robusta coffee, the production rate of Lamno’s Robusta coffee is relatively low. The unintensive farming system might be the reason behind the low of production. The farmers do not use fertilizers and rely mostly on natural fertility of soil. Moreover, they do not prune and trim the plants regularly. The farmers also do not use an appropriate irrigation system for the plantation.

Regardless its small share in the national coffee market, Lamno Robusta coffee has played a key role in the local market for the last 70 years. Moreover, Lamno Robusta coffee has all the potentials to be developed further. For this reason, extensive and further study is needed with regards to the industry and strategic analysis of Lamno Robusta Coffee.

1.1 Problem Statement

This research will be conducted to uncover the following problems: (1) how strong the competitive forces of Lamno Robusta Coffee; (2) how are the internal and external factor that influence the Lamno Robusta Coffee Farming; and (3) how are the industry attractiveness and the business strength the Lamno Robusta Coffee Farming.

2 Literature Review

2.1 Industry analysis

Economists define an industry as a group of firms that supplies a market [4]. To understand the competitive dynamics of an industry, businesses and analysts use industry analysis as a market assessment tool [5]. The objective of industry analysis is to indentify the factors that determine the level of profit in an industry [4].

According to Porter the industry analysis is needed to underpinning of competition and the root causes profitability[6]. Hence, a good industry analysis will uncover which forces that are underpinning (or constraining) today’s profitability and how might shifts in one competitive force trigger reactions in others [6].

The understanding the competitive forces, and their underlying causes, reveals the roots of an industry’s current profitability while providing a framework for anticipating and influencing competition and profitability over time [6]. Moreover, the understanding of the market forces will give an insight for related parties to design a strategy in order to anticipate as well as to influence the competition in the market.

There are five basic forces that influences the state of competition in an industry which are threat of the new entrants, threat of substitute products, bargaining power of suppliers, bargaining power of buyers and the rivalry among the competitors [7]. These concept is called Porter’s Five Forces. Porter [7] highlighted that knowledge of the competitive forces provides the groundwork for strategic action in order to make sure the sustainability of the profitable business in the long run. Related to the strategic action, Porter (Porter: 1980) suggest that the executive apply the following steps, (1) set the business in the position where the threats are the lowest; (2) take advantage the change in the competitive forces in the industry; dan (3) if it possible change the competitive forces for the good sake of the business.
The strength of each of these competitive forces is determined by a number of key structural variables [4]. According to Grant [4], these key structural variable are: (1) Threat of New Entrants: capital requirements, economies of scale, absolute cost advantages, product differentiation, access to distribution, legal barriers, retaliation, etc; (2) Threats of Substitute Products: buyers’ propensity to substitute, relative prices and performance of substitutes, etc.; (3) Bargaining Power of supplier: buyer price sensitivity, relative bargaining power of buyer, etc; (4) Bargaining Power of Buyer: cost of product relative to total cost, product differentiation, competition between buyers, size and concentration of buyers relative to producers, buyers’ switching costs, buyers’ information, buyers’ ability to backward integrate, etc.; (5) Rivalry Among Competitors: concentration, diversity of competitors, product differentiation, excess capacity and exit barriers, cost conditions, etc.

2.2 Strategic Analysis

Strategic analysis is the process of conducting research on a company and its operating environment to formulate a strategy [5]. McKinsey defined strategy as an integrated set of actions designed to create a sustainable advantage over competitors [8]. There are many tools that are currently available for strategic analysis. Most of them use multi criteria decision analysis (MCDA) techniques such as SWOT Analysis, GE/ McKinsey’s nine box matrix, etc. Multi-criteria decision analysis is an umbrella term describing the collection of formal approaches that take explicit account of multiple criteria in order to explore alternative decisions [9]. These strategic analysis tools can be used to get an insight of a diversified company’s business units in a way that suggests which units should be kept and which sold off and how financial resources should be allocated among them [8].

SWOT framework classifies the various influences on a firm’s strategy into four categories: Strengths, Weaknesses, Opportunities, and Threats. Strengths and weaknesses are related to the internal environment of the firm, especially its resources and capabilities; while the opportunities and threats are related to the external environment of the firm [4].

GE/McKinsey’s nine-box matrix analyze the business based on two dimensions which are the attractiveness of the relevant industry and the unit’s competitive strength within that industry. The matrix devides the business in three groups; (1) the business units below the diagonal of the matrix are the one that perform purely, so it will be the candidates to be sold, liquidated, or to consume little new capital; (2) the one on the diagonal can be candidates for selective investment; (3) and the business units above the diagonal are the one that perform well, so its should pursue strategies of either selective or aggressive investment and growth [8].

3 Methods And Materials

3.1 Research Methods

This research will apply descriptive qualitative approach using MCDA to solve the above problems. Three MCDA’s techniques will be used. These techniques are: (1) Porter’s Five Forces Analysis; (2) Strengths, Weaknesses, Opportunities and Threats (SWOT) Analysis; and (3) GE/ McKinsey Matrix will be applied subsequently to analyze the internal and external factors as well as the the industry and business attractiveness of Lamno Robusta Coffee. First, Porter’s five forces will be used to analyse the competitive forces of the coffee industry. Later, the SWOT framework will be applied to get insight on the internal and external factor that influence the Lamno Robusta Coffee business. The weighted score of the SWOT’s external factor will be used to quantify the industry attractiveness, while the weighted score of SWOTS’s internal factor will be used to measure the business strength of Lamno Robusta Coffee.
3.2 Research Framework

Figure 1. Research Framework

3.3 Data Collection

The research will use both the primary and secondary data. The primary data will be collected from direct observation in field, conducting interview and focus group discussion (FGD) with the stakeholders including but not limited to the farmers, the middlemen, the coffee roasters/brewers, and government officials. While the secondary data will get from credible resources such as the International Coffee Organization (ICO), the United States Department of Agriculture (USDA), Directorate General of Estate Crops, etc.

4 Result And Discussion

4.1 Competitive Forces Analysis

Porter’s Five Forces will be used to analyze the competitive forces related to Lamno Robusta Coffee. Parameters of the five forces will be measured based on the perception of the farmers, middlemen, the elders of the community, the consumers, the coffee grinders and other related parties. The analysis will be conducted as below:

1. Identify the relevant variables that affect the competitive forces.
2. Assign a weight that ranges from 0.00 to 1.00 to each variable. The weight assigned to a given variable indicates the relative importance of the variable. 0.00 means not important, while 1.00 indicates very important.
3. Assign a 1 to 5 rating to each variable. The rating captures whether the factor represents a major weakness (rating = 1), a minor weakness (rating = 2), neutral (rating = 3), a minor strength (rating = 4), or a major strength (rating = 5).
4. Multiply each variable’s weight by its rating to get the weighted score for each variable. Each competitive force will get into one out of three categories as the following:
1) Weak if the weighted score of competitive forces range from 0.00 to 1.67
2) Medium if the weighted score of competitive forces range from 1.68 to 3.34
3) Strong if the weighted score of competitive forces range from 3.35-5.00

4.2 Internal and External Factor Analysis

Descriptive qualitative analysis will apply to get insight on the internal and external factor that influence the Lamno Robusta Coffee. Internal factor will depend on the strength and the weakness of the business, while the external factor will be determined by the opportunity and the threat to business. Parameters of each factor will be measured based on the conclusion of field observation and interviews with stakeholders. The internal and external factor analysis will be the base ground for the SWOT Analysis that will reveal the strategic position of the Lamno Robusta Coffee.

The internal factor analysis will be conducted as below:
1. Identify 10 variable that determine the strength and weakness of the Lamno Robusta Coffee
2. Assign a weight that ranges from 0.00 to 1.00 to each variables. The weight assigned to a given variable indicates the relative importance of the variable. 0.00 means not important, while 1.00 indicates very important.
3. Assign a 1 to 5 rating to each variable. The rating captures whether the factor represents a major weakness (rating = 1), a minor weakness (rating = 2), neutral (rating = 3), a minor strength (rating = 4), or a major strength (rating = 5).
4. Multiply each variable’s weight by its rating to get the weighted score for each variable.

The external factor analysis will follow the following rules:
1. Identify 10 variable that determine the opportunities and threats of the Lamno Robusta Coffee
2. Assign a weight that ranges from 0.00 to 1.00 to each variables. The weight assigned to a given variable indicates the relative importance of the variable. 0.00 means not important, while 1.00 indicates very important.
3. Assign a 1 to 5 rating to each variable. The rating captures whether the factor represents a major opportunity (rating = 1), a minor opportunity (rating = 2), neutral (rating = 3), a minor threat (rating = 4), or a major threat (rating = 5).
4. Multiply each variable’s weight by its rating to get the weighted score for each variable.

Based on the weighted score of internal and external factor analysis, the strategic positioning of Lamno Robusta Coffee can be identified by conducting SWOT Analysis. The criteria for strategy formulation are below:
1. Strategy SO: the weighted score for external factor ranges 2.5-5 and the weighted score for internal factor ranges 2.5-5.0
2. Strategy ST: the weighted score for external factor ranges 0.0-2.5 and the weighted score for internal factor ranges 0.0-2.5
3. Strategy WT: the weighted score for external factor ranges 0.0-2.5 and the weighted score for internal factor ranges 0.0-2.5
4. Strategy WO: the weighted score for external factor ranges 2.5-5 and the weighted score for internal factor ranges 0.0-2.5

4.3 Industry Attractiveness

GE/McKinsey Matrix will be applied to get insight on industry attractiveness and business strength of Lamno Robusta Coffee. The industry attractiveness can be indentified from the weighted score of external factor analysis, while the weighted score of internal factor analysis will show the business strength of Lamno Robusta Coffee. The internal factor will get into one out of three categories as the following:
1. Weak if the weighted score of internal factor range from 0.00 to 1.67
2. Medium if the weighted score of internal factor range from 1.68 to 3.34
3. Strong if the weighted score of internal factor range from 3.35-5.00

The Graph below shows the GE/ McKinsey Matrix Analysis:
Table 2. GE/McKensney Matrix

<table>
<thead>
<tr>
<th>Attractiveness Of the Industry</th>
<th>Business Ability to Compete within the Industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>Invest, grow</td>
</tr>
<tr>
<td>Medium</td>
<td>Selectivity, earning</td>
</tr>
<tr>
<td>Low</td>
<td>Harvest, divest</td>
</tr>
</tbody>
</table>

Business Ability to Compete within the Industry

| High                     | Medium | Low |

Resources: Gluck et al. (2000)

5 Discussion

Based on the field observation, the coffee is currently cultivated mostly in 3 villages in Jaya Sub Distric which are Pantee Cermin, Sabeet and Mareue. Based on our survey to 64 families who are living in those villages, 93.33% of the families owned coffee plantation. In average the farmers manage 1.12 hectares coffee of land. Most of the farmers inherit their farming from their parent. The age average of the farmers are 45 years old with 11 years of experience in coffee farming. The farmers applied multi crops farming method.

The survey reveals that the age average of the plants are 9.98 years with the average amount of production is as much as 214.61 kg per hectar. The survey also shows the current total area of the robusta coffee farming in Aceh Jaya is 650 hectares. Therefore, the total coffee production in Aceh Jaya is predicted to be 139.50 ton. This amount is equal to 0.02% of total coffee production in Indonesia.

Based on the focus group discussion conducted with the middlemen and the elders from 3 villages that produce coffee in Jaya Sub Distric, the amount of coffee production in Aceh Jaya has been decreased to be less than half of its peak production before the turning of the centuries. The military conflict and the tsunami were two events that garnered the decrease of the coffee production in Aceh Jaya. Most farmers leaved their farming for years because of the conflict. Before the security condition was stable, the tsunami hit the surrounded area in 2004. The tsunami that brought a temporary micro climate change had devastated the coffee farming around the coastal area. Three vilages that mentioned above saved from the micro climate change because of their location are far from the costal area.

According to the elders most of the farmers do not have enough knowledge for coffee cultivation. The farmers have never applied fertilizer to their coffee plants. The fertility of the soil is the sole resource of nutrient supplies for their farm. They also do not prune their plants regularly. On the top of that the farmers used herbicide that make the soil become degraded to kill all the unwanted plants. All of those have contributed to the going decrease of coffee production in Aceh Jaya.

Contradicted to the decrease in production, the demand for Lamno Robusta Coffee persistently increase for the last few years. The increase of income and population has affected to the demand for coffee in Aceh. The local coffee roasters such as CV. Tgk. Aceh, CV. Solong Premium Coffee Ulee Kareng, CV. Solong Coffee Ulee Kareng and a few other coffee roasters have used Lamno Robusta Coffee green beans as their main raw material for their product for a long time.

Mr. Hasballah, the owner of Solong Premium Coffee Kareeng, reveals that the taste of Lamno Robusta Coffee is the best one. Moreover, because of its special taste, Mr. Hasballah who inherit the business from his father consistently use Lamno Robusta Coffee to produce his product. Unfortunately because of the limited production he has to mix the Lamno Robusta Coffee with other robusta coffee.

The increase of the demand that is not supported by the increase of supply combine with the local roasters preference, has make the price of the Lamno Robusta Coffee going up. In 2018 the price of the Lamno Robusta Coffee is $3.00/kg. It higher than the price of the robusta coffee in the world market that is traded at $2.25/kg in 2018.
5.1 Competitive Forces of Lamno Robusta Coffee

The strength of each competitive forces will be measured using structural variables as suggest by Grant (2016). The weighted and rating for each variable are the results from the combination of secondary data, FGD, and dept interviews with the stakeholders.

5.2 Threats of New Entrants

The threats of the new entrants will be analyzed using five relevant variables which are capital requirements, consumer’s loyalty, economies of scale, access to distribution channel, and legal barriers.

<table>
<thead>
<tr>
<th>No.</th>
<th>Indicator</th>
<th>Analysis</th>
<th>Weight</th>
<th>Rating</th>
<th>Score</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Capital requirement</td>
<td>Capital requirement relatively low. Our survey shows that the average initial investment per hectar for Lamno Robusta Coffee farming is Rp. 22,335,000.</td>
<td>0.30</td>
<td>5.00</td>
<td>1.50</td>
<td>The threat of the new entrants is strong with the weighted score range between 3.35-5.00</td>
</tr>
<tr>
<td>2</td>
<td>Consumer’s loyalty</td>
<td>Because of its special taste Lamno Robusta Coffee almost cannot replace by the other coffee product.</td>
<td>0.30</td>
<td>1.00</td>
<td>0.30</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Access to the distribution channel</td>
<td>Access to the distribution channel is relatively easy because the coffee market have been existed for decades in Aceh</td>
<td>0.20</td>
<td>4.00</td>
<td>0.80</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>The economies of scale</td>
<td>The economies of scale is relatively low. The farmers can start a profitable farming for less than one hectar of land.</td>
<td>0.10</td>
<td>5.00</td>
<td>0.50</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Legal barriers</td>
<td>There are no legal barrier to start a coffee farming in Aceh or Indonesia.</td>
<td>0.10</td>
<td>5.00</td>
<td>0.50</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total Score</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Source: Survey Data</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1.00</td>
<td>3.60</td>
<td></td>
<td>The above Graph shows that out of five variables that determine the threats of the new entrants, only one variable which is consumer’s loyalty that have a low rating. This contribute to the strong forces of the new entrants.</td>
</tr>
</tbody>
</table>

5.3 Threats of Substitute Products

Five variables that determine the threat of the substitute products are: buyers’ propensity to substitute, the accessibility of the substitute products, relative prices, switching cost and the service performance of the substitutes products.

<table>
<thead>
<tr>
<th>No.</th>
<th>Indicator</th>
<th>Analysis</th>
<th>Weight</th>
<th>Rating</th>
<th>Score</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Buyers’ propensity to substitute</td>
<td>There are many substitution product for coffee in Aceh such tea, juices, etc. However, for coffee lover, all of these substitute product cannot fully replace coffee</td>
<td>0.20</td>
<td>2.50</td>
<td>0.50</td>
<td>The threat of the substitute products is medium with the weighted score range between 1.67-3.35</td>
</tr>
<tr>
<td>2</td>
<td>The accessibility of the substitute products</td>
<td>Every consumers can get any substitute product easily in Aceh</td>
<td>0.20</td>
<td>4.00</td>
<td>0.80</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Relative prices</td>
<td>The price of substitute products relatively competitive.</td>
<td>0.20</td>
<td>3.00</td>
<td>0.60</td>
<td></td>
</tr>
</tbody>
</table>
Because of its specific function (e.g. to stay awake at night), the one who wants to replace coffee with other beverage needs to spend extra money.

The service performance of substitute products is relatively the same.

The above Graph shows that out of five variables that determine the threats of substitute products, only the accessibility of the substitute products that have a relatively high rating. Moreover, because of the consumers might have to spend extra money to replace coffee with a few substitute products, the rating for the switching cost becomes relatively low that weaker the forces of substitutes products.

**5.4 Bargaining Power of Buyers**

There are five variables that determine the bargaining power of buyers. These variables are: the product’s standard, competition between buyers, the amount of supply, concentration of buyers relative to producers, and buyers’ information.

<table>
<thead>
<tr>
<th>No.</th>
<th>Indicator</th>
<th>Analysis</th>
<th>Weight</th>
<th>Rating</th>
<th>Score</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Concentration of buyers relative to producers,</td>
<td>More than 60% of Lamno Robusta Coffee bought by three 3 companies that produce grounded coffee in Banda Aceh.</td>
<td>0.20</td>
<td>4.00</td>
<td>0.80</td>
<td>The bargaining position of buyers considered medium with the weighted score range between 1.67-3.35</td>
</tr>
<tr>
<td>2</td>
<td>Competition between buyers</td>
<td>Competition between buyers considered high. The entrant of the new players in the coffee processing business have created competition between buyers of Lamno Robusta Coffee. Three old buyers that dominate the market cannot control the new player who come into the market by offering the higher price. At the same time the old player who have acknowledge the special taste of Lamno Robusta Coffee and do not want the taste of their coffee product change, cannot replace the Lamno Robusta Coffee with other robusta simply because of the price. Hence, it make the price of Lamno Robusta Coffee higher than the world market price.</td>
<td>0.20</td>
<td>2.50</td>
<td>0.50</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>The amount of supply</td>
<td>The amount of Lamno Robusta Coffee production relatively small compared to demand for coffee in Aceh. It is can only supply less than 1% coffee for the local market.</td>
<td>0.40</td>
<td>1.00</td>
<td>0.40</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>The standard of product</td>
<td>The buyers do not set a specific standard for the Lamno Robusta Coffee. They are willing to pay the same price for the different grade of Lamno Robusta green bean.</td>
<td>0.10</td>
<td>1.00</td>
<td>0.10</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Buyers' information.</td>
<td>The buyers have a good access to the market information.</td>
<td>0.10</td>
<td>4.00</td>
<td>0.40</td>
<td></td>
</tr>
</tbody>
</table>

**Source: Survey Data**
The above analysis shows that although the concentration of buyers relative high, the limited supply make
the buyers do not have enough bargaining power in determine the price of the green bean. The buyers even cannot
set a standard quality for the coffee they bought. All of these facts lead to the medium force from the buyers.

5.5 Bargaining Power of Supplier

The bargaining power of buyers influence by 5 variables which are; concentration of suppliers relative to
buyers, the dependency of supplier to particular industry, switching cost of buyers, substitution of product
provided by supplier, and supplier threaten to integrate forward into the industry.

Table 6. Bargaining Power of Suppliers

<table>
<thead>
<tr>
<th>No.</th>
<th>Indicator</th>
<th>Analysis</th>
<th>Weight</th>
<th>Rating</th>
<th>Score</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Concentration of suppliers relative to buyers</td>
<td>The Lamno Robusta Coffee farming managed traditionally. Most of the material for the coffee farming fullfil by the farmer themself. The farmer only need a few farming tools such as cutting machine from suppliers. There are anumber of supplier who provide that tools. The level of competition between supplier considered high because of the limited market.</td>
<td>0.20</td>
<td>2,50</td>
<td>0.50</td>
<td>The bargaining position of suppliers considered low with the weighted score range between0.00-1.67.</td>
</tr>
<tr>
<td>2</td>
<td>Substitution of product provided by supplier</td>
<td>The farmer have many alternative for the product provided by supplier.</td>
<td>0.25</td>
<td>1.00</td>
<td>0.20</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Switching cost</td>
<td>The farmer do not have to spend additional cost if they switch supplier</td>
<td>0.20</td>
<td>1.00</td>
<td>0.20</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>The dependency of supplier to particular industry</td>
<td>The revenue of the supplier do not depend on the purchasing of their product by the coffee farmer. They can sell the related product to the other group of buyers.</td>
<td>0.20</td>
<td>2,50</td>
<td>0.50</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Supplier threaten to integrate forward into the industry</td>
<td>The suppliers do not have enough reason to enter the coffee farming simply to increase their bargaining position to the farmers</td>
<td>0.20</td>
<td>1.00</td>
<td>0.20</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total Score</td>
<td></td>
<td></td>
<td></td>
<td>1.00</td>
<td>1.60</td>
</tr>
</tbody>
</table>

Source: Survey Data

The bargaining power of supplier is considered low because the Lamno Robusta Coffee farming is managed
traditionally by the farmers and most of the material for the farming including but not limited to seed and man
power are provided by the farmer themself.

5.6 Rivalry Among The Existing Competitors

The intensity of rivalry will be measured using five variable as follow: number of competitors, product
differentiation, the industry growth, exit barriers, business commitment.

Table 6. Rivalry Among The Competitors

<table>
<thead>
<tr>
<th>No.</th>
<th>Indicator</th>
<th>Analysis</th>
<th>Weight</th>
<th>Rating</th>
<th>Score</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The industry growth</td>
<td>The world growth of coffee consumption in was 1.3% latley, however it will be increase in the near future along with the increase of the coffee consumption in emerging market such China. In national level, the industry growth is supported by the high growth of consumption that reach 12.15% for the last 7 years.</td>
<td>0.30</td>
<td>1.00</td>
<td>0.30</td>
<td>The intensity of rivalry among the existing competitors is medium with the weighted score range between1.67-3.34</td>
</tr>
<tr>
<td>2</td>
<td>Number of competitors</td>
<td>There are many coffee farming that currently exist either in Indonesia. Most of the coffee farming manage in a small scale by hundred</td>
<td>0.20</td>
<td>5.00</td>
<td>1.00</td>
<td></td>
</tr>
</tbody>
</table>
thousands of families. In Aceh the coffee farming dominantly take place in Gayo Highland that produce Arabica Coffee, while robusta coffee are produced in other area.

| 3 | Product Differentiation | Particular geographical climates would produce coffee with special aroma and taste (Ponte: 2001). The special aroma and taste enable Lamno Coffee to differentiate their product from the rest of other coffee product that currently exist in the market. | 0.20 | 1.00 | 0.20 |
| 4 | Business Commitment | Coffee farming that mostly develop in the developing country mostly manage from generation to generation. I create a high business commitment that make the farmer will keep their farming even in the worst situation. | 0.20 | 3.00 | 0.60 |
| 5 | Exit Barrier | The capital investment for coffee farming is low and the farmer can replace coffee with other crops easily. It make the exit barrier low for the industry. | 0.20 | 2.00 | 0.40 |

**Nilai Total**

| | | 1.00 | 2.50 |

*Source: Survey Data*

The growth of industry play a dominant role in shaping the strength of rivalry in coffee industry. Although there are many competitors in the industry, the rivalry among the existing competitors can be neutralized by highgrowth of industry.

5.7 The Internal and External Factor Analysis

**Internal Factor Analysis**

The internal factor determine by the strenght and weakness of the Lamno Robusta Coffee farming. Each of variable is influenced by five underlying parameters as the following:

1) **Strenght**

1) Farming Experience;
   Most of the farmer inherit their coffee farming from their parent. The survey shows that the average age of the farmers are 46 years with 11 years experience in coffee farming.
2) The Uniqueness of Taste;
   The taste of Lamno Robusta Coffee is unique and special that make the coffee processing business owner cannot replace it with the other variety coffee.
3) Specialty coffee branding;
   The application of organic farming system in a small scale with high intensity of labor enable the coffee farmer to get a premium price by getting organic product certificate or fair trade certificate [10]. Lamno Robusta coffee have a big potential to apply for these two scheme. It because the farmers develop coffee farming with organic system in a small scale. The farmer also develop multy crops farming in which they are not only grow coffee but also other plants for shading.
4) The customer’s loyalty
   The Lamno Robusta coffee have dominate the local market for 70 years. The existing customers cannot replace the Lamno Robusta green bean because of its special taste.
5) The existing of the market and distribution channel ;
   The coffee market has been exist for centuries in Aceh. Hence, the market and distribution channel has been established for a long time.

2) **Weakness**

1) The farming system;
   Lamno Robusta coffee farmers do not implement modern farming system in coffee cultivation. Farmers do not use fertilizer at all in the early stages of planting or when the coffee stalks have started to produce. Farmers also rarely do pruning or weeding regularly. Likewise with irrigation which only depends on the presence of rainwater. This makes coffee production relatively low compared to modern agriculture in other regions.
2) The economies of scale;
   Based on the survey results, the average area of coffee planted by farmers is 1.14 hectares. The economic scale of the farming is relatively low that make it become not really efficient in term of business.

3) Weak marketing practice;
   Although the Lamno Robusta coffee has a distinctive taste with organic farming system, it is only known locally. The branding of Lamno Robusta coffee as a special coffee product has never been done.

4) Do not enough knowledge on good farming practice;
   Based on the results of the FGD with the farmers and elders of the Lamno community, farmers generally do not have enough knowledge regarding the good practice of coffee cultivation. Farmers only develop coffee cultivation based on the habits of their parents and ancestors.

5) The financing access is limited;
   Based on the information conveyed by the farmers, they generally lack capital in developing agricultural businesses so that the business is carried out with the existing capabilities. Access to banking is very limited. The irregularity of their income and unbankable asset are two main prome that limitted their access to financing resources.

The following table shows the results of internal factor analysis based on the results of in-depth interviews with stakeholders, literature studies and field observation:

<table>
<thead>
<tr>
<th>No</th>
<th>Internal Factor Analysis</th>
<th>Weight</th>
<th>Rank</th>
<th>value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The farming experience</td>
<td>0.10</td>
<td>3.00</td>
<td>0.30</td>
</tr>
<tr>
<td>2</td>
<td>The uniqueness of taste</td>
<td>0.15</td>
<td>4.50</td>
<td>0.68</td>
</tr>
<tr>
<td>3</td>
<td>Specialty coffee branding</td>
<td>0.15</td>
<td>4.00</td>
<td>0.60</td>
</tr>
<tr>
<td>4</td>
<td>Familiarity in the local market</td>
<td>0.05</td>
<td>4.00</td>
<td>0.20</td>
</tr>
<tr>
<td>5</td>
<td>Market and distribution channel</td>
<td>0.05</td>
<td>4.00</td>
<td>0.20</td>
</tr>
<tr>
<td></td>
<td>Sub Total</td>
<td>0.50</td>
<td></td>
<td>1.98</td>
</tr>
<tr>
<td>1</td>
<td>The farming system</td>
<td>0.15</td>
<td>1.00</td>
<td>0.15</td>
</tr>
<tr>
<td>2</td>
<td>The economies of scale</td>
<td>0.10</td>
<td>2.00</td>
<td>0.20</td>
</tr>
<tr>
<td>3</td>
<td>Weak marketing practice</td>
<td>0.05</td>
<td>2.00</td>
<td>0.10</td>
</tr>
<tr>
<td>4</td>
<td>Limited knowledge on good farming practice</td>
<td>0.10</td>
<td>1.00</td>
<td>0.10</td>
</tr>
<tr>
<td>5</td>
<td>Financial access</td>
<td>0.10</td>
<td>1.00</td>
<td>0.10</td>
</tr>
<tr>
<td></td>
<td>Sub Total</td>
<td>0.50</td>
<td></td>
<td>0.65</td>
</tr>
<tr>
<td></td>
<td>Total Score</td>
<td>1.00</td>
<td></td>
<td>2.63</td>
</tr>
</tbody>
</table>

Source: Survey Data

The result of internal factor analysis shows that the strenght of Lamno Robusta Coffee farming overcome its weakness.

2. Internal Factor Analysisa

1) Opportunities

1) The industry growth;
   The industry growth was high in the national level. It was supported by the high growth of coffee consumption that reach 12.15% annual growth for the last 7 years. The data from the International Coffee Organization (ICO) shows that the growth average of coffee consumption was 1.3% for the last five years. Moreover ICO stated that the emerging market country will be the driver of the world coffee demand [2].

2) The market size;
   The United States Department of Agriculture (USDA), the world coffee consumption is projected to reach 9,792,000 ton in 2018. The same resource conveyed that the Indonesian coffee consumption in 2018 is predicted around 213,600 ton. Our survey suggest that the coffee consumption in Aceh reach 36,485 ton in 2017. These facts show that the market size of coffee product relatively big compared to capacity production of Lamno Robusta Coffee.

3) The fair trade practice;
Advocacy from environmental activists and human rights related to environmental sustainability and income distribution as well as fair trade practice during the past few decades have begun fruitful with the emergence of special coffee certification and fair trade implementation. This becomes more real when accompanied by the willingness of consumers to buy the specialty coffee products.

4) The economic growth;
   The economic growth of Indonesia consistently above 5% per year for the last five years. It has contributed to the increasing of income per capita. Consequently, it increase the purchasing power of the community that encouraged the coffee consumption.

5) The government support;
   The Government has provided sufficient support for the development of coffee farming businesses including promoting coffee product and direct assistance to the farmers. For Lamno Robusta coffee farmers, the Regency and Provincial Governments have provided assistance in term of land certification and seed assistance

2) Threats
   The are five underlying variables that potentially become the threat for the Lamno Robusta coffee farming as has been explain in the above. These variables are; threat of the new entry, threat of substitution products, the rivalry among the existing competitors, the bargaining power of buyers and the bargaining power of suppliers.

   The following table shows the results of external factor analysis based on the results of in-depth interviews with stakeholders, literature studies and field observation:

   **Table 9. External Factor Analysis**

<table>
<thead>
<tr>
<th>No</th>
<th>External Factor</th>
<th>Weight</th>
<th>Rank</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Opportunities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>The industry growth</td>
<td>0.15</td>
<td>3.00</td>
<td>0.45</td>
</tr>
<tr>
<td>2</td>
<td>The market size</td>
<td>0.15</td>
<td>4.50</td>
<td>0.68</td>
</tr>
<tr>
<td>3</td>
<td>The fair trade practice</td>
<td>0.05</td>
<td>2.50</td>
<td>0.13</td>
</tr>
<tr>
<td>4</td>
<td>The economic growth</td>
<td>0.10</td>
<td>2.75</td>
<td>0.28</td>
</tr>
<tr>
<td>5</td>
<td>The government support</td>
<td>0.05</td>
<td>2.50</td>
<td>0.13</td>
</tr>
<tr>
<td></td>
<td>Sub Total</td>
<td>0.50</td>
<td>1.65</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Threats</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Threat of the new entry</td>
<td>0.10</td>
<td>3.6</td>
<td>0.36</td>
</tr>
<tr>
<td>2</td>
<td>Threat of substitution products</td>
<td>0.10</td>
<td>2.4</td>
<td>0.24</td>
</tr>
<tr>
<td>3</td>
<td>The rivalry among the existing competitors</td>
<td>0.05</td>
<td>2.5</td>
<td>0.13</td>
</tr>
<tr>
<td>4</td>
<td>The bargaining power of buyers</td>
<td>0.15</td>
<td>2.2</td>
<td>0.33</td>
</tr>
<tr>
<td>5</td>
<td>The bargaining power of suppliers</td>
<td>0.10</td>
<td>1.6</td>
<td>0.16</td>
</tr>
<tr>
<td></td>
<td>Sub Total</td>
<td>0.50</td>
<td>1.22</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total Score</td>
<td>1.00</td>
<td>2.87</td>
<td></td>
</tr>
</tbody>
</table>

Sumber: Survey Data

The result of external factor analysis shows that the opportunities of Lamno Robusta Coffee farming overcome its threats. The following graph shows the SWOT Analysis based on the internal and external factor analysis above.
The score for external factor of Lamno Robusta Coffee farming is 2.87, while the internal factor is 2.63.
Both the total weighted score of the internal factor and the external factor that influence the business of Lamno Robusta coffee are more than 2.50. It is mean that the strength of the business overcome its weakness, while the opportunities the business might have overcome the threats it might face.

5.8 Industry Attractiveness and Business Strength Analysis

The internal and internal factor analysis inline with the industry attractiveness and business analysis. Because the external factor represented the industry attractiveness, while the internal factor represent the business strength. The GE/McKinsey Matrix of Lamno Robusta Coffee is formed based on the above assumption.

Since the score for industry attractiveness is 2.87, while the business strength is 2.63, the Lamno Robusta Coffee Farming will be placed in cell E of GE/McKinsey Matrix. It mean that both the market attractiveness and the business strength are in medium position. Therefore the farmer have to focus on the core business and invest more on production to achieve economies of scale as well as marketing to create brand image in order to get a better position.

<table>
<thead>
<tr>
<th>Industry Attractiveness</th>
<th>Strong</th>
<th>Medium 3.34</th>
<th>Weak 1.67</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A (Leader)</td>
<td>Invest and Grow</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seek dominance</td>
<td>Invest in growth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximize investment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The level of Industry Attractiveness is in the scale between 3.34 to 5.00. The level of Business Strength is in the scale between 3.34 to 5.00.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td>3.34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B (Try Harder)</td>
<td>Selective Growth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Identify Growth area</td>
<td>Identify Growth area</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Invest in growth</td>
<td>Invest in growth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The level of Industry Attractiveness is in the scale between 3.34 to 5.00. The level of Business Strength is in the scale between 1.67 to 3.34</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>1.67</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C (Cash Generation)</td>
<td>Selective Growth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintain position</td>
<td>Maintain position</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seek cash position</td>
<td>Seek cash position</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The level of Industry Attractiveness is in the scale between 3.34 to 5.00. The level of Business Strength is in the scale between 0.00 to 1.67</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 10. GE/ McKinsey Matrix of Lamno Robusta Coffee Farming
The level of Industry Attractiveness is in the scale between 1.67 to 3.34. The level of Business Strength is in the scale between 3.34 to 5.00.

<table>
<thead>
<tr>
<th>Industry Attractiveness</th>
<th>Business Strength</th>
<th>Low (1.67)</th>
<th>G (Improve or quit)</th>
<th>H (Phased withdrawal)</th>
<th>I (Withdrawal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.67</td>
<td>Harvest /Divert</td>
<td>Selectivity</td>
<td>Specialize niche</td>
<td>Seek acquisition</td>
<td>Harvest /Divert</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Attack Rivals</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Time exit</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Industry Attractiveness</th>
<th>Business Strength</th>
<th>Medium (3.34)</th>
<th>Specialize niche</th>
<th>Consider exit</th>
<th>Harvest /Divert</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.34</td>
<td>Harvest /Divert</td>
<td>Specialize niche</td>
<td>Consider exit</td>
<td>Harvest /Divert</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Attack Rivals</td>
<td>Time exit</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Industry Attractiveness</th>
<th>Business Strength</th>
<th>High (5.00)</th>
<th>Harvest /Divert</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.00</td>
<td>Harvest /Divert</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Sources:** Adaptation from Mokaya (2012) based on Mann & McKinsey and Company (1971)

**REFERENCE**

Implementation of Activity-Based Costing Method in Calculating Production Cost of Coffee Powder Manufacturing Company In Aceh

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Abstract. The purpose of this research is to study how the calculation and comparing the application of the traditional system method with the Activity Based Costing system method in the coffee manufacturing industry in Aceh. The result of the calculation can be concluded that the comparison cost between the calculation of the cost of goods produced by the traditional system and the calculation of the price of staple goods production has difference price amount in PT. Indo Cufco about Rp.603/kg (undercost), CV. Kupi Lampineung Rp.4.004/kg (undercost), UD. Kupi Teungku Aceh Rp.60,42/kg (overcost), UD. Degood Gayo Coffee Rp.3.042,6/kg (overcost), and UD. Raya Coffee Arabica Rp.9/kg (undercost).

Keywords: Cost of Goods Manufactured, Traditional Method, Activity Based Costing

1 Introduction

The industry is one of the drivers of the world economic turnaround. The industry is required to maintain the life-sustainability of its business in order to operate in accordance with the objectives set by the company and always generate profits for its owners. The development of the powder processing industry in Aceh province increasingly rapidly. The production of coffee commodities in Aceh Province is huge, with a total area 121,226 Ha, and producing about 46,828 tons per year. The processing of coffee powder using modern technology becomes one of the efficiency indicators and can improve the quality of the production process. Technological developments also have a complex impact on the industry. With the utilization of these technologies resulted in increased operating costs generated by the company that will impact on the high cost of production.

Calculation of manufacturing cost of the product is all costs used to process raw materials to be finished goods in a certain period of time either fixed or variable costs. The inaccuracy in the calculation of cost of goods manufactured has an adverse effect on the company, because the cost of production serves as the basis for setting the selling price and profit, as a tool to measure the efficiency of the production process implementation as well as the basis for decision making for the management of the company. Therefore, there is a new method in the calculation of the cost of production known as activity-based costing (ABC).

Purpose of the research is to find out the calculation and comparison of cost of production in the coffee processing industry in Aceh Province using traditional system and activity-based costing.

2 Literature Review

2.1 Management Accounting and Cost Accounting

The definition of management accounting by Horngren, Datar, & Rajan [1] is the process of identification, measurement and accumulation, analysis and preparation, interpretation, and communication of information that helps each executive to meet organizational goals. Management accounting also includes preparing financial statements for non-management groups such as shareholders, creditors, regulatory agencies. financial and non-financial means used by management to make decisions.

While, Horngren, Datar, & Foster [2] states "Cost Accounting provides the information needed for management accounting and financial accounting. Cost accounting measures and reports any financial and non-financial information related to the cost or utilization of resources within an organization". While the definition of costs according to Bustami & Nurlela [3] cost is the sacrifice of economic resources as measured in units of...
money that have occurred or are likely to occur to achieve certain goals. In addition, Mardiasmo [4] defined manufacturing cost as "the manufactured cost of a product or service is an accumulation of the costs imposed on products or services produced by the company".

2.2 Traditional System Method vs Activity-Based Costing

Hansen & Mowen [5] state that the traditional system is a cost accounting system which assumes that all are classified as fixed or variable related to changes in units or volumes of manufactured products. While activity-based costing according to Raiborn & Kinney [6] is a cost accounting system that focuses on organizational activities and collection of costs based on the underlying nature of the underlying level of some predetermined overhead and then calculated using a variety of cost drivers in the activities of an organization.

2.3 Previous Research

The results of research by Rahmaji [7] entitled "Implementation of Activity Based Costing System to Determine the Cost of Products of PT. Celebes Mina Pratama". PT. Celebes Mina Pratama is a company that produces 3 kinds of product ikan kauy, hana katsu and fish meal. The research concludes that with activity based costing system able to give a calculation of the cost of production more accurate. The results showed that activity-based costing system when compared with traditional methods then gives greater results. The difference that occurs due to the overhead cost of each product. The differences of this research is the object of research by Rahmaji on fish processing industry, while in research conducted by researchers in the coffee powder processing industry. The similarity of research conducted by Rahmaji with this research is on the subject of research. The company under study still uses Traditional System in calculating the cost of production so it is necessary to do research by using activity based costing system to evaluate the accuracy of calculation done at this time.

The result of the research of Suratinoyo [8] entitled "Application of ABC system for determining the cost of goods manufactured in Build Wenang Beverage". PT. Build Wenang Manado is a manufacturing company engaged in the manufacture of soft drinks. The calculation of the cost of production using the ABC method when compared with the method used by the company there is a difference of Rp.416,242,174 where the total cost of production using the ABC method is Rp.41,667,875,470. When compared with the traditional system of Rp.42,129,053,094. The differences of this research are the object of his research where Suratinoyo in the manufacture of soft drinks, while researchers in the coffee powder processing industry. The equation of research is to have similarity in using the traditional system to charge product cost so that need to be done by using an activity based costing system to calculate the cost of goods production.

The results of Rotikan [9], entitled "Application of activity-based costing method in determining the cost of production at PT. Tropica Cocoprima ". PT. Tropica Cocoprima is a company engaged in the production of coconut flour. The research yields the conclusion that calculation of the cost of production by ABC method shows undercost condition for ordinary coconut flour product and overcost condition for fine coconut flour.

The differences of this research are that in research undertaken by Rotikan choose coconut flour processing company, where researchers using coffee powder processing company as the subject of his research. The similarity of this research is to have similarities in using Activity-based costing to perform calculations and evaluate the accuracy of the calculations performed today.

3 Research Methods

3.1 Subject and Object of Research

The research subjects in this research are five coffee processing industry units in Aceh Province (PT Indo Cufco, CV Kupi Lampineung, UD Coffee Tgk Aceh, UD Degood Gayo Coffee, UD Raya Coffee Arabica). The object of research in this research is the data related to the determination of the cost of production. The data consists of: (1) Qualitative data, is data in the form of letters, pictures, diagrams and so forth (not numbers) that describe something or words. In this case, the required data is data about the history of PT. Indo Cufco, CV. Kupi Lampineung, UD. Coffee Tgk. Aceh, UD. Degood Gayo Coffee, UD. Raya Coffee Arabica and the development of these companies, company location, organizational structure, marketing area, production system, etc. (2) Quantitative data, is data in the form of numbers or data that can be calculated by unit count. These data are all

3.2 Operational Definition of Research Variable

Operational Definition of Research Variable of this research is: (1) Cost of production is all costs used to process raw materials to be finished goods within a certain period of time. (2) The traditional system is a system of determining the cost of production that uses the basis of charging costs in accordance with changes in unit or volume of products produced. (3) Activity-based costing is a cost calculation that emphasizes activities that use more cost driver to measure the resources used by the product more accurately and relevant.

3.3 Research Design, Data Collection Method and Data Analysis Method

This research is descriptive research. Descriptive research aims to describe the facts that currently apply. Descriptive research is categorized in the study of the object of past and present variables and describes the variables being studied [10].

Data collection conducted in this research is field study. Field study is a data collection steps taken author directly from PT. Indo Cufco, CV. Kupi Lampineung, UD. Coffee Tgk. Aceh, UD. Degood Gayo Coffee, UD. Raya Coffee Arabica which became the object of this research by:

1. Interviews with the company manager, this interview is a data collection technique that is done with parts that concerned and directly involved with the discussed and associated with the data required.
2. Direct observation of the work system, especially related to the activity-based costing process.
3. Observing procedures or policies implemented by the company.

Data analysis techniques used to calculate the cost of production with Activity-based costing are as follows:

1. Calculating the cost of production with the traditional system.
2. Calculating the cost of production using Activity-based costing, with the following ways:
   a. Identifying activity to each level activity (Unit, Batch, Product, and Facility).
   b. Determining the homogenous cost pool.
   c. Determining the pool rate per units of each cost pool.
   d. Allocating pool rate based on cost driver has consumed by each level activity.
   e. Arranged the cost of the product by activity-based costing method.
3. Compare the calculation of the cost of production based on traditional system and activity-based costing then calculate the difference.

4 Result and Discussion

ABC implementation study on 5 coffee powder processing companies in Aceh Province with different types of products, and different production capacity, in order to obtain various results from each type of product. At PT. Indo Cufco there are 4 types of products (arabica coffee specialty, longberry / peaberry, Luwak, and wine), CV. Kupi Lampineung Utama there are 3 types of products (robusta coffee, arabica coffee, and robusta jagung), UD. Kupi Teungku Aceh has 2 types of products (super robusta coffee and standard robusta coffee), UD. Degood Gayo Coffee has 5 types of products (arabica specialty coffee, long berry, peaberry, Luwak, and wine), and UD. Raya Coffee Arabica produces 2 types of products (specialty arabica and roasted bean coffee). There are several stages in the processing of coffee beans. The first stage, freshly harvested coffee beans were washed and stripped of the outer shell using a depulper machine, clean coffee beans were dried until the humidity was reduced by 30%, after the dry coffee beans were stripped from the coffee beans using a huller machine, the next stage was dried again to get the coffee beans with 12% moisture content, the last stage is sorting the beans by type and quality.

The dried green beans are then roasted using a roasting machine until they reach the desired level of maturity; there are two commonly used roasting tools, automatic machines, using heat power from gas fuel, and manuals are still done traditionally using fire heat from firewood. After the roasting process is complete then the coffee
beans are smoothed using a grinding machine to obtain coffee powder and then packed to maintain the taste quality of the coffee into several packing sizes. Powdered coffee ready for market.

The process of processing the coffee beans is not difficult, but requires a lot of manpower if still done manually, the company conducted research has combined with the use of production machinery to support production efficiency and suppress the use of labor, so the five companies have met the criteria for the calculation of price principal production using activity-based costing system.

The calculation of the cost of goods manufactured using activity-based costing system specifies the calculation of overhead costs into 4 activity levels and charges the cost according to the capacity of each product produced. Activity-based costing not only to charge the cost of accurate but also as a tool of cost control, from every activity we do will find out how much the cost incurred. The traditional method of calculation cannot be performed cost control because all costs are charged with the production unit.

Companies that do research still use the calculation of the traditional model, because the application is general and the calculation is simple. But responses from company owners assessed the activity-based costing system is helpful to companies in controlling costs because the activity-based costing system details the calculation of factory overhead cost according to the capacity of each product. So inflate the cost can be easily traced and taken control steps.

4.1 Specific Data

The production data of PT. Indo Cufco, CV. Kupi Lampineung, UD. Coffee Tgk. Aceh, UD. Degood Gayo Coffee, and UD. Raya Coffee Arabica in 2016 is presented in Table 1 – 5 as follows:

**Table 1. Production Data of PT Indo Cufco in the Year 2016**

<table>
<thead>
<tr>
<th>Product Type</th>
<th>Production Unit (Kg)</th>
<th>Cost Of Good Sold (Rp)</th>
<th>Labour Cost (Rp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specialty</td>
<td>5,000</td>
<td>1,000,000,000</td>
<td>85,200,000</td>
</tr>
<tr>
<td>Longberry/Peaberry</td>
<td>2,500</td>
<td>620,500,000</td>
<td>42,600,000</td>
</tr>
<tr>
<td>Wine</td>
<td>100</td>
<td>40,000,000</td>
<td>2,840,000</td>
</tr>
<tr>
<td>Luwak</td>
<td>700</td>
<td>245,000,000</td>
<td>11,360,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>8,300</strong></td>
<td><strong>1,910,000,000</strong></td>
<td><strong>142,000,000</strong></td>
</tr>
</tbody>
</table>

Source: PT Indo Cufco

**Table 2. Production Data of CV Kupi Lampineung in the Year 2016**

<table>
<thead>
<tr>
<th>Product Type</th>
<th>Production Unit (Kg)</th>
<th>Cost Of Good Sold (Rp)</th>
<th>Labour Cost (Rp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Robusta (Original)</td>
<td>972</td>
<td>29,191,000</td>
<td>3,575,000</td>
</tr>
<tr>
<td>Arabica (Original)</td>
<td>1,450</td>
<td>115,999,000</td>
<td>5,200,000</td>
</tr>
<tr>
<td>Robusta (Mixed with Corn)</td>
<td>6,217</td>
<td>162,892,500</td>
<td>23,725,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>8,639</strong></td>
<td><strong>308,012,500</strong></td>
<td><strong>32,500,000</strong></td>
</tr>
</tbody>
</table>

Source: CV Kupi Lampineung

**Table 3. Production Data of UD Kopi Teungku Aceh in the Year 2016**

<table>
<thead>
<tr>
<th>Product Type</th>
<th>Production Unit (Kg)</th>
<th>Cost Of Good Sold (Rp)</th>
<th>Labour Cost (Rp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Super</td>
<td>1,000</td>
<td>45,000,000</td>
<td>6,338,028</td>
</tr>
<tr>
<td>Standard</td>
<td>70,000</td>
<td>210,000,000</td>
<td>443,661,972</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>71,000</strong></td>
<td><strong>255,000,000</strong></td>
<td><strong>450,000,000</strong></td>
</tr>
</tbody>
</table>

Source: UD Kopi Teungku Aceh
Table 4. Production Data of UD Degood Gayo in the Year 2016

<table>
<thead>
<tr>
<th>Product Type</th>
<th>Production Unit (Kg)</th>
<th>Cost Of Good Sold (Rp)</th>
<th>Labour Cost (Rp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specialty</td>
<td>1.000</td>
<td>200,000,000</td>
<td>37,800,000</td>
</tr>
<tr>
<td>Longberry</td>
<td>500</td>
<td>75,000,000</td>
<td>18,900,000</td>
</tr>
<tr>
<td>Peaberry</td>
<td>300</td>
<td>54,000,000</td>
<td>10,800,000</td>
</tr>
<tr>
<td>Wine</td>
<td>70</td>
<td>28,000,000</td>
<td>3,600,000</td>
</tr>
<tr>
<td>Luwak</td>
<td>500</td>
<td>500,000,000</td>
<td>18,900,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2,370</strong></td>
<td><strong>875,000,000</strong></td>
<td><strong>90,000,000</strong></td>
</tr>
</tbody>
</table>

Source: UD Degood Gayo

Table 5. Production Data of UD Raya Coffee Arabica in the Year 2016

<table>
<thead>
<tr>
<th>Product Type</th>
<th>Production Unit (Kg)</th>
<th>Cost Of Good Sold (Rp)</th>
<th>Labour Cost (Rp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roasted Bean</td>
<td>1.500</td>
<td>157,500,000</td>
<td>14,760,000</td>
</tr>
<tr>
<td>Specialty</td>
<td>2.100</td>
<td>241,500,000</td>
<td>21,240,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3.600</strong></td>
<td><strong>399,000,000</strong></td>
<td><strong>36,000,000</strong></td>
</tr>
</tbody>
</table>

Source: UD Raya Coffee Arabica

PT. Indo Cufco, CV. Kupi Lampineung, UD. Kopi Tgk. Aceh, UD. Degood Gayo Coffee, dan UD. Raya Coffee Arabika has overhead costs of production used in 2016 to produce the above products is presented in table 6 as follows:

Table 6. Overhead of the Year 2016 (in Rp)

<table>
<thead>
<tr>
<th>Cost</th>
<th>PT Indo Cufco</th>
<th>CV Kupi Lampineung</th>
<th>UD Kupi Teungku Aceh</th>
<th>UD Degood Gayo</th>
<th>UD Raya Coffee Arabica</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>23,985,450</td>
<td>9,700,000</td>
<td>12,000,000</td>
<td>54,000,000</td>
<td>8,400,000</td>
</tr>
<tr>
<td>Vehicle Fuel</td>
<td>5,000,000</td>
<td>3,800,000</td>
<td>5,000,000</td>
<td>1,500,000</td>
<td>1,700,000</td>
</tr>
<tr>
<td>Machine Fuel</td>
<td>1,200,000</td>
<td>20,000,000</td>
<td>325,000</td>
<td>500,000</td>
<td>504,000</td>
</tr>
<tr>
<td>Vehicle Sparepart</td>
<td>3,000,000</td>
<td>500,000</td>
<td>400,000</td>
<td>5,000,000</td>
<td>300,000</td>
</tr>
<tr>
<td>Vehicle Maintenance</td>
<td>2,400,000</td>
<td>300,000</td>
<td>1,000,000</td>
<td>3,000,000</td>
<td>750,000</td>
</tr>
<tr>
<td>Machine Maintenance</td>
<td>500,000</td>
<td>200,000</td>
<td>300,000</td>
<td>3,000,000</td>
<td>800,000</td>
</tr>
<tr>
<td>Pickup Cost</td>
<td>0</td>
<td>700,000</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Employee Salary</td>
<td>0</td>
<td>0</td>
<td>40,000,000</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Factory Equipment</td>
<td>2,000,000</td>
<td>2,000,000</td>
<td>200,000</td>
<td>5,000,000</td>
<td>200,000</td>
</tr>
<tr>
<td>Cleaning Service</td>
<td>1,500,000</td>
<td>0</td>
<td>300,000</td>
<td>500,000</td>
<td>0</td>
</tr>
<tr>
<td>Employee Training</td>
<td>4,500,000</td>
<td>0</td>
<td>2,000,000</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Fix Assets Maintenance</td>
<td>2,000,000</td>
<td>200,000</td>
<td>2,000,000</td>
<td>5,000,000</td>
<td>0</td>
</tr>
<tr>
<td>Labor Assurance</td>
<td>12,000,000</td>
<td>0</td>
<td>12,000,000</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Vehicle Depreciation</td>
<td>30,000,000</td>
<td>5,595,000</td>
<td>5,000,000</td>
<td>6,000,000</td>
<td>3,333,000</td>
</tr>
<tr>
<td>Machine Depreciation</td>
<td>23,333,000</td>
<td>16,785,000</td>
<td>1,912,000</td>
<td>4,000,000</td>
<td>2,000,000</td>
</tr>
<tr>
<td>Factory Depreciation</td>
<td>5,428,000</td>
<td>9,000,000</td>
<td>7,500,000</td>
<td>2,000,000</td>
<td>1,666,000</td>
</tr>
<tr>
<td>Packaging</td>
<td>50,000,000</td>
<td>1,500,000</td>
<td>36,000,000</td>
<td>200,000,000</td>
<td>20,000,000</td>
</tr>
<tr>
<td>Shipping Cost</td>
<td>80,000,000</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Marketing</td>
<td>0</td>
<td>0</td>
<td>150,000</td>
<td>10,000,000</td>
<td>1,000,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>246,846,450</strong></td>
<td><strong>79,280,000</strong></td>
<td><strong>111,787,000</strong></td>
<td><strong>313,300,000</strong></td>
<td><strong>41,153,000</strong></td>
</tr>
</tbody>
</table>

Source: Secondary Data Processed

In addition to the above data, other data used to support the implementation of Activity-Based Costing System, among others:
1. Total electricity consumption
2. Number of hours of the inspection
3. Area of the area used
The quantity of the data can be presented in table 7 to table 11 as follows:

Table 7. Cost Driver of PT Indo Cufco

<table>
<thead>
<tr>
<th>Cost Driver</th>
<th>Product Variants</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Specialty</td>
<td>Longberry/ Peaberry</td>
</tr>
<tr>
<td>Total unit production (kg)</td>
<td>5,000</td>
<td>2,500</td>
</tr>
<tr>
<td>Total KWH</td>
<td>9,810</td>
<td>4,905</td>
</tr>
<tr>
<td>Total production hours</td>
<td>1,725</td>
<td>863</td>
</tr>
<tr>
<td>Area width (m²)</td>
<td>1,080</td>
<td>540</td>
</tr>
</tbody>
</table>

Source: PT Indo Cufco

Table 8. Cost Driver of CV Kupi Lampineung

<table>
<thead>
<tr>
<th>Cost Driver</th>
<th>Product Variants</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Robusta (Original)</td>
<td>Arabica (Original)</td>
</tr>
<tr>
<td>Total unit production (kg)</td>
<td>972</td>
<td>1,450</td>
</tr>
<tr>
<td>Total KWH</td>
<td>735,7</td>
<td>1,670,3</td>
</tr>
<tr>
<td>Total production hours</td>
<td>592</td>
<td>861</td>
</tr>
<tr>
<td>Area width (m²)</td>
<td>165</td>
<td>240</td>
</tr>
</tbody>
</table>

Source: CV Kupi Lampineung

Table 9. Cost Driver of UD Kopi Teungku Aceh

<table>
<thead>
<tr>
<th>Cost Driver</th>
<th>Product Variants</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Super</td>
<td>Standard</td>
</tr>
<tr>
<td>Total unit production (kg)</td>
<td>1,000</td>
<td>70,000</td>
</tr>
<tr>
<td>Total KWH</td>
<td>736,1</td>
<td>36,066,9</td>
</tr>
<tr>
<td>Total production hours</td>
<td>85</td>
<td>2,411</td>
</tr>
<tr>
<td>Area width (m²)</td>
<td>13</td>
<td>603</td>
</tr>
</tbody>
</table>

Source: UD Kopi Teungku Aceh

Table 10. Cost Driver of UD. Degood Gayo Coffee

<table>
<thead>
<tr>
<th>Cost Driver</th>
<th>Product Variants</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Specialty</td>
<td>Longberry</td>
</tr>
<tr>
<td>Total unit production (kg)</td>
<td>1,000</td>
<td>500</td>
</tr>
<tr>
<td>Total KWH</td>
<td>3,434</td>
<td>1,717</td>
</tr>
<tr>
<td>Total production hours</td>
<td>819</td>
<td>409</td>
</tr>
<tr>
<td>Area width (m²)</td>
<td>1,050</td>
<td>525</td>
</tr>
</tbody>
</table>

Source: UD Degood Gayo

Table 11. Cost Driver of UD Raya Coffee Arabica

<table>
<thead>
<tr>
<th>Cost Driver</th>
<th>Product Variants</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Roasted Bean</td>
<td>Specialty</td>
</tr>
<tr>
<td>Total unit production (kg)</td>
<td>1,500</td>
<td>2,100</td>
</tr>
<tr>
<td>Total KWH</td>
<td>2,347</td>
<td>3,377</td>
</tr>
<tr>
<td>Total production hours</td>
<td>885</td>
<td>1,275</td>
</tr>
<tr>
<td>Area width (m²)</td>
<td>164</td>
<td>236</td>
</tr>
</tbody>
</table>

Source: UD Raya Coffee Arabica

4.2 Discussion

4.2.1 Calculation cost of the product by traditional methods

The calculation cost of the product by traditional methods is presented in Table 12 – 16 as follows.
### Table 12. Production cost calculation with the traditional method of PT Indo Cufco

<table>
<thead>
<tr>
<th>Product</th>
<th>Cost Element</th>
<th>Total Cost (Rp)</th>
<th>Quantity (Kg)</th>
<th>Cost per Unit (Rp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specialty</td>
<td>Primary cost</td>
<td>1,085,200,000</td>
<td>5,000</td>
<td>217,040</td>
</tr>
<tr>
<td></td>
<td>Overhead cost = 29.740,5 x 5,000</td>
<td>145,432,801</td>
<td>5,000</td>
<td>29,085,5</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>2,464,127</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Longberry/Peaberry</th>
<th>Cost Element</th>
<th>Total Cost (Rp)</th>
<th>Quantity (Kg)</th>
<th>Cost per Unit (Rp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary cost</td>
<td>663,100,000</td>
<td>2,500</td>
<td>265,240</td>
<td></td>
</tr>
<tr>
<td>Overhead cost = 29.740,5 x 2,500</td>
<td>72,716,250</td>
<td>2,500</td>
<td>29,085,5</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>29,325</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wine</th>
<th>Cost Element</th>
<th>Total Cost (Rp)</th>
<th>Quantity (Kg)</th>
<th>Cost per Unit (Rp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary cost</td>
<td>42,840,000</td>
<td>100</td>
<td>428,400</td>
<td></td>
</tr>
<tr>
<td>Overhead cost = 29.740,5 x 100</td>
<td>2,908,650</td>
<td>100</td>
<td>29,085,5</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>45,748,650</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Luwak</th>
<th>Cost Element</th>
<th>Total Cost (Rp)</th>
<th>Quantity (Kg)</th>
<th>Cost per Unit (Rp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary cost</td>
<td>256,360,000</td>
<td>700</td>
<td>366,228,5</td>
<td></td>
</tr>
<tr>
<td>Overhead cost = 29.740,5 x 700</td>
<td>20,360,200</td>
<td>700</td>
<td>29,085,5</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>396,314</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Secondary Data Processed

### Table 13. Production cost calculation with the traditional method of CV Kupi Lampineung

<table>
<thead>
<tr>
<th>Product</th>
<th>Cost Element</th>
<th>Total Cost (Rp)</th>
<th>Quantity (Kg)</th>
<th>Cost per Unit (Rp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Robusta (original)</td>
<td>Primary cost</td>
<td>32,696,000</td>
<td>972</td>
<td>33,637,8</td>
</tr>
<tr>
<td>Overhead cost = 8.135,2 x 972</td>
<td>7,907,415</td>
<td>972</td>
<td>8.135,2</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>41,773</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Arabic (original)</th>
<th>Cost Element</th>
<th>Total Cost (Rp)</th>
<th>Quantity (Kg)</th>
<th>Cost per Unit (Rp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary cost</td>
<td>121,199,000</td>
<td>1,450</td>
<td>83,585,5</td>
<td></td>
</tr>
<tr>
<td>Overhead cost = 8.135,2 x 1.450</td>
<td>11,796,040</td>
<td>1,450</td>
<td>8.135,2</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>91,720,7</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Robusta (mixed with corn)</th>
<th>Cost Element</th>
<th>Total Cost (Rp)</th>
<th>Quantity (Kg)</th>
<th>Cost per Unit (Rp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary cost</td>
<td>186,617,000</td>
<td>6,217</td>
<td>30,017,2</td>
<td></td>
</tr>
<tr>
<td>Overhead cost = 8.135,2 x 6,217</td>
<td>50,575,285</td>
<td>6,217</td>
<td>8.135,2</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>38,152,4</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Secondary Data Processed

### Table 14. Production cost calculation with the traditional method of UD Kupi Teungku Aceh

<table>
<thead>
<tr>
<th>Product</th>
<th>Cost Element</th>
<th>Total Cost (Rp)</th>
<th>Quantity (Kg)</th>
<th>Cost per Unit (Rp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Super</td>
<td>Primary cost</td>
<td>51,338,028</td>
<td>1,000</td>
<td>51,338,028</td>
</tr>
<tr>
<td>Overhead cost = 4,412,67 x 1,000</td>
<td>4,412,676</td>
<td>1,000</td>
<td>4,412,676</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>55,750,70</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Standard</th>
<th>Cost Element</th>
<th>Total Cost (Rp)</th>
<th>Quantity (Kg)</th>
<th>Cost per Unit (Rp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary cost</td>
<td>653,661,972</td>
<td>70,000</td>
<td>9,338,028</td>
<td></td>
</tr>
<tr>
<td>Overhead cost = 4,412,67 x 70,000</td>
<td>308,887,320</td>
<td>70,000</td>
<td>4,412,676</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>13,750,70</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Secondary Data Processed
Table 15. Production cost calculation with the traditional method of UD Degood Gayo Coffee

<table>
<thead>
<tr>
<th>Product 1 - Specialty</th>
<th>Cost Element</th>
<th>Total Cost (Rp)</th>
<th>Quantity (Kg)</th>
<th>Cost per Unit (Rp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary cost</td>
<td>237,800,000</td>
<td>1,000</td>
<td>237,800</td>
<td></td>
</tr>
<tr>
<td>Overhead cost = 47,167,5 x 1,000</td>
<td>47,167,510</td>
<td>1,000</td>
<td>47,167,5</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>284,967</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Product 2 – Longberry</th>
<th>Cost Element</th>
<th>Total Cost (Rp)</th>
<th>Quantity (Kg)</th>
<th>Cost per Unit (Rp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary cost</td>
<td>93,900,000</td>
<td>500</td>
<td>187,800</td>
<td></td>
</tr>
<tr>
<td>Overhead cost = 47,167,5 x 500</td>
<td>23,583,750</td>
<td>500</td>
<td>47,167,5</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>234,967</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Product 3 – Picherry</th>
<th>Cost Element</th>
<th>Total Cost (Rp)</th>
<th>Quantity (Kg)</th>
<th>Cost per Unit (Rp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary cost</td>
<td>64,800,000</td>
<td>300</td>
<td>216,000</td>
<td></td>
</tr>
<tr>
<td>Overhead cost = 47,167,5 x 300</td>
<td>14,150,250</td>
<td>300</td>
<td>47,167,5</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>263,167</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Product 4 – Wine</th>
<th>Cost Element</th>
<th>Total Cost (Rp)</th>
<th>Quantity (Kg)</th>
<th>Cost per Unit (Rp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary cost</td>
<td>31,600,000</td>
<td>70</td>
<td>451,428,5</td>
<td></td>
</tr>
<tr>
<td>Overhead cost = 47,167,5 x 70</td>
<td>3,301,690</td>
<td>70</td>
<td>47,167,5</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>498,596</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Product 5 – Luwak</th>
<th>Cost Element</th>
<th>Total Cost (Rp)</th>
<th>Quantity (Kg)</th>
<th>Cost per Unit (Rp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary cost</td>
<td>518,900,000</td>
<td>500</td>
<td>366,228,5</td>
<td></td>
</tr>
<tr>
<td>Overhead cost = 47,167,5 x 500</td>
<td>23,583,750</td>
<td>500</td>
<td>47,167,5</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1,084,967</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Secondary Data Processed

Table 16. Production cost calculation with the traditional method of UD Raya Coffee Arabica

<table>
<thead>
<tr>
<th>Product 1 – Roasted Bean</th>
<th>Cost Element</th>
<th>Total Cost (Rp)</th>
<th>Quantity (Kg)</th>
<th>Cost per Unit (Rp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary cost</td>
<td>172,260,000</td>
<td>1,500</td>
<td>114,840</td>
<td></td>
</tr>
<tr>
<td>Overhead cost = 11,431 x 1,500</td>
<td>17,147,083</td>
<td>1,500</td>
<td>11,431</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>126,271</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Product 2 – Specialty</th>
<th>Cost Element</th>
<th>Total Cost (Rp)</th>
<th>Quantity (Kg)</th>
<th>Cost per Unit (Rp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary cost</td>
<td>262,740,000</td>
<td>2,100</td>
<td>125,114</td>
<td></td>
</tr>
<tr>
<td>Overhead cost = 11,431 x 2,100</td>
<td>24,005,100</td>
<td>2,100</td>
<td>11,431</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>136,545</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Secondary Data Processed

4.2.2 Calculation cost of the product by Activity Based Costing

4.2.2.1 The First Stage Procedure

The first stage determines the cost of production based on the activity-based costing system is to trace the cost of the Source power to the activities that consume it. This stage can be seen in Table 17 as follows:

Table 17. The classification of costs into various activities in the year 2016

<table>
<thead>
<tr>
<th>Activity Level</th>
<th>Cost</th>
<th>PT Indo Cufco</th>
<th>CV Kupi Lampineung</th>
<th>UD Kupi Teungku Aceh</th>
<th>UD Degood Gayo</th>
<th>UD Raya Coffee Arabica</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit</td>
<td>Electricity</td>
<td>23,985.450</td>
<td>9,700.000</td>
<td>12,000.000</td>
<td>54,000.000</td>
<td>8,400.000</td>
</tr>
<tr>
<td></td>
<td>Vehicle Fuel</td>
<td>5,000.000</td>
<td>3,800.000</td>
<td>5,000.000</td>
<td>1,500.000</td>
<td>1,700.000</td>
</tr>
<tr>
<td></td>
<td>Vehicle Sparepart</td>
<td>3,000.000</td>
<td>500.000</td>
<td>400.000</td>
<td>5,000.000</td>
<td>300.000</td>
</tr>
<tr>
<td>Cost pool unit level</td>
<td>Overhead</td>
<td>Amount (Rp)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------</td>
<td>---------------------------------</td>
<td>--------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost pool 1</td>
<td>Electricity cost</td>
<td>23,985,450</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total cost</td>
<td>Total KWH (KWH)</td>
<td>16,350</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pool rate 1</td>
<td>Pool rate 1</td>
<td>1,467.14</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost pool 2</td>
<td>Vehicle fuel cost</td>
<td>5,000,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vehicle spare parts cost</td>
<td>3,000,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vehicle maintenance cost</td>
<td>2,400,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vehicle depreciation</td>
<td>30,000,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total cost</td>
<td>Total production unit (Unit)</td>
<td>40,400,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pool rate 2</td>
<td>Pool rate 2</td>
<td>4,867.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost pool 3</td>
<td>Machine fuel cost</td>
<td>1,200,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Machine maintenance cost</td>
<td>500,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Machine depreciation</td>
<td>23,333,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total cost</td>
<td>Total cost</td>
<td>25,033,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pool rate 3</td>
<td>Pool rate 3</td>
<td>2.876</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost pool 4</td>
<td>Employee training cost</td>
<td>4,500,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Labor assurance cost</td>
<td>12,000,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total cost</td>
<td>Total cost</td>
<td>16,500,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pool rate 4</td>
<td>Pool rate 4</td>
<td>8.704</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost pool 5</td>
<td>Packaging cost</td>
<td>50,000,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Distribution cost</td>
<td>80,000,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 19. Pool rate activity of CV Kupi Lampineung

<table>
<thead>
<tr>
<th>Cost pool unit level</th>
<th>Overhead</th>
<th>Amount (Rp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost pool 1</td>
<td>Electricity cost</td>
<td>9,700,000</td>
</tr>
<tr>
<td>Total cost</td>
<td></td>
<td>9,700,000</td>
</tr>
<tr>
<td>Total KWH (KWH)</td>
<td></td>
<td>6,689</td>
</tr>
<tr>
<td>Pool rate 1</td>
<td></td>
<td>1,450,14</td>
</tr>
<tr>
<td>Cost pool 2</td>
<td>Vehicle fuel cost</td>
<td>3,800,000</td>
</tr>
<tr>
<td></td>
<td>Vehicle spare parts cost</td>
<td>500,000</td>
</tr>
<tr>
<td></td>
<td>Vehicle maintenance cost</td>
<td>300,000</td>
</tr>
<tr>
<td></td>
<td>Vehicle depreciation</td>
<td>5,595,000</td>
</tr>
<tr>
<td>Total cost</td>
<td></td>
<td>10,195,000</td>
</tr>
<tr>
<td>Total production unit (unit)</td>
<td></td>
<td>8,639</td>
</tr>
<tr>
<td>Pool rate 2</td>
<td></td>
<td>1,180,11</td>
</tr>
<tr>
<td>Cost pool 3</td>
<td>Machine fuel cost</td>
<td>20,000,000</td>
</tr>
<tr>
<td></td>
<td>Machine maintenance cost</td>
<td>200,000</td>
</tr>
<tr>
<td></td>
<td>Machine depreciation</td>
<td>16,785,000</td>
</tr>
<tr>
<td>Total cost</td>
<td></td>
<td>36,985,000</td>
</tr>
<tr>
<td>Operate hours (hour)</td>
<td></td>
<td>5,380</td>
</tr>
<tr>
<td>Pool rate 3</td>
<td></td>
<td>6,874,53</td>
</tr>
<tr>
<td>Cost pool 4</td>
<td>Packaging cost</td>
<td>1,500,000</td>
</tr>
<tr>
<td>Total cost</td>
<td></td>
<td>1,500,000</td>
</tr>
<tr>
<td>Product unit (unit)</td>
<td></td>
<td>8,639</td>
</tr>
<tr>
<td>Pool rate 4</td>
<td></td>
<td>1,467,27</td>
</tr>
<tr>
<td>Cost pool 5</td>
<td>Factory equipment cost</td>
<td>2,000,000</td>
</tr>
<tr>
<td></td>
<td>Fix asset maintenance</td>
<td>200,000</td>
</tr>
<tr>
<td></td>
<td>Building depreciation</td>
<td>9,000,000</td>
</tr>
<tr>
<td>Total cost</td>
<td></td>
<td>11,200,000</td>
</tr>
<tr>
<td>Area width (m²)</td>
<td></td>
<td>1,500</td>
</tr>
<tr>
<td>Pool rate 5</td>
<td></td>
<td>7,466,6</td>
</tr>
</tbody>
</table>

Source: Secondary Data Processed

Table 20. Pool rate activity of UD Kupi Teungku Aceh

<table>
<thead>
<tr>
<th>Cost pool unit level</th>
<th>Overhead</th>
<th>Amount (Rp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost pool 1</td>
<td>Electricity cost</td>
<td>54,000,000</td>
</tr>
<tr>
<td>Total cost</td>
<td></td>
<td>54,000,000</td>
</tr>
<tr>
<td>Total KWH (KWH)</td>
<td></td>
<td>36,803</td>
</tr>
<tr>
<td>Pool rate 4</td>
<td></td>
<td>1,467,27</td>
</tr>
<tr>
<td>Cost pool 2</td>
<td>Vehicle fuel cost</td>
<td>1,500,000</td>
</tr>
<tr>
<td></td>
<td>Vehicle spare parts cost</td>
<td>5,000,000</td>
</tr>
<tr>
<td></td>
<td>Vehicle maintenance cost</td>
<td>3,000,000</td>
</tr>
<tr>
<td></td>
<td>Vehicle depreciation</td>
<td>6,000,000</td>
</tr>
<tr>
<td>Total cost</td>
<td></td>
<td>15,500,000</td>
</tr>
<tr>
<td>Total production unit (unit)</td>
<td></td>
<td>71,000</td>
</tr>
<tr>
<td>Pool rate 2</td>
<td></td>
<td>218,30</td>
</tr>
<tr>
<td>Cost pool batch level</td>
<td>Overhead</td>
<td>Amount (Rp)</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Cost pool 3</td>
<td>Machine fuel cost</td>
<td>500,000</td>
</tr>
<tr>
<td></td>
<td>Machine maintenance cost</td>
<td>3,000,000</td>
</tr>
<tr>
<td></td>
<td>Machine depreciation</td>
<td>4,000,000</td>
</tr>
<tr>
<td>Total cost</td>
<td></td>
<td>7,500,000</td>
</tr>
<tr>
<td>Operate hours (hour)</td>
<td></td>
<td>17,752</td>
</tr>
<tr>
<td>Pool rate 3</td>
<td></td>
<td>422,48</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cost pool batch level</th>
<th>Overhead</th>
<th>Amount (Rp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost pool 4</td>
<td>Employee training cost</td>
<td>2,000,000</td>
</tr>
<tr>
<td></td>
<td>Labor assurance cost</td>
<td>12,000,000</td>
</tr>
<tr>
<td>Total cost</td>
<td></td>
<td>14,000,000</td>
</tr>
<tr>
<td>Operate hours (hour)</td>
<td></td>
<td>38,040</td>
</tr>
<tr>
<td>Pool rate 4</td>
<td></td>
<td>368,03</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cost pool product level</th>
<th>Overhead</th>
<th>Amount (Rp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost pool 5</td>
<td>Packaging cost</td>
<td>200,000,000</td>
</tr>
<tr>
<td></td>
<td>Distribution cost</td>
<td>10,000,000</td>
</tr>
<tr>
<td>Total cost</td>
<td></td>
<td>210,000,000</td>
</tr>
<tr>
<td>Product unit (unit)</td>
<td></td>
<td>71,000</td>
</tr>
<tr>
<td>Pool rate 5</td>
<td></td>
<td>2,957,74</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cost pool facility level</th>
<th>Overhead</th>
<th>Amount (Rp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost pool 6</td>
<td>Factory equipment cost</td>
<td>5,000,000</td>
</tr>
<tr>
<td></td>
<td>Sanitation cost</td>
<td>300,000</td>
</tr>
<tr>
<td></td>
<td>Fix asset maintenance</td>
<td>5,000,000</td>
</tr>
<tr>
<td></td>
<td>Building depreciation</td>
<td>2,000,000</td>
</tr>
<tr>
<td>Total cost</td>
<td></td>
<td>12,300,000</td>
</tr>
<tr>
<td>Area width (m²)</td>
<td></td>
<td>2,106</td>
</tr>
<tr>
<td>Pool rate 6</td>
<td></td>
<td>5,840,45</td>
</tr>
</tbody>
</table>

Source: Secondary Data Processed

Table 21. Pool rate activity of UD Degood Gayo

<table>
<thead>
<tr>
<th>Cost pool unit level</th>
<th>Overhead</th>
<th>Amount (Rp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost pool 1</td>
<td>Electricity cost</td>
<td>12,000,000</td>
</tr>
<tr>
<td>Total cost</td>
<td></td>
<td>12,000,000</td>
</tr>
<tr>
<td>Total KWH (KWH)</td>
<td></td>
<td>8,178</td>
</tr>
<tr>
<td>Pool rate 1</td>
<td></td>
<td>1,467,14</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cost pool unit level</th>
<th>Overhead</th>
<th>Amount (Rp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost pool 2</td>
<td>Vehicle fuel cost</td>
<td>5,000,000</td>
</tr>
<tr>
<td></td>
<td>Vehicle spare parts cost</td>
<td>400,000</td>
</tr>
<tr>
<td></td>
<td>Vehicle maintenance cost</td>
<td>1,000,000</td>
</tr>
<tr>
<td></td>
<td>Vehicle depreciation</td>
<td>5,000,000</td>
</tr>
<tr>
<td>Total cost</td>
<td></td>
<td>11,400,000</td>
</tr>
<tr>
<td>Total production unit (unit)</td>
<td></td>
<td>2,370</td>
</tr>
<tr>
<td>Pool rate 2</td>
<td></td>
<td>4,810</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cost pool batch level</th>
<th>Overhead</th>
<th>Amount (Rp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost pool 3</td>
<td>Machine fuel cost</td>
<td>325,000</td>
</tr>
<tr>
<td></td>
<td>Machine maintenance cost</td>
<td>300,000</td>
</tr>
<tr>
<td></td>
<td>Machine depreciation</td>
<td>1,912,000</td>
</tr>
<tr>
<td></td>
<td>Employee Salary</td>
<td>40,000,000</td>
</tr>
<tr>
<td>Total cost</td>
<td></td>
<td>42,537,000</td>
</tr>
<tr>
<td>Operate hours (hour)</td>
<td></td>
<td>1,950</td>
</tr>
<tr>
<td>Pool rate 3</td>
<td></td>
<td>21,814</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cost pool product level</th>
<th>Overhead</th>
<th>Amount (Rp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost pool 4</td>
<td>Packaging cost</td>
<td>36,000,000</td>
</tr>
<tr>
<td></td>
<td>Marketing cost</td>
<td>150,000</td>
</tr>
<tr>
<td>Total cost</td>
<td></td>
<td>36,150,000</td>
</tr>
<tr>
<td>Product unit (unit)</td>
<td></td>
<td>2,370</td>
</tr>
<tr>
<td>Pool rate 4</td>
<td></td>
<td>15,253</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cost pool facility level</th>
<th>Overhead</th>
<th>Amount (Rp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost pool</td>
<td>Factory equipment cost</td>
<td>200.000</td>
</tr>
<tr>
<td>-----------</td>
<td>------------------------</td>
<td>---------</td>
</tr>
<tr>
<td></td>
<td>Fix asset maintenance</td>
<td>2,000.000</td>
</tr>
<tr>
<td></td>
<td>Building depreciation</td>
<td>7,500.000</td>
</tr>
<tr>
<td>Total cost</td>
<td></td>
<td>9,700.000</td>
</tr>
<tr>
<td>Area width (m²)</td>
<td></td>
<td>2.500</td>
</tr>
<tr>
<td>Pool rate 5</td>
<td></td>
<td>3.880</td>
</tr>
</tbody>
</table>

Source: Secondary Data Processed

Table 22. Pool rate activity of UD Raya Coffee Arabica

<table>
<thead>
<tr>
<th>Cost pool unit level</th>
<th>Overhead</th>
<th>Amount (Rp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost pool 1</td>
<td>Electricity cost</td>
<td>8,400.000</td>
</tr>
<tr>
<td>Total KWH</td>
<td>5,725</td>
<td></td>
</tr>
<tr>
<td>Pool rate 1</td>
<td>1,467,14</td>
<td></td>
</tr>
<tr>
<td>Cost pool 2</td>
<td>Vehicle fuel cost</td>
<td>1,700.000</td>
</tr>
<tr>
<td></td>
<td>Vehicle spare parts cost</td>
<td>300.000</td>
</tr>
<tr>
<td></td>
<td>Vehicle maintenance cost</td>
<td>750.000</td>
</tr>
<tr>
<td></td>
<td>Vehicle depreciation</td>
<td>3,333,000</td>
</tr>
<tr>
<td>Total cost</td>
<td>6,083,000</td>
<td></td>
</tr>
<tr>
<td>Total production unit</td>
<td>3,600</td>
<td></td>
</tr>
<tr>
<td>Pool rate 2</td>
<td>1,689</td>
<td></td>
</tr>
<tr>
<td>Cost pool batch level</td>
<td>Machine fuel cost</td>
<td>504,000</td>
</tr>
<tr>
<td></td>
<td>Machine maintenance cost</td>
<td>800,000</td>
</tr>
<tr>
<td></td>
<td>Machine depreciation</td>
<td>2,000,000</td>
</tr>
<tr>
<td>Total cost</td>
<td>3,304,000</td>
<td></td>
</tr>
<tr>
<td>Operate hours</td>
<td>2,160</td>
<td></td>
</tr>
<tr>
<td>Pool rate 3</td>
<td>1,530</td>
<td></td>
</tr>
<tr>
<td>Cost pool product level</td>
<td>Packaging cost</td>
<td>20,000,000</td>
</tr>
<tr>
<td></td>
<td>Distribution cost</td>
<td>1,000,000</td>
</tr>
<tr>
<td>Total cost</td>
<td>21,000,000</td>
<td></td>
</tr>
<tr>
<td>Product unit</td>
<td>3,600</td>
<td></td>
</tr>
<tr>
<td>Pool rate 4</td>
<td>5,834</td>
<td></td>
</tr>
<tr>
<td>Cost pool facility level</td>
<td>Factory equipment cost</td>
<td>200,000</td>
</tr>
<tr>
<td></td>
<td>Fix asset maintenance</td>
<td>500,000</td>
</tr>
<tr>
<td></td>
<td>Building depreciation</td>
<td>1,666,000</td>
</tr>
<tr>
<td>Total cost</td>
<td>2,366,000</td>
<td></td>
</tr>
<tr>
<td>Area width</td>
<td>400</td>
<td></td>
</tr>
<tr>
<td>Pool rate 5</td>
<td>5,915</td>
<td></td>
</tr>
</tbody>
</table>

Source: Secondary Data Processed

4.2.2.2 The Secondary Stage Procedure

The cost of product calculation with activity-based costing system at PT. Indo Cufco, CV. Kupi Lampineung, UD. Degood Gayo Coffee, UD. Coffee Tgk Aceh, UD. Raya Coffee Arabica is presented in Table 23 – 27 as follows:

Table 23. Allocation Overhead by ABC Method in PT Indo Cufco

<table>
<thead>
<tr>
<th>Activity Level</th>
<th>Cost Driver</th>
<th>Allocation</th>
<th>Specialty</th>
<th>Longberry/Peaberry</th>
<th>Wine</th>
<th>Luwak</th>
</tr>
</thead>
<tbody>
<tr>
<td>KWH Unit</td>
<td></td>
<td>1.467 x 9.810</td>
<td>14,391,270</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.467 x 4.905</td>
<td>7,195,635</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.467 x 3.27</td>
<td>479,709</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.467 x 1.308</td>
<td>1,918,836</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4.867,5 x 5.000</td>
<td>24,337,500</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4.867,5 x 2.500</td>
<td>12,167,500</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4.867,5 x 100</td>
<td>486,700</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4.867,5 x 700</td>
<td>3,406,900</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Secondary Data Processed
### Table 24. Allocation Overhead by ABC Method in CV Kupi Lampineung

<table>
<thead>
<tr>
<th>Activity Level</th>
<th>Cost Driver</th>
<th>Allocation</th>
<th>Robusta (original)</th>
<th>Arabica (original)</th>
<th>Robusta (mixed with corn)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Batch</td>
<td>Operate hours</td>
<td>8.704 x 300 8.704 x 150.3 8.704 x 10 8.704 x 40 6.947 x 1.425 6.947 x 712.5 6.947 x 47.5 6.947 x 90</td>
<td>2.611.200 1.308.211 87.040 348.160 9.899.475 4.949.737 329.982 1.319.930</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Product</td>
<td>Total unit</td>
<td>15.663 x 5.000 15.663 x 2.500 15.663 x 100 15.663 x 700</td>
<td>78.135.000 39.157.500 1.556.300 10.964.100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facility</td>
<td>Area width</td>
<td>6.071 x 1.080 6.071 x 540 6.071 x 36 6.071 x 144</td>
<td>6.556.680 3.278.340 218.556 874.224</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Overhead</strong></td>
<td></td>
<td></td>
<td></td>
<td>136.111.125 68.056.923 3.158.287 18.832.150</td>
<td></td>
</tr>
</tbody>
</table>

Source: Secondary Data Processed

### Table 25. Allocation Overhead by ABC Method in UD Kupi Teungku Aceh

<table>
<thead>
<tr>
<th>Activity Level</th>
<th>Cost Driver</th>
<th>Allocation</th>
<th>Super</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit</td>
<td>KWH</td>
<td>1.450.14 x 735.7 1.450.14 x 1.070.3 1.450.14 x 4.882</td>
<td>1.066.868 1.552.084.84 7.079.583.48</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total unit</td>
<td>1.800.11 x 972 1.800.11 x 1.450 1.800.11 x 6.217</td>
<td>1.147.067 1.711.159.5 7.336.743.87</td>
<td></td>
</tr>
<tr>
<td>Batch</td>
<td>Operate hours</td>
<td>1.883 x 207,1 1.883 x 1.450 1.883 x 1.374,6</td>
<td>389.969,3 567.348 2.588.372</td>
<td></td>
</tr>
<tr>
<td>Product</td>
<td>Total unit</td>
<td>173.63 x 972 173.63 x 1.450 173.63 x 6.217</td>
<td>168.739,2 251.720 1.079.271,2</td>
<td></td>
</tr>
<tr>
<td>Facility</td>
<td>Area width</td>
<td>7.466 x 185 7.466 x 6.217 7.466 x 1.905</td>
<td>1.231.989 1.779.1984 8.175.927</td>
<td></td>
</tr>
<tr>
<td><strong>Total Overhead</strong></td>
<td></td>
<td></td>
<td></td>
<td>4.004.632,5 5.874.296,34 26.259.879,6</td>
</tr>
</tbody>
</table>

Source: Secondary Data Processed
Table 26. Allocation Overhead by ABC Method in UD Degood Gayo

<table>
<thead>
<tr>
<th>Activity Level</th>
<th>Cost Driver</th>
<th>Allocation</th>
<th>Specialty</th>
<th>Longberry</th>
<th>Peaberry</th>
<th>Wine</th>
<th>Luwak</th>
</tr>
</thead>
<tbody>
<tr>
<td>KWH Unit</td>
<td>1.467 x 3.434</td>
<td>5.037,678</td>
<td>2.518,839</td>
<td>3.598,551</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.467 x 1.717</td>
<td></td>
<td>479,709</td>
<td>2.518,839</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.467 x 2.453</td>
<td>4.810,000</td>
<td>2.405,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.467 x 327</td>
<td></td>
<td>1,443,000</td>
<td>336,700</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.810 x 1.000</td>
<td>17,865,666</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.810 x 300</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.810 x 70</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Batch Operate hours</td>
<td>21,814 x 819</td>
<td>15,253,000</td>
<td>7,626,500</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>21,814 x 234</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>21,814 x 78</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Product Total unit</td>
<td>15,253 x 1.000</td>
<td>15,253,000</td>
<td>7,626,500</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>15,253 x 500</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>15,253 x 300</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>15,253 x 70</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facility Area width</td>
<td>3,880 x 1.050</td>
<td>4,074,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3,880 x 525</td>
<td>2,037,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3,880 x 300</td>
<td>1,164,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3,880 x 100</td>
<td>388,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Overhead</td>
<td>47,040,344</td>
<td>23,521,535</td>
<td>15,885,927</td>
<td>3,973,611</td>
<td>23,621,535</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Secondary Data Processed

Table 27. Allocation Overhead by ABC Method in UD Raya Coffee Arabica

<table>
<thead>
<tr>
<th>Activity Level</th>
<th>Cost Driver</th>
<th>Allocation</th>
<th>Roasted Bean</th>
<th>Specialty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit KWH Total unit</td>
<td>1,467,14 x 2.347</td>
<td>3,443,377</td>
<td>4,954,531</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1,467,14 x 3.377</td>
<td></td>
<td></td>
<td>3,564,900</td>
</tr>
<tr>
<td>Batch Operate hours</td>
<td>1,530 x 885</td>
<td>1,354,050</td>
<td></td>
<td>12,251,400</td>
</tr>
<tr>
<td>Product Total unit</td>
<td>5,834 x 1.500</td>
<td>8,751,000</td>
<td></td>
<td>1,395,940</td>
</tr>
<tr>
<td>Facility Area width</td>
<td>5,915 x 164</td>
<td>970,060</td>
<td></td>
<td>24,099,521</td>
</tr>
</tbody>
</table>

Total Overhead | 17,051,987 | 24,099,521 |

Source: Secondary Data Processed
The calculation of the cost of production by using the activity-based costing system at PT. Indo Cufco, CV. Kupi Lampineung, UD. Degood Gayo Coffee, UD. Coffee Tgk Aceh, UD. Raya Coffee Arabica in 2016 can be presented in Table 4.28 – 4.32 as follows:

**Table 28. Calculation cost of the product by activity-based costing system of PT. Indo Cufco**

<table>
<thead>
<tr>
<th>Component</th>
<th>Specialty</th>
<th>Longberry/ Peaberry</th>
<th>Wine</th>
<th>Luwak</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw materials</td>
<td>1.000.000</td>
<td>620.500.000</td>
<td>40.000.000</td>
<td>245.000.000</td>
</tr>
<tr>
<td>Labor</td>
<td>85.200.000</td>
<td>42.600.000</td>
<td>2.840.000</td>
<td>11.360.000</td>
</tr>
<tr>
<td>Overhead</td>
<td>136.111.125</td>
<td>68.056.923</td>
<td>3.198.287</td>
<td>18.832.150</td>
</tr>
<tr>
<td>Cost of product</td>
<td>1.221.311.125</td>
<td>731.156.923</td>
<td>45.998.287</td>
<td>275.192.150</td>
</tr>
<tr>
<td>Unit product (Kg)</td>
<td>5.000</td>
<td>2.500</td>
<td>100</td>
<td>700</td>
</tr>
<tr>
<td>Cost per unit</td>
<td>244.262</td>
<td>292.463</td>
<td>459.983</td>
<td>393.131</td>
</tr>
</tbody>
</table>

Source: Secondary data processed

**Table 29. Calculation cost of the product by activity-based costing system of CV. Kupi Lampineung**

<table>
<thead>
<tr>
<th>Component</th>
<th>Robusta (original)</th>
<th>Arabica (Original)</th>
<th>Robusta (mixed with corn)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw materials</td>
<td>29.121.000</td>
<td>115.999.000</td>
<td>162.892.500</td>
</tr>
<tr>
<td>Labor</td>
<td>3.575.000</td>
<td>5.200.000</td>
<td>26.259.879.6</td>
</tr>
<tr>
<td>Overhead</td>
<td>4.004.632.5</td>
<td>5.874.296.34</td>
<td>212.874.380</td>
</tr>
<tr>
<td>Cost of product</td>
<td>36.700.632.5</td>
<td>127.073.296</td>
<td>212.874.380</td>
</tr>
<tr>
<td>Unit product (Kg)</td>
<td>972</td>
<td>1.450</td>
<td>6.217</td>
</tr>
<tr>
<td>Cost per unit</td>
<td>37.757.85</td>
<td>87.636.75</td>
<td>34.240.7</td>
</tr>
</tbody>
</table>

Source: Secondary data processed

**Table 30. Calculation cost of the product by activity-based costing system of UD Kupi Teungku Aceh**

<table>
<thead>
<tr>
<th>Component</th>
<th>Super</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw materials</td>
<td>45.000.000</td>
<td>210.000.000</td>
</tr>
<tr>
<td>Labor</td>
<td>6.338.028</td>
<td>443.661.972</td>
</tr>
<tr>
<td>Overhead</td>
<td>4.533.540</td>
<td>308.885.754</td>
</tr>
<tr>
<td>Cost of product</td>
<td>55.871.568</td>
<td>962.547.726</td>
</tr>
<tr>
<td>Unit product (Kg)</td>
<td>1.000</td>
<td>20.000</td>
</tr>
<tr>
<td>Cost per unit</td>
<td>55.871.56</td>
<td>13.750.68</td>
</tr>
</tbody>
</table>

Source: Secondary data processed

**Table 31. Calculation cost of the product by activity-based costing system of UD Degood Gayo**

<table>
<thead>
<tr>
<th>Component</th>
<th>Specialty</th>
<th>Longberry</th>
<th>Peaberry</th>
<th>Wine</th>
<th>Luwak</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw materials</td>
<td>300.000.000</td>
<td>75.000.000</td>
<td>54.000.000</td>
<td>28.000.000</td>
<td>500.000.000</td>
</tr>
<tr>
<td>Labor</td>
<td>37.500.000</td>
<td>18.900.000</td>
<td>10.800.000</td>
<td>3.600.000</td>
<td>18.900.000</td>
</tr>
<tr>
<td>Overhead</td>
<td>47.040.344</td>
<td>23.521.535</td>
<td>15.885.927</td>
<td>3.973.611</td>
<td>23.621.535</td>
</tr>
<tr>
<td>Cost of product</td>
<td>284.840.344</td>
<td>117.421.535</td>
<td>80.685.927</td>
<td>35.573.611</td>
<td>542.521.535</td>
</tr>
<tr>
<td>Unit product (Kg)</td>
<td>1.000</td>
<td>500</td>
<td>300</td>
<td>70</td>
<td>500</td>
</tr>
<tr>
<td>Cost per unit</td>
<td>284.840</td>
<td>234.843</td>
<td>268.953</td>
<td>508.194</td>
<td>1.089.043</td>
</tr>
</tbody>
</table>

Source: Secondary data processed

**Table 32. Calculation cost of the product by activity-based costing system of UD Raya Coffee Arabica**

<table>
<thead>
<tr>
<th>Component</th>
<th>Roasted Bean</th>
<th>Specialty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw materials</td>
<td>157.500.000</td>
<td>241.500.000</td>
</tr>
<tr>
<td>Labor</td>
<td>14.760.000</td>
<td>21.240.000</td>
</tr>
<tr>
<td>Overhead</td>
<td>17.051.987</td>
<td>24.099.521</td>
</tr>
<tr>
<td>Cost of product</td>
<td>189.311.987</td>
<td>286.839.521</td>
</tr>
<tr>
<td>Unit product (Kg)</td>
<td>1.500</td>
<td>2.100</td>
</tr>
<tr>
<td>Cost per unit</td>
<td>126.208</td>
<td>136.590</td>
</tr>
</tbody>
</table>

Source: Secondary data processed
4.2.2.3 The Tertiary Stage Procedure

Comparing traditional systems with activity-based costing system in determining the cost of production. Comparison of cost of production of traditional system with activity-based costing system is presented in Table 33 – 37 as follows:

Table 33. Comparison of cost of production by traditional system and activity-based costing system of PT. Indo Cufo

<table>
<thead>
<tr>
<th>Method</th>
<th>Specialty (TC/kg)</th>
<th>Longberry/Peaberry (TC/kg)</th>
<th>Wine (TC/kg)</th>
<th>Luwak (TC/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional</td>
<td>1.230.635.000/246.127</td>
<td>733.312.500/293.325</td>
<td>45.748.500/457.485</td>
<td>276.719.800/395.314</td>
</tr>
<tr>
<td>ABC System</td>
<td>1.221.311.125/244.262</td>
<td>731.156.923/292.463</td>
<td>45.998.287/459.983</td>
<td>275.192.150/393.131</td>
</tr>
<tr>
<td>Difference</td>
<td>9.323.875/1.865</td>
<td>2.155.577/862</td>
<td>-249.787/-2.498</td>
<td>1.527.650/2.183</td>
</tr>
</tbody>
</table>

Value Overcost Overcost Undercost Overcost
Source: Secondary data processed

Table 34. Comparison of cost of production by traditional system and activity based costing system of CV. Kupi Lampineung

<table>
<thead>
<tr>
<th>Method</th>
<th>Robusta Original (TC / kg)</th>
<th>Arabika Original (TC / kg)</th>
<th>Robusta Mixed with Corn (TC / kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional</td>
<td>40.603.415/41.773</td>
<td>132.995.040/91.720,7</td>
<td>237.192.295/38.152,4</td>
</tr>
<tr>
<td>ABC System</td>
<td>36.700.632,5/37.757,85</td>
<td>127.073.296/87.636,75</td>
<td>212.874.380/34.240,7</td>
</tr>
</tbody>
</table>

Value Overcost Overcost Overcost
Source: Secondary data processed

Table 35. Comparison of cost of production by traditional system and activity-based costing system of UD Kupi Teungku Aceh

<table>
<thead>
<tr>
<th>Method</th>
<th>Super (TC / kg)</th>
<th>Standard (TC / kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional</td>
<td>55.750.704/55.750,70</td>
<td>962.549.280/13.750,70</td>
</tr>
<tr>
<td>ABC System</td>
<td>55.871.568/55.871,56</td>
<td>962.547.725/13.750,68</td>
</tr>
<tr>
<td>Difference</td>
<td>120.860/120.86</td>
<td>1.555/0,02</td>
</tr>
</tbody>
</table>

Value Undercost Overcost
Source: Secondary data processed

Table 36. Comparison of cost of production by traditional system and activity-based costing system of UD Degood Gayo

<table>
<thead>
<tr>
<th>Method</th>
<th>Specialty (TC/kg)</th>
<th>Longberry (TC/kg)</th>
<th>Peaberry (TC/kg)</th>
<th>Wine (TC/kg)</th>
<th>Luwak (TC/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional</td>
<td>284.967.000/284.967</td>
<td>117.483.500/234.967</td>
<td>78.950.100/263.167</td>
<td>349.017.200/498.596</td>
<td>542.483.300/1.084.967</td>
</tr>
</tbody>
</table>

Source: Secondary data processed
Table 37. Comparison of cost of production by traditional system and activity based costing system of UD Raya Coffee Arabica

<table>
<thead>
<tr>
<th>Method</th>
<th>Super (TC / kg)</th>
<th>Syandard (TC / kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional</td>
<td>189,406,500/126</td>
<td>286,744,500/136</td>
</tr>
<tr>
<td>System</td>
<td>126,271</td>
<td>136,545</td>
</tr>
<tr>
<td>ABC</td>
<td>189,311,987/126</td>
<td>286,839,521/136</td>
</tr>
<tr>
<td>System</td>
<td>126,208</td>
<td>136,590</td>
</tr>
<tr>
<td>Difference</td>
<td>94,513/63</td>
<td>-95,021/-45,24</td>
</tr>
</tbody>
</table>

Value | Overcost | Undercost | Overcost | Undercost | Overcost | Value | Overcost | Undercost | Overcost | Undercost | Overcost |
<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>126</td>
<td>123</td>
<td>-5,786,69</td>
<td>-9,596</td>
<td>-76,07</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Secondary data processed

5 Conclusion, Limitation, And Suggestion

5.1 Conclusion

Based on the results of research and discussion conducted by the author at PT. Indo Cufco, CV. Kupi Lampineung, UD. Degood Gayo Coffee, UD. Coffee Tgk Aceh, UD. Raya Coffee Arabica, it can be concluded as follows:

1. The results of the five study subjects get the result of calculating the cost of production of different activity-based costing, that the company that specifies the complete overhead component of the factory tends to be more efficient when using the cost of production activity-based costing. This is evidenced in the company PT. Indo Cufco and CV. Kupi Lampineung.

2. In a company that incompletely informs the cost component of the factory overhead cost, the cost of production of the traditional method is more efficient.

3. Based on these conclusions, the difference between the cost of production by using traditional system and activity-based costing is caused by the overhead of factory overhead cost for each product. In traditional systems, the cost of each product is only charged to one cost driver only. As a result, there tends to be a distortion in the loading of factory overhead costs. In the activity-based costing method, the factory overhead cost for each product is charged to many cost drivers according to the use of production capacity, so that activity-based costing is able to allocate activity cost to each product type appropriately based on the consumption of each activity.

5.2 Limitation

This study has several limitations that can be considered for further research to be refined to obtain better results in the future. Limitations contained in this study include:

1. In this study, the data used is not completely real according to the conditions of consumption Source power companies in production, due to limited access and recording company financial statements have not been maximized.

2. The results of the calculation of the cost of production using this activity-based costing system cannot be generalized to other coffee powder processing industries in Aceh.
Province, because each company has a difference in the component overhead cost of the manufacturer, so not all companies are more efficient using the activity method based costing.

5.3 Suggestion

To examine the reference for further research, there are several suggestions that can be put forward, among others:

1. For the PT. Indo Cufco, CV. Kupi Lampineung, UD. Degood Gayo Coffee, UD. Coffee Tgk Aceh, UD. Raya Coffee Arabica
   a. Cost of production at PT. Indo Cufco, CV. Kupi Lampineung, UD. Degood Gayo Coffee, UD. Coffee Tgk Aceh, UD. Raya Coffee Arabica with activity-based costing shows results largely higher than the cost of production to the traditional system, but preferably for UD. Degood Gayo Coffee, UD. Coffee Tgk Aceh, UD. Raya Coffee Arabica should provide details of the Overhead Cost of the manufacturer component in accordance with the number of activities according to established standards and re-evaluate the system determines the cost of production because it will greatly affect the purchasing power of products on the market.
   b. PT. Indo Cufco, CV. Kupi Lampineung, should apply the calculation of the cost of production using activity-based costing method, while the UD. Degood Gayo Coffee, UD. Coffee Tgk Aceh, UD. Raya Coffee Arabica is still efficient if using a traditional system because the calculation of the cost of production is cheaper than the ABC method, so it can compete with the market price. If the company produces an increasingly varied product then the company can adopt an activity-based costing system for more accurate cost loading.

2. For the next researcher
   For further research, it is better to use other research objects, apart from manufacturing companies. Researchers may use service companies such as insurance companies, hospitals, hotels or consulting firms to obtain more varied information.

REFERENCES

The actualization of Local Wisdom Values in Strengthening Student’s Character

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Abstract. Actualization on character education is an essential domain to be expanded in all education level, which aims to create an integral character of an individual. There should be a serious attempt to look on the challenge and opportunity in developing character education at the formal education board. This research focuses on the actualization of local wisdom values in strengthening student’s character of Syiah Kuala University. It aims to: identify local wisdom values to be developed to students of Syiah Kuala University. Furthermore, the research aims to identify challenges and opportunities to perform local wisdom values in strengthening student’s character at Syiah Kuala University. Qualitative research design is conducted by using descriptive analysis and comprehensive interview as a medium to collect data. Research subjects are 45 people from structural leaders and experts surround Syiah Kuala University. The research proves that there are three sources of value influencing local wisdom and formulated as basic in strengthening the character of the student at Syiah Kuala University, that is Islamic value, nationality value, and Acehnese cultural values. Research findings, then, reveal that strategy to implement local wisdom values in Syiah Kuala University can be performed by the curricular program, extracurricular and co-curricular. In another part, the research also finds that actualization models of character education in Syiah Kuala University are conducted by three models: a) integrative model, (b) compliment model, and (c) discrete model.

Keywords: Character, Local Wisdom Values

1 Introduction

Geographically, Indonesia is an archipelagic large country. Indonesia has positively supported and consisted of some factual having strategic geopolitical position, natural resources and biodiversity, socio-cultural plurality, and a large population. People of Indonesia, then, have enormous opportunities to develop, equitable, prosperous and dignified. In quantity, Indonesia is a country with the fourth rank of the largest population in the world, but in term of quality, Indonesia is a country with “worst” rank in all aspects. “Worst” is caused by the inefficiency of the education process. A nation will be more left behind when the education sector is not managed as well, although it is a nation that fully loaded with natural resources, the nation remains underdeveloped.

The process of education is a key sector that should be constantly improved to pursue changing demands of the age. It has to be admitted that modern countries with advance
education (such as Japan, America, and some European) have been able to exploit potential energy resources possessed by other countries. Moreover, modern countries have also successfully conquered the world economy line. For that reason, developing country such as Indonesia was subject to the rules set by the superpowers. This situation arises and caused by degenerated education in Indonesia, either in quality or quantity.

In relation to education, it is not only concern on the ability of knowledge transfer, or power output of technology, but also concern more complex on the transfer value. History has proven that dignity and noble level of a nation depends on its character. Philosophers and leaders prioritize on education values/character than others. No matter how to advance a nation in science and technology, it often brings to destruction, which harms people. Character education in Islam is based on the faith of One God, as “Creator” and “Source” of all goodness and truth.

Characteristic dimension in Islam is exposed in relation to goodness and avoiding His prohibitions. In placing such positive and negative issue, human build a good thinking, peaceful soul, strong personality, and a healthy body. Character in the Islamic perspective is a combination of faith in God, religious ritual (spiritual activity), and social behavior in all aspects of human life.

If we tracing back on the history of Aceh, nearly all writings that we will find regarding culture and customs are “defaulted” into Acehnese value. It is implemented in all life aspect by Acehnese in reference to Islamic value. Since Acehnese consists of people with the Moslem majority who committed to the teachings of religion. For Acehnese, religious knowledge is a must [1]. Morality is one of the most emphasized principles of Islam. It is proven that Allah has sent Prophet Muhammad to the world to edify human morals. Without morals and morality, knowledge will be disrespected. It is then leading to technology “deviation”, which can harm and even threatening the human race. We have to admit that, most of the time, education in Indonesia is oriented only to knowledge, whereas education value is abandoned. While national regulation for education system Sisdiknas Regulation year (2003), chapter II, article 3, stated that:

"National education serves to develop the ability and figuring out character and civilization of nation in order to educate human life, aimed to expand potential learners into believers to God the Almighty, has good behavior, health, educated, skillful, creative, independent, become a democratic citizen and responsible.”

It is clear that education is not merely the knowledge transfer process, but also as a medium to build personality, mindset, psychology, and pattern of behavior. Therefore, urgent awareness about developing character education takes place in all formal institutions, either high school or university. Individual character is formed from a young age influenced by genetic and environment. Intentionally, character formation process will affect the way an individual sees himself and the environment, reflected in his/her behavior every day. College or University is a formal institution that assigned by the state to organize education and develop science, knowledge, technology, and arts.

It is recognized that character education is significantly required to be applied in university. Since the university is the place where students seeking knowledge in the complex. As an agent of change, university students should be equipped with values based on nationality pillars. In addition, as middle class, university students have a great responsibility to control changing progress acceleration. Control to the changing will be pragmatic when idealism and independence of university student do not base on value order. Therefore, comprehensive discussion regarding the implementation of character education in Syiah Kuala University based on local value is needed.
1.1 Problem Formulation

According to the background illustrated above, five problems formulation are arranged as follow:
1. What kinds of values are actualized in strengthening students’ character of Syiah Kuala University?
2. How shall actualization strategy of local wisdom values in strengthening student’s character in Syiah Kuala University?
3. What are the challenges and opportunities of actualizing local wisdom values in strengthening student’s character in Syiah Kuala University?

1.2 Research Objective

Based on the problematic formula mentioned above, the objective of this research will be as follow:
1. Describe in details actualized values in strengthening student’s character at Syiah Kuala University.
2. Illustrate the strategy to actualize local wisdom values in strengthening student’s character at Syiah Kuala University.

1.3 Research Significance

In general, the research significance will be useful to scientific literature development which directly related to the theory of development value. However, specifically, the research significance is described as follows:
1. As the main guideline for stakeholders in the process of strengthening students’ characters at the level of Syiah Kuala University.
2. In addition to Syiah Kuala University, the research significance can also be made as an initial guideline to other universities, both public and private universities in their support to strengthen the character of a university student.

1.4 Theoretical Basis

Generally, everyone would agree that character formation process as something critical. Character education is an attempt of transferring value in a process and at every level of education. In this matter, according to Elkind & Sweet [3], character education is defined as follows:

“Character education is the deliberate effort to help people understand, care about, and act upon core ethical values. When we think about the kind of character we want for our children, it is clear that we want them to be able to judge what is right, care deeply about what is right, and then do what they believe to be right, even in the face of pressure from without and temptation from within”.

Furthermore, character education is everything implemented by stakeholders, who are able to influence learner’s character into positive change. The teacher helps in building learner’s behavior, includes teacher’s manners, the way of talking or delivering material, how teacher tolerate, and other related things. In this subject, according to Ramli [4], character education has the same definition and essence of moral education. The purpose is to create an individual with
a good personality, good community, and a good citizen. Therefore, the nature of character education in the context of education in Indonesia is derived from its cultural educational value to build the personality of the young generation [5].

Character education is initiated from human basic character, deriving from universal values of moral (absolute), deriving from religion which is referred to as the golden rule. According to psychologists, some basic character values are: love to God and His creation (nature with its contents), responsibility, honest, respectful and polite, affectionate, caring and cooperation, confidence, creative, hard worker and perseverance, justice and good governance, good and humility, tolerance, love of peace, love and unity. Other opinion says that basic human character consists of: trustworthy, care and respect, honesty, responsibility; citizenship, sincerity, courage, diligence, discipline, visionary, fair, and have integrity. Implementation of character education in university should be based on basic character values, which are then in the next step developed into more or higher values in line with the requirements, conditions, and the environment of the campus.

Education specialist generally agreed on the substance of character education improvement on formal education corridor [6]. However, different opinions among them come up in terms of approach. In relation to approaching or method, some specialist suggests in the using of moral education approach that grown in Western countries, such as the cognitive moral development approach, analysis value approach, and clarification value approach. Others suggest in the using of traditional approach by setting in social values within learners [7].

According to grand design developed by Kemendiknas (2010)[8] psychologically and socio-culturally, individual character formation is a function of entire potential human beings of the individual in the context of social and cultural interaction in lifetime progress. Configuration characters within the context of the totality of psychological and socio-cultural process can be grouped into: (a) Spiritual and emotional development; (b) Intellectual Development; (c) Physical and Kinesthetic Development), and (d) Affective and Creativity Development).

Specialists have suggested various theories concern on moral education. In this subject, according to Hersh, Miller, & Fielding [9] among various developed theories, there are six theories which commonly used: rational development approach, consideration approach, clarification value approach, cognitive moral development approach, and social behavior approach [6]. In contrast to this classification, [10] classifies various theories into three: cognitive approach, affective approach, and behavioral approach. The classification is based on three elements of morality, which became the object of Psychological study: behavior, cognition, and affection [6].

Character education as a curricular program has been implemented in some countries. Research by Halstead & Taylor [11] described how learning and teaching values as an approach in forming individual character has been developed in universities in the United Kingdom. According to Halstead & Taylor [11], prominent roles of campus on character formation are based on the following values: “to build on and supplement the values children have already begun to develop by offering further exposure to a range of values that are current in society (such as equal opportunities and respect for diversity); and to help children to reflect on, make sense of and apply their own developing values”.

Thus, it can be defined that character education is designed and implemented systems to help learners understand human behavior values related to God, human itself, among human beings, environment, and nationality that is embodied in mind, attitude, feeling, word, and deed based on religious norms, laws, manners, culture, and customs [12].
Phases on Character Development

The implementation of character education is a necessity because the goal of character education basically encourages generation with good character (insan kamil). A good character in somebody grows and develops to encourage him/her to have the ability to live in truth and life purpose. Thus, it will encourage Indonesian new young with true character.

It should be recognized that character development is not something easy, or as simple as turning hand palm. However, character development requires intensity based on high consistency attitude from all stakeholders. That is because individual character development has particular phases. Thus, pattern approach adjustment in learner’s character development is significantly based on referred phases.

The following two references from a specialist are important in relation to moral development phases. First, Jean Peaget [13], said that moral development takes place in two phases. The first phase is called moral realism the second phase is called autonomous morality. In the first phase, children judge an action as right or wrong according to its consequence, rather than the motivation behind them. Children morality automatically follows the rules without thinking or judging, and they tend to assume that adults have power. The main here, according to Piaget, that children assess right and wrong based on punishment, rather than its moral values. In the second phase, cognitive development in children had been created and they can consider all possibility to solve a particular problem. At this phase, children have the ability to see problems from a different point of view and may consider possible factors to solve the problems.

Second, Lawrence Kohlberg [13], which has the opinion that moral development at an individual person passes through three phases. Each phase consists of two sub-phases. Phases that defined by Kohlberg are divided into several levels.

1. Pre-conventional phase
   Consists of two phases, orientation phases on children compliance and punishment by doing something to earn prizes, or without charge any punishment; relativistic hedonism phase, children are no longer depends on rules, but they start in to realize every relative incident and orienting more on satisfaction principles.

2. Conventional phase
   Focus on social needs. Phases in conventional time consists of two phases: orientation regarding on good children, where children will perform action and others able to judge; phase on defending social norms and authority, where children aware of their obligation, implementing norms and defending norms existence, by means to live in harmony, social groups should accept and implement rules agreement.

3. Post-conventional phase
   An individual internally looks moral judgment on proper principles. There are two phases, orientation on agreement between an individual with social environment, reciprocal relationship between individual and social environment presents when a person carrying out his duties in accordance with social demands norms, he hopes to get protection from community; have universal principles, subjective ethical norms and personal norms are presents which means that subjective elements in the relationship between one person to society are presents to judge if an action is good or not good, with moral or not.

Furthermore, according to Adler [14], there are two main impulses in human that influence his behavior, egoism encouragement and social encouragement. Egoism encouragement appears in individual ego; while social encouragement appears in a cooperative, social relation, interpersonal relations, and group relation, etc. In other words, social encouragement means to conform to society as an environment and help them to gain perfect purposes [6]. The same
opinion is expressed by Edwards Lee Thorndike [13], an adherent of psychological behavior. Adler uses the term “social encouragement”, but Thorndike expresses “learn” in describing the behavioral background of someone. Which means that it associates between events in someone’s environment, he calls it “stimulus” which is the response given to the stimulus.

According to some thoughts above, the character is developed in the stages of knowledge, implementation, and habits. The character is not only limited to knowledge. A person who has knowledge of goodness is not absolutely capable to act in accordance with his knowledge if s/he is not used to it. Character is also reaching out emotion and habits. Thus, it is required three components of good character, moral knowing (knowledge about moral), moral feeling (emotional reinforcement) about moral and moral action. Those are necessary to have students who involved in education system understand, feel, comprehend, practice moral values.

Seeking further, dimensions include in moral knowing that will load in cognitive domain is moral awareness, knowledge regarding moral values (knowing moral values), perspective point of view (perspective taking), logic of moral (moral reasoning), courage to behave (decision making), and self introduction (self knowledge). The moral feeling is about strengthening the emotional aspect of the learner into a characterized human. This reinforcement is linking to attitudes perceived by learners, i.e. awareness of identity (conscience), confidence (self-esteem), the sensitivity of suffers (empathy), love the truth (loving the good), restraint (self-control), humility (humility). Moral action is the outcome of Performa resulted in two other character’s component. Understanding what encourage someone in performing goodness (act morally), should be observed in the other three characters, i.e competence, will, and habit.

**Local wisdom value**

Local wisdom concept in the dictionary consists of two words: wisdom and local. However, in general, local wisdom implicitly defined as local ideas with full of wisdom, discernment, good-value, embedded and followed by member community. In term of anthropology is known as a local genius.

Gobyah [15] said that local wisdom (local genius) is a truth that has been cultured in a local area. Local wisdom is a combination of sacred values and various existing values. Local wisdom is created an advance local culture in the community or geographically. Local wisdom is a product of a past culture that should be constantly stood as a way of life. It is local value but somehow values in it believed as universal. Local wisdom is also a source of knowledge generated dynamically and develops or carried on by certain populations integrated with their understanding of surrounding natural and culture.

Local wisdom is fundamental for policy maker in local level regarding health, agriculture, education, natural resource management, and rural community activities. Local wisdom sometimes is also local culture wisdom. It is local knowledge unified with belief systems, norms, a culture which expressed in tradition and myth, embraced in a long time period.

**2 Methodology**

This study uses a descriptive qualitative approach to describe the process of strengthening student character through local wisdom values. The selection of informants is done in a structured and systematic manner, besides that, it is also done by means of purposive sampling to get answers to controls from informants at other levels besides students. Informant or Subject in the study was 45 persons consist of four elements. There were 10 main persons who stand as leaders in university, and other 10 persons stand as the element faculty leaders. Next 10 persons
stand as organization leaders from university students, and the last subject, 15 persons stand as a lecturer with character education. The process of collecting data in this study was gained in-depth interview with the selected subjects. Since data in this study is qualitative, so data analysis is also performed in descriptive in accordance to the cycle that suggested by Miles & Huberman [16] that “data analysis consists of three activities implemented together, those are data collection, data reduction, data presentation, research conclusion”. The cycle of whole data analysis by Miles and Huberman.

3 Results and Discussion

After generating an interview with selected respond ent regarding on local wisdom actualization value in order to strengthen student’s local character of Syiah Kuala University, following discussion related to research would be:

3.1 Actualized Local Wisdom Values in strengthening student’s character at Syiah Kuala University

Local wisdom values that live and develop in the community have generally agreed as values that remarkable to be actualized in the process of strengthening learner’s character. The result of the research also revealed that local wisdom values end down to three main sources. First, religion value, enlighten people of Indonesia in general, and Acehnese as Moslem community. Therefore, Islamic values have been unified into Acehnese in particular. Those values internalized as the main value for character education process at Syiah Kuala University in Banda Aceh. Islamic values are faith, honest, reliable, smart, and humanist values as basic human rights context. If necessary, training on Syaria Islam should be undertaken in the early admission of new students, and each of them must follow the training as well as the training of national internalization of ‘orde lama’ and ‘orde baru’ through P4 training.

Second, local wisdom values in Acehnese are influences by nationalism values in line with Pancasila, 1945 Constitution, and Bhinneka Tunggal Ika and The Unitary State of Republic Indonesia. The nationalism values are unity, mutual respect/tolerance, love of homeland, loyalty and other pillars living as a nation and country. The respondent argued that we live in a plural country instead of homogeneous. We live diverse ethnic, language, race, culture, and customs, and nationalism stand as life adhesive among multiculturalism in Indonesia. However, Indonesia can stand in unity to develop Indonesia into a big country.

Third, other local wisdom values are affected by former customs and culture of the community. According to respondents, local values currently ignored in the education process. Meanwhile, Aceh has been given special autonomy and it is possible to develop students character based on Acehnese values. Some local wisdom values based on Acehnese customs and culture are: like helping each other, respecting elder people, high care, humble, not greedy, simple life, loyal to the family and brave. Acehnese in history is known as brave and tough. Even Dutch assume that Acehnese is modern. Today, courage in Acehnese generation had begun to fade if compared to the former. Acehnese was ready to sacrifice their treasure and their life to defend truth principles. So, Acehnese values should return and internalize in strengthening the process of student’s character in Syiah Kuala University, and even in all levels of education as the process of learner’s character formation.
3.2 Actualization strategy of local wisdom values to strengthen student’s character in Syiah Kuala University

In relation to the implementation of actualization strategy, building character education for students of Syiah Kuala University is implemented by curricular, co-curricular and extracurricular. Curricular activities are definitely related to learning activities guided by the curriculum, in this subject is Basic Social and Cultural Sciences (ISBD), Islamic Science, Nationality Education, and Pancasila Education. In addition to the subjects’ religion, ISBD, and PKN, another local material is added. The local material is not only, but discussing local wisdom in Aceh, initiated from historical view up to Acehnese local wisdom an how it is implemented in farming, guarding forest, trading, resolving disputes and resolving large scale of conflicts.

Besides the implementation of learning value by specific local subject, ISBD, religion, PKN, and Pancasila, the other way is inserting values to all subjects, or in another word formally unified into each faculty. Spiritual refreshment at the beginning of the learning process can be the method before getting into core subject. This should be performed in every learning process every time. Then, in relation to character development values through curricular, the most important is performing all course by obligating proper Course Events Unit. In some cases, many lecturers fail to remember teaching planning, more or less standard of content, and competency standards. Therefore, by well-prepared curriculum and tutorial, the result would be remarkable. Student Center Learning (SCL) should not be forgotten in the process of character education, students are getting more active than lecturer, they studying material and doing presentation to have a space for discussion, here we can develop values, patient, respecting opinions, politeness, skills to argue, the way of good communication is less seen in our current students.

In addition to curricular, actualizing local wisdom value can also be performed through extracurricular. The strategy: first, creating a group study. This group study is required in any program or faculty. In this group study, the interaction will be intensively present between each other, they will learn awareness to each other, and they will learn how to appreciate others, compete fairly. Second, by inviting students to participate in a seminar and general lecture. Third, provide regular training on each semester to all students. The training means leadership training, entrepreneurial training and etc. As for an extra-curricular activity, those training mainly required and expanded in university. Actually, extra-curricular activities can also very effective as a medium of internalization for local wisdom values. Research findings have also proved that standard operational procedure (SOP) is important in the implementation of extracurricular activities.

Then, actualizing strategy for local wisdom through co-curricular activities should be carried out, the strategy is: first: by assessment (evaluation), lecturer provides a special award for students to get involved in co-curricular activities, awarding them 10 percent of student total grade. This system has never applied so far. Thus, students will often engage in co-curricular activities, and they will learn more in many aspects related to their character formation, discipline, cooperation, and honesty in the team. Second, expanding dedication activities, this can be performed during vacation. Students will learn more about empathy and sympathy as well as responsibility to look down at phenomena in the field. Therefore, those three activities: curricular, extracurricular, and co-curricular are the strategy to actualize local wisdom values in Syiah Kuala University in order to strengthen student’s character.

There are at least three models of approach or method that is applied in the process of actualizing local wisdom value: (a) integrative model, (b) complement model, and (c) discrete model (separate). First, integrative model, character implementation is attached and integrated
into curricular programs, curriculum, and existing courses or even the learning the process. Curricular programs or courses should contain character values. This model requires the keenness and high ability from the teacher. S/he is required to be creative, full of initiative, and fully loaded with ideas. Teachers must be smart and clever to plan and outlining the curriculum, manage to learn, and developing awards. Despicable is a plus for this model since it is not charged expensive fare and no need to add lecturer.

Second, complement model or character implementation, which is inserted into the curricular educational program and existing curriculum structure rather than courses. The implementation of this model can be performed by adding characters subject as local content in curriculum structure. This Model requires an extra specific time, additional lecturers and requires expensive fares. In addition, this model can burden students and lecturers since it needs higher financial and implicate the institution. However, this model can be optimally and intensively used to build a student’s character. Third, the discrete model, separated implementation character, divided and released from curricular programs or courses. Its implementation could be packaged and served specifically to the student. Its presentation could be related to the curricular program or could be extracurricular. The model requires excellent preparation, expensive fare, and school preparedness. This model also requires good planning to prevent miss-application; however, this model still can be used to create learner’s character comprehensively and relieved.

From all these three models, the complement model is generally used to actualize local wisdom values at Syiah Kuala University, which allows local subject course in addition to particular courses such as religious education, ISBD, and PKN. It is possible due to special autonomy that allows adding local course content as far as not interfering national curriculum system. Then, a special institution with a default structure is required: there should be a Chairman who serves as coordinator with a number of staff, not so many, the most important is the Expert Council which consist of representative from faculties, the Dean from faculties, and one person that is selected from each faculty in accordance to the Track record. The Institution should be directly under the rector.

4 Conclusion

Following on field data collection and the discussion, it can be summarized that:

1. There are three sources of Acehnese local wisdom that can be formulated as fundamental to strengthen student’s character at Syiah Kuala University.

2. Implementation strategy of character education is performed through curricular activities: religious subject, ISBD, PKN, and local content course which able to be included in any new course program. While the implementation of character education through extracurricular activities and co-curricular can also be carried out with full responsibility by a Standard Operational Procedure (SOP).

According to this research, suggestions have been formulated as follows:

1. University needs to insert a character education program in the annual budget. The financial stimulus is required in terms of character education to support and have optimal character education program.

2. University and faculty, as well as study program, should commit clearly to implement character education program at Syiah Kuala University.

Together, the University and technical implementation unit should monitor and evaluate the implementation process of character education.
REFERENCES

Effect of Characteristics of Health Worker in Sub Distric Public Health Centre and Endicimity Status to Preparedness in Facing Outbreak of Dengue Hemorrhagic Fever in Banda Aceh City

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Abstract. The increase in incidence and affected region of dengue hemorrhagic fever (DHF) in Banda Aceh poses a high risk for health disaster or outbreak. Incidence of DHF in Banda Aceh tends to increase every year. Free-flick number in 11 sub-districts within Banda Aceh city are yet 69.1%, far lower than the national standard. Thus, the preparedness of health workers in sub-district public health center dealing with health disaster due to DHF must be improved. This study aims to analyze the effect of the characteristics of health workers working in the sub-district public health center and endemicity status to preparedness in the face of DHF outbreaks in Banda Aceh City. The research design used was an analytical survey with a sample of all health workers in 11 (eleven) health centers in the city of Banda Aceh, totaling 165 people. Data collection was done using a questionnaire and analyzed by univariate, bivariate and multivariate. The results showed that gender, length of service and training partially related to preparedness of health workers in dealing with DHF outbreaks. It was found that gender, job title, duration of duty and training is partially related to the preparedness of health workers in dealing with DHF outbreaks. The analysis results from binary logistic regression show that age, duration of duty and training are significant predictors of the preparedness of health staff in the Public Health Centre in dealing with DHF outbreaks. The result also shows that the older the health worker age, the more prepared in dealing with DHF outbreak. Similarly, the longer duration of duty the better prepared the health workers on the face of DHF outbreak. It was also found that training is the most dominant predictor affecting the preparedness of health workers in dealing with DHF outbreak. Based on these results, it is suggested to Banda Aceh Health Office to facilitate and advocate training activities related to DHF countermeasure by providing the necessary budget. It is also suggested that the transfer of medical workers should consider and maintain employee with long duration of duty due to their experiences in facing the DHF outbreak.

Keywords: Characteristics of health workers, endemicity, preparedness, health workers, DHF outbreaks
1 Introduction

World Health Organization (WHO) has classified disaster into 3 categories, namely (1) natural disaster, (2) non natural disaster, and (3) social disaster. A non natural disaster is a disaster caused by an event or a series of events of non-natural origins such as the event of a health disaster in the form of a disease outbreak [1]. One disease that has the high potential to become a health disaster is Dengue Hemorrhagic Fever (DHF). DHF is an endemic disease caused by arboviral with significantly increased morbidity and mortality in tropical and subtropical regions all over the world [2].

DHF incidence increases 30 folds and expands geographically into new countries including urban and rural areas. Nowadays, there are approximately 2.5 billion people or more than 40% of the world population poses a high risk for DHF. WHO reported that there are 50 to 100 millions DHF incidences in the whole world every year. DHF disease initially an epidemic occurred in nine countries in 1970. However, nowadays DHF is become epidemic in more than 100 countries spreading from Africa, America, East Mediterranean, South East Asia to West Pacific. America, South East Asia, and West Pacific regions are the most seriously affected regions. DHF cases all over America, South East Asia, and West Pacific regions has exceeded 1.2 million cases in 2008 and over 2.3 million cases in 2010. A recent report shows that the number of DHF case is continuously increasing. It was reported just in America, there are 1.6 million dengue fever cases occurred and 49.000 cases are severe DHF in 2010 [2].

It was reported that there 100.347 DHF cases with death toll of 907 persons (Incidence Rate (IR)/morbidity= 39,8 per 100.000 population and Case Fatality Rate (CFR)/mortality= 0,9%) in Indonesia on 2014 (Kemenkes, 2015) and it increases to 129.650 cases with death toll of 1.071 persons (IR/morbidity = 50,75 per 100.000 population and CFR/mortality= 0,83%) on 2015. Even it increased significantly in 2016 reaching 204.171 cases with a death toll of 1.598 persons. IR also increases as compared to 2015, namely from 50,75 per 100.000 population to 78,85 per 100.000 population. However, CFR due to DHF decreases from 0,83% to 0,78% (Kemenkes, 2017). The target of the strategic plan of the Indonesian Health Ministry for the morbidity of DHF in 2015 is < 49 per 100.000 population, meaning Indonesia has yet reached the target of the 2015 strategic plan.

Data from Aceh Public Health Office shows DHF incidence in Aceh in 2014 was 2.211 cases and death toll was 7 persons (IR/mobility = 45 per 100.000 population). The number of DHF incidence in 2015 was 1.510 cases with a dead tool of 6 persons (IR/morbidity = 30 per 100.000 population and CFR/mortality = 0,4%), showing a decrement as compared 2014 [3] However, it reached 2.643 cases on 2016, boldly increases, about 70% from 2015. The death toll also increases largely, from 6 persons in 2015 to 19 persons in 2016.

While in Banda Aceh city, there are 299 DHF cases in 2014, however, there was no death (Dinkes Kota Banda Aceh, 2015). There are only 127 DHF cases in Banda Aceh in 2015, significantly decrease as compared to 2014. There was one person died in 2015 [3]. DHF incidence in Banda Aceh city again increases in 2016, reaching 152 cases as compared to 2015. But there was no death. Similarly, it again increases significantly in 2017, reaching 236 cases. Furthermore, the average value of flick free, called larva free numbers (Angka Bebas Jentik, ABJ in Indonesian) on 2017 in 11 sub-districts within the city of Banda Aceh was only 69,1%, still far away from the national standard, namely ≥95%. This means that on average in sub-districts in the city of Banda Aceh there are still many larvae of dengue mosquitoes [3].

The increase in cases and the extent of the spread of DHF in the city of Banda Aceh has the potential to be a non-natural disaster, namely health disaster (outbreaks). Regulation from
Minister of Health of the Republic of Indonesia Number 82 on 2014 concerning Prevention of Communicable Diseases states that outbreaks are the occurrence or increase in the incidence of morbidity and/or death that is epidemiologically meaningful in an area over a period of time, and is a condition that can lead to outbreaks [5].

Based on the principle of disaster risk assessment proposed by the United Nations International Strategy for Disaster Reduction [6], namely the existence of hazards in the form of the growth of dengue mosquito larvae that are evenly distributed in each sub-district indicated by an average value of free flick number is still low (69.1% <95%), there is very high potential for outbreaks. Furthermore, there is also the vulnerability of the community to be affected by DHF which is indicated by an increase in the number of DHF cases in Banda Aceh every year. Thus, Banda Aceh city poses a very high risk to outbreaks or extraordinary events (called kejadian luar biasa, KLB in Indonesian) if no serious handling measures are carried out [7].

The risk of non-natural disasters in the form of health disasters that may occur due to DHF disease in Banda Aceh City can actually be reduced. One way is to increase the preparedness of health workers in the sub-district public health center, Puskesmas, to deal with the possibility of DHF outbreaks. The Health Office of Banda Aceh City through each sub-district public health center has made efforts to reduce the risk of health disaster due to DHF outbreak, such as mobilizing the potential of the community to participate in activities for eradication of mosquito nests, called pemberantasan sarang nyamuk, PSN in Indonesian, including 3M plus, namely close (menutup), drain (menguras) and bury (mengubur). with 3M Plus. However, the number of DHF cases in Banda Aceh City is still high [8].

Several studies have proven the importance of health workers’ preparedness for facing disasters. Ogedegbe, Nyirenda, DelMoro, Yamin, & Feldman [9] showed that most of the 5,790 health workers surveyed, namely 79% strongly agreed that they knew what to do in the event of a disaster and the majority were willing to work in the event of a disaster. Clinical health workers are significantly better prepared than non-clinical health workers to deal with disasters. Older health workers are better prepared compared to young age.

Desai, Doke, & Mohanty [10] showed a positive attitude towards the disaster planning process from the health workers and the majority of health workers had preparedness for future emergency situations. Health workers need training related to disaster preparedness. Furthermore, [11] found that 51.4% of health workers in the sub-district public health center (Puskesmas) have good disaster preparedness. Variables that relate to the preparedness of health workers for disasters are knowledge, attitudes and fixed procedures.

Considering the data and phenomena described above, the government of Banda Aceh City needs to improve the preparedness of the sub-district public health center, Puskesmas, to the risk of health disasters due to the outbreak of DHF. The preparedness of the sub-district public health center, Puskesmas, is reflected in the preparedness of health workers at the health center. Thus, the purpose of this study is to analyze the effect of the characteristics of health workers in the sub-district public health center, Puskesmas, and endemicity status to preparedness in the face of DHF outbreaks in Banda Aceh City.

2 Research Methodology

This research is analytic survey research. Samples were selected by purposive sampling method, namely health workers in charge of DHF prevention (doctors, nurses, sanitarians, surveillance, laboratory staff, and health promotion officers) in the sub-district public health center, Puskesmas, within the Banda Aceh City area of 165 people. Instruments for collecting data in the form of questionnaires that measure the characteristics of health workers (age, sex, education, position, length of service and training), endemicity status and preparedness of health
workers for DHF outbreaks. The results of data collection were analyzed by univariate, bivariate and multivariate.

3 Research Result

3.1 Characteristics of Health Workers

Characteristics of health workers in the sub-district public health center, *PUSKESMAS*, studied in this research are age, sex, education background, length of service and training.

<table>
<thead>
<tr>
<th>No</th>
<th>Characteristics</th>
<th>Frequency (f)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a.</td>
<td>Old</td>
<td>80</td>
<td>48.3</td>
</tr>
<tr>
<td>b.</td>
<td>Young</td>
<td>85</td>
<td>51.7</td>
</tr>
<tr>
<td>2</td>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a.</td>
<td>Male</td>
<td>12</td>
<td>7.3</td>
</tr>
<tr>
<td>b.</td>
<td>Female</td>
<td>153</td>
<td>92.7</td>
</tr>
<tr>
<td>3</td>
<td>Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a.</td>
<td>Graduate</td>
<td>32</td>
<td>19.7</td>
</tr>
<tr>
<td>b.</td>
<td>Diploma</td>
<td>133</td>
<td>80.3</td>
</tr>
<tr>
<td>4</td>
<td>Length of Duty</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a.</td>
<td>Old</td>
<td>85</td>
<td>51.7</td>
</tr>
<tr>
<td>b.</td>
<td>New</td>
<td>80</td>
<td>48.3</td>
</tr>
<tr>
<td>5</td>
<td>Training</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a.</td>
<td>Yes</td>
<td>78</td>
<td>47.0</td>
</tr>
<tr>
<td>b.</td>
<td>No</td>
<td>87</td>
<td>53.0</td>
</tr>
</tbody>
</table>

Table 1 shows that the characteristics of health workers in the sub-district public health center, *PUSKESMAS*, within the Banda Aceh City, namely 85 people (51.7%) are young, 153 people (92.7%) women, 133 people (80.3%) with Diploma level education, 85 people (51.7%) have been serving in the sub-district public health center, *PUSKESMAS*, for a long time and 87 people (53.0%) have never received training in disaster and emergency.

3.2 Endemicity Status

The measurement of endemicity status in the area in the city of Banda Aceh was based on the criteria for the number of cases and deaths from DHF for 3 consecutive years. The results of the analysis of the endemicity status of DHF in the city of Banda Aceh can be seen in Table 2.

<table>
<thead>
<tr>
<th>No</th>
<th>Endemicity</th>
<th>Frequency (f)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Endemic</td>
<td>151</td>
<td>91.7</td>
</tr>
<tr>
<td>2</td>
<td>Sporadic</td>
<td>14</td>
<td>8.3</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>165</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 2 shows that according to health workers most people or 151 people (91.7%) stated that the city of Banda Aceh is an endemic area of DHF.
3.3 Preparedness of Health Workers

The measurement of preparedness of health workers at the sub-district public health center, *Puskesmas*, in dealing with DHF outbreaks in Banda Aceh City uses an instrument adopted from LIPI-UNESCO/ISDR (2006)[12], which includes knowledge and attitudes, policies and guidelines, emergency response plans, early warning systems, and resource mobilization. The results of the analysis of the preparedness of health workers in dealing with DHF outbreaks are as follows:

<table>
<thead>
<tr>
<th>Preparedness</th>
<th>Siap</th>
<th>%</th>
<th>Tidak Siap</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Knowledge</td>
<td>67</td>
<td>40.7</td>
<td>98</td>
<td>59.3</td>
</tr>
<tr>
<td>2. Preparedness Plan</td>
<td>69</td>
<td>42.0</td>
<td>96</td>
<td>58.0</td>
</tr>
<tr>
<td>3. Warning System</td>
<td>60</td>
<td>36.3</td>
<td>105</td>
<td>63.7</td>
</tr>
<tr>
<td>4. Resource Mobility</td>
<td>79</td>
<td>48.0</td>
<td>86</td>
<td>52.0</td>
</tr>
<tr>
<td>5. Policy</td>
<td>69</td>
<td>41.7</td>
<td>96</td>
<td>58.3</td>
</tr>
<tr>
<td>6. Preparedness</td>
<td>76</td>
<td>46.3</td>
<td>89</td>
<td>53.7</td>
</tr>
</tbody>
</table>

Table 3 shows that most people or 98 people (59.3%) health workers in the sub-district public health center, *Puskesmas*, were not prepared in terms of knowledge about DHF outbreaks. Furthermore, it was also known that 96 people (58.0%) health workers were not ready in the emergency preparedness plan of the DHF outbreak. A total of 105 people (63.7%) health workers were not prepared in the event of an emergency warning system for DHF outbreaks. The mobility aspect of health personnel is also not ready, as many as 86 people (52.0%) and as many as 96 people (58.3%) health workers are not prepared in terms of the DHF outbreak preparedness policy. In general, the preparedness of health workers in the sub-district public health center, *Puskesmas*, in Banda Aceh City is in the category of unprepared, which is as many as 89 people (53.7%).

3.4 Bivariate Analysis

Analysis to determine the relationship between health worker characteristics and endemicity status with the preparedness of health workers in dealing with DHF outbreaks was conducted using a chi-square test. The results of the analysis can be seen in Table 4. Table 4 shows that out of 80 health workers who are old, most of them, namely 46 people (57.5%) are not ready to face DHF outbreaks. Furthermore, from 85 health workers who were young, the majority or 43 people (50.6%) were also not ready to face the DHF outbreak. The results of the analysis show that $P = 0.356 > 0.05$ so that Ho is accepted which means that there is no relationship between age and health workers' preparedness in dealing with DHF outbreaks in Banda Aceh City. Furthermore, it was also known that out of 12 health workers with male sex, the majority or 9 people (72.7%) were ready to face the DHF outbreak. Furthermore, out of 153 health workers with female sex, most of the 86 people (56.0%) were not ready to face the DHF outbreak. The results of the analysis show that $P = 0.013 < 0.05$ so that Ho is rejected, which means there is a relationship between gender and preparedness of health workers in dealing with dengue outbreaks in Banda Aceh City.
Table 4. Results from Bivariate Analysis

<table>
<thead>
<tr>
<th>Variable</th>
<th>Preparedness</th>
<th>Total</th>
<th>A</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ready</td>
<td>%</td>
<td>Not Ready</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>%</td>
<td>F</td>
<td>%</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Old</td>
<td>34</td>
<td>42.5</td>
<td>46</td>
<td>57.5</td>
</tr>
<tr>
<td>2. Young</td>
<td>42</td>
<td>49.4</td>
<td>43</td>
<td>50.6</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Male</td>
<td>9</td>
<td>72.7</td>
<td>3</td>
<td>27.3</td>
</tr>
<tr>
<td>2. Female</td>
<td>67</td>
<td>44.0</td>
<td>86</td>
<td>56.0</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Graduate</td>
<td>18</td>
<td>55.0</td>
<td>14</td>
<td>45.0</td>
</tr>
<tr>
<td>2. Diploma</td>
<td>58</td>
<td>43.9</td>
<td>75</td>
<td>56.1</td>
</tr>
<tr>
<td>Length of Duty</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Long</td>
<td>48</td>
<td>56.7</td>
<td>37</td>
<td>43.3</td>
</tr>
<tr>
<td>2. New</td>
<td>28</td>
<td>54.8</td>
<td>52</td>
<td>45.2</td>
</tr>
<tr>
<td>Training</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Yes</td>
<td>41</td>
<td>52.2</td>
<td>37</td>
<td>47.8</td>
</tr>
<tr>
<td>2. No</td>
<td>35</td>
<td>40.6</td>
<td>52</td>
<td>59.4</td>
</tr>
<tr>
<td>Endemicity Status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Endemic</td>
<td>69</td>
<td>45.8</td>
<td>82</td>
<td>54.2</td>
</tr>
<tr>
<td>2. Sporadic</td>
<td>7</td>
<td>50.0</td>
<td>7</td>
<td>50.0</td>
</tr>
</tbody>
</table>

Table 4 also shows that out of 32 health workers with undergraduate education, the majority or 18 people (55.0%) were ready to face the DHF outbreak. Furthermore, from 133 health workers with Diploma level education, the majority or 75 people (56.1%) were not ready to face DHF outbreaks. Next, the results of the analysis show that P = 0.148 > 0.05 so that H₀ is accepted which means there is no relationship between education and preparedness of health workers in dealing with DHF outbreaks in Banda Aceh City. The length of service for health workers based on the table above shows that out of 85 health workers who have been on duty for a long time, most of them (48.7%) have the readiness to face DHF outbreaks. Furthermore, the 80 new health workers on duty, most or 52 people (59.4%) were not ready to face the DHF outbreak. The results of the analysis showed the value of P = 0.0001 <0.05 so that H₀ was rejected which means there is a relationship between the length of service and the preparedness of health workers to the face of DHF outbreaks in Banda Aceh City.

Furthermore, it was found that out of 78 health workers who received training, the majority or 41 people (52.2%) were ready to face the DHF outbreak. Then from 87 health workers who did not get training, most or 52 people (59.4%) were not ready to face the DHF outbreak. The results of the analysis show that P = 0.028 <0.05 so that H₀ is rejected which means that there is a relationship between training and preparedness of health workers in dealing with DHF outbreaks in Banda Aceh City. Endemicity status also showed that of 151 health workers who stated the status of their working area was DHF endemic areas, most or 82 people (54.2%) were not ready to face DHF outbreaks. Furthermore, from 14 health workers who stated that the status of their working area was sporadic in DHF, the majority or 7 people (50.0%) were also not ready to face the DHF outbreak. The results of the analysis show that P = 0.838 > 0.05 so that H₀ is accepted which means there is no relationship between endemicity status and preparedness of health workers in dealing with DHF outbreaks in Banda Aceh City.
3.5 Multivariate Analysis

Multivariate analysis using the Binary Logistic Regression test using the Stepwise method. The repeated analysis was carried out by issuing insignificant variables from the model. The results of the analysis of the last model from the Binary Logistic Regression test using the Stepwise method can be seen in the table below.

<table>
<thead>
<tr>
<th>Predictor</th>
<th>B</th>
<th>OR</th>
<th>P Value</th>
<th>95% CI  Lower</th>
<th>95% CI  Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>1,333</td>
<td>3.792</td>
<td>0.002</td>
<td>1.656</td>
<td>8.681</td>
</tr>
<tr>
<td>Length of Duty</td>
<td>1,215</td>
<td>0.297</td>
<td>0.007</td>
<td>0.123</td>
<td>0.715</td>
</tr>
<tr>
<td>Training</td>
<td>1,795</td>
<td>6.021</td>
<td>0.0001</td>
<td>3.335</td>
<td>10,870</td>
</tr>
</tbody>
</table>

Table 5 shows the results of the analysis of the Binary Logistic Regression test using the Stepwise method for the last model. These results indicate that the age variable (P-value = 0.002), position (P value = 0.0001), duration of service (P-value = 0.007) and training (P-value = 0.0001) are significant predictors of preparedness of health workers in the face of the DHF outbreak. It was found that the older the age of health workers, the better prepared to deal with DHF outbreaks. The longer the health staff is on duty, the more prepared they will be in facing DHF outbreaks and the more often the health workers attend training, the more prepared they will be in dealing with DHF outbreaks. The results of the Binary Logistic Regression with the Stepwise method also showed that training was the most dominant predictor affecting the preparedness of health workers in dealing with DHF outbreaks (OR: 6.021) after being controlled by age (OR: 3.792) and length of time (OR: 0.297). Training affects preparedness as much as 6.021 or 6 times, age affects preparedness as much as 3.792 or 4 times and the duration of duty affects preparedness 0.297 or 0.3 times.

4 Discussion

The results showed that there was no relationship between age and health personnel preparedness in dealing with dengue outbreaks in Banda Aceh City (P = 0.356). These results are in line with what was reported by Wahidah (2016), there is no relationship between age and disaster preparedness. Cornell, Cusack, & Arbon [14] said that older people are considered to lack of preparedness for disaster events. This is related to a decrease in physical function that will affect dexterity and speed and the thought process when a disaster occurs. In contrary, Najafi, Ardalan, Akbarisari, Noorbala, & Jabbari [15] said older people have more experience in dealing with previous disasters. Experience significantly influences disaster preparedness behavior on someone.

Robbins & Coulter [16] said that age will affect one's physical, mental, workability, and responsibility. Drucker [17] said that older people are not as effective as young people in carrying out certain tasks. As with disaster preparedness, younger people are usually better prepared than older people. This is mainly because the body of older people is not as strong as the young to perform certain tasks efficiently. But Bolden [18] said there are some important differences between older people and those who are psychologically younger. On certain tasks, older people can do better than younger ones because of experience. Preparedness for disasters is also closely related to the experience of facing previous disasters. Older people are usually better prepared to face disasters because they have enough experience.
Based on the above description, it is known that the results of this study differ from several theories and other studies. Many factors basically cause differences in these results. Preparedness of health workers in dealing with DHF outbreaks is a form of performance of health workers at the sub-district public health center, Puskesmas. The performance of a health worker is actually influenced by many other factors. Sharma, Webster, & Bhattacharyya [19] stated that the motivation and performance of health workers in the community is influenced by various factors that arise from the complex context in which he/she works. This includes various personal factors (such as age), professional factors (training, job security) and organizational factors (infrastructure) along with other factors that arise from the external work environment. Referring to several differences of opinion, namely younger people have preparedness for disasters due to physical and performance factors but older people also have disaster preparedness because of experience, researchers assume that age is not a variable that significantly related to the preparedness of health workers in the sub-district public health center, Puskesmas in dealing with DHF outbreaks in the city of Banda Aceh. There are other factors that significantly relate to the preparedness of these health workers.

The results of this study also indicate that there is a relationship between gender and preparedness of health workers in dealing with DHF outbreaks in the city of Banda Aceh (P = 0.013). Regarding disaster preparedness issues and their relationship to gender, Mehta [20] stated that men are better able to respond in crisis or disaster situations compared to women. It is said that there is an assumption that men are physically and emotionally stronger in disaster preparedness as compared to women. Čvetković, Roder, Ōcal, Tarolli, & Dragićević [21] also said that men appear to be more confident in their abilities in disaster preparedness. However, women show a deeper understanding of disaster preparedness. Perhaps because of a deeper level of understanding, women show attitudes and behaviors that are more concerned with disaster preparedness. Furthermore [21] said that the low level of disaster preparedness was related to lower capacity and willingness to protect. Men have a higher tendency to take precautionary measures and higher knowledge about disaster preparedness. Conversely, women are caused because their main focus on child care and household responsibilities rather than work cause women to be less prepared for disaster.

Women carry out many activities related to emergency preparedness. It is also noted that women are excluded from emergency planning and preparedness decisions in developing countries. Basically, women and men carry out different preparedness activities and women are mostly not presented in formal emergency preparedness [22]. Research conducted by Ogedegbe [9] gave results that 77% of health workers studied were women. Seventy-nine percent of health workers know what to do in the event of a disaster, and the majority are willing to respond in the event of a disaster. The most common obstacle for women health workers in responding to disasters is because they have to care for children. Based on the above description, it is known that men and women have differences in preparedness in the face of disasters. Therefore researchers assume that the sex of health workers influences preparedness in the face to DHF outbreaks.

The results of the next study showed that there was no relationship between education and preparedness of health workers in dealing with DHF outbreaks in Banda Aceh City (P = 0.148). The results of this study are different from the opinions expressed by Muttarak & Pothisiri [23], namely that formal education has a positive relationship with the act of taking preparedness against disasters. Preparedness actions are influenced by various factors. Risk perception is strongly related to disaster preparedness because individuals must see risks to be motivated to initiate preparedness actions. Previous individual experiences with hazardous events can improve risk perception and promote preparedness actions. Other factors that influence
preparedness behavior vary greatly with socio-economic and demographic characteristics. Individuals from different social groups receive and evaluate risk information differently and have unequal resources to carry out preparedness measures.

The results of this study are also different from the opinions expressed by Kasika [24], namely that education qualifications have a significant effect on work performance. The higher the level of education, the more the effect of education level and skills on job performance. Related to the preparedness of health workers for disasters, the higher the education of health workers, the higher their preparedness for disasters. The study put forward by Teddy [25] on factors related to the performance of health workers in the Seberang Padang Health Center Padang Selatan District, Padang City showed results that were in line with this study. The study conducted by [25] revealed that there was no significant relationship between the level of education and job training with the performance of health workers. Regarding the preparedness of health workers for disasters, the higher the education, the higher the preparedness of these health workers for facing disasters. Kotur & Anbazhagan [26] studied the influence of education and work-experience-Influence to job performance and found that the performance shown by health personnel varies due to their educational qualifications. The general trend is that with increasing educational qualifications, the performance of health workers will decline. Based on the description above which is in line with this research, the researcher assumes that the education background of health workers in the sub-district public health center, Puskesmas, is not related to preparedness in dealing with DHF outbreaks in Banda Aceh City.

The results of the next study were that there was a significant relationship between the length of time served with the preparedness of health workers in dealing with DHF outbreaks in Banda Aceh City (P = 0.0001). The working period is related to the experience of health workers in dealing with disasters (DHF outbreaks). Hoffmann & Muttarak [27] said that in addition to education, previous disaster experience is another key factor that determines disaster preparedness behavior. Health workers who have long worked at the sub-district public health center, Puskesmas, certainly have a lot of experience in dealing with DHF outbreaks so they have more preparedness than those who have just worked. Furthermore, Hoffmann & Muttarak [27] said that someone who has faced a disaster in the past will learn about potential harmful impacts and consequently be better prepared for future disaster events. Theoretically, a person's experience of disasters previously can affect preparedness behavior through channels similar to education. Hazard awareness and risk perception, for example, are closely related to previous disaster experiences. Seeing or feeling the impact of a disaster can increase awareness about the potential for destruction, show the benefits of preparation and evacuation, and increase knowledge about how to recover afterward and how to overcome the threat of further disasters [27].

The working period of health workers in dealing with DHF outbreaks at the sub-district public health center, Puskesmas, will affect their preparedness for the outbreak of DHF. This is related to the experience of health workers in overcoming DHF outbreaks that have occurred in their working area in the past. Becker, Paton, Jhonston, Ronan, & McClure [28] said that experience has seven different influences on the preparedness process including encouraging thinking and speaking; increasing awareness and knowledge; helping individuals understand the consequences of a disaster; developing trust; developing preparedness; affecting emotions and feelings; and encouraging someone's interaction about disaster issues.

Kiongo [29] also said that understanding the dimensions of disaster preparedness was found to be related to the work experience of health workers. This is consistent with research conducted in the Caribbean about the vulnerability of hospital staff to disasters which shows that there is a relationship between preparedness and work experience. A number of studies also
show this relationship. Work experience in a risk environment leads to response predictions. Prediction is part of disaster mitigation. Mohammad-pajooh & Aziz [30] argues that past experience can improve preparedness for disasters, because it affects someone to get more information about disasters and inform someone about the possibility of similar events in the future and as a result increases disaster preparedness. Seeing the effect of years of work through one's experience in facing disasters, the researchers argue that the length of duty or work period will affect the preparedness of health workers in the sub-district public health center, Pukesmas, in dealing with dengue outbreaks depends on experience and motivation at work.

The results of other studies are that there is a relationship between training and preparedness of health workers in dealing with DHF outbreaks in the city of Banda Aceh (P = 0.028). The results of this study are in line with the research conducted by Hely [31], about the influence of knowledge and training on earthquake disaster preparedness training on the preparedness of health workers. The study shows that knowledge and training have a relationship and influence on earthquake disaster preparedness. However, this research is in line with the research conducted by Husna [11] on factors associated with the preparedness of health center workers in the face of earthquake and tsunami disasters in the city of Padang. The study showed that there was no relationship between training and preparedness of health workers at the sub-district public health center, Puskesmas (P = 0.375).

Cotanda, Martines, Maza, & Cubells [32] found that disaster management training programs significantly increased knowledge about disaster preparedness. Health workers feel more prepared to face disasters after the training program (15.5% vs 41.8%, P <0.001). However, Karanci, Aksit, & Dirik [33] said that disaster training participants had a higher perception of the threat of disasters than those who did not attend training. An important issue of disaster awareness training is motivating individuals to take appropriate action. Thus, the trainees have been involved in more significant preparedness behaviors.

Alim, Kawabata, & Nakazawa [34] said that training proved to be effective in increasing disaster preparedness knowledge and abilities for health workers. Juanita, Suratmi, & Maghfiroh [35] also said that basic disaster management training and simulation training were more effective in increasing disaster preparedness for health workers. The attitude of disaster preparedness to health workers can be influenced by their experience in facing and participating in disaster events or disaster simulations. Changes in the attitude of health workers can be mediated by simulation experiences that enable deep and meaningful learnings. Based on the description above, it can be assumed that the training on disaster for health workers in the sub-district public health center, Puskesmas, contributed greatly to the preparedness of health workers in dealing with dengue outbreaks in Banda Aceh City.

The next results of this study showed that there was no relationship between endemicity status and the preparedness of health workers in dealing with DHF outbreaks in Banda Aceh City (P = 0.838). The results of this study are different from the opinions expressed by Yanagisawa, Wada, Spengler, & Sanchez-Pina [36] namely the preparation for the emergence of the threat of infection is very important given the nature of infectious DHF disease. The pragmatic approach that must be taken is to have a preparedness plan so that health workers together with the community know how to recognize the symptoms and how to respond. WHO [2] further said that the human resource capacity of health workers must exist to effectively implement DHF prevention and control programs. The development of skills, processes, and resources of health personnel is needed in the field of case identification, case management, diagnostics, supervision, vector control, risk communication, surge and outbreak management, and evaluation.
WHO [1] states that emergency preparedness and contingency planning must be explicitly included in DHF monitoring and control policies. These policies must be reviewed regularly. Emergency preparedness and response are often ignored by health workers and policy makers. When the dynamics of DHF activity is known, the timing of response activities can be adjusted by health workers to maximize their effectiveness. In DHF endemic areas, activities that must be carried out by health workers can be grouped into activities that must be made continuously, activities that must be conducted during epidemics, and activities that must be carried out in the post-epidemic period. Different activities and approaches may be needed in areas where DHF occurs sporadically and in areas with DHF fever at risk of transmission.

Zaputri, Sakka, & Paridah [37] shows that the results of the countermeasure program for DHF are considered quite good. In the evaluation of inputs it was considered good enough, but the availability of personnel was still lacking. Process evaluation is considered good because it is in accordance with the program plan, but it needs to be improved in the process of epidemiological investigation activities which still have a number of obstacles related to incomplete patient data resulting in officers being late in responding to case reports. Output evaluation is considered good because almost every activity has reached a predetermined and proven target with the number of DHF sufferers decreasing from the previous year. Based on the results of the discussion above, the researchers assumed that endemicity status did not improve the preparedness of health workers in the sub-district public health center, Puskesmas, in the face of DHF outbreaks in Banda Aceh City. There are contributions from other technical factors such as the availability of trained health personnel and adequate facilities and infrastructure.

The results of the logistic regression analysis showed that age (P = 0.0001), duration of duty (P = 0.0001) and training (P = 0.0001) were the most significant predictors of preparedness of health workers in the sub-district public health center, Puskesmas, in dealing with DHF outbreaks. The training was the most dominant predictor affecting the preparedness of health workers in dealing with DHF outbreaks (OR: 4.954) after being controlled by age (OR: 2.610) and length of time (OR: 0.145). The results of this study are just in line with those proposed by Kiongo [29], namely there is a significant relationship between age, disaster management training, experience and level of awareness with disaster preparedness on health workers. Mohammad-pajooh & Aziz [30] also said in his research that the majority of social demographic indicators such as income, education, age, and property ownership showed a significant contribution to variations in disaster preparedness. For example, men are far more prepared than women; High levels of income and education also have a much higher readiness compared to those who have low income and education levels. The race is the only different factor from the findings of previous studies; because race does not affect preparedness.

Najafi et al.[15] said something different, namely the monthly income level, previous disaster experience, housing, and employment districts were demographic factors that significantly affected disaster preparedness. However, disaster preparedness is not influenced by gender, education level, number of household members, type of house, house ownership and being the head of the household. Other studies such as those conducted by Wahidah [13] found that there is a relationship between age, length of work, previous disaster experience, experience in refugee camps, self-regulation, health service atmosphere (p <α = 0.05). From the multivariate analysis, it is known that the length of the work factor is the one that most influences nurse preparedness (p = 0.020). These results indicate that the duration of work affects nurse preparedness.

Chan, Yue, Lee, & Wang [38] showed that middle-aged (40-64 years) and higher education are related to disaster preparedness. In addition, higher education, high income, and experience
in work affect disaster preparedness. In addition, the older age group (40-64 years) has a higher preparedness compared to the young age group (15-39 years). Cvetković et al [21] said that demographic factors that are considered to have the most influence on disaster preparedness. Disaster preparedness varies depending on factors such as the type of disaster, location and time. The risk of death can vary by age and sex in different ways in each disaster. Demographic characteristics of the health worker are clear indicators of community risk perceptions. Disaster preparedness correlates with certain socio-demographic variables such as income, gender, education and age of the individual.

5 Conclusion

The preparedness of health workers in the sub-district public health center, Puskesmas, in dealing with DHF outbreaks in the city of Banda Aceh was strongly influenced by individual characteristics such as age, gender, position, length of duty and training. The older the age of health workers in the sub-district public health center, Puskesmas, the more ready they will be in dealing with DHF outbreaks in Banda Aceh City. The longer the health staff is on duty, the more ready they will be in dealing with dengue outbreaks in Banda Aceh City. Disaster and emergency training are very important for the preparedness of health workers in dealing with DHF outbreaks. The more often health workers attend training, the more prepared they are to deal with dengue outbreaks in Banda Aceh City.

Acknowledgments

Thank you to the respondents who participated in this study

REFERENCES


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gempa bumi kesiapsiagaan tenaga kesehatan terhadap di rumah sakit umum bunda thamrin kota medan Tahun 2013,” University of Sumatera Utara, 2014.


Spatial Analysis Of Agricultural Cultivation Area Based On Space Allocation In Gayo Lues District Spatial Planning, the Year 2012 - 2032

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Abstract. This study aimed to (1) analyze the needs and availability of cultivation space that has been allocated based on the population of Gayo Lues District until the year of 2033 and (2) analyze the suitability of cultivation space utilization patterns based on space allocation in the Gayo Lues District Spatial Plan. The research was done in Gayo Lues District, Aceh Province, from March to Oct. 2018. Gayo Lues is located at 03º 40'26" - 04º 16'55" N and 96º 43'24" - 97º 55'24" E, with an area of 554,991 ha. Materials and methods used included various thematic maps and imagery of Landsat satellites in 2016. In addition to the field observations, a survey tool in the form of a global positioning system (GPS) was used, and Arc GIS 10.4 software was used for spatial data processing. The results showed the allocation of the cultivated area until the year 2032 was 160,017 ha. This area is sufficient for the increasing population up to 2032 of 1.69% annually. However, the used space was not so uniformly distributed that we still found three sub-districts were not yet fulfilled such as Blangkejeren, Blang Pegayon, and Putri Betung since 2016, and Kuta Panjang starting in 2020. Based on the analysis of existing land use, we found a deviation of 1,482.30 ha of land use. Land use deviations occur in all subdistricts, but the most deviated one was in Blangkejaren District, Dabun Gelang and Putri Betung. The deviation occurred was mainly due to the development of Sere Wangi cultivation. Based on the agreeable forestry land (TGHK) criteria, we found the unused area of 37,000 ha of 160,017 ha, for cultivation. However, there is 50,000 ha outside the allocation of cultivation area could be used for cultivation land. It is suggested that the allocation of cultivation be revised before the year 2032.

Keywords: Cultivation Space, Adequacy And Land Availability, Land Use Deviation

1 Introduction

District of Gayo Lues Spatial Planning (RTRW) is a legal provincial/district document that allocates various provincial/district plannings[1], for Aceh Province is Qanun Aceh Nomor 19 of 2013 and Gayo Lues it is found in Qanun Nomor 15 (2013).

Base on RTRW document of Gayo Lues District is 554.991 ha. This area had allocated on noncultivated area 394.974 ha (71,17%) and the cultivated area had allocated 160.017 ha (28,83%). The population of Gayo Lues d in 2016 was 89,500 people [4], spread out in 11 sub-districts and 145 villages (Table 1).
Table 1. Allocation area, population and its density at each sub-district based on cultivation and no cultivation.

<table>
<thead>
<tr>
<th>No.</th>
<th>Sub-District</th>
<th>Allocation Area</th>
<th>Total Population</th>
<th>Population Density</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Non-cultivation</td>
<td>Cultivation</td>
<td>(person)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(ha)</td>
<td>(ha)</td>
<td>(person/ha)</td>
</tr>
<tr>
<td>1.</td>
<td>Kuta Panjang</td>
<td>21,904.95</td>
<td>5,047.77</td>
<td>8,246</td>
</tr>
<tr>
<td>2.</td>
<td>Blangkerango</td>
<td>25,633.96</td>
<td>12,607.76</td>
<td>7,176</td>
</tr>
<tr>
<td>3.</td>
<td>Blangkejeren</td>
<td>8,909.77</td>
<td>7,701.86</td>
<td>27,487</td>
</tr>
<tr>
<td>4.</td>
<td>Pari Betung</td>
<td>96,437.48</td>
<td>3,248.61</td>
<td>7,431</td>
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<tr>
<td>5.</td>
<td>Dabun Gelang</td>
<td>30,387.60</td>
<td>14,083.53</td>
<td>5,933</td>
</tr>
<tr>
<td>6.</td>
<td>Blang Pegayon</td>
<td>24,973.28</td>
<td>2,244.81</td>
<td>5,738</td>
</tr>
<tr>
<td>7.</td>
<td>Pining</td>
<td>84,699.33</td>
<td>50,359.02</td>
<td>4,861</td>
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<td>8.</td>
<td>Rikit Gaib</td>
<td>17,267.47</td>
<td>9,140.37</td>
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<td>9.</td>
<td>Pantan Cuaca</td>
<td>14,973.53</td>
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<td>Terangun</td>
<td>43,662.91</td>
<td>23,517.36</td>
<td>8,944</td>
</tr>
<tr>
<td>11.</td>
<td>Tripe Jya</td>
<td>26,179.63</td>
<td>17,533.10</td>
<td>5,521</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>394,973.91</td>
<td>160,017.17</td>
<td>89,500</td>
</tr>
</tbody>
</table>

Source: Spatial Planning (RTRW) of Gayo Lues District, 2012 – 2032

Field observation found that land use has deviated from the designated allocation of cultivation space. This is due to: (1) the community did not know clearly the boundaries of the cultivation area, (2) the land allocated for the cultivation area did not meet the needs of the farmers, both the extent and distribution, (3) the land ownership by the community for generations, because the criteria are determined as an area protected without being discussed with the concerned community, (4) farmers failed in utilizing the cultivation area properly to support their lives, (5) potential commodities were not planted according to land suitability classes and (6) commodities grown on land with suitable land suitability classes were not followed by the adoption of appropriate technology packages.

Based on the area of cultivation stated in the RTRW document and rapid development of the population of Gayo Lues, it is imperative that there is a deep evaluation of spatial adequacy based on the available area of cultivation in order Gayo Lues communities can carry out various economic activities now and future effectively and efficiently. The research objectives were to: (1) analyze the needs and availability of cultivated land that had been allocated based on the population of Gayo Lues District until the year 2032, and (2) analyze the suitability of cultivated utilization patterns based on space allocation in the Gayo Lues District Spatial Plan.

2 Materials And Methods

The study was conducted in Gayo Lues District, Aceh Province. Gayo Lues is located at: 03° 40'26" - 04° 16'55" N and 96° 43 '24" - 97° 55' 24" E, with an area of 554,991 ha. The study was conducted during March till Oct. 2018.

Maps of Gayo Lues’ earth, administration, RTRW, slope, altitude, soil type with the scale of 1: 50,000 were used in this study [5], while data of population was taken from the national statistical office [4]. The global positioning system (GPS) was used during the ground check. A spatial data processing tool Arc GIS software was used (ESRI) for existing land use. Spatial analysis was carried out at the Remote Sensing and Cartography Lab., Fac. of Agriculture, Syiah Kuala University.

The research methodology used was survey followed by descriptive analysis. The data used included primary and secondary data. Primary data was obtained through surveys and field observations, while secondary data from relevant agencies and literature studies. The population growth rate was calculated using the formula: \(\{(CBR - CDR)/BR\} \times 100\%\). To predict the population up to 2032, population data of the year 2005 and 2016 was used. Allocation of cultivation areas refers to space patterns based on the Gayo Lues RTRWK. Existing land use was obtained from the analysis of Landsat imagery in 2016. TGHK maps were obtained based on Ministry Decree Number: (SK Menteri Pertanian Nomor 837/Kpts/Um/11/1980).

The first objective was conducted by calculating of land requirement using Seomerwoto formula (Seomarwoto, 1985), we then looked at the number of individual land needs by overlaying with spatial planning of Gayo Lues district 2013-2032[3]. Furthermore, whether the land needs have been fulfilled according to the local area of the farmer (sub-district), then a comparison proceeded with the allocation of cultivation space that stipulated in the spatial planning of Gayo Lues district.

The second objective was done by analyzing irregularities in land use. We overlapped between the map of the space pattern (cultivation area) and the existing land use map. If land use deviations occur because the allocation is not fulfilled (the results of objective 1), then we proceed overlapping between the existing land use map and a map of the allocation of the cultivation area.
3 Results And Discussion

3.1 Population Growth Analysis

Based on population data from 2005 to 2016 and the projected population by 2032. Five-yearly population data for each sub-district, namely population data for 2016, 2020, 2025, 2030 and 2032 are presented in Table 2.

Table 2 shows that the population growth rate of Gayo Lues District is 1.69% (medium criteria). Gayo Lues District is isolated and far from centers of economic growth. The distance from Blangkejeren City to the center of service and growth, namely: to the city of Banda Aceh with a distance of 475 km, to the city of Takengon with a distance of 112 km, to the city of Idi with a distance of about 205 km, to the City of Blang Pidie with a distance of about 148 km, and to the city of Medan, North Sumatra with a distance of 332 km. All transportation routes (roads) to these cities are still not optimal.

<table>
<thead>
<tr>
<th>No.</th>
<th>Sub District</th>
<th>Population and its Projection Growth (persons)</th>
<th>Rate (%)</th>
<th>Criteria</th>
<th>Numbe of HH, 2016</th>
<th>Number People per HH (people), 2016</th>
<th>Number of Farmers (people), 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Kuta Panjang</td>
<td>8.246 8.730 9.376 10.06 10.36 1.44 S 2.617 3.1 S 0 6</td>
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<td></td>
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<td>2</td>
<td>Blang Jerango</td>
<td>7.176 7.620 8.213 8.852 9.122 1.51 S 2.299 3.1 S 2 4</td>
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<tr>
<td>3</td>
<td>Blangkejeren</td>
<td>27.48 30.112 33.748 37.82 39.58 2.31 S 8.422 3.2   6 2</td>
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<td></td>
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<tr>
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<td>Putri Betung</td>
<td>7.431 7.885 8.491 9.145 9.420 1.49 S 2.521 2.9 S 5 5</td>
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<td>Dabun Gelang</td>
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<td>Blang Pegayon</td>
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<td>Pining</td>
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</tr>
<tr>
<td>10</td>
<td>Terungan</td>
<td>8.944 9.481 10.198 10.96 11.29 1.47 S 2.705 3.3 S 1 5.217</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Tripe Jaya</td>
<td>5.521 5.661 5.841 6.027 6.103 0.63 S 1.754 3.1 S 5 3.698</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total/Average</td>
<td>89.50 95.692 104.03 113.111 116.958 1.69 S 28.01 3.2 S 50.45</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: BPS District of Gayo Lues (2017); *Projection data by year. S = medium population growth, R = low population growth; HH = head of households

Table 2 also shows that the population growth rate per subdistrict includes the medium criteria, except the Rikit Gaib sub-district with low criteria (negative growth). This negative growth, if traced further, is caused by the movement of people to other sub-districts within the Gayo Lues District, especially the Pantan Cuaca Sub-District and Blangkejeren sub-District and/or other sub-districts in other districts, especially Bener Meriah District, Southeast Aceh, and Central Aceh.

Table 2 shows that the number of heads of households (HH) of Gayo Lues District is 28,011 households and 56% (15,766 households) of which are farmer households. This data also shows, even though the largest number of HH farmers in Blangkejeren Subdistrict, but from the proportion of HH the largest farmers remain in sub-districts that function as producers, such as Putri Betung, Pining, Pantan Cuaca, Tripe Jaya, and others.

3.2 Space Allocation for Cultivation Area

Data on the allocation of cultivated area based on the Gayo Lues Spatial Planning is presented in Table 3 and a map of the allocation of space for cultivation and non-cultivation areas is presented in Figure 1.
Table 3. Plans for allocation of cultivated area (dry land and rice fields), non-cultivation areas, population profile, and profile of agricultural land according to BPS (2017) and Spacial Planning (RTRW) 2012 - 2032 of Gayo Lues District

Table 3 and Figure 1 show that the cultivation area (DL, WL, and OU) of Gayo Lues District is 160,017.17 ha (28.832%) and the area of non-cultivation areas (NCA) is 394,973.91 ha (71.168%). If explored in more detail, the most extensive district of the cultivation area is Pining and Terangun sub-District and the narrowest is Blang Pegayon and Putri Betung Subdistrict. When viewed from the existing agricultural area, the allocation of cultivation space is in line with the direction of agricultural development in the Gayo Lues District, although it has not been followed by population distribution. Agricultural development areas are directed in the subDistricts of Pining, Terangun, Tripe Jaya, Pantan Cuaca, Daban Gelang, and Blang Jerango. The plan of space allocation as a reference for regional development must be studied properly so that it can accommodate regional development and can provide benefits for the welfare of the community [8], [9]. Furthermore, it is stated that the planned space allocation is carried out through the process and procedures for the preparation and determination of spatial plans based on the laws and regulations that apply and bind all parties [8].

The cultivation area is 160,017.17 ha (28.832% of the total area of Gayo Lues District) and with a population of 89,500 people in 2016, the area of cultivated land is sufficient to support the activities of the...
community of Gayo Lues District. This condition is suitable for the results of calculating the Z value of 0.74 ha/person.

Table 3 shows, the population density of all sub-districts including rare criteria, except Blangkejeren Sub-District is classified as medium. The fewest population is Pining Subdistrict, which is around 3-4 people per km², while the most densely populated is Blangkejeren subDistrict, which is 165 - 166 people per km². When associated with the availability of cultivated land, the most extensive area of cultivation is Pining Sub-district is 9-10 people per km², while the narrowest subdistrict of agricultural land is Blangkejeren subDistrict, which is 442 - 443 people per km² (around 0.23 ha per person). Based on this condition, it is necessary to make a policy for the movement of farmers from one sub-district to another or farmers not farming in the sub-district where they live.

3.3 Farmer Growth Projections

The number of farmers increase per year on average is 55.93% until the year 2032. It means that more and more people depend on agriculture. This condition certainly encourages more extensive agricultural lands needed by farmers. The proportion of farmers in each sub-district is still higher than the people who have non-agricultural livelihoods, except the Blangkejeren and Dabun Gelang SubDistrict. This is understandable, because Blangkejeren subDistrict as the capital of Gayo Lues District is the center of government, and Dabun Gelang is a new growth area after the Gayo Lues was divided from Southeast Aceh District. In the District of Dabun Gelang as a new growth center, there are currently hospitals and military complexes, thus encouraging many people to live in the area and work with non-agricultural employment.

3.4 Agricultural Land Needs

Our results based on RTRW and number of the population until the year 2032 showed that cultivation area totaling of 160,017 has fulfilled people’s needs. However, detail analyses based on sub-districts resulted that Blangkejeren, Putri Betung, and Blang Pegayon have not yet been fulfilled, and even Kuta Panjang will not be fulfilled since the year 2020.

The results of the calculation of the adequacy of agricultural cultivation land (wetland and dry land) as stated in the Gayo Lues District Spatial Planning document Qanun Nomor 15 the year 2013 of each sub-district. It shows that based on the allocation of cultivated land, all sub-districts have been fulfilled, except Blangkejeren, sub-districts are not fulfilled, and neither is Kuta Panjang starting in 2020. Surplus and Deficit of required space allocation is given in Table 4.

Furthermore, for each subdistrict, population pressure is calculated on agricultural land and land carrying capacity to support farmers' activities. Calculation of population pressure using a formula Soemarwoto (1985) is presented in Table 4.

Table 4 shows that in general in Gayo Lues District there has been population pressure (PP > 1) on agricultural land exceeding the carrying capacity of agricultural land (LCC < 1). This condition occurs in all sub-districts, except Putri Betung, Dabun Gelang, and Pining sub-district. The rate of land use change continues to occur, such as settlements shifting agricultural areas and agricultural land being pushed into forest areas, specially protected forests. The amount of land use change and population pressure on agricultural land results in the ability of the land to support life will change [11].

Specifically Putri Betung Subdistrict, in principle, agricultural land has been depressed by the population, but in this calculation, it is not visible. It is because that formula \[\frac{\{P(1 + r)^t\}}{L}\] [10], it divided the total area in the relevant sub-district. Whereas if we look at the allocation of agricultural cultivation space, for the Putri Betung sub-district there are only around 3,200 ha for about 7,000 more residents. While the large area in Putri Betung Subdistrict is allocated for protected areas (LNP, Protection Forest, river border, lake border, etc.) around 96.74% of the total area of Putri Betung Sub-District (Table 4). Whereas Pining Subdistrict was allocated a cultivation area of 48,288 ha and farmers around 69.92% and Dabun Gelang with an area of 12,774 ha and farmers around 42.48%.

3.5 Analysis of Utilizing Spatial Area Allocation

In this study, we used existing land as the cultivation space pattern. The farmers have carried out their cultivation for a long time, both those fostered by the Government and farming that have been carried out for generations. This farming business utilizes the appropriate space/ suitable for certain commodities according to the farmers' own assessment or the area that has been allocated by the government through the Gayo Lues District RTRW 2013 - 2032. In accordance with the Gayo Lues RTRWK 2012 - 2032, the cultivation area is allocated 160,017, 17 ha, which consists of dryland agriculture, wetland agriculture and other uses, and the non-cultivated area is allocated an area of 394,973.91 ha (Table 4). This classification should comply with its
function criteria and is made in the form of land zoning based on its designation, including forestry, aquaculture, settlements, rice fields, industrial areas, plantations, tourist areas, and public facilities areas which can be interpreted as natural resource strategic plan [12]-[14]. The essence of the arrangement of agricultural cultivation space is to regulate the pattern of utilization and control of the cultivation space. The arrangement of cultivation space is crucial to be considered so that development actors understand the existence of an imbalance between the availability and needs of the regional space.

Table 4. Population Pressure of agricultural Land, Allocation of Cultivated Areas Available, Land Carrying Capacity of each Sub-District in Gayo Lues District 2012 – 2032

<table>
<thead>
<tr>
<th>No.</th>
<th>Sub District</th>
<th>Required Allocation (ha)</th>
<th>Surplus (ha)</th>
<th>Deficit (ha)</th>
<th>Population Pressure</th>
<th>Criteria</th>
<th>Carrying Capacity</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Kuta Panjang</td>
<td>2.716</td>
<td>3.457</td>
<td>741</td>
<td>1.94</td>
<td>PP &gt; 1</td>
<td>0.52</td>
<td>LCC &lt; 1</td>
</tr>
<tr>
<td>2.</td>
<td>Blang Jerango</td>
<td>2.895</td>
<td>11.588</td>
<td>8.693</td>
<td>1.46</td>
<td>PP &gt; 1</td>
<td>0.69</td>
<td>LCC &lt; 1</td>
</tr>
<tr>
<td>3.</td>
<td>Blangkejeran</td>
<td>8.284</td>
<td>6.855</td>
<td>-</td>
<td>1.429</td>
<td>PP &gt; 1</td>
<td>0.10</td>
<td>LCC &lt; 1</td>
</tr>
<tr>
<td>4.</td>
<td>Putri Betung</td>
<td>3.853</td>
<td>3.208</td>
<td>-</td>
<td>0.75</td>
<td>PP &lt; 1</td>
<td>1.33</td>
<td>LCC &lt; 1</td>
</tr>
<tr>
<td>5.</td>
<td>Dabun Gelang</td>
<td>1.868</td>
<td>12.774</td>
<td>10.906</td>
<td>0.82</td>
<td>PP &lt; 1</td>
<td>1.23</td>
<td>LCC &gt; 1</td>
</tr>
<tr>
<td>6.</td>
<td>Blang Pegayon</td>
<td>2.189</td>
<td>1.824</td>
<td>-</td>
<td>1.58</td>
<td>PP &gt; 1</td>
<td>0.63</td>
<td>LCC &lt; 1</td>
</tr>
<tr>
<td>7.</td>
<td>Pining</td>
<td>2.580</td>
<td>48.288</td>
<td>45.708</td>
<td>0.37</td>
<td>PP &lt; 1</td>
<td>2.70</td>
<td>LCC &lt; 1</td>
</tr>
<tr>
<td>8.</td>
<td>Riki Gailb</td>
<td>1.787</td>
<td>8.970</td>
<td>7.183</td>
<td>1.29</td>
<td>PP &gt; 1</td>
<td>0.78</td>
<td>LCC &lt; 1</td>
</tr>
<tr>
<td>9.</td>
<td>Pantan</td>
<td>2.006</td>
<td>14.453</td>
<td>12.447</td>
<td>1.32</td>
<td>PP &gt; 1</td>
<td>0.76</td>
<td>LCC &lt; 1</td>
</tr>
<tr>
<td>10.</td>
<td>Terangun</td>
<td>3.856</td>
<td>18.407</td>
<td>14.551</td>
<td>1.11</td>
<td>PP &gt; 1</td>
<td>0.90</td>
<td>LCC &lt; 1</td>
</tr>
<tr>
<td>11.</td>
<td>Tripe Jaya</td>
<td>2.772</td>
<td>17.164</td>
<td>14.392</td>
<td>1.21</td>
<td>PP &gt; 1</td>
<td>0.83</td>
<td>LCC &lt; 1</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>36.829</td>
<td>147.588</td>
<td>111.000</td>
<td>1.28</td>
<td>TP &gt; 1</td>
<td>0.78</td>
<td>LCC &lt; 1</td>
</tr>
</tbody>
</table>

Source: BPS District of Gayo Lues (2017); Data Analisys (2018)
Note: PP = population pressure; LCC = land carrying capacity
PP > 1: Population pressure happened greater than carrying capacity
PP < 1: Population pressure not occurred yet, in other words, land has not been used yet.
LCC > 1: high land carrying capacity.
LCC < 1: low land carrying capacity.

The space allocation for the cultivation area turned out to have fulfilled the needs of the farming community until 2032, but in 2016 (after 3 years of preparation) it turned out that there were 3 subdistricts that did not fulfill their land allocation needs, namely Blangkejeren, Putri Betung, and Blang Pegayon.

3.6 Use of Existing Land

Existing land use was mapped through analysis of satellite imagery in 2016. The results of this land use analysis were checked for correctness in the field. Existing land use maps are presented in Figure 2. Analysis of the existing land use map obtained by dry land (DL) is 127,419.32 ha (22.96%), wet land (WL) as big as 5,507.21 (0.99%), others use (OU) of 1,256.48 (0.23%), protected area (PA or non cultivation area-NCA) of 420,833.05 ha (75.82%), each spread in 11 sub-districts.

![Figure 2. Existing land use maps from image analysis of Landsat satellite in 2016 Gayo Lues District](image-url)
When compared to Table 4 (allocation plan) and existing land use, we found some differences. The difference between; (1) the area of Gayo Lues District is about 25 ha. This condition is understandable and may occur due to shifting digitation; (2) differences in space allocation for cultivation areas, allocation of about 28.83%, and existing calculations only around 24.72%, there is a difference of 4.11%; (3) there is a difference in the utilization of dry land allocation of 12,422.62 ha. General utilization remains in the area of each district, except in the District of Rikit Gaib the utilization has exceeded the allocation; (4) there is a difference in the utilization of the wetland allocation of 2,379.07 ha. In general, this condition is the same as the use of dry land; (5) there is a difference in the use of other use allocations of 11,032.47 and; (5) in the existing calculation, it turns out that the allocation of non-cultivation land is greater than 25,859.14 ha. This difference after the field check turns out to be true, that field conditions have occurred such as Figure 2.

3.7 Land Use Deviation

Land use irregularities are presented in Figure 3, and Table 5. Deviations are calculated for each sub-district and through unstructured interviews (discussions) with farmers, village officials, sub-districts, community leaders, answers are found.

Deviations in land use were analyzed, especially on lands allocated for non-cultivation areas, namely the LNP area and protected areas. There have been irregularities in the use of LNP land and protected forests in the amount of 1,482.30 ha (0.38%). When viewed from the percentage of irregularities in land use, we found it is still small (nonsignificant). Deviations in land use occurred in all districts, and the largest occurred in Blangkejeren (35.18%), Putri Betung (16.28%), and Dabun Gelang (21.83%). The biggest irregularities in land use were used by the Sere Wangi community, which amounted to 91.02% and spread across all sub-districts. Even resident housings were built in the LNP area (Putri Betung) and protected areas (Pantan cuaca and Pining). In addition, we found also there are irregularities for coffee plantations (Blangkejeren and Pantan Cuaca) and rice fields.

Table 5. Irregularities in Landuse in Gayo Lues District

<table>
<thead>
<tr>
<th>Sub-district</th>
<th>Area Status</th>
<th>LNP</th>
<th>CP</th>
<th>PRK</th>
<th>DLA</th>
<th>SWG</th>
<th>RF</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kuta Panjang</td>
<td>PA</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>19.13</td>
<td>-</td>
<td>19.13</td>
</tr>
<tr>
<td>Blanggerango</td>
<td>PA</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>52.34</td>
<td>-</td>
<td>52.34</td>
</tr>
<tr>
<td>Blangkejeren</td>
<td>PA</td>
<td>31.99</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>420.71</td>
<td>0.20</td>
<td>452.90</td>
</tr>
<tr>
<td>Putri Betung</td>
<td>LNP</td>
<td>38.08</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>30.43</td>
<td>-</td>
<td>68.51</td>
</tr>
<tr>
<td>Dabun Gelang</td>
<td>PA</td>
<td>-</td>
<td>13.64</td>
<td>-</td>
<td>-</td>
<td>220.23</td>
<td>7.40</td>
<td>241.27</td>
</tr>
<tr>
<td>Blang Pegayon</td>
<td>PA</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>361.3</td>
<td>-</td>
<td>361.3</td>
</tr>
<tr>
<td>Pining</td>
<td>PA</td>
<td>-</td>
<td>0.11</td>
<td>-</td>
<td>-</td>
<td>44.31</td>
<td>1.43</td>
<td>45.85</td>
</tr>
<tr>
<td>Rikit Gaib</td>
<td>PA</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>111.24</td>
<td>-</td>
<td>111.24</td>
</tr>
<tr>
<td>Pantan Cuaca</td>
<td>PA</td>
<td>37.19</td>
<td>3.13</td>
<td>0.01</td>
<td>-</td>
<td>75.08</td>
<td>-</td>
<td>115.41</td>
</tr>
<tr>
<td>Terangun</td>
<td>PA</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>111.24</td>
<td>-</td>
<td>111.24</td>
</tr>
</tbody>
</table>
3.8 Other Cultivation Areas that Can Be Utilized

Cultivation areas that have the potential to still be utilized outside the allocation of agricultural cultivation space are done by overlaying the map of the cultivation area and the agreeable forestry land (TGHK) map. The TGHK map is presented in Figure 4 and the data is presented in Table 6. While sub-districts where there is not enough allocation of cultivation space for agriculture, available suitable land is used for agriculture.

Table 6 shows that based on the TGHK criteria, the cultivation area was only 119,907.37 ha (21.60%). This area is actually up to the year of 2032 is still quite sufficient, because, in the year 2032, it requires only cultivation land of 89,772.48 ha. However an area of 119,907.37 ha is not evenly distributed, thus Blangkejeren, Puti Betung, and Blang Pegayon are not fulfilled. Table 13 shows that the cultivation area is only 23.95% different from the allocation of cultivation areas which is almost 29%.

Land use is a basic aspect needed for any kinds of human activity, such as agriculture, industry, settlement, transportation, recreation or areas that are maintained by their natural conditions for scientific purposes such as protected forests and others [7]. The land is a natural resource that cannot be renewed, while the demand for land is always increasing. This is because the rate of the population continues to increase. Therefore, land use must refer to the allocation plan that has been set for each level [7]. The highest land use values are industrial and trade areas, followed by residential areas, agricultural land, and lastly uncultivated grazing and wildland [15]–[17].
Further detail analysis based Table 6, we found an area of 226.98 ha of Leuser national park is a cultivation area, and we also found an area of 50,430.800 ha of the protected forest is also the cultivation area. Therefore, an area of 50,657.78 ha of cultivation is declared as a non-cultivation area.

We also found that irregularities in land use may be due to the allocation of space for cultivation areas that not fully meet the indicators of land potential. In addition, the allocation of space for cultivation areas has not met the needs of the farming community, especially not spread proportionally. If the Gayo Lues RTRWK can be revised, there are 50,657.78 ha area of land within a protected area that can be used as a cultivation area. This condition can be done by exchanging land that has been allocated to the cultivation space but does not meet the TGHK criteria. There are an area of about 37,000 lands allocated for cultivation space but do not meet the criteria of TGHK as a cultivation area, namely production forests of around 7,000 ha and limited production forests of around 30,000 ha. The allocation of this area can be returned to its function as a non-cultivation area and land that meets the criteria for the cultivation of 50,000 ha which is currently in a protected area can be issued as a cultivation area.

4 Conclusion and Recommendation

1. Allocation of cultivation space that is provided until the year 2032 is 160,017 ha. In general, for districts, this area is sufficient for the population up to 2032 which increases at a rate of 1.69% per year. Based on the sub-district, this area is not well distributed so that there are three sub-districts not fulfilled, namely Blangkejeren, Blang Pegayon, and Putri Betung Sub-districts since 2016 and Kuta Panjang sub-district starting in 2020.

2. There has been a land use deviation of 1,482.30 ha. Land use deviations occur in all districts. The widest sub-district is Blangkejaren, Dabun Gelang, and Putri Betung. The deviation of land use is mainly used for the development of Sere Wangi commodities. There is around 37,000 ha of 160,017 ha of cultivation space allocation that cannot be used. Conversely, there is about 50,000 ha of land outside the allocation of cultivation space can be used for cultivation land.

   To arrange the allocation of cultivation space so that there is no greater deviation, especially in Blangkejeren, Dabun Gelang, Putri Betung, Blang Pegayon, and Kuta Panjang Districts, it is recommended that this allocation of cultivation space be revised before 2032.

REFERENCES


Soil Fertility on Dryland Areas of Bireuen District Aceh Province, Indonesia

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Abstract. Soil fertility status is important information in soil management. Field studies and laboratory analyzes have been conducted to assess soil fertility status in some dryland areas in Bireuen District, Aceh Province (Indonesia). Soil samples taken from 26 sites in Bireuen Regency represented six types of soil namely Podzolic Haplic (Typic Hapludults), Regosol Humic (Typic Udipsamments), Alluvial District (Typic Udifluvents), Lithosol (Lithic Udorthents), Gleysol Eutric (Typic Fluvaquents) and Gleysol Humic (Typic Humaquepts). Soil samples were taken at the depths of 0-20 cm, then taken to analyze some soil fertility properties including: pH, organic C, total N, total P2O5 and K2O content (25% HCl extract), available P (Bray II), exchangeable cations (Ca, Mg, K, and Na) and CEC (1N ammonium acetate pH7 method), exchangeable Al and H (1M KCl extract), and electrical conductivity (EC). The results showed that the soil chemical characteristics in Bireuen dryland varied between soil types, but all the soils were low fertility. The limiting factors of soil fertility are low soil organic matter (<1.5%), low base saturation (<35%), and low P2O5 and K2O content. Soil pH varies from acid to neutral (5.04-7.02), while the CEC values, available P, varied from low to high. The exchangeable Al and EC values are generally very low. The main key to improving soil fertility status of dryland areas of Bireuen District is to provide ameliorant material in the form of organic matter, biochar, compost, and fertilizers.

Keywords: Dryland Farming, Soil Fertility, Constraints, Soil Improvement

1 Introduction

Dryland is one of the natural resources for agricultural development, especially in increasing the production of food crops, horticulture and plantations in order to maintain national food needs. In Indonesia, 63.4 million ha of dryland areas have been used for agricultural lands [1]. In Aceh Province the potential of dryland for agriculture is still very wide, reaching 1,154,445 ha. In Bireuen District the area of dryland that has the potential for agriculture reaches 79,238 ha while the rest is non-irrigated rice fields 6,946 ha, dryland area is 46,761 ha, fields are 21,892 ha, and the land is 3,639 ha [2]. The main obstacle in utilizing dryland for agriculture is the low level of soil fertility caused by a number of chemical constraints that limit plant growth such as acidity and nutrient availability [3].

According to Abdurachman, Dariah, & Mulyani [4], the area of dryland generally has low soil fertility which indicated by low soil organic matter, low base saturation, and low nutrient availability. This condition is exacerbated by the limited use of organic fertilizers, especially for the annual food crops. In addition, naturally, the levels of soil organic matter in the tropical regions are rapidly decreasing reaching 30-60% within 10 years [5]. Carbon from organic bonds is generalized by microorganisms to carbon dioxide so that gradually soil organic matter decreases [6], [7]. Another problem of many soils on dryland in a humid tropical region dominated by acid soils especially in the orders of Ultisol, Oxisol, Inceptisol, Andisol, and Spodosol [3] which are often called as acid mineral soils [8]. These soils are characterized by low soil pH (pH <6.5), low soil CEC, low cations content, and high phosphate fixation [3]. Sufardi, Muyassir, & Martunis [9] have reported that most dryland of Aceh Besar District has low organic C and total N, low base saturation, and low cation nutrient availability, although there are variations between soil types. Other studies show that there are also some soils on dryland that have low soil CEC and low P available [10], [11] so that generally the quality is low. Research conducted by Husni, Sufardi, & Khalil [12] states that in some dryland it turns out that it has a high soil CEC (>35 cmol kg-1) and also has a very high available P (>40 mg kg-1). From the results of the study indicate that the soil chemical
characteristics in dryland vary depending on the level of development and type of soil, climate, and level of soil management.

Although information about the constraints and soil fertility in dryland farming systems has been known, but the specific information on each type of soil and agroclimatic zone is still limited, therefore, to obtain data on soil characteristics and soil fertility there is a need for field observations to obtain data on soil chemical characteristics on dryland, so that the management is more appropriate [13]. According to Lakitan & Gofar [14] solutions that can be done to overcome the obstacles found in dryland in addition to finding alternative sources of water, the use of drought-resistant plants, effective and efficient management of irrigation systems, efforts to improve the quality and fertility of the soil are also important to be applied. This will succeed if the management is based on basic data from the results of the survey and laboratory analysis. This study aims to determine soil chemical characteristics and evaluate soil fertility status in some dryland areas in Bireuen District, Aceh Province.

2 Materials and Method

This research was carried out in Bireuen District, Aceh Province (Indonesia). This study uses a descriptive survey method through field observation and laboratory analysis. Field observation was carried out to obtain primary data in the form of general biophysical conditions and soil type whereas the laboratory analysis was conducted to analyze soil chemical characteristics. The soil profile is made by digging the soil in three-dimensional shape with a size of 100 m x 150 m x 150 m or by utilizing an open hill cliff.

Determination of soil type is done by observing and identifying morphological of soil profile and diagnostic horizon characteristics. For this purpose soil samples were taken at each layer of the horizon and analyzed in the laboratory. To evaluate soil chemical characteristics and fertility status each soil type in dryland areas, at least 26 soil composite samples were collected from 26 sites of topsoil (0-20 cm) representing a range of soil types, and land use of dryland farming of Bireuen District, Aceh. These samples were analyzed for soil pH (KCl and H2O), electrical conductivity (EC), organic carbon (Walkley & Black method), total N (Kjeldahl method), available P (Bray II), cations and CEC (1N NH4-acetate buffered at pH 7), exchangeable Al and H (1M KCl extract), P2O5 and K2O (extracted with 25% HCl), and electrical conductivity (EC) measured by using EC-meter.

Identifications of soil type, soil morphology and soil properties of the sites based on two soil classification systems (the Bogor Soil Classification System 2014 and the USDA Soil Taxonomy system 2014). Interpretation of soil chemical properties is based on the assessment criteria for soil chemical properties and soil fertility status according to the Soil Research Centre (1983) [15] by using parameters of cation exchange capacity (CEC), base saturation (KB), total P2O5 and K2O, and organic C content.

3 Results and Discussion

The results of field survey at 26 sites indicated that dryland areas in Bireuen District can be grouped into six soil types i.e Podzolic Haplic (Typic Hapludults), Regosol Humic (Typic Udipsamments), Alluvial Dystric (Typic Udifluvents), Lithosol (Typic Udorthents), Gleysol Eutric (Mollic Fluvaquents), and Gleysol Humic (Typic Humaquepts) according to Indonesian Soil Classification (2014). This means that dryland areas of Bireuen District consist of three soil orders namely Ultisols, Entisols, and Inceptisols.

3.1 Soil Chemical Properties

3.1.1 Soil pH and exchangeable Al

Table 1 shows that the pH H2O of soils varies from pH 5.70 to 7.02 (slightly acid to neutral). Soil type with neutral pH was found on Gleysol Eutric, while other soil types (Podzolic Haplic, Regosol Humic, Alluvial Dystric, Lithosol, Gleysol Eutric, and Gleysol Humic) were categorized as soils with acid pH. Based on these data it can be said that with the range of pH values above, in general, the soils on dryland areas in Bireuen District has a problem with soil acidity, so that in soil management it is necessary to add ameliorant which reduces soil acidity or by planting tolerant plants to soil acidity [16]. Although most soil types can be categorized as acid soils but based on the results of survey and analysis, no soil with acidic extreme pH or pH <4.50. This is also supported by the soil analysis which indicated low exchangeable Al (Table 2). Furthermore, the pH KCl of soils from each soil type was lower than the pH value of H2O and the difference ranged from -0.85 to -1.37 pH units. This is an
indication that the soils in dryland of Bireuen District have negatively charged because the negative values of ΔpH are greater than -0.05 [8]. Comparison of pH values of H₂O and pH of KCl between soil types is more clearly can be seen in Figure 1.

<table>
<thead>
<tr>
<th>Soil chemical characteristics</th>
<th>Podzolic Haplic</th>
<th>Regosol</th>
<th>Alluvial District</th>
<th>Lithosol</th>
<th>Gleysol Eutric</th>
<th>Gleysol Humic</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH (H₂O)</td>
<td>5.70</td>
<td>6.15</td>
<td>6.44</td>
<td>6.36</td>
<td>7.02</td>
<td>6.18</td>
</tr>
<tr>
<td>pH (KCl)</td>
<td>4.46</td>
<td>5.04</td>
<td>5.59</td>
<td>5.35</td>
<td>5.65</td>
<td>5.21</td>
</tr>
<tr>
<td>ΔpH (pH KCl-pH H₂O)</td>
<td>-1.24</td>
<td>-1.11</td>
<td>-0.85</td>
<td>-1.01</td>
<td>-1.37</td>
<td>-0.97</td>
</tr>
<tr>
<td>Organic C (Walkley &amp; Black, %)</td>
<td>1.49</td>
<td>1.21</td>
<td>0.92</td>
<td>1.94</td>
<td>1.88</td>
<td>1.14</td>
</tr>
<tr>
<td>Total N (Kjeldahl, %)</td>
<td>0.26</td>
<td>0.15</td>
<td>0.17</td>
<td>0.19</td>
<td>0.16</td>
<td>0.29</td>
</tr>
<tr>
<td>Available P (Bray II, mg kg⁻¹)</td>
<td>28.7</td>
<td>61.1</td>
<td>67.5</td>
<td>160.3</td>
<td>8.45</td>
<td>45.8</td>
</tr>
<tr>
<td>P₂O₅ (HCl 25%, mg/100g)</td>
<td>34.9</td>
<td>58.0</td>
<td>102.6</td>
<td>107.3</td>
<td>35.0</td>
<td>90.0</td>
</tr>
<tr>
<td>K₂O (HCl 25%, mg/100g)</td>
<td>22.9</td>
<td>7.50</td>
<td>46.6</td>
<td>66.3</td>
<td>39.0</td>
<td>34.0</td>
</tr>
<tr>
<td>Exchangeable cations:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ca-exch (cmol kg⁻¹)</td>
<td>3.10</td>
<td>1.82</td>
<td>2.82</td>
<td>3.03</td>
<td>4.29</td>
<td>2.30</td>
</tr>
<tr>
<td>Mg-exch (cmol kg⁻¹)</td>
<td>0.23</td>
<td>0.30</td>
<td>0.46</td>
<td>0.48</td>
<td>0.89</td>
<td>0.32</td>
</tr>
<tr>
<td>K-exch (cmol kg⁻¹)</td>
<td>0.10</td>
<td>0.08</td>
<td>0.11</td>
<td>0.11</td>
<td>0.10</td>
<td>0.10</td>
</tr>
<tr>
<td>Na-exch (cmol kg⁻¹)</td>
<td>0.17</td>
<td>0.18</td>
<td>0.19</td>
<td>0.20</td>
<td>0.19</td>
<td>0.19</td>
</tr>
<tr>
<td>CEC (cmol kg⁻¹)</td>
<td>36.0</td>
<td>16.0</td>
<td>21.6</td>
<td>28.4</td>
<td>43.4</td>
<td>19.2</td>
</tr>
<tr>
<td>Base saturation (%)</td>
<td>11.6</td>
<td>14.3</td>
<td>19.0</td>
<td>13.4</td>
<td>12.7</td>
<td>15.1</td>
</tr>
<tr>
<td>Al-exch (1M KCl, cmol kg⁻¹)</td>
<td>1.25</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>H-exch (1M KCl, cmol kg⁻¹)</td>
<td>3.25</td>
<td>3.20</td>
<td>2.50</td>
<td>2.40</td>
<td>2.10</td>
<td>2.34</td>
</tr>
<tr>
<td>Electrical conductivity (dS m⁻¹)</td>
<td>0.16</td>
<td>0.07</td>
<td>0.08</td>
<td>0.12</td>
<td>0.31</td>
<td>0.08</td>
</tr>
</tbody>
</table>

SA/A/N = slightly acid/acid/neutral; a/b/c/d/e = very low/low/medium/high/very high; *)very significant

Figure 1. Soil pH value (pH-H₂O and pH-KCl) in each soil type in dryland of Bireuen District

3.1.2 Carbon and Nitrogen

Organic matter is an important component of soil especially on soils in the tropical region. In these areas most soil have low of organic matter. Because of this, the keep of organic matters in the soils is very important to retain of soil quality. Table 1 shows that organic C content on dryland in Bireuen District is generally low and ranges from 0.92-1.88% (very low to low), while the total N of soil varies from 0.15 to 0.29% (low to medium). This data indicated that one of the problems in dry land in Bireuen District are low organic C and low N. From the Figure 2 it can be seen that the lowest organic C was found at soil type of Alluvial District while the highest C was found on Lithosol and Gleysol Eutric. The low soil organic C because these soils are formed from sediment.
materials which are low of organic matter [12]. Soil organic matter content in these soil less 3%. Sanchez [3] states that some of the characteristics of soils in tropical dryland are low organic matter. The results of the study are not much different from those reported by Sufardi et al [9] at Aceh Besar's dryland which also has a low total C and N contents.

The content of soil organic matter reflects soil quality [6] because directly or indirectly can improve soil physical, chemical and biological properties [17], [18]. In the humid tropical region, most soils low of organic matter and usually only ranges from 1-5% [17]. Therefore, efforts to maintain soil organic matter above 2 percent is highly recommended for tropical drylands [3]. Organic matter also functions as a source of nutrients especially N, because in this material the N content can reach 3-5% [19].

3.1.3 P2O5 and K2O

Table 2 also shows that the total P2O5 content of soils in drylands of Bireuen District turned out to vary greatly in each soil type from moderate to very high, while available P varied from very low to very high. At Figure 2, the highest total P2O5 was found on Lithosol and Alluvial District soil types, while the lowest was found on Podzolic Haplic and Gleysol Eutric. The highest available P was also found on Lithosol and the lowest was on Gleysol Eutric. The high content of total P2O5 and available P on Lithosol because these soils are categorized as undeveloped soil which formed from limestone (carst) parent material. This parent material is estimated to contain an apatite primary mineral which high phosphorus [19]. The difference in the total P2O5 and available P in each soil type of Bireuen District can be seen in Figure 3.

Furthermore, in Table 2 it can also be seen that the total K2O content in each soil type of Bireuen District's dryland varies greatly ranging from very low to very high, while the exchangeable K value in almost all soil types is very low (<0.2 cmol kg⁻¹). Based on this data it can be said that even though some of the soils in drylands of Bireuen District have sufficient potassium stock in the soils, but the availability of potassium is very low. The low exchangeable K may be due to source of potassium in soil found as original minerals form which difficult to decompose, so this K source does not correlate directly with the release of K into the soil solution. Havlin et al [19] state that the availability of potassium in the soil depends on the climate, type clay minerals, soil moisture, and soil CEC. Therefore, to increase the availability of potassium in soil solution, it is necessary to add fertilizer and organic matter. Organic matter can act as a solvent for soil minerals by reacting with organic acids [20], [21]. Figure 3 shows the difference in total K2O content and exchangeable K between soil types. The content of exchangeable K in the soils is relatively same between soil types, except on Regosol Humic that lowest exchangeable K content, because this soil has a lot of sand fraction which is low in potassium.
3.1.4 Exchangeable Ca, Mg, CEC and Base Saturation

The results of laboratory analysis (Table 2) showed that the exchangeable Ca of soils in drylands of Bireuen District varied from very low to low (1.82 to 4.29 cmol kg\(^{-1}\)), while exchangeable Mg also varied from very low to low (0.23 to 0.89 cmol kg\(^{-1}\)). The highest values of exchangeable Ca and Mg were found on Gleysol Eutric soil type, while the other soil types of soil contained exchangeable Ca less 3 cmol kg\(^{-1}\) and exchangeable Mg of <0.5 cmol kg\(^{-1}\) (Figure 4). Based on these data, it can be stated that the availability of Ca and Mg is a problem in drylands of Bireuen District because these two elements become the limiting factors for plant growth. Mengel & Kirkby [20] suggest that Ca and Mg are macronutrients essential for plant growth. If one or both of these elements are in a limited (deficient) state in soil, the plant growth does not optimally [18], [19], [21]. Furthermore, Table 2 also shows that the value of CEC also varies between soil types from low to very high (16.0 to 43.4 cmol kg\(^{-1}\)). Figure 4 shows that the high CEC values (>25 cmol kg\(^{-1}\)) were found on Gleysol Eutric followed by Podzolic Haplic and Lithosol, while low CEC (<16 cmol kg\(^{-1}\)) were found on Regosol soil types.

Unlike the CEC value, percentage of base saturation (BS) in drylands of Bireuen District relatively similar between soil type and all of them are classified as low categories (11.6 to 15.1%). Based on these data, it can be stated that the low BS value of the soil is one of the obstacles found in Bireuen dryland because this BS value reflects the number of exchanged base cations that occupy soil colloids [7]. This statement is also evidenced from this study which shows that the cations such as Ca, Mg, K, and Na in all soil types are included in the low category so that these values are correlated with base saturation values (Table 2). However, the low BS and base cations on this land are opposite to the CEC value. Usually, the CEC value of the soil is proportional to the KB value and the number of base cations [22]. This is presumably because the soils have properties as variable charged soils as a common feature of soils in the tropics [8]. Van Ranst, Qafoku, Noble, & Xu [23] suggested that one of the characteristics of variable charged soil is having amphibious colloidal properties. This property is characterized
by mineralogical composition and soil organic matter [24]. Included in the soil with variable charge are Oxisol, Ultisol, Andisol, Spodosol, and Alfisol [25].

Figure 4. Exchangeable Ca and Mg, CEC value, and base saturation of each soil types in dryland of Bireuen District

3.1.5 Exchangeable Na and Electrical Conductivity (EC)

Table 2 shows that the exchangeable Na of all soil types in dryland of Bireuen District has low criteria (0.17 to 0.20 cmol kg⁻¹), while EC value is included in the criteria of very low to low (0.07 to 0.21 dS m⁻¹). Figure 5 shows that soil exchangeable Na is relatively not different between soil types and all have a value of <0.2 cmol kg⁻¹. This shows that the soil on the dryland of Bireuen District is not indicated by salinity properties because all soil types low EC value. Based on this fact, there is no effect of salinity in the dryland of Bireuen District.
3.2 Soil Fertility Status

The assessment of soil fertility status in each soil type in dryland of Bireuen District is presented in Table 2. The table shows that soil fertility status of all soil types is low criteria because there are several limiting factors. The limiting factors found in each soil type are different, but each soil type at least has 2 to 3 soil fertility parameters which are low or medium categories. Table 2 shows that the limiting factors found in dryland of Bireuen District are: (1) low organic C, (2) low base saturation, and (3) low total K2O content. Organic C in the soil is very important to maintain soil fertility and productivity. Bohn et al.[22] stated that organic matter greatly

**Table 2.** Evaluation of soil fertility status in dryland of Bireuen District

<table>
<thead>
<tr>
<th>No</th>
<th>Soil Type (SN 2014)</th>
<th>CEC</th>
<th>BS</th>
<th>P2O5</th>
<th>K2O</th>
<th>TOC</th>
<th>Status of Soil Fertility</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Podsolik Haplic</td>
<td>High</td>
<td>Low</td>
<td>Medium</td>
<td>Medium</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>2.</td>
<td>Regosol Humic</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>3.</td>
<td>Alluvial Dystric</td>
<td>Medium</td>
<td>Low</td>
<td>High</td>
<td>High</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>4.</td>
<td>Lithosol</td>
<td>Medium</td>
<td>Low</td>
<td>High</td>
<td>High</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>5.</td>
<td>Gleysol Eutric</td>
<td>High</td>
<td>Low</td>
<td>Medium</td>
<td>Medium</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>6.</td>
<td>Gleysol Humic</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
<td>Medium</td>
<td>Low</td>
<td>Low</td>
</tr>
</tbody>
</table>

CEC = cation exchange capacity; BS = base saturation; TOC = total organic carbon
4 Conclusion

Status of soil fertility in dryland farming of Bireuen District of each soil type is low because has 2-3 limiting factors. These factors can affect soil quality and crop production. The main problem of chemical aspects is soil acidity, low of exchangeable Ca, Mg, and K, low total organic carbon (TOC) and low total N. The content of P2O5, K2O, available P, and CEC value of the soils are generally high, but the availability of K and base saturation are low. To improve soil fertility in dryland of Bireuen District it is necessary to add soil organic amendment in the form of organic matter, biochar, compost, and fertilizers. Further research is needed to examine the effects of soil amendment on soil productivity and crop production on dryland of Bireuen District.

Acknowledgment

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Fractionation of Fulvic And Humic Acid On Andisol Based On Altitude Under Organic Arabica Coffee At Bener Meriah District, Aceh Province

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Abstract. The formation of humic substances (humic acid, fulvic acid, and humin) which comprise the majority of soil organic matter, still needs to be clarified because these very complex processes may involve numerous organic components as starting materials, as well as many reactions such as oxidation, polymerization, condensation, and hydrolysis. Altitude-based soil samples were taken from the organic coffee plantation at Bener Meriah District, Bandar and Bukit subdistrict, Aceh Province, Indonesia. Soil types are Aquic Hapludand (alt. < 1,000 m asl), Typic Hapludand (alt. 900 – 1,600 m asl), and Typic Durudand (alt. > 1,500 m asl). Descriptive methods followed by field investigation and laboratory analysis were used. The lands were planted since 1992 consisting of two subdistricts (Bandar and Bukit), Bener Meriah District, Aceh Province, (96° 51' 41" - 96° 59' 44" E and 4° 42' 49" - 4° 50' 27" N). Research objects were open land spaces planted by Arabica coffee plants covering all communities’ coffee plantation in Bandar and Bukit subdistricts, Bener Meriah Districts. Arabica Coffee plantations at Bandar and Bukit Subdistricts with variety of catimor jaluk, plants density 2,500 plants per hectare, age 15 years have been managed organically since 1992. The soil profile was made on each measurement point, and each soil horizon of it, soil samples were taken for Humic substances (HA and FA) analysis and chemical analysis (pH, CEC, and organic C). Our results showed that the content of fulvic and humic acid differs on each horizon and among altitudes. Humic acid content on the surface horizon ranges from low to high. The highest humic acid content was found on the surface horizon at an altitude of 1,050 m asl. The higher the altitude, the humic acid content decreases on the surface horizon.

Keywords: Fulvic Acid, Humic Acid, Andisol, Altitude, Slope, Organic Arabica Coffee

1 Introduction

Andisol is also called a Andisol organic matter because the soil is dominated by organic matter. Soil organic matter plays important roles in soil health. Enhancing soil organic matter can improve soil quality, i.e., increasing nutrient retention, improving soil structure, enhancing soil biotic activity and improving soil moisture and temperature regimes. Andisol’s parent material is derived from volcanic ejecta and makes it different soil properties from other soil formed parent [1]. The decay of soil organic matter from andisol provides a huge amount of CO2 into the atmosphere and may cause a change in climate [2]. The attention of organic matter stored in the soil profile has been attracted by a lot of scientists because it has been promoted for the mitigation of climate change. However, when the soil organic carbon content falls below 1 percent, the soil is in endangered, because the soil aggregates become destabilize and soil nutrient cycling is compromised [3]. Increasing carbon in the soil should still be pursued for improving soil structure, atmospheric CO2 attenuation, and nutrient cycling.

Humic substances found in Andisol, the major organic constituents of soils and sediments, are widely distributed over the earth’s surface, occurring in almost all terrestrial and aquatic environments. Approximately 60-70% of the total soil-C occurs in humic materials [4]. Important characteristics of humic substances are their ability to form water-soluble and water-insoluble complexes with metal ions and hydrous oxides and to interact with clay minerals and organic compounds such as alkanes, fatty acids, pesticides, etc. Of special concern is the formation of water-soluble complexes of fulvic acids (FA’S) with toxic metals and organics which can increase the concentrations of these constituents in soil solutions and in natural waters to levels that are far in excess of their normal solubilities.

According to Schnitzer [5], a large variety of organic materials in soils can be grouped into humic and non-humic substances. The latter include those whose physical and chemical characteristics are still recognizable, such as carbohydrates, proteins, peptides, amino acids, fats, waxes, and low-molecular-weight organic acids. Most of these compounds are attacked relatively readily by microorganisms and have usually only a short life span in soils and sediments. By contrast, humic substances exhibit no longer specific physical and chemical
characteristics (such as a sharp melting point, exact refractive index, and elementary composition, definite IR spectrum, etc.) normally associated with well-defined organic compounds.

Yanagi, Nishimura, & Shindo [6] mentioned that soil organic matter was classified into humic and non-humic substances. Humic substances have been divided into humic acid (HA, alkali-soluble and acid-insoluble), fulvic acid (FA, alkali- and acid-soluble), and humin (alkali-insoluble) fractions. The mechanisms that underlie the formation of humic substances, which comprise the majority of SOM (soil organic matter), still need to be clarified because these very complex processes may involve numerous organic components as starting materials, as well as many reactions such as oxidation, polymerization, condensation, and hydrolysis.

Bener Meriah District, Aceh Province, Indonesia lies on 750 till 3,000 m above sea level with annual rainfall 1,700 – 2,500 mm. Dominant soils found are Andisol characterized by highly porous, dark-colored soil, lower bulk density, and exchangeable complex is dominated by amorf. Rapid weathering of the porous parent material results in allophanic compounds (allophane and imogolite). These hydrous aluminosilicates give peculiar properties to volcanic soils such as variable charge, high water retention, low bulk density and highly stable aggregates [1], [7]. Kimsey, Garrison-Johnson, & Johnson [8] said that soil property characterization indicated that surficial ash soils often reflect the physical and mineral characteristics of subsurface soils, but climatic conditions control their chemical expression through the degree of mineral weathering. Bartoli, Poulenard, & Schouller [9] found total specific surface area and isol (SSAs) were positively related to micropore SSA. The more allophanic the Andisol horizon sample, the larger were its total, micropore, and mesopore SSAs. Humic substances (HA and FA) are playing an important role in soil fertility, crop productivity and they are relatively resilient to erosion and compaction [1].

Therefore, crop development and mobility of nutrient are influenced. In order to get more benefits from this volcanic soils (Andisol), knowledge management of Andisol must be practiced. The objectives of this study were to evaluate status and behavior humic and fulvic acid in Andisol at the coffee plantation which organically managed.

2 Materials and Methods

The research was conducted in Soil physics and chemistry laboratory, Faculty of Agriculture Syiah Kuala University Banda Aceh Indonesia since July – November 2014. Altitude-based soil samples were taken from the organic coffee plantation at Bener Meriah District, Bandar and Bukit subdistrict, Aceh Province, Indonesia. Soil types are Aquic Hapludand (alt. < 1,000 m asl), Typic Hapludand (alt. 900 – 1,600 m asl), and Typic Durudand (alt. > 1,500 m asl) [10].

Descriptive methods followed by field investigation and laboratory analysis were used in this study. Research focus was arabica organic plantation. The lands were planted since 1992, consisting of two subdistricts (Bandar and Bukit), Bener Meriah District, Aceh Province, (960 51’ 41” - 960 59’ 44” E and 40 42’ 49” - 40 50’ 27” N). Land suitability evaluation for organic coffee plantation in Andisol was conducted during March 1997 till Feb 1999.

Soil samples were taken from community coffee plantation based on the altitude at Bandar and Bukit, Bener Meriah Sub District. Karim et al [10] found that soil types at sites were Aquic Hapludand (alt < 1,000 m asl), Typic Hapludand (alt. 1,000 – 1,500 m asl), and Typic Durudand (alt. > 1,500 m asl). Tools used in this research are maps, compass, altimeter, soil munchel color chart, augers, hoes, knives, and other related tools.

Research objects were open land spaces planted by Arabica coffee plants since 1992 [11] covering all communities coffee plantation in Bandar and Bukit subdistricts, Bener Meriah Districts. Soils were sampled at the following sites:

1. Arabica Coffee plantations at Bandar and Bukit Subdistricts with variety of catimor jaluik, plants density 2500 plants per hectare, age 15 years managed organically since 1992.
2. Altitude class; seven classes applied i.e 900 - 1,000 m asl (P1) with slopes > 30%; 1,000 - 1,100 m asl (P2) with slopes 8 - 15%; 1,100 - 1,200 m asl (P3) slopes 0 - 3%; 1,200 – 1,300 m asl (P4) slopes 0 - 3%; 1,300 - 1,400 m asl (P5) slopes 0 - 3%; 1,400 - 1,500 m asl (P6) slopes 8 - 15%; and 1,500 - 1,600 m asl (P7) with slopes > 30%.

The soil profile was made on each measurement point, and each soil horizon of it, soil samples were taken for Humic substances (HA and FA) analysis and chemical analysis (pH, CEC, and organic-C). Humic substances were analyzed according to Tan procedure [12].
3 Result And Discussion

Our general finding in term of field observation showed similarities and differences in the natures of the seven soil profiles.

a. Soil Acidity

We measured soil acidity (pH) in forms of pH(H₂O) and pH(KCl). As stated by Nanzyo, Dahlgren, & Shoji [13] the pH(KCl) values provide a measure of acidity in Andisols and are usually lower than pH(H₂O). Crop growth is influenced by soil acidity and each crop requires a specific pH for growing and good yielding. In general, crops have wide ranges in pH tolerance with the condition nutrients are available. pH influences the availability of Ca, Mg, Al, P, and other nutrients. Our study showed that general soil acidity was found in a range of 5.50 to 6.50. Soil pH (H₂O) at Profile P1 (950 m asl), horizon Ah is 5.80, and pH(KCl) is 4.50 (Table 1). Nanzyo et al.[7] stated that there is considerable number allophanic Andisols and show pH(H₂O) values of 5.80 to 6.00, although the base saturation of these soils is 10 percent or less.

The deeper the soil, the lower the soil pH. But, at profile P2 (1,050 m asl) soil pH increased with the increase of soil depth. The value of pH on the surface horizon showed lower at profile P1 (4.55). This is in line with the higher organic content on the soil surface. Although there are a variety of soil components contributing to soil acidity [14], [15] panic clays, 2:1 layer aluminosilicates, and humus are especially important in most Andisols.

The values of pH(H₂O) at 1,150 m asl tend to be lower with the increase soil depth. The value of pH(H₂O) at soil surface horizon is lower than that of at profile P3 (4.98). The value of pH(H₂O) tended to increase with the increase of soil depth. At profile P5 (1,350 m asl) the value of pH(H₂O) subsurface was higher than the value of surface, but decreased with the deeper soil. The value of pH(H₂O) surface horizon P7 (1,575 m asl) has the highest value observed that is 6.25.

The value of pH subsurface horizon has a little increase on the top of the soil observed.

We also found the values of soil pH(KCl) are lower that the value of pH(H₂O). The different value (-ΔpH) -0.03 till -1.67. Uehara & Gillman [16], pointed out that -ΔpH means the soil has negative exchangeable surface complex causing possible Alexch present but a lower number [17].

b. Organic Carbon

A very high amount of organic carbon (C-organic) content (5.84%) was found at the surface horizon under the P1 profile (950 m asl). This is the highest value among the 7 profile of all horizons, followed by P5 (1,350 m asl) totaling 4.50%. The values decrease in order of P2 and P3 (4.42% and 4.38%), then P4, P6 and P7 (4.32%, 4.20, and 3.66%) accordingly. High levels of C-organic on the surface horizon on the P1 profile result in a darker color than other soils. According to Tan (1978), the accumulation of organic material is due to the presence of amorphous clay minerals so that it can be maintained high organic material content.

<table>
<thead>
<tr>
<th>Profile</th>
<th>Horizon</th>
<th>Depth (cm)</th>
<th>pH酸度 (pH)</th>
<th>ΔpH</th>
<th>C-organic (%)</th>
<th>CEC (me/100 g)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>H₂O</td>
<td>KCl</td>
<td>(pHKCl-pH H₂O)</td>
<td></td>
</tr>
<tr>
<td>P1</td>
<td>Ah</td>
<td>0-25</td>
<td>5.80</td>
<td>5.77</td>
<td>-0.03</td>
<td>5.34</td>
</tr>
<tr>
<td>(950 m asl)</td>
<td>AB</td>
<td>25-51</td>
<td>5.50</td>
<td>4.75</td>
<td>-0.75</td>
<td>4.50</td>
</tr>
<tr>
<td></td>
<td>Bw1</td>
<td>51-118</td>
<td>4.62</td>
<td>4.55</td>
<td>-0.07</td>
<td>3.18</td>
</tr>
<tr>
<td></td>
<td>Bw2</td>
<td>118</td>
<td>5.69</td>
<td>4.65</td>
<td>-1.04</td>
<td>2.45</td>
</tr>
<tr>
<td>P2</td>
<td>Ah</td>
<td>0-23</td>
<td>4.55</td>
<td>4.16</td>
<td>-0.39</td>
<td>4.38</td>
</tr>
<tr>
<td>(1,050 m asl)</td>
<td>Bw1</td>
<td>23-41</td>
<td>4.72</td>
<td>4.70</td>
<td>-0.02</td>
<td>3.14</td>
</tr>
<tr>
<td></td>
<td>Bw2</td>
<td>41-93</td>
<td>5.53</td>
<td>4.45</td>
<td>-1.08</td>
<td>2.49</td>
</tr>
<tr>
<td></td>
<td>BC</td>
<td>+93</td>
<td>5.04</td>
<td>4.50</td>
<td>-0.54</td>
<td>1.48</td>
</tr>
<tr>
<td>P3</td>
<td>Ah</td>
<td>0-37</td>
<td>5.53</td>
<td>3.90</td>
<td>-1.63</td>
<td>4.42</td>
</tr>
<tr>
<td></td>
<td>Bw1</td>
<td>37-60</td>
<td>5.60</td>
<td>3.93</td>
<td>-1.67</td>
<td>4.04</td>
</tr>
</tbody>
</table>
Table 1 shows that the P1 profile with an altitude of 950 m asl has the highest C-organic content of the other location profile. The high C-organic content of the P1 profile (the lowest altitude) is because the organic matter in the form of coffee skin at P1 is available and weathering process is rapid and intensive, whereas, in the profile located at a higher altitude, the weathering process is slower so that the C-organic content is lower. Karim[18] stated that the difference in altitude above sea level shows a negative relationship with C-organic levels where the higher the altitude, the lower the C-organic content.

c. Cation Exchange Capacity

The cation exchange capacity (CEC) shows the ability of a land exchange complex to absorb and exchange cations. The cation exchange capacity on the surface horizon profile P1 (950 m asl) is high, i.e 31.20 me/100 g and CEC on the Ah profile horizon P2 (1,050 m asl) is very high, i.e 33.40 me/100 g which is the highest CEC value of all horizons among the 7 profiles observed. The next sequence was found at P3 (1,150 m asl), which was 31.80 me/100 g, then decreased on P5 and P4 profiles, i.e 29.60 me/100 g and 28.80 me/100 g, then P6 profile and P7, i.e 31.20 me/100 g and 27.40 me/100 g. The high value of CEC in the surface horizon on each profile relates to the soil C-organic content, where high levels of C-organic in Andisol soil are found in the upper layers. It is known that organic matter has a large CEC, so it can cause increased soil CEC.

The dominance of Humic Acid and Fulvic Acid

This soil profile is located in the Village of Mangku, Bandar SubDistrict at an altitude of 950 m asl with slopes > 30% (Table 2). The soil was classified as Aquic Hapludand. In the surface horizon, the content of fulvic acid is higher than humic acid and decreases to a depth of 118 cm, while humic acid content increases in the lower layer and is found to be higher than fulvic acid (Fig. 1).
<table>
<thead>
<tr>
<th>Profile</th>
<th>Horizon</th>
<th>Depth (cm)</th>
<th>Soil Organic Fraction</th>
<th>Fulvic Acid (%)</th>
<th>Humic Acid (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>Ah</td>
<td>0-25</td>
<td>2.42</td>
<td>1.13</td>
<td></td>
</tr>
<tr>
<td>950 m asl</td>
<td>AB</td>
<td>25-51</td>
<td>1.54</td>
<td>1.31</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bw1</td>
<td>51-118</td>
<td>1.43</td>
<td>2.16</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bw2</td>
<td>118</td>
<td>1.62</td>
<td>3.10</td>
<td></td>
</tr>
<tr>
<td>P2</td>
<td>Ah</td>
<td>0-23</td>
<td>2.03</td>
<td>7.63</td>
<td></td>
</tr>
<tr>
<td>1,050 m asl</td>
<td>Bw1</td>
<td>23-41</td>
<td>1.48</td>
<td>1.61</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bw2</td>
<td>41-93</td>
<td>1.00</td>
<td>5.49</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BC</td>
<td>+93</td>
<td>2.98</td>
<td>0.75</td>
<td></td>
</tr>
<tr>
<td>P3</td>
<td>Ah</td>
<td>0-37</td>
<td>2.50</td>
<td>6.93</td>
<td></td>
</tr>
<tr>
<td>1,150 m asl</td>
<td>Bw1</td>
<td>37-60</td>
<td>2.03</td>
<td>8.38</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bw2</td>
<td>60-102</td>
<td>1.68</td>
<td>4.05</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BC</td>
<td>+102</td>
<td>2.13</td>
<td>2.06</td>
<td></td>
</tr>
<tr>
<td>P4</td>
<td>Ah</td>
<td>0-36</td>
<td>2.56</td>
<td>6.85</td>
<td></td>
</tr>
<tr>
<td>1,250 m asl</td>
<td>A1</td>
<td>36-57</td>
<td>2.42</td>
<td>3.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bw1</td>
<td>57-77</td>
<td>2.24</td>
<td>1.86</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bw2</td>
<td>77-101</td>
<td>1.68</td>
<td>4.77</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BC</td>
<td>+101</td>
<td>3.04</td>
<td>1.59</td>
<td></td>
</tr>
<tr>
<td>P5</td>
<td>Ah</td>
<td>0-33</td>
<td>3.25</td>
<td>3.40</td>
<td></td>
</tr>
<tr>
<td>1,350 m asl</td>
<td>Bw1</td>
<td>33-63</td>
<td>3.03</td>
<td>2.93</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bw2</td>
<td>63-86</td>
<td>2.57</td>
<td>3.75</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BC</td>
<td>+86</td>
<td>2.25</td>
<td>2.20</td>
<td></td>
</tr>
<tr>
<td>P6</td>
<td>Ah</td>
<td>0-24</td>
<td>2.25</td>
<td>2.57</td>
<td></td>
</tr>
<tr>
<td>1,450 m asl</td>
<td>AB</td>
<td>24-47</td>
<td>1.84</td>
<td>1.16</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bw1</td>
<td>47-74</td>
<td>3.44</td>
<td>1.78</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bw2</td>
<td>+74</td>
<td>2.42</td>
<td>1.45</td>
<td></td>
</tr>
<tr>
<td>P7</td>
<td>Ah</td>
<td>0-33</td>
<td>2.33</td>
<td>2.25</td>
<td></td>
</tr>
<tr>
<td>1,575 m asl</td>
<td>B1</td>
<td>99-51</td>
<td>2.56</td>
<td>1.48</td>
<td></td>
</tr>
<tr>
<td></td>
<td>B2</td>
<td>51-73</td>
<td>1.24</td>
<td>2.29</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bw</td>
<td>73-128</td>
<td>0.98</td>
<td>0.13</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BC</td>
<td>128-138</td>
<td>1.19</td>
<td>0.08</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ab</td>
<td>+138</td>
<td>1.00</td>
<td>0.36</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 1.** The content of humic acid (HA) and fulvic acid (FA) on Andisol organic arabica coffee plant at altitude 950 m above sea level (m asl)
The highest content of fulvic acid is found at a depth of 0 - 25 cm, ie 2.42%. This may be due to the decomposed organic material found in surface horizons. At this location, the management of organic material was done by giving the skin of coffee and Lamtoro cuttings to the soil surface since 1992, and profile 2 is located in the village area of Genteng Rapi Subdistrict at an altitude of 1,050 m asl with slope 8 - 15%, Typic Hapludand soil classification. In contrast to the P1 profile, the P2 profile has a humic acid on the surface horizon more dominant than fulvic acid, and its distribution according to the soil depth varied greatly. Humic acid content was lower in the lower horizon. The highest content of fulvic acid was found in BC (93 cm) horizon, which is 2.98%. The content decreased towards the surface layer (Fig. 2). This is because the location was planted by Vetiver grass, provision of organic ingredients of coffee skin, and its location lies on the slope of 8 - 15% (wavy). It was also assumed that the Vetiver grass root zone and its soil morphology affected the soil fulvic acid.

**Figure 2.** The content of humic (HA) and fulvic acid (FA) on Andisol organic arabica coffee plant at altitude of 1,050 m asl

Profile of P3 is located in Sidodadi Village, Bandar Subdistrict at an altitude of 1,150 m asl with slope 0 - 3%, *Typic Hapludand*. In each horizon, the humic acid content was more dominant than fulvic acid except the BC horizon (102 cm). The highest humic acid content was found on the subsurface horizon, the content was decreasing regularly as the soil went deeper. The highest content of fulvic acid was found in the upper horizon of 2.50% (Fig. 3). The P3 profile had the highest humic acid content of all layers compared to other research sites. This is caused by the provision of organic material that comes from the supplying skin of coffee more intensively.
Figure 3. The content of humic acid (HA) and fulvic acid (FA) on Andisol organic arabica coffee plant at altitude of 1,150 m asl.

Profile P4 is located in Kramat Jaya Village, Bandar SubDistrict at an altitude of 1,250 m asl with slopes 0 - 3%, *Typic Hapludand*. In the Ah horizon, the humic acid content was higher than the fulvate and decreased to a depth of 101 cm (Table 2). Its extents to the depth of the soil were highly fluctuating (Fig. 4). However, the fulvic acid content was increasing in the lower layer and the highest content was found in BC (101cm) horizon, which was 3.04%. This showed that the farther away from the soil surface activity of microorganisms decreased. The content of decomposed organic matter was also decreasing.

Figure 4. The content of humic acid (HA) and fulvic acid (FA) on Andisol organic arabica coffee plant at an altitude of 1,250 m asl.

Profile P5 is located in the Village Pondok Gajah, SubDistrict Bandar at an altitude of 1,350 m asl with slopes 0-3%, *Typic Hapludand*. On the Ah, a humic acid content was found slightly higher than fulvic acid, which is 3.40% and 3.25% and decreased irregularly to a depth of 86 cm, while the highest fulvic acid content was found in surface horizon (0 - 33 cm), ie 3.25%.
Profile 6 is located in Panji Mulia, Bukit SubDistrict at an altitude of 1,450 m asl with slope 8 - 15%, and *Typic Hapludand*. The humic acid content was higher than fulvic acid, 2.57% and decreased according to the depth of soil, while the fulvic acid content increased in the Bw1 horizon (47 - 74 cm), i.e. 3.44% (Fig. 6). This is because at that location added organic ingredients in the form of coffee skin continuously.

Profile 7 is located in the village of Sidoarjo Bukit SubDistrict at an altitude of 1,575 m asl with slopes> 30%, *Typic Hapludan*. In each horizon, the content of fulvic acid was more dominant than humic acid except on the B2 horizon (51-73 cm) (Fig. 7). A greater decreased in humic acid was found in the BC horizon (128 - 138 cm).

There is a tendency of higher profile location from sea level, fulvic acid content gets increased and vice versa humic acid decreased.

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**Figure 5.** The content of humic acid (HA) and fulvic acid (FA) content in Andisol organic arabica coffee plantation at altitude 1,350 m asl.

**Figure 6.** The content of humic acid (HA) and fulvic acid (FA) on Andisol organic arabica coffee plant at altitude 1,450 m asl.
Conclusion

The content of fulvic acid and humic acid differs on each horizon and among altitudes on the Andisol grown under organic arabica coffee plantation. Humic acid content on the surface horizon ranges from low to high. The highest humic acid content was found on the surface horizon at an altitude of 1050 m asl. The higher the altitude, the humic acid content decreases on the surface horizon. The highest content of fulvic acid was found at an altitude of 1,450 m asl that is on the Bw1 horizon of 3.44%.

REFERENCES


The Performance of School Principals in The Implementation of School-Based Management In State Vocational School (SMKN) 1 of Al Mubarkeya and SMK Negeri 1 of Darul Kamal Aceh Besar Regency

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Abstract. The implementation of a School-Based Management in a school might be correlated to the performance of the school principal. The aim of this research was to identify the leadership, motivation, discipline, and commitment of the school principals in implementing the School-Based Management (SBM) in State Vocational School (SMKN) 1 Al Mubarkeya and State Vocational School (SMKN) 1 of Darul Kamal, Aceh Besar Regency. A descriptive research method and a qualitative research approach were used in this study. The data were collected by doing interviews, doing observations, and collecting other relevant facts or physical evidence. The principals, the vice principals, the teachers, and the educators or staffs in the schools were the subjects of this research. The results indicate that: (1) the leadership of the principals had a crucial role in implementing SBM since the principals were the ones who made a decision or planning regarding the eight teams who would work on the eight national education standards. It was also found that (2) the motivation was expected to be shown not only from the principal but also from the teachers or the educators. In addition, (3) the discipline of all of the school’s elements was affected by the discipline shown by the principal. Finally, (4) the commitment of the principals in implementing the SBM was in accordance with the planning that had been made.

Keywords: Performance, Principal, School-Based Management

1 Introduction

An awareness toward the importance of the educational quality which can provide hope and having the possibility to get a better future has encouraged various efforts and attention of all levels of society. They pay attention to every movement and development in the educational world. Education is one of the efforts to improve the quality of human life which aims to humanize humans, to mature, to change behavior, and to improve quality for the better.

Nowadays, the quality of education in Indonesia, especially in Aceh, still has frequent improvements and various efforts have been made to improve the quality of education. Consequently, the government’s effort to achieve good quality in the educational world is to implement the national standards of education.
According to the Government Regulation [1] on National Standards of Education in Chapter XV Article 91 on the 1st Paragraph states: “Setiap satuan pendidikan pada jalur formal dan nonformal wajib melakukan penjaminan mutu pendidikan.” In essence, education includes educating, teaching and training activities. The activity is carried out as an effort to transform values. These transformed values include cultural values, knowledge values, and technology. Then, these values are transformed to maintain, to develop, and to change the culture that belongs to the community. Hence, National Education System formulates that national education aims to develop the potential students to become human beings who have faith in God, have a noble character, healthy, knowledgeable, capability, creativity, independent, become democratic and being responsible citizens.

In fact, education is not solely an easy effort, but it takes a dynamic and challenging activity. Education will always change as time goes by. Consciously, education always becomes the vocal point and even becomes the target of dissatisfaction because education belongs to every people. It is not only related to investment or living conditions in the future, but it also has an influence on life currently. Therefore, education always requires effort and improvement along with the increasing of peoples’ needs and demands.

As an educational institution, a school is a place for educational activities which certainly has an integrated and dynamic system. At present, school is not only a place for teachers-students interaction, but it is interrelated systems. Moreover, it is seen as an organization that requires management in order to produce the quality of educational institutions. The main activity of the school is the management of the human resource. In optimizing the management of human resources, a good system and management are needed in the implementation of the educational process in school. Management is a function related to efforts to achieve the goal. Indeed, it means that human resources have an important role in achieving goals, especially the educational goals that have been formulated in an institution.

How the peoples do in a real workplace becomes the measuring rod to see the quality of the education. It concerns of how the capability related to the skills upon the working demands, how the school graduation toward the alumnus and the qualifications of jobs’ opportunities, and how the alumnus from the educational institutions getting involved in the workplace. In short, one of the measuring rod upon the quality of education in an educational institution is the ability of the educational institution to produce the quality of human resources.

To resolve the various problems of education in Indonesia, the government has carried out various innovations in the educational fields, such as education autonomy policies, school-based management, ratifying the regulation of national education system, establishing national standards of education, and socializing the implementation of the latest curriculum. In addition, the improvement of teachers’ professionalism quality through certification and competency tests are also carried out. Furthermore, the strategic plans toward educational innovations have also been carried out with the ultimate goal of improving the quality of education.

Actually, vocational education becomes the government’s efforts in improving the quality of education relating to the work world. According to Regulation No. 20 Tahun 2003 [2] concerning the National Education System stated that vocational education is education that prepares students to have an ability to work in certain fields. Murniati [3] argues that “vocational education is education that provides students to have various knowledge, skills, and experiences so that they are able to do certain jobs for themselves, for the work world, and for the development of their nation”.

The vocational education has the relation to the industrial process, especially to fulfill the human resource demands. It is such a challenging work to do since the vocational schools have a responsibility to prepare the skillful human resources. Yet, only a few vocational schools that
are able to implement the educational program in enhancing students to be knowledgeable, skillful, having experienced so they have the capability in doing a certain job.

The important task of the school principal is to achieve the objectives of vocational schools in preparing skilled alumnus as expected. This expectation is certainly inseparable from the performance of a school principal in performing an educational institution based on the standards of national education.

Fortunately, vocational school is one of the educational institutions that have a considerable impact on the implementation of SBM. The challenges faced by vocational management are changes in various types of work fields and qualifications. In fact, the challenge is quite hard. Some technology experts argue that the education of ready-to-use labor is an unrealistic concept because the development of technology is fast. Then, it is impossible to be followed by a vocational school. The practice facilities at vocational schools will be lag behind. In another idea is stated by economists that the implementation of vocational schools is too expensive compared to the rate of return. Then, this thing must take into account.

The implementation of SBM requires the professional leadership of school principals that has management ability and personal integrity that put the vision into action, being democratic, and transparent in decision making. In implementing SBM, school principals are the key success in improving the quality of education in schools. Therefore, the principal must have a vision, mission, and broad insights about effective schools in implementing SBM. In addition, professional skills are required in realizing it through the performance of the school principal.

2 Result And Discussion

2.1 Performance Theory

Performance is related to the achievement level toward the implementation of a program/activity/policy in realizing the goals, objectives, vision, and mission of the school. Usman[4] revealed that “Performance is an action that is performed through the skills and motivation shown by each employee, both in quality and quantity in carrying out their work in accordance with the responsibilities.” Furthermore, according to Fahmi[5], “Performance is the result obtained by an organization which is profit oriented and non-oriented produced over a period of time.” Indeed, the basic principle is a description of the achievement level of an activity or program in realizing goals, objectives, mission, and vision contained in the strategic schemes.

Good performance can be influenced by capability and motivation. Performance is an achievement that can be achieved by a person or organization based on certain criteria and instruments. According to Drucker in Usman [4], “the parameter that is commonly used is effectiveness, efficiency, and productivity.” Furthermore, Armstrong and Baron in Fahmi[5] revealed that: “Performance is the result of work that has a firm relationship with the goal of the organization, customer satisfaction, and giving the economic contribution.” In an organization or society, individuals contribute their performance to the group. Then, the group will contribute its performance to the organization or society. In an effective organization, management always creates positive synergies, which yield a greater result.

2.2 School Principal

According to Karwati & Priansa [6] “School principal is the responsibility to lead a school, where the instructional process is held including the teachers-students interaction.” In another
A definition, the principal is those who know a lot of their duties and those who determine the needs of their school.

The principal’s performance is the effort that can be achieved by the principal in implementing the school management both in quality and quantity to achieve the educational goals effectively, efficiently, productively, and accountably. The performance of the principal is the result of implementing work in physical/material and non-physical/non-material in a certain period of time.

Based on Permendiknas of 2007 [7], [8] concerning the standards of school principal determined that principals are required to master the dimensions of personal, management, entrepreneurial, supervisory and social competence. In fact, most school principals do not master the standards of competency required. Due to this reality, the quality of educational institutions will not be achieved properly. The successful educational institutions are largely determined by the principal as a top manager.

Regulation of the Minister of National Education Permendiknas of the Indonesian Republic No 28 of 2010 [9] concerning the assignment of teachers as principals provides fresh air for increasing the professionalism of a school principal. In the Permendiknas, it is explained that a teacher who had passed the selection of prospective school principals was required to attend education and training as an activity to provide theoretical and practical learning experiences aimed at developing knowledge, attitudes, and skills in the dimensions of personality, management, entrepreneurship, supervision, and social competence.

2.3 School-Based Management

School-Based Management, first appeared in the United States. The background begins with the curiosity of the community about what schools can offer to the community. It is also the relation between education and the community needs. At that time, the community thought that school performance was not able to prepare the students in entering the business worlds. They also thought that the school is not able to provide the results in the context of competitive economic life.

School-based management is a new paradigm of education that provides school to be independent within the framework of national education. In another term, the school has broad autonomy. Autonomy is given so that schools are free to manage the resources and funds by allocating them according to the needs or local needs.

Based on the terminology, school-based management comes from three words, namely management, basic, and school. Management is the process of using resources effectively to reach the target. Then, based which means basic or principle, while the school is learning and teaching institution and a place to receive and give lessons. Conceptually, school-based management is as an alternative choice to managing the structures of education by placing schools as the main unit of improvement. The authority of policymakers is as a basic element in this concept to improve the quality of educational outcomes. On the other hand, school-based management is a way to motivate school principals to be responsible for the quality of students.

For this reason, principals should develop comprehensive educational programs to serve all the needs of students in schools. All school personnel should take part in formulating an operational program because they have an awareness about the needs of their students. Hence, school-based management is a strategy to improve education by transferring important decisions by the state and local government to the individuals in a school. Additionally, school-based management provides principals, teachers, students, and parents with enormous control in the educational process by giving them full authority and responsibility to independently determine
educational programs including curriculum and its implications for various school policies in accordance with the vision, mission and objectives of the education.

Starting from the conditions and restructuring of school management, in the context of the educational development in Indonesia, a school system is needed to provide basic capabilities for students. The concept of school-based management upon the students’ improvements is defined as a form of educational reform. It is directed at designing and modifying the structure of government into a school with the concept of school empowerment.

The focus of empowerment is intended to increase the autonomy and professionalism of schools which becomes the quality of education. The school management idea should need to be well understood by all stakeholders in the implementation of education, especially schools because school-based management does not merely bring basic changes in terms of policies and orientation, but it takes part in parental and community participation.

During this time, educational management was embraced and centralistic implemented, where the department center is very dominant in decision making. In contrast, regions and schools are passive because they were only as recipients and implementers of central policies. Centralistic education systems often yielded a gap between school needs and central policy. Therefore, school-based management provides more autonomy to schools. Fortunately, schools have greater authority and responsibility in managing their schools so that they are more independent. Then, schools are more empowered in developing programs that are certainly more in line with their needs and abilities/potential. Due to a sense of belonging, it will lead to an increased sense of responsibility. Increased accountability will increase the dedication of every stakeholder in the school. This is the goal of the school and community participation in education. Through SBM, effective schools can be developed independently because schools are given greater authority and responsibility (autonomy) to manage their potential resources, both human resources and other resources (money, equipment, materials, time and so on). Moreover, school management will occur and expected to support the implementation of an effective and efficient in the teaching and learning process that will improve the quality of education. Indeed, SBM is one of educational reform that offers schools to provide a better and more adequate education for students.

School-Based Management is an alternative form of school as a result of the decentralization of education. The principle of SBM relies on schools and society. After that, SBM has the potential to increase community participation, equity, efficiency, and management that relies on schools or madrasah. SBM is intended to increase school autonomy, determine what teaching needs and manage existing resources to innovate. SBM also has the potential to improve and create school principals, teachers, and administrators to be professional, and the needs of each student and the school community. Student achievement can be optimized through the direct participation of parents and the community. Undoubtedly, increasing the quality of education is not an easy task because it is not only related to technical problems, but it also covers a variety of very complex problems, either concerning planning, funding, efficiency or effectiveness in the school system. Then, improving the quality of education also demands better management of education.

According to Mulyasa[10] “school-based management is one of educational reform that offers schools to provide a better and more adequate education for students.” Similarly, school-based management is a strategy to improve schools by giving authority to school. Even, school-based management gives great freedom and power to the school accompanied by a set of responsibilities. The responsibility for resource management and the development of school-based management strategies run in accordance with local conditions, so the schools can further improve the teachers’ welfare so they can concentrate more on their tasks.
The application of SBM in the school refers to the Regulation of National Education Permendiknas No. 19 of 2007[8] concerning to the Standards of Educational Management by the Primary and Secondary Educational Unit [11]. The main feature of School-Based Management is the independence of the school in all aspects to determine the direction of development. Then, it is adapted based on the conditions and the demands of the local community.

Furthermore, The World Bank [11] said that: “School-Based Management is decentralized level of school administration authority to the school level.” Hence, the school principal has a responsibility in decision-making on school implementation. Even, teachers, parents, students and other members of the school community.

In Aceh, every level of education has implemented a School-Based Management system which has been approved by the local government in accordance with Aceh Law or Qanun No. 5 of 2008[12] “Management of formal education at the elementary and secondary education level implements School-Based Management (SBM) in accordance with religious, social and cultural values.” So that, every school in Aceh implements School-Based Management.

2.4 Characteristic of School-Based Management

School-based management has characteristics that need to be understood by schools. In other words, if the school wants to be successful in implementing school-based management, the following characteristics of SBM need to be owned. The characteristics of SBM cannot be separated from the characteristics of an effective school. In another word, SBM is a container or framework, then the effective school is the contents.

The characteristics of SBM consist of effective school elements, which are categorized into input, process, and output. The characteristic of SBM based on the aspect of educational input are having clear policies, objectives, quality and having the available resources, highly competent and dedicated staff, and having high achievement expectations, focusing on students and management input.

Effective schools generally have a characteristic process, namely a learning process that is more effective, the firm school leadership, a safe and orderly school environment, an effective management of educational staff, having a quality culture, having an intelligent and dynamic timework, independent, having high participation from school members and the community, transparency of management. It is also including the schools that carry out continuous evaluation and improvement and the schools that are responsive and perceptive toward the needs and have accountability.

According to Brown in Yahya[13], the main and effective characteristics in implementing SBM in schools are as follows.

a) School autonomy

   Autonomy is defined as the authority or independence which is independence in managing and not depending on the others. Independence in funding programs is the main benchmark for an independent school. Independency that takes place continuously will guarantee the development of the school.

b) Flexibility.

   Flexibility can be interpreted as the free authority given to schools to manage, to utilize and to empower the schools’ resources as optimally as possible to improve schools. Indeed, the schools will be more agile and do not have to wait for the direction from their superiors in managing, utilizing and empowering their resources. In this way, the school will be more responsive and faster in responding to all challenges faced.
However, the flexibility must remain within the corridor of existing policies and regulations.

c) Cooperation
SBM that is able to improve the quality of education demands the cooperation between the stakeholders in the school. The impact will be beneficial for the students, especially the importance of teamwork in the learning process.

d) Participation
Participatory improvement aimed to create an open and democratic environment. The stakeholder in a school (teachers, students, staffs, and the community are encouraged to be directly involved in conducting education starting from the decision making, implementation, and evaluation of education that is expected to improve the quality of education.

Additionally, apart from the characteristics of school-based management, there are several facts that need to be considered toward school-based management that relate to (1) school obligations, (2) government policies and priorities, (3) the role of parents and society, (4) the role of professionalism, management, and professional development.

   a) School Obligations
Schools are required to be able to display transparency, democratic, without a monopoly, and having responsibility for the community and the government in order to increase the service capacity for students. Therefore, the implementation needs to be accompanied by a set of obligations, monitoring and relatively high demands of accountability. Therefore, schools which have autonomy also have an obligation to implement government policies and meet the expectations of the school community.

   b) Government Policies and Priorities
Since the government has the responsibility for national education. They have the right to formulate policies that become national priorities, especially those in which is related to literacy and numeracy programs, efficiency, quality, and education equity.

   c) The Role of Parents and Communities
In implementing SBM, the active involvement of various community groups and parents in the planning, organizing and monitoring educational programs in schools is something that is utmost importance to consider. The community and parents must be aware that education is our responsibility. Then, the school is an educational institution that needs to be supported by all parties.

   d) Role of Professionalism and Management
School principals, teachers, and administrative personnel must have to be professional and have management characteristics in order to meet the requirements for SBM implementation. School principals are demanded to study more about government policies and priorities, especially their school priorities.

   e) Professional Development
In SBM, the government must ensure that all important elements of education staff (human resources) receive the professional development needed to manage schools effectively. In addition, it is important to note that schools and communities should be involved in the process of implementing SBM as early as possible.

Thus, the application of school-based management is commonly known among others. Then, the schools can optimize school organization, learning processes, human resource management, management of resources and administration.
Based on implementation studies in other countries, it is also expressed and implied in government policies and the National Education System Law No. of 2003 concerning community-based education in article 55 on 1st paragraph: the community has the right to organize community-based education in formal and non-formal education in accordance with the religion, social environment, and culture for the benefit of the community. Similarly, there are at least four aspects in it namely quality, relevance, justice, effectiveness and efficiency, and accountability.

SBM aims to achieve the highest quality and relevance of education. It is in accordance with a benchmark of outputs and outcomes assessment rather than on the methodology or process. In another idea, the results of educational quality are at the same time relevant to various needs and contexts. If we separate them, then, the quality refers to achieving specific goals by students (graduates), such as test scores or other achievements. While the relevance refers more to the benefits of what students get through education in various fields/life demands and including education that is not tested.

SBM aims to ensure justice for every child to obtain the quality of education in the school. Since every child has the potential to learn, SBM has the flexibility for each school to handle every child with a different socio-economic and psychological background. It makes them have the opportunities to get a better education so they can grow optimally. Then, every school must serve every child, and the school must achieve minimum competency standards for each graduated child. This justice is so important so that effective school experts shorten the objectives of effective schools only on quality and justice.

SBM aims to improve effectiveness and efficiency. Effectiveness relates to the process, procedure, and the use of all inputs used in the education process in the schools, so it produces students’ learning outcomes as expected. To know how the school is effective or not, then the result will be determined after the evaluation assessed. On the contrary, to achieve good results, every effort is made to apply the indicators or characteristics of effective schools. By applying SBM, it is expected that every school, according to the conditions can apply the right method. Then, other inputs are put in the right way so that all inputs are effective and targetted. In other words, it is effective to improve the quality of education. Meanwhile, the term of efficiency relates to the value of money spent to fulfill all inputs.

SBM aims to increase school accountability and commitment of all stakeholders. Accountability is the responsibility for everything that is done in accordance with the authority and responsibility obtained. Recently, school accountability is more about financial administrative problems and in accordance with the bureaucratic path. The technical responsibility is limited to the implementation of the program according to instructions and guidelines from the central department without accountability toward the results of the implemented program. Through SBM, schools can improve their capabilities in planning, managing, financing, and organizing the educational program in the school. Then, schools can also utilize and empower available resources and can increase the awareness of the school member and community members in the implementation of education in accordance with their abilities.

School-based management focuses on aspects of school independence with the transparency characteristics of implementation that starts from planning until reporting. Autonomy can create independence with the direct involvement of the school and the community toward the formulation of school programs. The flexibility in managing the resources and community participation to participate, having the professional school principal in carrying out his role as a manager and as a leader. It also gives opportunities for school principals to compile curriculum
and teachers can innovate by developing curriculum in accordance with the conditions and needs of the school.

School-based management encourages the professionalism of teachers and principals as school managers. School-based management emphasizes the maximum involvement of various parties such as the participation of staff, teachers, parents, students, and the wider community in the formulations of school decisions. Participation can increase their commitment to the school. Furthermore, it supports effectiveness in achieving school goals. The society provides control and monitoring from the government so that school management becomes accountable, transparent, egalitarian, democratic, and eliminates monopoly practices in school management. Finally, SBM makes community involvement in decision making, formulating school programs, and formulating costs, and sources of funds. School decisions are no longer only from school principals but decision making takes part from community schools.

3 Conclusion

The principal’s performance is the performance performed by the principal through skills and motivation, both in quality and quantity, she is carrying out his/her work in accordance with the responsibilities required. The principal has a role in the implementation of SBM where a school principal must be able to make decisions and conduct planning at the beginning of the year by forming 8 teams to organize the planning of 8 the standard of national education. The motivation of principals in carrying out SBM is done not only for principals but also for educators and education. The principal's discipline affects the performance of all school because the principal is a role model for the school community.

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Developing an Assessment Instrument for Integrated Science Process Skill (ISPS) in Fundamental Chemistry Course

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Abstract. In this research, the development of the instrument integrated science process skill (ISPS) in a basic chemistry course in the form of multiple choices test. This study a Research and Development (R & D) with 3 stages, starting from; 1) the problem identification, examines the theoretical study and needs analysis, 2) the composing activities including planning, group meeting, expert validation, readability test, testing of small group and initial product, 3) evaluation activities, first field trial, product revisions, second field trial, analysis of items and final product revisions. The research subjects were students of 3rd semester (pre-service teachers) chemistry education department. Data analysis uses descriptive percentages and quantitative analysis. The ISPS aspects used are formulating hypotheses, defining operations, interpreting data/graphs, identifying/controlling variables and designing experiments. Fifty-five (55) questions have been developed but after analysis discrimination index, difficulty index, validity, reliability analysis only 31 valid test items for ISPS instruments with a reliability value of 0.967 the criteria are very high.

Keywords: ISPS, Thinking Skill, Discrimination Index, Difficulty Index, Validity, Reliability

1 Introduction

Education in the era of industrial revolution 4.0 has been re-oriented to accommodate learning environment for developing thinking skill rather than memorizing facts. One of the essential skills is critical thinking [1]. The manifestation of critical thinking skill in science learning might be part of science process skills (SPS). Such skill is crucial for students to apply knowledge in society and necessary in daily life [2]–[4]. SPS is a science process skill that includes cognitive and motorists which trains reasoning skills [5]–[8]. It is also known as procedural, experimental, scientific inquiry and thinking skills, which might be drilled through laboratory activities [2], [9], [10]. Basic science process skills (BSPS) were usually experienced in primary school levels and the integrated science process skills (ISPS) can be accomplished by higher level school students [11]. ISPS is the development of basic SPS [8], [12], which composes five aspects, namely formulating hypotheses, defining operations, interpreting data/graphs, identifying/controlling variables and designing experiments [4], [7], [9], [13], [14]. Assessing the ISPS is not simply to measure the cognitive aspects but it also to examine the thinking skill process. ISPS is formulated as a scenario within a text and followed by several multiple choice questions. Therefore ISPS instrument has not been much available in literature especially for fundamental chemistry course [6], [15].

1.1 Problem of Research

ISPS assessment is crucial at the beginning of the lecture because it can diagnose the learning objective achievement of the lab practical and other learning activities. Conventional lab practical work has not been accommodated all science process skill especially the skill of designing experiment is very rare in student lab worksheet [16]. Such skill is, even more, changing for in-service teachers in a rural area [17]. Therefore this study is to develop valid ISPS instruments for basic chemistry courses to evaluate new student ISPS.

1.2 Research Focus

Research on the developing SPS test instruments has been carried out by several researchers. Feyzioglu, Demirdag, Akyildiz, & Altun [18] developed SPS test instruments on environmental chemical technology in the form of 30 multiple choice questions with a reliability score of 0.83. Similar research models regarding the
validity and reliability tests also have been existed in the literature including ISPS for natural science course [14], [19]–[21]. Some ISPS was composed in the form of essay test [12], [22]. While the focus of this study is to develop a valid and reliable ISPS instrument in multiple-choice forms that can be used as a test tool to find out ISPS students. Specialized as a tool to measure ISPS in the student's basic chemistry courses at the beginning of the lecture, evaluating practical activities and other learning activities.

2 Methodology of Research

The Subjects were 55 third semester students majoring in chemistry education at University. ISPS was developed by verifying the previously thesis on developing ISPS for science [16], [23]. The design of the instrument development was carried out by adapting the design of [12], [23], [24] and the process was displayed in Figure 1. ISPS instrument was developed in 55 of multiple choice questions as the initial product. The questions were given to 55 pre-service teachers (third semester of teacher training university-students) with voluntary sampling. The generated data is analyzed with the help of a test item analysis program developed by [25].

![Figure 1. The design of the study.](image-url)
2.1 Data Analysis

The content ISPS instrument was validated by 3 experts (chemistry professor and science teaching) to evaluate each test time that representing ISPS aspects (formulating hypotheses, defining operations, interpreting data/graphs, identifying/controlling variables and designing experiments) and also language. The validation sheets were analyzed using descriptive analysis that is calculating in percentage representation [15]. After revising several times according to expert suggestion then, the instrument was tested on 55 third-semester chemistry students (pre-service teachers). Data was analyzed to search the index of difficulty \((P)\) (range score of \(0.30 < P \leq 0.70\)), the moderate level of difficulty was chosen. The discrimination index \((P)\) was taken in score range of \(0.20 < P \leq 1.00\); the validity test was calculated on \(0.20 < r_{xy} < 1.00\) and reliability test was conducted using formula of Kuder Richardson 20 with score range of \(0.79 - 1.00\) [7], [8], [14], [18], [19].

3 Results and Discussion

The content validation data obtained by analyzing the validation sheets, the data were grouped into material validation, contract validation and language validation [26]. This indicated that the assessment format is suitable, the subject matter is clearly formulated (appropriateness of the conceptual, the ISPS aspects), language use (Indonesian) is appropriate. The validation score on material and language aspects were in the level of very accurate (> 80%) and the construction aspect was considered accurate or valid as shown in Table 1.

Table 1. The result of the validation of ISPS test instrument by the experts.

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Value</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material</td>
<td>81.72%</td>
<td>Very accurate</td>
</tr>
<tr>
<td>Construction</td>
<td>79.83%</td>
<td>Accurate</td>
</tr>
<tr>
<td>Language</td>
<td>82.15%</td>
<td>Very accurate</td>
</tr>
<tr>
<td>Validity average total score</td>
<td>81.24%</td>
<td>Very accurate</td>
</tr>
</tbody>
</table>

Based on the data in Table 1, the results of the validation of the test questions by the experts as a whole in terms of material, construction and language are in very accurate or valid with the average value is 81.24%. However, a small improvement and revision were carried out on a number of questions, one of which was an SPS question of identifying/controlling variables aspect. Improvements were made because the description of the questions presented was less clearly formulated and raised ambiguous questions. Therefore, the questions were fixed but with the same answers, also the alternative answer choices provided is not right. The following are examples of questions before and after revision can be seen in Table 2. Furthermore, from the five aspects of integrated SPS that were revised by the experts, some questions were changed and also reviewed, the results of the integrated SPS questions recapitulation can be seen in Table 3.

Table 2. The example of ISPS question before and after revision

| Question before revision | A student conducted a simple trial by storing water in an opened bottle and a closed bottle with the same amount of water. After a few days, it turns out that the |
volume water in the opened bottle is reduced, while the water in the closed bottle remains the same volume. At a certain temperature, the water will evaporate and will form a gas (water vapor), the vapor will condense and form liquid these are called dynamic equilibrium. The water in the closed bottle will evaporate and condense in the bottle and flow again to the bottle. How do students know the relationship between air temperature and the amount of water vapor that condenses and the cause of this dynamic equilibrium?

a. The water in the opened bottle decreases due to the influence of the temperature.

b. The water in the opened bottle evaporates and condenses out of the bottle so the amount of water in the bottle will decrease.

c. The water in the closed bottle remains the same because the environment temperature does not influence the water.

d. The water in the closed bottle remains the same because of the evaporation and condensation process.

A student has just learned that air contains water vapor in the form of gas. The gas turns into the water at a low temperature. He took 5 equal-sized formulated milk cans and filled in with a number of an ice cube in different pieces. Each of the cans is placed above the funnel that can collect the dew into the measuring cup. How do students know the relationship between air temperature and the amount of moisture that condenses?

a. Measure the volume of water produced and compared it with the initial temperature of each can.

b. Observe the five cans and compare the amount of water vapor produced.

c. Measure the temperature of each can and compare the amount of water vapor produced in each.

d. Measure the volume of the dew collected at certain intervals on each can and record the temperature outside of each can.

### Table 3. ISPS question recapitulation result revised by the experts.

<table>
<thead>
<tr>
<th>ISPS aspect</th>
<th>The number of questions before revision</th>
<th>The number of questions after revision</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Determining the hypothesis</td>
<td>9</td>
<td>9</td>
<td>4 questions are revised</td>
</tr>
<tr>
<td>Defining the operation</td>
<td>11</td>
<td>11</td>
<td>6 questions are changed and 2 questions are revised</td>
</tr>
<tr>
<td>Identifying and controlling the variable</td>
<td>10</td>
<td>10</td>
<td>3 questions are changed and 1 questions are revised</td>
</tr>
<tr>
<td>Interpreting the data/reading the chart</td>
<td>12</td>
<td>12</td>
<td>4 questions are changed</td>
</tr>
<tr>
<td>Designing experiments</td>
<td>13</td>
<td>13</td>
<td>4 questions are changed</td>
</tr>
</tbody>
</table>

Next, the readability test carried out by 8 respondents, the aim is to know the suitability of the language and the understanding of the respondents to the sentences presented [24]. This is done to make it easier for respondents to understand the questions. This test uses an answer sheet that contains opinions and suggestions about the instrument, the procedure is that the respondent reads the questions and gives opinions, criticisms, suggestions if there are languages and sentences that are difficult to understand. Based on the readability test results of several respondents, the language of the questions presented is easy to understand, the story-type question makes it easier to understand, the use of systematic procedural questions makes it easier to examine the questions and the case used in the question based on daily life hence it triggers
to analyze the problem. The suggestions presented by respondents are the text presented in the question is too long it takes time to read it. It is necessary to know the questions of measuring integrated SPS aims to find out thinking skill, therefore the questions presented are long because the form of the SPS question is analyzing problems in daily life that cover basic chemistry course. So, the SPS questions that developed are more procedural or practical questions and presents problems [10].

3.1 The First Field Test

Difficulty index test serves to determine the level of difficulty of the test questions. The criteria for good questions are questions that are not too easy and not too difficult [8]. First stage test was applied for 55 respondents who chemistry undergraduate students of teacher training. Of the 55 questions tested, there were 6 easy, 40 medium and 9 difficult questions. The easy question has a difficulty index of 0.71 - 1.00, moderate 0.70 - 0.31 and difficult from 0.30 - 0.00. Then, the difficulty index of the five aspects of ISPS questions developed is at an average of > 0.31 and < 0.70. The questions that considered by a student the most difficult was in test items of “designing the experiment” with difficulty index of 0.362, the easy one is the aspect of “identifying/controlling the variable” with difficulty index of 0.571.

Discrimination index test analysis aims to find how the question is able to distinguish high-capability and low-ability samples to have opportunity to answer correctly [8]. From the discrimination index, there were 21 questions with deficient criteria, 10 questions are enough, 21 good questions and 3 questions with very good. Questions that are categorized as deficient with a score of ≥ 0,190 were rejected. This occurs because the questions developed are not able to measure smart respondents with less intelligent respondents. The effectiveness of deception is also very important to determine the level of accuracy and understanding of respondents. The answer choices function to see the understanding of respondents in analyzing the questions. Proper deception provisions are chosen ≥ 5%, means that the deceiver functions if at least 3 respondents respond to the same answer choices from the total of respondents.

From the validity analysis, there were 17 questions that had very low criteria (0.20) that means consistency and accuracy of the questions were invalid. There were 12 questions that have low validity (>0.20) and 7 questions were medium validity (0.40), 15 questions were highly valid (>0.60) and 4 questions were very high validity (>0.80). The reliability analysis shows a very high score of 0.887 which means that the ISPS instruments are very reliable. Therefore only 34 out of 55 questions were selected due to high reliability (0.887) for test items of the ISPS assessment instrument. Among 34 questions, 3 of which has been revised for the second times for re-use. In average it took 90 minutes for respondents to complete all questions.

3.2 The Second Field Test

The second field test was applied for 51 respondents who chemistry undergraduate students of teacher training with 34 questions tested. The difficulty index of the instrument was > 0.31 (moderate) that is ideal for a standardized instrument. The 3 questions were considered difficult (the score 0.30) and the easy question was none. Distribution of the difficulty index in each aspect of ISPS was tabulated in Figure 2.
Figure 2. The distribution of difficulty indexes for each aspect of ISPS instrument

Figure 2 shows that the lowest difficulty index is in the aspect of designing the experiment with a value of 0.385, which means that this problem was the most difficult compared to other and the aspect of identifying/controlling the variable was considered the easiest with a value of 0.467. This finding consistent with the previous study where designing experience is the most difficult for students although for the subject of high school science [16][27]. Also reported that the ISPS aspect on identifying/control the variable is considered a moderate difficulty for the respondents. This is because regular science practicum already contained some exercise for students to drill skill in identifying/controlling variables but an exercise in designing experiment are very rare in conventional science practical works.

Discrimination index in the second test found 3 questions (bad) 2 question (sufficient), 21 question (good) and 8 questions (very good), therefore 29 questions were chosen. The choice of answers used all functioned while there were 5 questions which were not good enough that means the answer choices presented were not functioning, therefore revisions were made before the final product was obtained. Validity test show 14 questions have highly valid, 15 questions are valid, 3 question is sufficient and 3 questions were poor. Reliability test found 34 questions have high reliability (0.967). There were 31 questions that have moderate difficulty index and 3 questions were considered too difficult and it was rejected. Those 31 selected questions distributed in five aspects of ISPS as shown in Table 4.

<table>
<thead>
<tr>
<th>ISPS aspects</th>
<th>The question number</th>
<th>Total of questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formulating hypothesis</td>
<td>3, 6, 17, 23, 27</td>
<td>5</td>
</tr>
<tr>
<td>Defining operational</td>
<td>5, 8, 11, 12, 14, 15, 18, 24</td>
<td>8</td>
</tr>
<tr>
<td>Identifying/controlling variable</td>
<td>16, 19, 22, 29, 30</td>
<td>5</td>
</tr>
<tr>
<td>Interpreting data/ reading graph</td>
<td>1, 2, 4, 9, 21, 28</td>
<td>6</td>
</tr>
<tr>
<td>Designing experiments</td>
<td>7, 10, 13, 20, 25, 26, 31</td>
<td>7</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>31</td>
</tr>
</tbody>
</table>
4 Conclusions

Based on the results of this study it can be concluded, the test questions was developed is good with an average index level of difficulty is medium, good power difference, and high validity. This means the instrument is high of quality and meets the standards to be used. The level of reliability of the instrument increased from the first test 0.887 becomes 0.967 in the second test which was on very high criteria, means that the instrument was very reliable. Also, obtained 31 test questions of good criteria consisting of 5 aspects, which could be used to measure integrated SPS in the basic chemistry course.

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Abstract. HIV/AIDS is a threat to health disasters. The increase in the epidemic was very rapid in developing countries such as Indonesia, including Aceh Province. Transmission through sex, the use of the syringe, blood transfusions and transmission of mother to child. This study only analyzed the risk factors for transmission due to sex and the use of a contaminated syringe. Characteristic factors also play a role: age, gender, religion, marriage, education, employment, income, and ethnicity. Design research analytic survey with a cross-sectional method with 74 samples out patient treatment RSUDZA uses Slovin techniques. An analysis program data through SPSS 23.0 for linear regression. The results show the characteristic factors that are vulnerable: groups of 31-45 years old, male, married, Muslim, non-working, laborers, entrepreneurs, scholars, income below the regional minimum wage and other tribes. Regression results showed a significant relationship at 95% confidence level, sexual intercourse (p = 0.0001), syring use (p = 0.0001). R² value = 59.6% with the contribution of the use of contaminated syringes by 39.8% more dominant than the sex of 19.8% in the risk of transmission of HIV/AIDS in Aceh Province. Risk factor sexual intercourse include sex with an official partner and even free sex, a lack of knowledge about partner health, especially related to HIV / AIDS, lack of awareness of condom use and has a hospital chart of PMS. Risk factors for syringe use include the used syringe of alternately in drugs and treatment.

Keywords: HIV/AIDS, Sexual Intercourse, Use of the syringe

1 Introduction

HIV/AIDS like an iceberg as it's infectious, deadly, and its height stigma of the community towards HIV/AIDS sufferers and their families so as to lead to discriminatory treatment in work, medicine, care, education and so on. In the epidemic disaster management cycle, this disease is included in the situation where there is no disaster, including prevention and mitigation activities related to effective and efficient prevention, control and eradication efforts. Statistics on HIV/AIDS cases in Indonesia cumulatively HIV/AIDS since 1 April 1987 until 30 September 2014 amounted to 150,296 cases of HIV, and 55,799 cases of AIDS and 9,796 cases of death [1] recorded cumulatively HIV / AIDS cases as many as 389 cases. VCT clinic administration Aceh Province in RSUDZA HIV cases until July 2015 amounted to 286 cases. These numbers are quite alarming, where the number of people with HIV / AIDS in Aceh Province has reached 0.2% of all HIV/AIDS sufferers in Indonesia. The development of these data shows that the Province of Aceh risk of experiencing an endemic disaster at future. Some risk factors for
transmission of HIV / AIDS through sexual intercourse, blood transfusion, mother to child transmission, and the use of alternating syringe [2]. Studies of the risk factors for HIV/AIDS transmission, especially as a result of sex and the use of the syringe, are considered very high important as material knowledge and education so disaster prevention can be done well and efficiently. Therefore it is necessary to do research on "Analysis Of Risk Factors HIV/AIDS Transmission Caused By Sexual Intercourse And Use Of Syringe In Aceh Province".

2 Research Methods

The study was conducted at the Voluntary Counseling and Testing clinic Zainoel Abidin Regional General Hospital (VCT RSUDZA) in Aceh Province from 18 to 31 May 2018. The research design is a survey that is analytically based cross-sectional with multiple linear regression methods. The sampling technique is Non-Random Sampling ) Accidentally by using Slavin formula as the following [3]:

\[ n = \frac{N}{1 + Ne^2} \]

\[ n = \frac{286}{1 + 286 (0.1)^2} \]

\[ n = \frac{286}{3.86} \]

\[ n = 74.09 \] (adjusted by the researcher )

The analyzed data is primary data obtained from instruments in the form of a questionnaire. Recapitulation of respondents' answers was tabulated with Ms. Excel for the process of analysis, discussion, and conclusions. The first step in multiple linear regression analysis is the classical assumption test. After the test is fulfilled, the multiple linear regression analysis can be done through the SPSS 23.0 program with regression equations [4] as follows:

\[ Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + e \] (1)

\[ Y = \text{HIV/AIDS}, \; \alpha = \text{Constants}, \; X_1 = \text{Sexual Intercouse}, \; \beta_1 = \text{coefficient regression of variable X1}, X_2 = \text{Use of contaminated syringe/drugs Injections}, \; \beta_2 = \text{Regression coefficients of variable X2,} e = \text{Standard error} \]

3 Research Results

The highest age of HIV/AIDS characteristic patients is at the age of 36 years to 40 years as many as 20 people (27.0%), 41 years to 45 years as many as 16 people (22%), and 31 years to 35 years as many as 14 people (19%). Thus, it can be seen that the age category is vulnerable to HIV/AIDS is 31 years to 45 years which is productive age. The number of male patients as many as 65 people (88%) very dominant than females 9 people (12%). This is in line with previous research by Fahdhienie & Desvita [6] identified that men were more infected with HIV/AIDS (65%) than women (35%).

The patient of HIV/AIDS in Aceh Province 93% came from Muslims. This is in accordance with the statistical data on the number of the Muslim population in Aceh Province, namely above 90% [7]. A person's religious status does not guarantee that he is not infected with
HIV/AIDS if it is not aligned with behavior (morals) in implementing religious guidance. In essence, all existing religious teachings in the world demand their people behave well and be clean and even holy. So that the high number of people with HIV/AIDS from Muslims can be linked to activities that violate the provisions of religion and norms by their followers.

Furthermore, HIV/AIDS sufferers with a married status 44 people (60%) are the highest group compared to unmarried status as many as 18 people (24%) and those widow/widower status as many as 12 people (16%). Similarly, the religious factor, married status is also not a guarantee to protect the epidemic of contracting HIV/AIDS. Possibly affected by other factors.

When connected with characteristic respondents by education, most of the sufferers were identified in undergraduate education at 35.1% (26 people), followed Senior high school is 31.1% (23 people), junior high school is 25.7% (19 people) and elementary school is 8.1% (6 people). Theoretically, the higher level of education will influence a person’s behavior patterns in taking a better policy. However, the results of the study show that high education is directly proportional to the level of HIV/AIDS risk transmission. This thing explains high education, the pattern of one's life becomes worse, which is evidenced by the number of HIV/AIDS.

High Education support decent jobs with earnings sufficient. Conversely, high education does not necessarily also get a decent job and income. From the number of respondents who have income below the regional minimum wage is obtained that has a bachelor status and works as an entrepreneur. It shows that high education with occupation entrepreneurs do not ensure have a better income. Aceh suffered as much as 32.4% with entrepreneur employment, the unemployment group of 20.3%, the labor group of 18.9%. The group with the type of work as civil servants is the lowest HIV/AIDS group of 12.2%.

Types of work proved to affect people's susceptibility to HIV/AIDS. This can be explained by one's lifestyle which is very closely related to work with income. If an entrepreneur is considered a high-income person or higher than the regional minimum wage and otherwise a worker is considered a low-income person or below the regional minimum wage, then the phenomenon that appears is very interesting. High income triggers a person with a free, unlimited lifestyle, and vice versa low income makes people behave apathetically which also leads to a bad lifestyle.

Suffers from income below the regional minimum wage as many as 39 people (52.7%). They are thought to be an accumulation of people with HIV/AIDS who are unemployed, laborers, and private employees. Whereas sufferers with income higher than regional minimum wage as many as 23 people (31.1%). This explains both incomes that is higher than the regional minimum wage nor the earnings below the regional minimum wage has a chance of infection of HIV/AIDS. With income higher than regional minimum wage can encourage someone to do many things that can change their healthy lifestyle especially related to sex. Where only by relying on money then it's easy can get something, you want especially related to deviant behavior. As for people who earnings lower than regional minimum wage, did not rule out the conditions for low income and the level of faith that is lacking it will most likely lead to a pattern of behavior that is not good for getting income much more than or in other words, can fall into sex with background want to get money.

Suffers infected with HIV/AIDS in Aceh Province identified mostly came from other tribes by 41% (30 people). One of the factors that favor the spread of the epidemic HIV/AIDS is a population migration activity for various reasons such as work and marriage. By chance, this research was conducted in Aceh. Therefore, a small portion of the Acehnese is identified with the status of HIV/AIDS. It can be explained that the HIV/AIDS epidemic in Aceh Province has spread to evenly distributed ethnic groups. Aceh's specialty in the field of religion and culture
is not a guarantee for the formation and a healthy and good lifestyle. This requires the attention of all parties to be able to carry out HIV/AIDS disaster mitigation efforts.

3.1 Sexual Intercourse

Sexual behavior related to the transmission of HIV/AIDS in Aceh Province was analyzed from questionnaire questions number 1-10 given code P1-P10. The results of the study can be seen in Figure 3.1.

![Figure 3.1 Percentage of Respondents' Answers Regarding Sexual intercourse (n = 74)](image)

Figure 3.1 Percentage of Respondents' Answers Regarding Sexual intercourse (n = 74)

Based on Figure 3.1, a total of 74% (55 people) with HIV/AIDS in Aceh Province had had sexual intercourse (P1), or in other words, as many as 26% of respondents have never had sexual intercourse. This correlates with the characteristics of marital status, of which 76% are married to HIV/AIDS and 24% of respondents are unmarried.

HIV/AIDS sufferers those who only had sex with an official partner (P2) amounted to 29 people (39%). When associated with the analysis of the previous question (P1), almost 50% of patients who have had sexual intercourse or are married make a statement that they only have sexual intercourse with an official partner. In other words, there are 50% of people with HIV/AIDS who have relationships with informal partners.

Furthermore, in the third question (P3), the frequency of frequent sexual intercourse is recognized by only 21% of people with HIV/AIDS. It can be explained that more people with HIV/AIDS who have a frequency rarely have sex with their partners (31%). This reflects the problem of harmonization in the household which leads to a low level of partner sex. This disharmonization can then produce new problems such as deviant sexual behavior or drug use.

Disharmonization is also shown by the fact that only 22% of people with HIV/AIDS know their partner's health condition (P4) in general. Here there is a phenomenon of apathy towards the couple, which is not considering the health of their partner by 31%. When continued with the question whether you know that your partner has HIV/AIDS (P5), only 20% of people with HIV/AIDS know that their partner also has HIV/AIDS. In this case, 33% of HIV/AIDS sufferers did not know their partner's HIV/AIDS status. This incident is quite natural because an HIV/AIDS sufferer tends to want to keep his health status secret in regard to feelings of shame and worry about getting social sanctions such as mistreatment or even being abandoned by his partner.

The results of the study on the question (P6) show that 15% of people with HIV/AIDS also engage in sexual intercourse with unofficial partners. The quality of this relationship is worse
with the condition of the level of knowledge of HIV/AIDS sufferers towards unofficial partner health (P7) lower (15%) and conversely, the level of knowledge of HIV/AIDS sufferers on unofficial HIV/AIDS status (P8) is also lower, namely 9%. While the frequency of sex with an unofficial partner (P9) ranges from 13%. These results can be correlated with the status of the implementation of Islamic law in Aceh Province where the condition of the people is still more controlled compared to the conditions of the people in other big cities such as Medan and Jakarta. It can be said that the possibility of having sexual intercourse with an informal partner in Aceh Province is relatively low.

Regarding the technique of safe sexual intercourse, only 12% of respondents want to use a condom for their sexual activities. Apart from the existence of a free condom provision program at government health service. This can be attributed to low income so that it is unable to fulfill condoms that have to pay more.

3.2 The Use of Contaminated Syringes

The behavior of using contaminated syringe related to the transmission of HIV/AIDS in Aceh Province was analyzed from questionnaire questions number 1-10 given code P11-P12. The results of the study can be seen in Figure 3.2.

Based on Figure 3.2, as many as 40 people (54%) with HIV/AIDS in Aceh Province are drug users (P11). In other words, 46% are not drug users. This can be correlated with the high rate of HIV/AIDS sufferers of the male sex, where men have a greater potential to use drugs compared to women. In question P12, 27% of people with HIV/AIDS admitted that they had used a contaminated syringe, but some said they did not use a contaminated syringe. The cause of the use of a contaminated syringe is because only 10% of people with HIV/AIDS have personal syringe supplies (P13). This means that 40% of people with HIV/AIDS do not have personal syringe supplies. As a result of the low ownership of syringe equipment, 47% of people with HIV/AIDS used this syringe alternately (P14) with a frequency level (P17) of 24%. This is where the chance of contracting HIV/AIDS can be seen because alternating use is a critical point of HIV/AIDS transmission. The use of shared syringes when treatment (P15) is low, which is only 16% with a frequency of 14% (P18). This can be attributed to the level of knowledge of HIV/AIDS sufferers on the transmission of this disease through the use of a contaminated.
syringe (P16) which was low by 32%. The low level of ownership of personal syringe equipment can be attributed to low income where the majority of HIV/IDS sufferers (52%) earn below regional minimum wage.

Furthermore, HIV/AIDS sufferers felt that they were infected through the use of a contaminated syringe (P19) of 33%. As many as 31% of people with HIV/AIDS claimed to have had blood contact through the use of tools before they realized that they had HIV/AIDS (P20). This can be attributed to the previous question, namely P16 about their knowledge of HIV/AIDS transmission through the use of a contaminated syringe. It can be said that all people living with HIV/AIDS who know about the risk of transmission of HIV/AIDS through the use of contaminated syringes and already become drug users assume that they are infected with HIV/AIDS through this factors.

### 3.3 Risk of HIV/AIDS Transmission

Each Risk factors for HIV/AIDS transmission in Aceh Province were analyzed from 10 questions coded P21-P30. The results of his research can be seen in Figure 3.3.

![Figure 3.3 Percentage of Respondents' Response to HIV/AIDS (n = 74)](image)

Based on Figure 3.3, people with HIV/AIDS who have a history of previous sexually transmitted diseases (P21) amounted to 24 people (32%). Then only 10% of people with HIV/AIDS were examined by a doctor regarding the sexually transmitted disease (P22). HIV/AIDS sufferers who know the early symptoms of HIV/AIDS (P23) are 76% while those with HIV/AIDS who know the acute symptoms of HIV/AIDS (P24) are 85%. This is understandable because early symptoms of HIV/AIDS are more difficult to know compared to acute symptoms. The level of knowledge of people with HIV/AIDS on early and acute symptoms shows that knowledge of people with HIV/AIDS about this disease is quite good. Moreover, this can be correlated with the level of education of HIV/AIDS sufferers dominated by scholars. The same is confirmed by the question P25, that 78% of people with HIV/AIDS know about their immune paralysis due to the HIV virus attack. As many as 72% of people with HIV/AIDS have examined their health before seeing that they have contracted HIV/AIDS (P26). This reflects the results of the attack of the HIV virus on the body's immunity which causes sufferers of HIV/AIDS early symptoms often feel unwell.

HIV/AIDS is a frightening assumption in society. In question P27, as many as 58% of people with HIV/AIDS stated that their status was known to the community around their residence. As many as 76% of people with HIV/AIDS stated that their families knew their status (P28). This
has become very important, which shows that there is great support from the family for subsequent HIV/AIDS sufferers.

The risk of transmission of HIV/AIDS has been realized by 95% of people with HIV/AIDS (P29). This number is quite high. However, the government must not ignore the 5% of people with HIV/AIDS who do not know the risk of HIV/AIDS transmission properly. Awareness of the risk of transmission of HIV/AIDS has to it reach 100%, where both people with HIV/AIDS or another person can be saved by this knowledge.

The impact in terms of social, 77% of people with HIV/AIDS began to limit the association of their social community. This can be understood as a result of feeling embarrassed or worried about getting scorn and stigma from the community. However, increasing knowledge that the opportunity and the right to life of people living with HIV/AIDS are the same as other people need to continuously campaign. HIV/AIDS sufferers are not community trash, but are part of the community. Especially passive HIV/AIDS sufferers who are infected from their official partners, children who are infected from their mothers, people who are infected by transfusions and so on.

3.4 Factor Analysis of HIV/AIDS Transmission in Aceh Province

The results of the analysis of multiple linear regression models for risk factors for transmission of HIV/AIDS could be written with the equation:

$$Y = 0.909 + 0.452 X_1 + 0.487 X_2$$ (2)

Based on these equations can be explained that the value of 0.909 is the value of a constant or an intercept value that shows the value $Y$ when $X_1$ and $X_2$ do not exist. Increase in the number of $X_1$ as many as 1 time will increase the chance of HIV/AIDS transmission by 45.2%. Likewise, the increase in the number $X_2$ 1 time will increase the risk of HIV/AIDS transmission by 48.7%. To obtain more accurate data or test the feasibility of multiple linear regression equations, 3 (three) tests are carried out, namely: First, the t-test where the variable free ($X_1$ and $X_2$ ) in Parsial significant effect on the risk of HIV/AIDS transmission. With the value of $t$ count > 1.993 and $p$-value < 0.05. In other words, an alternative hypothesis can be accepted. Second, F test where the variable free ($X_1$ and $X_2$ ) simultaneously have a significant effect on the dependent variable ($Y$). Use values $F$ count > 3.13 and $p$-value < 0.05 . In other words, alternative hypotheses can be accepted. Third, $R^2$ value of 0.596 (59.6%) means that there are 59.6% the contribution of sex factors and the use of syringes that were contaminated with risk factors for HIV/AIDS transmission while 40.4% were influenced by other risk factors not examined in this study. The use values $r$ at 0, 772 meaning “strong”, the contribution of each variable was described using Beta coefficient for sex at 0.406 and syringe use at 0.604. The $r$-value of sex is 0.489 and syringes are 0.660 with p-value of 0.0001 that is: First, the contribution of variable sex which is 0.489 x 0.406 = 0.198534 . Second, the contribution of injectable needle variables is 0.660x 0.604 = 0.39864 . Third, the contribution of both is 0.59717 or rounded to 0.597 (R - square). Thus, a more dominant contribution to the risk factors for transmission of HIV/AIDS in Aceh Province is the use of contaminated syringe of 39.8% compared to the contribution of sexual intercourse at 19.8%.


4 DISCUSSION

4.1 Sexual Intercourse

Based on Figure 3.1 illustrates the behavior of people with HIV/AIDS in Aceh Province related to sexual behavior that has a significant influence on HIV/AIDS transmission. The relationship is related to sexual intercourse with an official partner and even free sex is carried out as a result of the low frequency of sex with a legitimate partner and lack of sensitivity to the partner's health conditions related to the illness. The frequency of low sex with a legitimate partner is due to the HIV (+) status in question which causes reluctance of the couple to have sex. Besides that, only some of them use safeguards in the form of condoms during sexual intercourse to prevent transmission of HIV/AIDS. In additions, some people with HIV/AIDS have a history of sexually transmitted diseases.

The results of this study are in accordance with the opinion of KPA [2] in Wanda[8] that HIV can be transmitted through penetrative sex that is not protected. The risk of contracting this disease is higher if through vaginal sex although transmission through anal sex is reported to have a risk 10 times higher than vaginal sex. Having a history of sexually transmitted infections specifically related to wounds and duh (fluid coming out of the body) that is not treated, then have an average of 6-10 times higher the possibility of transmitting HIV through sexual intercourse. While transmitting HIV through oral sex has a risk low, but the risk can increase if there are sores/ulcers around the mouth when ejaculating.

Reinforced by the opinions of [9] that sexual intercourse has a very high risk of transmitting the HIV virus plus the possibility of ignorance partner on the prevention of HIV/ AIDS. Supported by Simanjuntak's research result (2010) that the presence of significant influence of risk factors influence the incidence of illicit sex HIV/AIDS in the city of Medan that says that the modes of transmission of HIV/AIDS through heterosexual intercourse by 51.3%. The higher the sexual behavior, the place of prostitution, moral poverty and coupled with the habit of changing partners causing HIV transmission to be higher.

Sex without marriage (free sex) can occur because of the encouragement of sexuality to get pleasure or satisfaction only sexual organs. The more frequent sex, the greater the likelihood of contracting various diseases, especially if the relationship is carried out without safety and the virus easily enters the bloodstream of the sex partner if there are injuries to the genitals, will increase if the couple has a history of sexually transmitted diseases (PMS). Associated with the technique of having sex for couples who already have HIV/AIDS, the solution is to have sex using safeguards such as condoms. This use needs to be more socialized as a form of preventing HIV/AIDS.

Even without doing any research, risk factors for transmission through sex have an influence on the outbreak of HIV/AIDS directly. However, to strengthen this statement, an attempt is made to prove statistically. The analysis result shows that the contributing factor to the risk of sexual transmission of HIV / AIDS in the province is 19.8%. In the end, HIV / AIDS does not know whether someone is young or old, Muslim or non-Muslim, married or not, educated or not, and rich or poor, and the Acehnese or other tribes. HIV / AIDS can only be prevented by avoiding doing activities that cause the onshore transmission factor. In this case, sex with a positive (+) partner with HIV / AIDS should not be done. But for married couples, they have their own rules for sex with their partners who are HIV (+), namely the use of condoms. This does not mean legalizing sex outside marriage.
4.2 The Use of contaminated syringes (injectable drugs)

Based on Figure 3.2, the majority of respondents were drug users through syringes. Syringes alternately between other users. Viruses can enter through injury. Viruses that have entered the blood will be detected within a few weeks or more. Even so, it still has a great chance of transmitting to others through the blood. The inaction and unconsciousness of the transmission of the HIV/AIDS virus cause the extent of infection to other people. The use of IDUs with their own equipment will have a small possibility for the spread of the virus if the equipment is clean and sterile. It is also impossible that having personal equipment can avoid contracting the HIV virus. But the effects of the drug which can encourage users unknowingly having sex with an infected person even possibility though. This is one of the causes of being infected with the HIV virus. In principle, once related to someone who has been infected and even with equipment that has been infected it is also likely to be infected.

The results of this study are in line with Susilowati [11] research that there is a significant influence between the risk factors of the influence of the use of a contaminated syringe (injectable drugs) and the incidence of HIV/AIDS in the city of Semarang. Some of the reasons for drug users using shared syringe include the fact that it is difficult to find a new syringe, there is a fear of being caught by police raids, looking for practical use of drugs and reducing the burden of purchase, a state of confusion which results in not thinking. The results reinforced by Kaplan, Sallis, & Patterson [12] in Lubis's research [13] suggested that misuse drugs through contaminated syringe significantly increase the incidence of HIV/AIDS.

The level of the possibility of contracting HIV/AIDS through syringes alternately for drug users is very high especially one of the users whose blood contains HIV. It is not only HIV disease that can be contagious if you use a syringe together, even diseases like Hepatitis B and Hepatic C will also be infected at once. Therefore, the chain of HIV transmission through injection drug users must be decided by strict law enforcement in addition to monitoring those who have been infected with this disease.

Although without doing research, risk factors through the use of contaminated syringe have an equally strong influence with risk factors for sexual intercourse in influencing the spread of HIV/AIDS directly. However, to strengthen that statement then made efforts to prove statistically. The analysis shows that the contribution of the contaminated syringe to the risk of HIV/AIDS transmission in Aceh province is 39.8 %. This is in line with the high number of drug cases in Aceh. Based on the results of this study, all parties need to be aware of cases of high rates of drug cases in the province of Aceh, moreover this case has an impact on cases of sexual intercourse without marriage (free sex) which then simultaneously contribute to increasing the risk of HIV/AIDS transmission in Aceh province.

5 Conclusion

Sexual intercourse affects the risk factors for HIV/AIDS in Aceh Province with a contribution amounting to 19.8 %. These risk factors include sex with an official partner and even free sex, a lack of knowledge about partner health, especially related to HIV/AIDS, lack of awareness in condom use and having a history of PMS. While the use of contaminated syringes (injectable drugs) has an effect on the risk factors for HIV/AIDS transmission in Aceh Province with a contribution of 39.8 %. These risk factors including the use of syringes alternately in drug even medication that is associated with the level of frequency in its use.
REFERENCES


The Role of Organizational Investment in Social Capital, Information Technology and Service Commitment on Employee Performance With Good Governance Principles as Intervening Variables

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Abstract. This study aims to determine the effect of the organizational investment in social capital, information technology and service commitment on the employee performance with the implementation of good governance as an intervening variable. This study was conducted in the education agency of Aceh province, Indonesia, with a sample of 189 civil servants. The data were collected using a questionnaire and analyzed by statistical means of structural equation model (SEM). It was found that organizational investment in social capital, information technology, and services commitment have a positive and significant effect on the implementation of good governance and employee performance. Furthermore, the implementation of good governance mediates the effect of organizational investment in social capital, information technology and services commitment on employee performance. Nevertheless, the mediation role of the variable is partial mediation.

Keywords: Employee’s performance, Implementation of good governance, organizational investment in social capital, information technology, and service commitment

1 Introduction

The Aceh Education Agency is a public institution that is expected to be able to support the Aceh government program relating to the activities of the education sector, especially primary and secondary education. The existence of these services has a very important role in providing public services in education. To serve its role and carry out its operational activities, the Aceh Education Agency currently employs 404 personnel.

To date, the government of Aceh has been trying to improve the service performance of the entire Aceh Government Work Unit (Satuan Kerja Pemerintah Aceh/ SKPA) in providing public services including the Aceh Education Agency. The application of good governance principles in the service is characterized by the transparency of service activities, responsive services and oriented to the interests of the community, fairness in service, efficiency and effectiveness of services, service accountability, and the willingness of the agency to accept criticism and suggestions from the public regarding services provided. All of these elements are crucial in
ensuring that efforts to improve service delivery also involve the active participation of the community in providing advice and input for the advancement of Aceh's education in the future.

The results of the initial survey that were found by the authors indicate that not all employees at the Aceh Education Agency have a good perception of the successful implementation of the principles of good governance. There are still some employees who have the view that the implementation of the good governance principles in these institutions has not succeeded at all. Lack of transparency and accountability in budget management, for example, is one indication that there are still some principles of good governance that are neglected. In this study, the measurement of good governance refers to 9 principles of good governance which consist of participation, a fair legal framework, transparency, responsiveness to stakeholders, orientation towards the interests of society, equality, efficiency and effectiveness, accountability and strategic vision.

Regarding employee performance, organizational investment in social capital, application of information technology and commitment to service, the results of the initial survey also showed that employees of these agencies had a different performance from each other. Indications of differences in employee performance can be seen from the differences in attitudes and behaviors in the workplace. Some employees actually appear to have low work motivation, lack enthusiasm in carrying out work hence at certain times they are not able to complete work in a timely manner. This phenomenon is not uncommon to occur among employees of the Aceh Education Agency.

Employee’s evaluation of organizational investment in social capital is also relatively different. Organizational investment in social capital seen from the employee's assessment among others consist of perceptions about the frequency of top management in encouraging employees to work better, perceptions of leadership figures, consistency of communication direction between leaders and employees, organizational or management appreciation for employees and the willingness of top management to spend time off with employees.

In connection with service commitments, initial information obtained indicated that the commitment of employees to support efforts to improve public services at the Aceh Education Agency is relatively varying among the employees. On the one hand there are employees with relatively high service commitments and on the other hand, there are also employees with relatively low service commitments.

The results of the initial survey relating to employee appraisal of information technology also indicate differences in perceptions among employees. The conception of information technology in this study is based on a number of indicators including the adequacy of information technology hardware such as Assistant (PDA), Laptop, Server, and Mainframe and so on, the adequacy of software, data management, and storage, internet network availability and so on. Some employees are of the opinion that information technology which is an important infrastructure in supporting the operational activities of the Aceh Education Office is relatively good and supports the smooth running of the tasks they carry out. Those who belong to this group are generally employees who have relatively higher positions with better work facilities that are viewed from their accessibility to the use of information technology owned by the agency. On the other hand, there are also a number of employees who have the opposite perception.

Research on the relationship between good governance and employee performance has been carried out extensively by many previous researchers. Nevertheless, the variables they use to predict good governance and employee performance are relatively different from each other. For example, research conducted by Trakulmututa & Chaijareonwattana [1] in Thailand concluded that the success of implementing good governance is influenced by employee
performance. Furthermore, the results of the study of Mazidi, Reza, Amini, & Latifi [2] and Imran[3] who used information technology as a predictor of variables for employee performance found that employee performance is influenced by information technology. Other studies that also examined employee performance were carried out by Ellinger et al [4] which examined the effect of organizational investment in social capital on service commitment and employee performance. They concluded that investment in social capital has an effect on employee performance.

Despite the contributions of the abovementioned prior studies, a number of research gaps can be identified. First, they examine the relationships between variables separately. This means that studies of good governance and employee performance using a number of predictor variables such as information technology and investment in social capital, for example, are carried out separately and do not include all of these variables at once. Second, some of the research was conducted on private companies as in the study of Mazidi et al [2] about the relationship between information technology and employee performance which was carried out on a number of employees in the manufacturing company.

In contrast to the previous research, this study analyzes the linkages between employee performance, the application of the principles of good governance, investment in social capital, information technology, and service commitments simultaneously with the analysis unit are government agencies namely the Aceh Education Agency. In this study, good governance is also placed as an intervening variable or intermediate variable between investment in social capital, information technology and service commitment with employee performance. Therefore the findings derived from this study are not only expected to strengthen the findings of previous research but also be able to express the role of employee performance in mediating the influence of the three exogenous variables on the application of the principles of good governance in government agencies.

2 Literature Review

2.1 The Influence of Investment in Social Capital on Employee Performance

Employee performance is very important in pushing the achievement of organizational goals [5]. Therefore every organization leader needs to make efforts to improve the performance of its employees [6], [7]. Organizational investment in social capital is subsequently vital in developing a sense of togetherness among employees. Organizational investment in social capital can be interpreted as a policy intervention by leaders and top management with the objective of increasing the sense of togetherness among fellow employees so that good cooperation is established [8]. Cohen & Prusak[9] stated that every leader's actions and decisions could represent the embodiment of investment in social capital. Investments in the social capital of organizational members are identical to developing strategic resources so that organizations can achieve their intended goals [10]. Organizational investment in social capital reflects management behavior that seeks to improve employee performance [11].

2.2 The Influence of Information Technology on Employee Performance

Many previous researchers have empirically proved the influence of information technology on employee performance. Vozikis, Ypofanti, & Papadopoulos [12] in his research conducted in Greece found that the use of information technology can improve employee performance.
Similar results were also found in the study of Imran[3] who also concluded that information technology has a positive and significant effect on employee performance.

2.3 The Influence of Service Commitment on Employee Performance

Employee commitments or employees' attachment to the organization they work for can have an impact on their performance. For government agencies that provide public services, for example, there is a need for employee commitment to support all services provided. Service commitment determines the sincerity of employees in carrying out the tasks assigned to them. When employees have a relatively good service commitment, they will be motivated to carry out their duties at their best. Thus there is a unidirectional relationship between service commitment and employee performance. Service commitment has a positive and significant effect on employee performance [13]. Employees who have a strong commitment will tend to work seriously and earnestly in completing the work that is assigned to them so that their performance increases [14].

2.4 Investment in Social Capital and the Implementation of Good Government Governance

Organizational investment in social capital can be interpreted as an organization's effort to build up a sense of togetherness among fellow employees hence good cooperation can be established in work [8]. Leaders and management have a decisive role in organizational investment in social capital. Each leader's actions and decisions can represent the embodiment of investment in social capital[9]. Whereas Hitt & Ireland [10] state that investments in the social capital of organizational members are identical to developing strategic resources so that the organization can achieve its intended goals.

Based on the above discussion, it is clear that organizational investment in social capital is related to the efforts made by leaders and managers in an organization to improve good cooperation among fellow members of the organization. The intended cooperation is to support the operational activities of the agency in accordance with the stipulated procedures. The success of the implementation of good governance principles in government agencies is certainly inseparable from the support of all employees as a result of the investment in social capital. Organizational investment in social capital represents a development strategy that is useful for improving the work environment by encouraging an internal culture that can increase employees' commitment to improving service quality. Ellinger et al [4] concluded that organizational investment in social capital has an effect on service commitment as an important indicator of the implementation of good governance principles.

2.5 The Influence of Information Technology on the Implementation of Good Government Governance

The existence of information technology can also influence the implementation of good government governance (GGG). This is due to the efforts in using information technology in work that can support transparency, accuracy, and effectiveness of work. Consequently, these three things are the most important part of GGG implementation in government agencies. The influence of information technology on the implementation of GGG has been proven by Trakulmututa & Chaijareonwattana [1] in their research in Thailand which concluded that the attainment of good governance in government agencies was influenced by several factors including information technology.
2.6 The Influence of Service Commitments on the Implementation of Good Government Governance

Implementation of GGG in government agencies requires employee commitment. This is because employees are the main resources of agencies that play a role in running all activities in the agency. The implementation of GGG is basically expected to be able to improve the quality of public services to meet the needs of the community. Hence the commitment of employees to support institutional activities, especially related to service, is important in the implementation of the GGG itself. The findings of empirical research conducted by Trakulmututa & Chaijareonwattana [1] in Thailand prove that one of the factors that determine the success of GGG implementation is HR management and employee commitment in carrying out their duties.

2.7 The Influence of the Application of Good Governance Principles on Employee Performance

The application of good governance principles in government agencies is not only expected to be able to provide benefits to the community as users of public services but also encourage employees to work better. As explained earlier, the implementation of good governance has several basic principles that must be met including responsiveness, consensus orientation, efficiency and effectiveness, accountability and strategic vision.

The responsiveness principle implies that government institutions must be quick and responsive in serving their stakeholders, especially the community. Furthermore, the consensus orientation principle requires that the activities carried out must be directed towards the interests of the wider community. The principle of efficiency and effectiveness means that the management of public resources is carried out efficiently and effectively. Meanwhile, the accountability principle is related to the existence of public accountability for the activities carried out. Finally, the strategic vision principle implies that every government organizer and society must have a far-reaching vision. Implementation of the principles of good governance in government agencies requires that every employee work better. They must be able to work effectively and efficiently, improve the quality of services provided, and be able to ensure the realization of performance accountability related to all the activities they undertake.

Empirically there is a correlation between the application of the principles of good governance and employee performance as evidenced by Trakulmututa & Chaijareonwattana [1] in their research on achieving good governance in Thailand. They concluded that there was a very close relationship between the application of good governance principles and employee performance.

3 Research Method

This research was conducted at the Aceh Education Agency. Research object relates to the relationship between the application of the good governance principles and the performance of employees with investments in social capital, information technology, and service commitments. In this case, the application of the principles of good governance is also used as an intervening variable in testing the relationship between employee performance and investment in social capital, information technology, and service commitment.

Sample of this study consist of 189 civil servants who work for the public agency. Data was collected through questionnaires containing closed-ended questions. Data were analyzed using Amos 21 statistical structural equation model (SEM) equipment.
4 Results And Discussion

Investment in social capital, information technology infrastructure, and service commitment influences the implementation of good governance principles and employee performance. In addition, the implementation of the principles of good governance also directly affects the performance of employees. Therefore the existence of the implementation of the principles of good governance can be interpreted as an intervening variable in the relationship between investment in social capital, information technology infrastructure and service commitment and the performance of employees. In other words, the three exogenous variables not only directly influence employee performance, but also can be through the implementation of the principles of good governance as an intervening variable (intermediary).

Table 1. Path coefficient values for research variables

<table>
<thead>
<tr>
<th>GG Principles</th>
<th>Services Commitment</th>
<th>Estimate</th>
<th>C.R.</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>GG Principles</td>
<td>Information Technology</td>
<td>.227</td>
<td>4.098</td>
<td>***</td>
</tr>
<tr>
<td>Employee Performance</td>
<td>Services Commitment</td>
<td>.184</td>
<td>4.201</td>
<td>***</td>
</tr>
<tr>
<td>Employee Performance</td>
<td>Information Technology</td>
<td>.213</td>
<td>4.795</td>
<td>***</td>
</tr>
<tr>
<td>Employee Performance</td>
<td>Investasi Modal Sosial</td>
<td>.211</td>
<td>4.638</td>
<td>***</td>
</tr>
<tr>
<td>Employee Performance</td>
<td>GG Principles</td>
<td>.461</td>
<td>6.733</td>
<td>***</td>
</tr>
</tbody>
</table>

The path coefficient value of each exogenous construct towards the implementation of good governance principles is 0.240 for investment in social capital, 0.227 for information technology infrastructure and 0.305 for a service commitment. These coefficient values can be interpreted that the direct effect of investment in social capital on the implementation of the principles of good governance is 5.760 percent, the direct influence of information technology infrastructure on the implementation of good governance principles is 5.153 percent and the direct effect of service commitment on the implementation of good governance principles is 9.303 percent. Furthermore, the third path coefficient value of exogenous construct on employee performance is 0.211 for investment in social capital, 0.213 for information technology infrastructure and 0.184 for a service commitment. Referring to the coefficient value of each variable can be interpreted that the direct effect of investment in social capital on employee performance is 4.452 percent, the direct influence of information technology infrastructure on employee performance is 4.537 percent and the direct effect of service commitment on employee performance is 3.386 percent.

Based on the table above, it can also be seen that the path coefficient value of the implementation of the principles of good governance on employee performance is 0.461. This figure can be interpreted that the direct effect of the implementation of the principles of good governance on employee performance is 21.252 percent.
The path coefficient of the investment in social capital towards the implementation of the principles of good governance is 0.240 and the path coefficient for the implementation of the principles of good governance on employee performance is 0.461. Thus the indirect effect of investment in social capital on employee performance through the implementation of the principles of good governance is 11.064 percent, greater than the direct effect of investment in social capital on employee performance by 4.452 percent. Therefore it can be interpreted that the existence of the implementation of the principles of good governance can strengthen the influence of investment in social capital on the performance of employees of Aceh Education Agency.

The path coefficient value of information technology infrastructure on the implementation of good governance principles is 0.227 and the path coefficient value of the implementation of the principles of good governance on employee performance is 0.461 hence the indirect influence of information technology infrastructure on employee performance through the implementation of good governance principles is 10.465 percent. This figure is also greater when compared to the direct influence of information technology infrastructure on employee performance by 4.537 percent. Thus it can be interpreted that the implementation of the principles of good governance can also strengthen the influence of information technology infrastructure on employee performance.

5 Research Implication

The findings of this study reveal that the influence of organizational investment in social capital on employee performance is in accordance with the opinion of Shub & Stonebraker [11] which states that organizational investment in social capital reflects management behavior that seeks to improve employee performance. This finding supports the results of research by Cohen & Prusak [9] who also found that investment in social capital has a positive and significant effect on employee performance.

Furthermore, the findings of this study that indicate the influence of information technology infrastructure on the implementation of the principles of good governance and employee performance at the Aceh Education Agency are consistent with the results of the Trakulmututa & Chaijareonwattana [1] study in Thailand which concluded that several factors influenced the achievement of good governance in government including information technology. In addition, this study is also in accordance with the results of the study of Vozikis et al.[12] and Imran[3] found that the use of information technology can improve employee performance.

As previously discussed, this study found that service commitment influences the implementation of good governance principles and employee performance. This finding is consistent with the research findings of Trakulmututa & Chaijareonwattana [1] which concluded that one of the factors that determine the success of GGG implementation is HR management and employee commitment in carrying out their duties. Employees who have a strong commitment will tend to work seriously and earnestly in completing the work assigned to them so that their performance increases [14].

The managerial implications of this study are concerned with relevant parties especially for the head of the Aceh Education Office. The findings of this study that indicate a positive and significant influence of investment in social capital, information technology infrastructure and service commitment to the implementation of the principles of good governance in these agencies have implications that efforts to increase the intensity of the application of good governance principles to these institutions can be done through intervention policies in the form of increasing organizational investment in social capital, improving the quality of information
technology infrastructure and increasing employee commitment in providing public services to meet the interests of the community.

Additionally, the existence of the implementation of the principles of good governance is proven to mediate the effect of investment on social capital, information technology infrastructure and service commitment on employee performance. This implies that consistency in the application of the principles of good governance is an important requirement for improving the performance of staff at Aceh Education Agency. Hence it can be concluded that these variables can strengthen the investment effect on social capital, information technology infrastructure and service commitment to the performance of the agency's employees.

6 Conclusion and Recommendation

This study has provided evidence that organizational investment in social capital, information technology, and service commitment has a positive and significant effect on the implementation of the principles of good governance at the Aceh Education Agency. The better organizational investment in social capital, the better the availability of information technology and the better the employee commitment of service, consequently the better the principles of good governance in the agency. Conversely, the decline in organizational investment in social capital has an impact on the quality of good governance principles.

Apart from that, investment in social capital, information technology, and service commitment has a positive and significant effect on the performance of employees at the Aceh Education Agency. The better organizational investment in social capital, information technology, and service commitment, hence the better the performance of employees. In contrast, the decline in the quality of organizational investment in social capital, information technology and service commitment can have an impact on reducing employee performance.

Interestingly this study has also found that implementation of the principles of good governance can mediate the influence of investment in social capital, information technology and service commitment to the performance of employees at Aceh Education Agency. The mediating effect raised by the variable is however partial mediation.

Referring to the conclusion above, the Head of the Aceh Education Agency must be able to improve the performance of its employees. Efforts to improve employee performance must be oriented towards improving the skills and work skills of employees in accordance with the field of work assigned to them. In addition, the emphasis on the importance of thoroughness and precision must be done by building their awareness of the need for quality work results from every work performed.

REFERENCES


Development and Validation of a Modified Contois Kinetics Model for Microalgae *Chlorella Kessleri*

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**Abstract.** Microalgae is a promising source for renewable biofuels, medicines, healthy foods, animal feeds and many more. Microalgae have to be produced on a large scale in order to give a significant impact for the benefit of the society. Consequently, an understanding of the kinetic growth model of particular microalgae becomes necessary for the purpose of scaling up the production system. This study explores the development of an algae growth model for the *Chlorella kessleri* culture. The proposed growth model for *Chlorella kessleri* was developed from the original Contois growth model, which later modified to include the second substrate as the influencing factor for the growth of cell biomass. Differential equations resulted from mathematical development and modification of Contois model were numerically solved using the Runge-Kutta method. Values of model parameters are optimized using the Levenberg-Marquardt algorithm method. All computation for the above modeling purpose was done with the aid Matlab 7.1 software. The results of the study show that validation of the original Contois model produced predictions of cell and substrate concentrations which deviate from experimental data. When the Contois model was modified to include the effect of the second substrate for the *Chlorella kessleri* cell growth, in addition to N-NO₃ as the first substrate, predictions produced an excellent agreement with the experimental data. Further validation against other experimental data of *Chlorella kessleri* culture is required to allow the generality of the proposed modified Contois model.

**Keywords:** Growth Model, Microalgae, Contois Model, Chlorella kessleri

1 Introduction

Microalgae or microscopic algae have high economic and industrial potentials as sources for producing medicines, healthy foods, ingredients, chemicals, biofuels, electricity, animal feeds and many more. In addition, microalgae also offer a solution to current environmental problems, such as the greenhouse effect and wastewater treatment. Microalgae can bind carbon dioxide through photosynthesis and eliminating excess nutrients with minimal costs. They are also able to utilize various types of nitrogen compounds and absorb heavy metals. As a consequent, many studies have been done to seek possibilities of microalgae as a source of foods [1], energy production [2], medicines [3], and other valuable products.

Although in general algae are some of the most robust organisms on earth able to grow in wide range conditions, in nature they grow in a completely submerged aquatic environment having low-density cellular suspension. For the purpose of having a significant impact on social, economic and environment, microalgae have to be produced on a large scale in order to increase the production volume. In this relation, a knowledge on microalgae kinetics growth model...
becomes an important issue for scaling up an algae processing system for the intention of commercial production. Unfortunately, studies on growth kinetics on specific microalgae, with particular attention to Chlorella kessleri are still very rare and consequently, information about the dynamics of the particular microalgae growth is still very limited. A kinetics growth model obtained from a laboratory kinetic study would be very beneficial for the design of a microalgae production system, whether it is continuous or batch ones. A number of general growth models, both structured and non-structured, are available elsewhere [4].

The development of a growth model requires consideration on several factors so that the mathematical model becomes relatively simple to be implemented, without losing its biological characteristics. Growth models are often developed on the basis of a steady state condition by only considering a single substrate that limits cell growth [5]. However, the growth phenomena are the result of a number of very complex biochemical reactions that occur in the cells. For engineering purposes, such phenomena are described by chemical reactions and measured by a parameter termed as yield [6].

A number of growth models for various types of algae have been developed. Davidson & Gurney [5] used the Droop growth model [7] to describe the growth of Thalassiosira pseudonana microalgae. One of the objectives of their study was to develop a model which is able to include the influences of nutrients competition in the model. Filali et al [8] developed kinetics growth models for microalgae Chlorella vulgaris in a photo-bioreactor. The model took into account the combined influences of light intensity and the total inorganic carbon available per cell. It was capable of providing a good result when validated against experimental data. Although microalgae Chlorella kessleri has attracted attention to a number of investigators due to its ability to produce biofuel and at the same time capable of minimizing organic and nitrogen compounds in wastewater [9], [10], limited information is available on its kinetics growth model. It is, therefore, a requirement to develop a kinetics growth model that is suitable for the growth of microalgae Chlorella kessleri. The present study reported the development of a growth model for Chlorella kessleri on the basis of Contois model and validated against the experimental data of [10].

2 Microbial Kinetics Growth

Microbial kinetics growth describes the relationship between the specific growth rate \( (\mu) \) and the substrate concentration \( (S) \). It can be categorized into non-structured and structured models, depending on the level of complexity. The former models perceive cells as a unity with a fixed and clear nature and are used to represent the overall microbial response. Even though it was introduced for more than seventy years ago, such models are still mostly used at the present time among investigators. Unfortunately, these models still possess shortcomings since they do not account for changes in the biological characteristics of the microorganisms, while the structured model considers various cellular properties that influence the process.

The simplest non-structural growth model is the one proposed by Jacques Monod in 1942 based on observations of the growth of E. coli at various glucose concentrations [4]. In the mathematical form, it is shown in Equation 1.

\[
\mu = \mu_{\text{max}} \frac{S}{K_s + S} \quad [1]
\]
In Equation 1, \( S \) represents the concentration of the nutrient in the media at time \( t \) and \( K_s \) is the half-saturation constant. Symbols \( \mu \) and \( \mu_{\text{max}} \) are specific and maximum growth rate, respectively. The latter is unique for every microbial culture [11].

The Monod model is very suitable for single culture systems and simple substrates, but its accuracy is poor for systems with mixed cultures and complex substrates which most probably due to its inadequate theoretical understanding of parameters in the equation [12]. To consider these weakness factors, many researchers have tried to further develop the growth model developed by Monod. The Contois model is one model that is often used if biomass is considered to inhibit microbial growth. If the biomass concentration becomes very high, the biotic phase will meet the reactor volume, so that substrate utilization is prevented by the presence of biomass [13]. In the mathematic form, the Contois model is described as in Equation 2.

\[
\mu = \mu_{\text{max}} \frac{S}{S + K_s X}
\]  

[2]

Here, \( X \) denotes the biomass concentration in the reactor. Of course, it is difficult to imagine how the concentration of cells can hamper its own growth. But in many cases, the Contois model fits experimental data. It could be explained that the Contois kinetics considers the influence of substrates or metabolite products that are not taken into account in the Monod Model.

Although some researchers emphasize environmental influences as a starting point to commence the microbial kinetics growth, many of them ignore the fact that in the real condition, microalgae grow in environments consisting many substrates, and growth is not only controlled by a single nutrient, but also by two or more limiting nutrients [14]. In such conditions, there exists a very complex interaction. Consequently, it would be very difficult to explain the microalgae growth using a non-structured growth model. For the growth which is influenced by the existence of two substrates, Tsao & Hanson [15] has compiled a non-structured growth model with many growth parameters, as shown in Equation 3.

\[
\mu = \frac{u_{\text{max},1} S_1 + u_{\text{max},2} S_2}{(S_1 + K_1)(S_2 + K_2)}
\]  

[3]

Equation 3, for example, can be used to model the growth of methanotrophic bacteria with two substrates of \( O_2 \) and \( CH_4 \). This is one of the processes used to produce single cell proteins.

3 Methodology

Experimental data for the validation of the modified Contois model under this study were taken from the experimental works of Lee & Lee [10]. They conducted a study of the growth of microalgae *Chlorella kessleri* in media containing nitrate and glucose substrates. Mathematical model development to represent the microalgae growth is presented in Section 2.1 and the modification of Contois model is further described in Equation 9 and 10. Differential equations resulted from mathematical development and modification of Contois model were numerically solved using the Runge-Kutta method. The value of model parameters is optimized using the Levenberg-Marquardt algorithm method. The solution to the non-linear equations using the Levenberg-Marquardt approach was performed by Matlab application software version 7.1 [16].
Matlab software was run on laptops that use Intel Core processors at a speed of 2.60 GHz and 4.0 GB of memory access.

### 3.1 Mathematical Model Development

State variables commonly employed in the non-structured models include substrate concentration, biomass and metabolite products concentrations, and culture growth volume [17]. In the present study, the experimental data of Lee & Lee (2002) provide substrate and microalgae cell concentrations. For the purpose of modifying the growth model, it is started from the mass balance for microalgae growth and substrate reduction which can be described as Equations 4 and 5.

\[
\frac{dX}{dt} = \mu \cdot X \quad [4]
\]

\[
\frac{dS}{dt} = -\left(\sigma \cdot X\right) \quad [5]
\]

where \(\mu\) is the growth rate indicated by Equation 2 and \(S\) is the concentration of the limiting substrate for growth and \(X\) is the concentration of microalgae. The rate of the substrate reduction \(\sigma\) can be calculated using Equation 6.

\[
\sigma = \left(\mu \cdot Y_{X/S}\right) \quad [6]
\]

where the \(Y_{X/S}\) cell yield coefficient is equal to the amount of cell mass produced divided by the amount of the substrate utilized. By assuming that at the growth rate \((\mu) = 0\), cells still need a substrate to maintain the cell metabolism, a "maintenance" coefficient, \(m_s\) is added to Equation 6, to obtain Equation 7.

\[
\sigma = \left(\mu \cdot Y_{X/S}\right) + m_s \quad [7]
\]

Equation 8 is obtained by substituting Equation 7 to Equation 5.

\[
\frac{dS}{dt} = -\left(\mu \cdot Y_{X/S} + m_s\right) \cdot X \quad [8]
\]

Equation 8 demonstrates the change of the substrate concentration over time.

### 4 Results and Discussion

Experimental data of Lee & Lee [10] show the trend of the concentration of N-NO\(_3\) substrate which declined over time until it reached below 2 mg/L. Therefore, in the present study, for the purpose of growth simulation, it is assumed that N-NO\(_3\) is the limiting substrate for growth. In addition, the experimental data also show that the growth rate decreases over time allowing to assume the growth rate experiences inhibition due to the increase of microalgae biomass concentration. On the basis of these two assumptions, the simulation was carried out using the Contois growth model as shown by Equation 2.
Figures 1 and 2 presented the comparison of predicted biomass and substrate concentrations against experimental data, respectively. Solid lines are prediction resulted from simultaneous solutions of Equations 2, 4 and 7 while symbols are experimental data provided by Lee & Lee[10]. The values of the model parameter appeared in Equations 2, 4 and 7 are first obtained through optimization with the Levenberg-Marquardt algorithm. Detailed methodology for such an optimization process can be consulted through Matlab manual [16]. The resulted optimization values for the model parameter are presented in Table 1.

<table>
<thead>
<tr>
<th>Parameter Definition</th>
<th>Unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\mu_{\text{max}}$</td>
<td>the maximum specific growth rate</td>
<td>day$^{-1}$</td>
</tr>
<tr>
<td>$K_s$</td>
<td>half saturation constant</td>
<td>mg/L</td>
</tr>
<tr>
<td>$Y_{X/S}$</td>
<td>cell yield coefficient</td>
<td>mg cell/mg substrate</td>
</tr>
<tr>
<td>$m_s$</td>
<td>maintenance coefficient</td>
<td>mg substrate/mg cell</td>
</tr>
</tbody>
</table>

Figure 1 compares predictions of cell biomass concentration using the Contois model with experimental data of by Lee & Lee[10]. Under-predictions of cell biomass concentrations are observed during the first six days of algal culture in the bioreactor. However, predictions are in good agreement in the later period. Such results indicate that the original Contois model is not capable of providing a good prediction of algae biomass concentration at the initial stage of its growth. Similar results were also evident in the prediction of substrate concentration as shown in Figure 2. Experimental data clearly illustrated that a rapid decrease of substrate concentrations was seen in the first few days of the operation and followed by a slow decrease of the substrate concentration in the later days of operation. Unfortunately, the prediction by the original Contois model was unable to capture the whole trend of experimental data.
Although the predictions are in good agreement with experimental data for the substrate concentrations in the later period of bioreactor operation, predictions in the first few days of operation significantly deviated from the experimental data. With these discrepancies, it can be concluded that the assumption of nitrogen as the only single substrate which controls the growth is not appropriate. Consequently, in an attempt to produce better predictions, in agreement with the experimental data, it is necessary to modify the Contois growth model.

Figure 2: Comparison of predicted substrate concentration by Contois model (line) and experimental data (symbol)

The modification made to the Contois model was started by assuming that the growth is also influenced by the concentration of glucose as a carbon source for the growth of microalgae. This means that glucose is the second substrate, in addition, nitrogen nitrate. The Modification of the Contois model can be developed by combining the original Contois model from Equation 2 with a non-structural growth model proposed by Tsao & Hanson [15], to give Equation 9.

\[
\mu = \frac{\mu_{\text{max},1} \mu_{\text{max},2} S_1 S_2}{(K_1 \cdot X + S_1)(K_2 \cdot X + S_2)} \tag{9}
\]

where \(\mu_{\text{max},1}\) is the value of the specific growth rate for nitrogen substrate. and \(\mu_{\text{max},2}\) is the specific growth rate for the carbon substrate. The \(S_1\) and \(S_2\) notations represent the concentration of the nitrogen and carbon substrates, respectively. Symbols \(K_1\) and \(K_2\) denote the saturation constant for the nitrogen and carbon substrates, respectively. The change of the concentration of the carbon source, glucose, in this case, can be calculated using Equation 10.

\[
\frac{dC}{dt} = -\left(\mu \cdot Y_{X/C}\right) \cdot X \tag{10}
\]
where \( Y_{EC} \) is the yield coefficient for the carbon substrate. Again values for growth parameter appeared in Equations 8, 9 and 10 were obtained through optimization with the Levenberg-Marquardt algorithm. Values for those model parameters are shown in Table 2.

![Figure 3: Comparison of predicted biomass concentration by the modified Contois model (line) and experimental data (symbol)](image)

On the basis of the modified Contois model, using Equations 8, 9 and 10 as well as optimized values of model parameters in Table 2, predictions of algal cell biomass and substrate concentrations were validated against experimental data. Figure 3 presents the predictions of cell biomass concentrations on the basis of the modified Contois model, validated against experimental data. It is clearly seen that qualitatively and quantitatively the predictions are in excellent agreement with the experimental data. A drastic improvement in predicted cell and substrate concentrations was evident after the inclusion of the second substrate, glucose, as the carbon source for the growth of the microalgae. This result indicates that the assumption of the cell growth affected by two substrates, N-NO\(_3\) and glucose is valid. Although the validation of the modified Contois model against experimental data of Lee & Lee [10] is in excellent agreement, legitimacy of the modified model needs to be tested against other experimental data of *Chlorella kessleri* culture. However, the lack of experimental data of this specific culture hinders the validation of the modified model.

Table 2. Values of growth parameters for the use with modified Contois model

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Definition</th>
<th>Unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \mu_{\text{max},1} )</td>
<td>maximum specific growth rate for nitrogen substrate</td>
<td>day(^{-1})</td>
<td>0.7844</td>
</tr>
<tr>
<td>( \mu_{\text{max},2} )</td>
<td>maximum specific growth rate for carbon substrate</td>
<td>day(^{-1})</td>
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<tr>
<td>Substrate</td>
<td>Coefficient</td>
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<tr>
<td>-----------</td>
<td>-------------</td>
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<td>-------</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>$K_1$</td>
<td>mg/L</td>
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</tr>
<tr>
<td>Carbon</td>
<td>$K_2$</td>
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<tr>
<td>Nitrogen</td>
<td>$Y_{X/S}$</td>
<td>mg cell/mg substrate</td>
<td>0.0204</td>
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<tr>
<td>Carbon</td>
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<td>mg cell/mg substrate</td>
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<tr>
<td></td>
<td>$m_s$</td>
<td>mg substrate/mg cell</td>
<td>0.0012</td>
</tr>
</tbody>
</table>

![Figure 4: Comparison of predicted substrate concentration by the modified Contois model (line) and experimental data (symbol)](image)

5. CONCLUSIONS

A non-structured kinetic growth model to represent the *Chlorella kessleri* culture has been developed. The new model was developed on the basis of Contois growth model, modified to include the effect of the second substrate for the *Chlorella kessleri* cell growth, in addition to N-NO₃ as the first substrate. Inclusion of the second substrate to the original Contois model produced excellent predictions in terms of cell and substrate concentrations when validated against the experimental data. Further validation against other experimental data of *Chlorella kessleri* culture is required to allow the generality of the modified Contois model.

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Relationship Between Principal Leadership Styles and Organizational Culture With Work Motivation of Man and Mas Teachers at Dewantara Subdistrict North Aceh

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Abstract. This research aims to examine how are the influence of principal leadership style and organization culture on the teacher’s working motivation at State (MAN) and Private Senior High School (MAS) in Dewantara Subdistrict. This research uses the quantitative approach with descriptive method. The population in this research is the teachers who teach at State and Private Senior High School in Dewantara sub-district, the sample is 103 teachers. The data analysis method used in this research is multiple linear regressions. The result of the analysis based on the multiple linear regressions shows that $Y = 2.227 + 0.172x1 + 0.264x2$. The result of the research shows that partially the principal leadership style variable has strong correlation toward the teachers’ working motivation at State and Private Senior High School in Dewantara sub-district in which the regression coefficient value is 0.264 and the test result simultaneously shows that the principal leadership style and the organization culture has correlation toward the teacher’s working motivation at State and Private Senior High School in Dewantara sub-district with Fscore 15.815, while Ftable on the significance level of $\alpha = 5\%$ is 3.284. The Fscore statistic test shows that Fscore>Ftable, with the probability level, is 0.000.

Keywords: Principal Leadership Style, Organizational Culture, and Teacher’s Work Motivation

1 Introduction

Leadership is a very important thing in the management of educational institutions, from this institution human resources will be created to be ready for and capable of competing with local and global situations through education. Education leaders, in this case, are the school’s principals, in the hands of these policy holders, the fate of the school is at stake. In leadership there is a relationship between humans, that is, the relationship affects the leader and the obedience-obedience relationship of the followers because it is influenced by the authority of the leader. The followers are influenced by the power of the leader, and arise spontaneously a sense of obedience to the leader. Furthermore, Uha [1] says that “Leadership is the ability to persuade other people to achieve the goals that have been determined by intuition”.

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The school is one type of organization that is often called a formal education body. One of the most important elements in its body is its people. The internal personnel of the school organization consists of the headmaster, teachers, students, and administrative staff. The main activity they do is teaching and learning activities. In the context of achieving organizational goals, it is very unlikely that the objectives of an educational institution can be achieved without the existence of a cooperative effort of all organizational personnel and supported by sufficient facilities and infrastructure. Education leaders as top leaders in an educational institution formulate and communicate a clear vision and mission in advancing education.

The principal is an education unit level of education leader, who must be responsible for all school activities. Besides that, the principal is an education leader whose position is very important in the school environment, because the principal is closer and directly related to the implementation of each education program. Therefore, principals are required to have various abilities, both the ability to link with management and leadership issues, so they can develop and advance their schools effectively, efficiently, independently and productively. Furthermore, Hendarman [2] states that "Principals as managers of education units (schools) are responsible for the effectiveness and efficiency of implementing education in their schools, through the roles they play". Whether or not an education program can be implemented and the purpose of education can be achieved or not depends on the skills and wisdom of the school’s principal as the leader of education.

Besides the schools' principal, a teacher is a person who is very influential in the teaching and learning process. A teacher has several important roles because it has responsibilities that cannot be replaced by any other sophisticated types of equipment. Therefore the teacher can ideally prepare himself as a teacher who remains progressive and productive in all learning processes. In relation to the personality of the teacher he/she carries out, always putting his professionalism in line with having a good personality or knowledgeable that is appropriate and can be an example in all daily life activities both in the school environment, family, and the community. Because in the hands of teachers the progress and the glory of a nation rely on.

The efforts made by the principals in optimizing the use of existing personnel, one of which is teacher empowerment. Empowerment, in this case, is intended as a way or effort of the principal in developing potential and encouraging the power possessed by the teacher to be able to work and work as much as possible to achieve the stated goals. According to Susanto [3] "Empowerment of teachers is one of the steps taken by principals in optimizing teachers so that they are able to provide good performance until finally, they can offer more effective and efficient services". The development carried out by the principal of the school personnel, especially the teacher, is a step in preparing teachers to be more competent to contribute to improving work productivity, especially in the teaching and learning process.

In carrying out the task of educating students, teachers have different traits and behaviors, some are enthusiastic and full of responsibility, there are also teachers who often skip truant, come in time and do not obey orders. These kinds of the condition are a problem in every formal education institution. With the existence of teachers who have low performance, the school will find it difficult to achieve expected goals. A good teacher’s performance will be achieved when principals are able to communicate, coordinate and supervise regularly.

Thus the leadership style of the principal in leading will have an impact on teacher performance and in terms of creating a conducive atmosphere for the school environment. Therefore the leadership style used must be right. Susanto[3] explains that: "The leadership style of a leader can basically be explained through three streams of theory, namely genetic theory, social theory, and ecological theory". Furthermore, Hersey and Blanchard [3] argue that "The
leadership style is basically the embodiment of three components, namely the leader itself, subordinates, and situations where the leadership process is realized.

The success of education in schools is largely determined by the success of the principal in managing the educational staff at the school. The principal is one component of education that has an influence on improving teacher performance. The view that principals as a determining factor in improving the quality of education is explained by Mulyasa [2], that "Principals are responsible for the implementation of education, school administration, coaching of other education personnel, utilization and maintenance of facilities and infrastructure as well as supervisor at the school he leads". This becomes more important in line with the increasingly complex demands of school principals, who want more effective and efficient performance support.

Work motivation is one of the factors that determine the performance of a teacher. The amount or the influence of motivation on teacher performance depends on how much motivation is influenced by internal and external dimensions. Robbins [4] defines "Motivation as a process that shows the individual intensity, direction, and perseverance of efforts towards achieving goals".

The teacher becomes an educator because of the motivation to educate if he does not have motivation he will not succeed in educating or teaching.

Based on the results of interviews conducted by the authors with several MAN and MAS teachers in the North Aceh District, there was information that most teachers had difficulties in making syllabus and lesson plans, lack of discipline emphasized to the teacher, unvaried use of learning methods and strategies, inability to compile evaluation tools, classroom management activities, and lack of ability to determine approaches and methods of evaluation.

Thus, it is strongly assumed that the principal's leadership style, organizational culture, and work motivation are key factors that can influence teacher performance in school. The school will succeed if it is supported by the leadership quality of the principal and a good organizational culture and is supported by good work motivation. With the existence of teachers who have low performance, the school will find it difficult to achieve results as expected by the organization.

2 Research Methods

2.1 Research Design

This research is classified as quantitative research in the form of a correlational study to examine relationship both directly and indirectly. Usually, the size of the relationship is expressed in numbers called relationships or correlation coefficients. Correlation coefficient moves between 0.289 to + 0.704 or between 0,000 to 1,000, depending on the direction of the correlation, nil, positive or negative. Positive signs indicate a negative correlation direction. Whereas, the coefficient that is -0.001 shows no correlation between X and Y[5]. Correlation research, intended to determine whether there is a relationship between the school principal's leadership style and organizational culture with the motivation of MAN and MAS teachers in Dewantara Subdistrict, North Aceh.

2.2 Population and Samples

What is meant by population and sample are people, objects or documents that can provide the data needed to prove the research hypothesis stated above. So, the population and sample in this study were all MAN and MAS teachers in Dewantara Subdistrict, North Aceh totaling 103 people. Because the number of sample members is limited and only in one school, saturated
samples are not taken. This means that all members of the subject were used as research respondents.

2.3 Data Analysis

Technical data analysis is a technique used in research with the intention to test and draw a conclusion from the results of the test. Data analysis was used to determine the existence or absence of a relationship between three variables, namely the relationship between the principal's leadership style and organizational culture with the motivation of MAN and MAS teachers in Dewantara Subdistrict of North Aceh.

3. RESULT AND DISCUSSION

3.1 Analysis of the relationship between School’s Principal Leadership Style and Organizational Culture on Teachers’ Work Motivation at MAN and MAS Dewantara Subdistrict, North Aceh.

Based on the results of the analysis, it reveals that organizational culture variables have a dominant influence on the motivation of MAN and MAS teachers in Dewantara Subdistrict, North Aceh Regency, with a regression coefficient of 0.172 having a dominant influence on increasing MAN and MAS teachers’ work motivation in Dewantara Subdistrict, North Aceh Regency. Whereas, the variable of the principal's leadership style had a relatively lower influence on teachers’ work motivation with a regression coefficient of 0.264.

3.2 Correlation Coefficient and Determination

The Correlation coefficient (R) = 0.700 which indicates that the degree of relationship (correlation) between the independent variable and the dependent variable is 70.0%. This means that the motivation of MAN and MAS teachers in Dewantara Subdistrict, North Aceh Regency has a close relationship with the principal's leadership style variable (X1), organizational culture (X2) so that both variables have an influence on increasing MAN and MAS teachers’ motivation in Dewantara Subdistrict, North Aceh Regency.

The Determination Coefficient (R²) is 0.489. This means that 48.9% of changes in the dependent variable (motivation of MAN and MAS teachers in Dewantara Subdistrict, North Aceh) can be explained by changes in the principal's leadership style factor (X1) and organizational culture (X2).

While the rest, which is equal to 51.1%, is explained by other factors outside of the two variables used as indicators of research, meaning there are still variables that can affect the motivation of MAN and MAS teachers in Dewantara Subdistrict, North Aceh Regency. Variables outside of this study can be predicted such as teachers’ education level, continuous training program (MGMP), school environment factors, competence, and teaching and learning supporting facilities in MAN and MAS Dewantara Subdistrict, North Aceh Regency, are expected to increase teachers’ motivation.

The results of this study indicate that the principals’leadership style and organizational culture both jointly and partially can influence the motivation of MAN and MAS teachers’ in Dewantara Subdistrict, North Aceh Regency, so that the leadership style of MAN and MAS principals in Dewantara Subdistrict, North Aceh needs to get attention from the leadership, in this case, the headmaster and Head of the North Aceh District Youth and Sports Education
Office can be improved through continuous training programs. Also, the organizational culture should also be a concern of the principal which can give an impact both directly and indirectly on increasing motivation for MAN and MAS teachers in Dewantara Subdistrict, North Aceh Regency.

The results of this study support the theory that has been carried out by Nurmalina[6], that the leadership style of the teacher-principal can influence the increase in teacher motivation. This is because the presence of the principal's leadership style that is applied by the principal will have an impact on increasing teacher motivation. With the application of the leadership style of the principal, is expected to be accepted by all teachers and students in order to increase work motivation.

Likewise, the organizational culture can also support the increase in teacher work motivation, this is in line with the results of a research conducted by Fatmawati[7], that organizational culture will have an impact on increasing teacher’s work motivation because of the new responsibilities in carrying out tasks and responsibilities as a teacher.

4. CONCLUSIONS AND SUGGESTIONS

4.1 Conclusions

1. The partial test results of principals' leadership style variables have a significant influence on teachers’ work motivation at MAN and MAS Dewantara Subdistrict, North Aceh Regency with a regression coefficient value of 0.172.

2. The partial test results of organizational culture variables also have a significant influence on the teachers’ motivation at MAN and MAS Dewantara Subdistrict, North Aceh Regency with a regression coefficient value of 0.264.

3. While the results of the simultaneous testing also show that the principal leadership style variable and organizational culture have a significant influence on the teachers’ motivation at MAN and MAS Dewantara Subdistrict North Aceh Regency by obtaining a Fcount value of 15.815, while Ftable at a significance level = 5% is 3.284. Based on the calculation of the Fcount statistical test shows that Fcount> Ftable, with a probability level of 0.00.

4.2 Suggestions

1. To improve teacher’s work motivation, the role of the principal in giving instructions and direction to the teacher should be conducted continuously, this is because not all teachers have the same ability to carry out the teaching and learning process.

2. The results of this study indicate that MAN and MAS teachers in Dewantara Subdistrict, North Aceh Regency have high work motivation and it is expected that principals continue to provide work motivation to teachers so that they can carry out the teaching-learning process better.

3. It needs further research using a different approach, because of the limited interpretation of the phenomena obtained in this study that might not be able to explain in depth. This is because this study uses a quantitative approach so that it is more focused on the results in the form of numbers. Besides using other variables that can affect the motivation of teacher work by teachers at MAN and MAS in Dewantara Subdistrict, North Aceh Regency.
REFERENCES


Discussion Management of Math Subject Teacher to Increase The Ability of High School Teachers In The Implementation of The 2013 Curriculum in Banda Aceh

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Abstract. The management of a group discussion of the mathematics subject teachers is very important to increase the ability of high school teachers in the implementation of the 2013 curriculum so that education quality of the senior high school in the Aceh which is directly a part of Aceh Education Department Office is increasing every year. This study aims to understand the design, the implementation, the use of funds and the monitoring system to the group discussion of match subject teachers in increasing the capacity of a high school teacher upward. This research used the qualitative technique data collection by doing interview, documentation, and observation. This research was carried out at the group discussion of math-subject teachers in Banda Aceh. The subject of study is the head of the group and also teachers who are active in the group. The research results show that the planning program activities to increase the capability of teachers senior high school has already been good, such as in making and setting some programs that have been planned to enhance the capacity of a high school teacher in implementing the curriculum 2013 in Banda Aceh. The activities include: (1) Designing and making a relevant, innovative and creative lesson plan, (2) Designing and making innovative teaching materials, (3) Designing and making proper assessment and (4) Discussing the test that considered as the hard ones (including teacher competency test). The implementation of the group discussion of math teacher runs well, nevertheless some participants are absent in the activities. The fund used for these activities is from the national and regional budgets in accordance with guidance and directions of the Aceh Education Department. The Supervisor System is done in two ways; direct and indirect ways. The direct supervisory system allows the superintendent to attend directly ceremonial events. While Indirectly supervisor system is used by making the written report of the activity. No evaluation is done whether to the activities and the program itself.

Keywords: A group discussion of math teacher management, the ability of high school teachers, and the 2013 curriculum.
1 Introduction

Throughout human history, there have been records of a variety of regular and systematic behaviors, this is because Allah SWT after creating human and nature and its contents provides rules through angels and his prophets. Furthermore, the process of inheriting value by one generation to the next generation is done through social interaction and socialization among them, both formal, non-formal and informal. Socialization behavior is formally named as education and teaching behavior, even it becomes very important for a nation, so education is arranged in such a way as to shape behaviors that characterize and become the personality of the nation’s generation continuously.

The 1945 constitution of Republic Indonesia mandates Pancasila as the basis of the nation and view of the nation’s development. One of the aspects of development is education. Development in education is very important considering the function of education is as a process of forming the character of the nation both philosophy, ideology, normative, historic and social-cultural. The implementation of the mandate of the constitution was outlined in the 2003 national education system law which confirmed that:

Education is a conscious and planned effort to create a learning atmosphere, and learning process so that students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble character, and skills needed by themselves, society, and nation.

Education that leads to the development of the nation’s character is a big idea that was sparked by the founder of the nation because it is very important for a pluralistic Indonesian society to realize the welfare and prosperity of all the people of Indonesia. National development that has been carried out has shown progress in various fields of life, but development in the old education still has a lot of problems and challenges that have not been fully resolved.

Education is an absolute and important activity for human life, with human education know himself, the creator and the surrounding environment. With human education can recognize manners, good bad, right wrong, beautifully ugly, which is concluded as values and norms, and laws to other people in certain ways both formal, informal and non-formal.

World civilization demands human resources who are strong, competent, have the motivation and work experience who are skilled in carrying out their roles and functions both for individuals and organizational goals. Teachers as educational institutional implementers objectives built by the central government and regional governments at the provincial and district/city levels are of course always improving and developing themselves.

According to Low no.14 of 2003 article 1 am concerning, teachers and lectures, especially teachers are professional educators with the main task of educating, teaching, guiding, directing, training, assessing, and evaluating students in early childhood education through formal education, basic education, and secondary education. Meanwhile, educators are professional educators and scientists with the main task of transforming, developing, and disseminating science, technology, and art through education, research, and community service. With the emergence of this law teachers/lectures have been recognized as professionals equivalent to other professions. What is meant by professionals here is work or activity carried out by a person and becomes a source of live income that requires expertise, skills, or skills that meet certain quality standards or norms and require professional education.

The teaching profession has the main task of serving the community in the world of education to achieve the goals of national education to improve the quality of education today, the professionalization of teachers is intended to stimulate, maintain, and improve teacher
competencies in solving education and learning problems that have an impact on improving the quality of student learning outcomes.

Depdiknas sets 14 activities in the context of developing teacher competencies, including programs to improve teacher education qualifications, equalization and certification programs, competency-based integrated equalization programs, education supervision programs, and empowerment program of discussion of the subject teacher. We are all increasingly aware of the strategic existence of subject matter discussions on increasing the quality of education in Indonesia.

The main thing in this research is the group discussion of math teacher management to increase the ability of high school teachers in the implementation of the 2013 curriculum. From the main things, there are four things that are done in the research, include:

The programs planned for the group discussion of math teacher meetings to increase the ability of high school teachers in the implementation of the 2013 curriculum
The implementation of the group discussion of math teacher to increase the ability of high school teachers in the implementation of 2013
Management of the group discussion of math subject teacher to increase the ability of high school teachers in the implementation of 2013
The monitoring system of the group discussion of math teacher to increase the ability of high school teachers in the implementation of 2013.

As for the purpose of this research include:

To be able to explain the programs planned in the meeting the group discussion of math teacher to increase the ability of high school teachers in the implementation of the 2013 curriculum
The explaining about the implementation of the group discussion of math teacher to increase the ability of high school teachers in the implementation of the 2013 curriculum.
To explain about fund management the group discussion of math teacher to increase the ability of high school teachers in the implementation of the 2013 curriculum
To explain the supervisory system of the group discussion of math teacher to increase the ability of high school teachers in the implementation of the 2013 curriculum.

At present, it is a very good momentum if the teacher, Indonesian republican teacher association, local government, regional legislative council, education quality assurance institution, education and culture department, and related parties carry out a joint movement to empower the discussion of a math teacher. We are all increasingly aware of the strategic existence of subject matter deliberations on increasing the quality of education in Indonesia.

Real steps that can be taken so that the group discussion of the teacher is empowered as follows:

Operational funding assistance for subject teachers from the regional government and central government must be further enlarged, along with 20% of funds allocated for education from the central government.

The role of the group discussion of math teacher in developing teacher professionalism is even more important after the government enacts a new curriculum.

By promoting the group discussion of teachers as a place for teachers to reform themselves in order to be able to prepare students who are strong, creative, critical, and skilled, it is expected that the learning process approach is no longer teacher-centered but student-centered. Various learning innovations such as contextual learning (Contextual Teaching and Learning), CBSA (Student Active Learning), Problem Solving (Problem-Based Learning), and so on are expected to be mastered by the teacher well.

But in reality, there are still teachers who have not utilized it the discussion of subject teacher increase their professionalism by participating in various activities both at the school level, at
the city/district level, and at the provincial level. In addition, the awareness and commitment of some of the management towards their responsibilities in the organization still need to be improved. Even though the funds carry out the work program are sufficient, both block grand funds from the state budget and expenditure and from the regional income and expenditure budget. Another obstacle faced by the discussion of a math teacher is that the training provided by competent parties is lacking. Therefore, the writer is very interested in wanting to examine the title of: "discussion of management mathematics subject teacher to improve the ability of high school teachers in the 2013 Curriculum Implementation in Banda Aceh.

2 Literature review

Fajri [1] that management is "Effective use of resources to achieve the intended goals or objectives". several management functions namely; planning, organizing, acting, financing (budgeting), and controlling (controlling).

2.1 Teachers as Educational Resources

Educators and education personnel are all people who carry out the education process. Those who are classed as educators and education personnel are called human resources education. The competence of teachers is covering; pedagogic competence, personality competence, social competence, and professional competence.

2.2 The aim of developing teacher professionalism

The purpose of teacher development through teacher development is to improve the teaching and learning process in which teachers and students are involved, through a series of actions, guidance, and direction. Furthermore, as a tribute to teachers who are able to improve their professional quality, they are given awards, including by increasing their rank/class.

2.3 Purpose teacher professional development

The purpose of teacher development through teacher coaching is to increase of teacher competence is carried out through various strategies in the form of both education and training (diklat) and non-education and training. As for education and training can be explained as follows:

1. Education and training.
   a. In house training (IHT).
   b. Internship program.
   c. School partnership.
   d. Tiered training and special training.
   e. Internal coaching by the school.
   f. Further education.

2. A Group Discussion of Teacher as Self-Development Containers

Discussion Of Subject Teacher a forum/forum for professional activities subject teachers of a kind of deliberation reflect activities from, by, and for teachers. What is meant by subject teachers are junior high school/MTs and high school/MA teachers, who take care of and are responsible for managing the subjects specified in the curriculum
3 Discussion and Result

3.1 Activity Program of Group Discussion of Math Teacher in Banda Aceh

The Group Discussion Of Math Teacher held socialization of the 2013 Curriculum Implementation. This was in accordance with the mandate of the government through the directorate general who carried out the socialization and training to the core teachers. The teacher teaches information gathered in Jakarta to all of his friends from the Discussion of math subject. Therefore the Discussion of Subject Math Teacher has helped the government in achieving its goals in the field of education to implement the national curriculum. Discussion of the subject teacher becomes the government's hand in the implementation and success of the national curriculum, namely the 2013 curriculum.

Ahead of the implementation of the activity, the management prepared a place, office stationery, prepared a schedule of events, prepared necessary infrastructure such as wireless, overhead projectors and informed participants and invited resource persons and related parties.

3.2 Activity Implementation Of Discussion Of Math Subject Teacher

Discussion Of Subject Math Teacher carry out activities that are in accordance with the needs of the teacher namely; "Updating information, especially about the latest government policies so that teachers can always prepare themselves in teaching according to curriculum expectations". Discussion Of Subject Math Teacher Banda Aceh City facilitates Mathematics teachers in the city of Banda Aceh to improve their competence in the implementation of the 2013 curriculum. Acting as facilitators in these activities include widyaiswara from the Aceh Educational Quality Assurance Institute, lecturers of Syiah Kuala University and Ar Raniry Islamic University and resource person or instructor for National Mathematics.

3.3 Fund Management

Sources of funds for the implementation of Group Discussion Of Math Teacher activities come from the central government (the state budget and income) which is called the Block grand fund and from the Banda Aceh Education Agency called operational funds. Before the activity is carried out the management has prepared a budget plan and submitted it to the government.

The Group Discussion Of Math Teacher proactively proposes funds to the government for math teachers in Banda Aceh so that they can improve their competence in the implementation of the 2013 curriculum.

3.4 Monitoring System

The supervisory system of the Discussion Of Subject Math Teacher was carried out by supervisors from the Aceh Education Office who carried out their duties to conduct direct supervision by attending the opening of the event. There are those who open the activity directly or just attend it if the activity is opened by the head of the service. Indirect supervision is also carried out by asking for reports from the management for each activity.
4 Conclusions and Recommendations

4.1 Conclusions

1. Management of The Group Discussion Of Math Teacher is arranged to plan program activities, among others; (1) Design and make learning tools that are relevant, innovative and creative, (2) Design and make innovative teaching materials, (3) Design and make a proper assessment system, and (4) Discuss questions that are considered difficult (including math teacher competency test).

2. The implementation of Mathematics Teacher Consultation activities, in general, can be carried out especially in terms of activities and material is sufficient, but the attendance of participants is not as optimal as the number of actual participants. The types of activities carried out are in accordance with the needs of teachers and schools.

3. Management of Discussion Of Subject Math Teacher funds in accordance with the instructions and direction of the supervisor and Education Office of Banda Aceh City in the previous period and the Aceh Provincial Education Service to improve the ability of high school teachers in the implementation of the 2013 Curriculum.

4. There is a direct and some indirect monitoring system for The Group Discussion Of Math Teacher. Directly, supervisors attended the ceremonial event directly opening MGMP activities. Indirectly through the report of the committee or committee in writing. There is no evaluation action, and follow-up is planned by the organization's management.

4.2 Recommendations

1. With the planning expected, the Management of The Group Discussion Of Math Teacher in the future will be better with excellent programs that are useful for improving the competence of high school math teachers.

2. With the implementation of Discussion The Group Discussion Of Subject Math Teacher, the government is expected that the Education Office can increase attention to the teacher organization, namely the Discussion Of Subject Math Teacher, and the mathematics teacher must utilize the Discussion Of Subject Math Teacher as a self-development forum.

3. With the management of The Group Discussion Of Math Teacher in accordance with the instructions and direction of the supervisor and the Office of Education, it is expected to improve the ability of high school teachers in the implementation of the 2013 Curriculum.

4. Through the proper supervision system, it is expected that the management can conduct an evaluation, and follow up on the MGMP organization that is its responsibility so that the behavior of the teacher organization is more effective.

REFERENCE

Effects of Heavy Metal Lead (Pb) Exposure on Chlorophyll Content and Anatomic Structure of rice (Oryza sativa L.)

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Abstract. Lead (Pb) is one of the heavy metals that have received considerable attention as a poisonous pollutant and has a bad effect on living things, one of them on plants, especially food crops such as rice (Oryza sativa L.). Lead exposure has been shown affected by rice plant growth, but require further testing of the anatomy. This research was conducted with the aim to know the effects of heavy metal lead (Pb) on the chlorophyll and anatomy of rice, especially the anatomy of roots and leaves. The rice variety used is Inpari-32. This research type is experimental, with a qualitative and quantitative approach. The experimental design used in this study was Completely Randomized Design (CRD) which consisted of three treatments variations with nine replications. Chlorophyll content was analyzed by ANOVA test while root and leaf anatomy was done descriptively. From the measurement result using a spectrophotometer, it showed significant differences for chlorophyll content in each treatment, where the average result of chlorophyll analysis from the three treatments was 39.31 mg/L (P0), 16.294 mg/L (P1), and 10.815 mg/L (P2). From the analysis, it has been known that the values Fvalue > Ftable (27.79,323,356 > 3.40), it can be concluded that lead exposure effects total chlorophyll content and caused anatomic structures to change of the roots and leaves of rice.

Keywords: Lead (Pb), Oryza sativa L., Root and leaf anatomy, Chlorophyll content

1 INTRODUCTION

Pollution caused by heavy metals is an issue against the current environmental conditions. Among the many heavy metals, such as lead (Pb), mercury (Hg), cadmium (Cd) is widely known as the most toxic to the environment. These metals get into an environment where they are produced, used, and finally discarded. Highly toxic heavy metals, such as ions or compounds form, they are water soluble and easily absorbed into living organisms. Once absorbed, these metals can bind to cellular components such as proteins vital structural, enzymes, nucleic acids, This can interfere with the function/activity of the component [1].

Lead (Pb) is a metal that is widely known by the public. Pb is a type of metal that is malleable and blackish-brown. The danger posed by the use of Pb is a frequent cause of poisoning. Pb metal widely used in industrial batteries, wiring, paint, gilding, pesticides, also as the substance in gasoline [2].
Lead pollution is generally derived from human activities that use the metal, as expressed by Amaliah [3] where the source of the pollution of lead (Pb) from the largest man-made, namely gasoline made from a mixture of lead to materials motor vehicle fuel. In addition, having a bad influence on humans, lead exposure can also effect badly against the surrounding environment in a wide range, including agricultural land adjacent to the road. Indirectly the agricultural land located at the roadside can accumulate Pb from waste air emissions of motor vehicles.

The distance between agricultural land and road may affect the levels of lead in the soil, the statement is supported by the results of research that have been done by Nurmalia[4] about the content of heavy metals lead (Pb) in the soil of paddy fields surrounding the highway Banda Aceh-Medan in Indrapuri subdistrict of Reukih Village, Aceh Besar Regency. Sampling is done at a distance of 50-300 m from the highway. The results showed that the highest lead levels found in a rice field at a distance of 50 m from the highway, 0.059 ppm. Although the levels are still in the category currently, but now with a volume of vehicles continues to increase, it cannot be denied that the impact of lead pollution against the agricultural land located on the side of the road is getting high. With the presence of heavy metals in soils implies absorbed into plant tissue, especially when heavy metals are present in the dissolved form if the plant that binds are food crops like rice then heavy metal pollution would be more dangerous to humans [5].

Rice plant can absorb lead not only from the air. Other means of contamination of lead can pass through water used for agricultural activities, metal concentrations can be affected by the influx of wastewater containing heavy metals such as industrial and domestic wastes into the waters with the help of rain, river water, and the wind [6]. Based on research conducted by Amelia, Rachmadiarti, & Yuliani [7] concerning the analysis of heavy metals Pb against the rice, lead which comes from water and polluted substrate have a positive effect against rice growth include high, number of leaves and its biomass. Plants that are exposed by lead can change in growth, development, morphology, anatomy, and physiology [8].

In this issue is needed for further research concerning the physiology and anatomy of rice exposed by the heavy metals lead (Pb). Therefore, research is carried out with the purpose to know the effects of lead exposure on chlorophyll content and anatomic structure of rice (Oryza sativa L.)

2 Method

2.1 Place and Time

This research was conducted in the biology laboratory of Mathematics and Natural Sciences Faculty and the laboratory of Biology Education Faculty of Teacher Training and Educational Sciences Syiah Kuala University, Banda Aceh. This research took place from April until July 2018.

2.2 Research Procedure

The variety used in this research is Inpari-32. Rice cultivation using hydroponic techniques for 36 days. There are three types of treatment with nine replicates. As treatment, time variations of lead in the form of Pb (NO₃)₂ with its concentration is 1000 ppm, where the first treatment without any given Pb (controls), at the second treatment is given from the initial Pb nursery, then the third treatments are given Pb right at the moment the seedlings were transferred into
the tub (10 day old seedlings). Each media contain 10 rice seeds. The degree of acidity (pH) of nutrient solution used worth 6, can be observed by using a pH meter.

There are two parameters to be analyzed, chlorophyll content and the anatomy of rice (root and leaf). Analysis of chlorophyll content done by taking 1 gram of sample from each treatment, then put into a mortal and then crushed, added 20 mL alcohol 96%. The aqueous extract is filtered using the filter paper, then poured into a tube and after that its absorbance is measured by using a spectrophotometer at a wavelength of 649 nm and 665 nm. Total chlorophyll content (mg/L) is determined using the equations according to Winternans & De Mots [9] in Larasati [10]:

\[ Chl_{total} = 20.0 \cdot A_{649} + 6.10 \cdot A_{665} \]

Description:
\[ Chl_{total}: \text{Total chlorophyll} \]
\[ A_{665}: \text{Absorbance at 665 nm wavelength.} \]
\[ A_{649}: \text{Absorbance at 649 nm wavelength.} \]

Anatomical observation of rice plant using permanent preparations made with paraffin method by Sass [11] with little modification. As a sample, the plant is taken from each treatment then separated the roots and leaves, soaked in a solution of fixative (FAA) for 24 hours. The sample then is dehydrated using alcohol with stratified concentrations. The next stage, namely the initial treatment using a solution of alcohol-xylol gradually up to pure xylol. After that continued with the process of infiltration using paraffin gradually, and then carried out the process of planting preparations (embedding). Preparations using a microtome slashed with a thickness of 20 μm, and then colored and observed using a microscope.

3 Results and Discussion

3.1 Results

1. Chlorophyll Content

The average result of chlorophyll content from three treatments showed significant differences. Chlorophyll for each treatment P0, P1 and P2 in sequence is 39.831 mg/L, 16.294 mg/L and 10.815 mg/L. Data then tested using the variant analysis (ANOVA) (Table 1).

<table>
<thead>
<tr>
<th>Source of Diversity</th>
<th>The Degree of Freedom (DF)</th>
<th>The Sum of Squares (SS)</th>
<th>Central Square</th>
<th>F-value</th>
<th>F-table (0.05)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment</td>
<td>2</td>
<td>4277,890</td>
<td>2.138,945</td>
<td>27.798.532,356*</td>
<td>3.40</td>
</tr>
<tr>
<td>Error</td>
<td>24</td>
<td>0,002</td>
<td>0,0000769</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>26</td>
<td>4,277,892</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Real different in level test 0.05
The results of the analysis of variants against rice leaf chlorophyll content showed $F_{value} > F_{table}$ ($27798532.356 > 3.40$) (Table 1), it may be stated $H_0$ is rejected at the 0.05 level test and $H_1$ received with real. Therefore, it can be concluded that heavy metals lead (Pb) exposure effect on total chlorophyll of rice. Further trials are needed to know of any differences between the treatments. Advanced test selection based on the current value of the diversity of coefficient (DIVC). The value of DIVC is 0.04% (<5%), the next test should be used is Honestly Significance Difference (HSD). HSD test results presented in Table 2.

Table 2. HSD Test Results Against lead (Pb) Effect on Chlorophyll of Rice (*Oryza sativa* L.).

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Chlorophyll Content + HSD</th>
<th>Distance Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>P2</td>
<td>10,815 + 0,010</td>
<td>10,825</td>
</tr>
<tr>
<td>P1</td>
<td>16,294 + 0,010</td>
<td>16,304</td>
</tr>
<tr>
<td>P0</td>
<td>39,831 + 0,010</td>
<td>39,841</td>
</tr>
</tbody>
</table>

Description: the numbers followed by a letter and in the same column means the different unreal.

Based on Table 2 it can be noted that the average levels of the chlorophyll from three treatments showed significant differences. Most high chlorophyll content found in the control plants (P0), followed by P1 and P2 as.

2. Anatomic structure of rice (*Oryza sativa* L.)

On leaf and root tissue preparations observed indicates that there are differences in the anatomy of each treatment. Observations using a microscope with a magnification of 400 times can be seen in Figure 1 for the anatomy of root and Figure 2 for the anatomy of the leaf.

![Figure 1. Cross Section Transverse Root Tissues of rice (*Oryza sativa* L.) (400x) (e: epidermis, k: cortex).](image-url)
4 Discussion

4.1 Effect of Lead on Chlorophyll Content

Lead Exposure can affect the total chlorophyll of rice (Oryza sativa L.), total chlorophyll from three treatments showed that there is a difference. The longer the metal exposed by the plant, it will be increasingly reduced chlorophyll levels. That statement is supported by the results of research conducted by Puspita, Santoso, & Yulianto [12] about the effects Pb towards the levels of chlorophyll in a plant leaf, where the result showed that the more higher concentration and the longer exposure of lead causes chlorophyll experienced a significant decline.

The high accumulation of lead is excessive intake of nutrients can reduce the Fe and Mg which resulted in changes in the number and volume of chloroplasts. Iron deficiency in plants resulting in the number and size of the grana of chloroplasts in being small, thus interrupting the formation of chlorophyll [13]. In addition to Fe and Mg concentrations, high lead also affects the availability of zinc (Zn) in plants.

Porifirin ring is a component of chlorophyll. Precursors of the ring is a δ-Aminolevulinat acid (ALA). The biosynthesis of the ALA can be done through two paths: (1) of suksinal-CoA and glycine, and (2) of glutamate. On the change of δ-Aminolevulinic acid (δ-ALA) requires the enzyme Porphobilinogen into δ-Aminolaevulinic acid dehydratase (ALAD). ALAD is the enzyme that has 8 identical subunits with one active site at each dimer. This enzyme binds 8 Zn in each subunit. There is 4 Molecular Zink serves as the tertiary structure of the ALAD enzyme stabilizers, while 4 other Zink molecule serves as a catalyst. Lead inhibits the activity of the enzyme with changing the positions of in active site of the ALAD enzyme [14].

Iron (Fe) plays an important role in the process of chlorophyll synthesis. A precursor of chlorophyll synthesis is blocked under the condition of Fe deficiency, which can cause a decrease in the concentration of chlorophyll. Fe is an important cofactor of numerous enzymes.
involved in the biosynthesis pathway of chlorophyll [15]. Conversion of Mg-protoporphyrin monomethyl ester (MgPMME) became Protochlorophyllide (Pchlide) through the three stages of oxidation, where two electrons in each phase of its use. At this stage, the electron, the electron donating Fe derived from changes to Fe$^{3+}$ into Fe$^{2+}$ [16]. Magnesium (Mg) is the central atom of chlorophyll structure. In case of deficiency against three of metal, then the plant can not do the series of chlorophyll biosynthesis, chlorophyll which ultimately will not be formed.

Lead is more reactive than Zn, Fe, and Mg. On the other hand, these elements can be easily replaced with lead. Therefore with the absorption of lead in small quantities—also can replace the elements needed in the biosynthesis of chlorophyll, so it resulted in decreased pigment in the leaves of plants, yellowing leaves are finally experiencing chlorosis.

4.2 Effect of Lead on Root and Leaf Structure

Plants can absorb lead upon the condition of fertility and low soil organic matter content. In this situation of heavy metals Pb will be detached from the bonds of the soil and the form of non-moving ions in the soil solution. If other metals are not capable of inhibiting its existence, then it will happen absorption lead by plant roots [17].

When heavy metals enter the cell, even in a matter of minutes, the metal will produce the effect of toxins on many processes: inhibit enzyme activity, largely interfere with the absorption of nutrients, disrupt hormonal work. These disorders can affect physiology and many activities in high concentrations can lead to cell death. Effects of heavy metals arising due to bind with protein functional groups, particularly groups of enzymes-SH, lead can be easily bound to the cluster sulfhidrit (-SH) [18].

If the work of enzymes is compromised, then the hormone's work will work uninterrupted. Hormones that play a role in the process of the formation of such cytokinin and auxin. Cytokinin plays a role in stimulating cell division whereas auxin that acts to push the enlargement of cells. Disruption of the work of the enzyme causes the hormone to suffered a second labor disruption in cell division and enlargement [19].

The root is the first organ that will absorb Pb before getting into other plant organs. Lead exposure in the early growth of the roots can affect hormone balance, which ultimately affects cell division causing changes in the number of cells in the tissues. Lead initially moving through the lines apoplast and follow the flow of the water until it reaches the endodermis. The movement of the lead in the root system is disturbed by the presence of a barrier from the root endodermis. Endodermis block translocations Pb into the center of the tissues with the Casparian strip and continued with the translocation line symplast. However, a high concentration of lead is able to destroy the physical barrier formed by the Casparian strip [20].

Thickening of the endodermis cells also become an adaptation for blocking Pb translocation into the stele tissue. According to Handayanto, Mudarrisna, & Fiqri [21], high Pb content can cause the formation of abnormal morphology in plants, such as the occurrence of irregular thickening of the radial on the roots, endodermis cell walls and the formation of lignin in the parenkimm cortex.

Thickening of the walls of the epidermis is also one of the effects of lead absorption by cells. These statements are supported by Alves, de Jesus, de Almeida, Souza, & Mangabeira [22] that the absorption of metals Pb by the roots can affect the thickness of the epidermis in plants. The higher the concentration and the longer exposure of lead will be even greater damage occurred. The lead was also influential on the leaf epidermis, according to Weryszko-Chmielewska & Chwil [23] changes caused by lead on epidermis structure of leaves in the form of a reduction in the size of the cell.
The other part that becomes a point of attention, namely the vessel tissues. The tissues can be seen clearly on the results of the transverse incision of the leaf. There are vessels the carrier xylem and phloem tissues. Xylem and phloem have different functions and specific. Xylem takes place in transport water and minerals from the soil through the roots, while the phloem in carries the results of photosynthesis to all the organs of the plant [24].

Xylem and phloem were instrumental in the process of transporting elements of lead from the outside into the organs of the plant. After the lead entered into the root, then the metal is transported over a tissues transport that is xylem, headed to the other plant organs, such as the leaves. According to Weryszko-Chmielewska & Chwil [23], the effects of lead exposure towards the transport chain can be a vast reduction of xylem and phloem in the vascular tissue and also affects the diameter of the xylem vessels.

5 Conclusion

Based on the results of the research, to be drawn the conclusion that the difference between exposure to heavy metals lead (Pb) effect on chlorophyll concentration of rice, the longer the plant exposed causes the low levels of chlorophyll. Metal exposure also effects on root and leaf anatomy of rice.

REFERENCES


The Application of Near Infrared Reflectance Spectroscopy as A Fast and Non-Destructive Method to Determine Inner Quality Parameters of Intact Mango

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Abstract. Generally speaking, to determine inner quality parameters such as soluble solids content (SSC) and vitamin C of intact mango or other fruits, several methods were already employed. Yet, most of them are based on chemical analysis and fruit extraction followed by other laboratory analysis. These methods often require complicated sample processing, longer time consuming and destructive. In the last three decades, the application of near infrared reflectance spectroscopy (NIRS) as a fast, robust and non-destructive method in agricultural industries is gaining more attentions. Thus, the main purpose of this present study is to apply the NIRS method in determining SSC and vitamin C of intact whole mango by developing prediction models. Near-infrared spectra data, in the form of diffuse reflectance spectrum, were acquired for a total of 53 mango samples. Spectra data were corrected and enhanced using mean normalization (MN), standard normal variate (SNV) and the combination of them (MN+SNV). Prediction models used to predict SSC and vitamin C of intact mangos were developed using partial least square regression (PLSR). The results showed that SSC and vitamin C can be predicted rapidly and simultaneously using NIRS method with maximum correlation coefficient (r) were 0.85 for SSC and 0.96 for vitamin C, with residual predictive deviation (RPD) index were 1.92 and 3.53 for SSC and vitamin C respectively. Based on obtained results, we may conclude that the NIRS method can be applied as an alternative fast and non-destructive method in determining quality parameters of intact mango.

Keywords: Soluble Solids Content (SSC), Near Infrared Reflectance Spectroscopy (NIRS), Mangos

1 Introduction

Mango, which is known as king fruit, is one of the most popular fruits around the world due to its taste, appearance and high nutritional value [1]. According to [2], approximately 50% of all tropical fruits produced worldwide are mangos. They are grown commercially in more than 87 countries with its production more than 43 million tons in 2017. As a country with a tropical climate, Indonesia contributes to worldwide total mango production with more than 673 440 hectares, yielding 110 902 Hg/ha in 2017 and is placed as the fourth of the twelve top mango producers in the world [3]. However, the total export of fresh fruit fluctuated in the last five years both in the total volume and the total value of major fresh fruit exports, whilst the fruit production remained relatively stable. One of the major problems currently restricting
international trade in mangos is the strong heterogeneity in their physical maturity, which produces a low uniformity in ripening degree of fruit lots offered for sale [4].

In general, consumers purchase fresh fruits and vegetables on the basis of quality which is an important subject to those engaged in horticultural industries. Their acceptance depends on highly subjective factors including appearance, touch, smell, taste and even hearing. Soluble solids content (SSC) and vitamin C are two main quality parameters among others for mango fruit.

To determine these both quality parameters, several methods were employed. Yet, most of them were used based on solvent extraction with standard laboratory analysis. This analysis is sometimes complicated procedures, time-consuming and using of hazardous chemical solutions, from which may cause environmental pollutions. Therefore, unsuitable for the quality control of fresh agricultural products which requires real-time, rapid, on-line and non-destructive measurements [1].

Alternative fast, robust, non-destructive and pollution free methods are required to determine quality parameters of intact mango and other agricultural products. Near-infrared reflectance spectroscopy (NIRS) has been developed and widely applied in many sectors including in agriculture and horticulture industries [5]–[7]. The increasing importance of NIRS in agriculture is obvious from the recent increase in numbers of publications, as well as from the fact that many manufacturers and agricultural industries (e.g., grains, beverage, milk and dairy, and fruits and vegetables) have now implemented NIRS systems to measure and determine various quality parameters [8], [9].

Near-infrared reflectance spectroscopy (NIRS) technique works based on the principle of interaction of electromagnetic radiation with biological objects and thus it is considered to be suitable for determining the inner quality of food and agricultural product since this method is characterized by low labor costs, simple sample preparation, non-destructive, pollution free, and high speed of analysis. This technique gained widespread acceptance for analyzing agricultural products since its development in 1965 [8].

The overall research findings of our own studies show that NIRS was feasible to be applied as a rapid and non-destructive tool for quality attributes prediction. The prediction model performance was sufficiently robust and accurate with correlation coefficient (r) range of 0.87 – 0.95 and residual predictive deviation (RPD) index was 1.14 – 2.15 which is categorized as sufficient prediction models, and need some improvement.

Based on the advantages and excellence of NIRS as a novelty method to measure agricultural and food qualities, we attempted to apply the NIRS method in determining inner quality attributes of intact mango. So that it can be applied in sorting and grading processes. Thus, the main objective of this present study is to apply NIRS as a rapid, simultaneous and non-destructive method in quality parameters evaluation of intact mangos in form of SSC and vitamin C through prediction models.

2 Methods

2.1 Samples

A total of 58 intact mango samples were used in this experiment with different maturity stages from unripe to over-ripe stage. Samples were purchased in the local auction and stored in 25°C for two days to equilibrate before spectra acquisition and further chemical analysis.
2.2 Spectra data acquisition

Near-infrared (NIR) spectra data of intact mango samples were obtained using Fourier transform infrared instrument (FTIR, Thermo Nicolet Antaris II MDS). The basic measurement chosen for this spectra data measurement is high resolution with integrating sphere. Diffuse reflectance spectra data were acquired and recorded in the wavelength range from 1000 to 2500 nm with co-added 20 scans and averaged. Spectra data were recorded and saved in local computer with two different file formats (*.SPA and *.CSV)

2.3 Actual soluble solids content (SSC) and vitamin C measurements

After acquiring and recording NIR spectra data, all mango samples were analyzed for their inner quality parameters in the form of soluble solids content (SSC) and vitamin C. Both these quality parameter measurements were carried out simultaneously by making juice from 25 grams of pulp sample and maximum of 100 ml distilled water. A single drop filtered supernatant juice was squeezed and dropped onto a hand-held analog refractometer (model HRO32, Krüss Optronic GmbH) to record SSC as oBrix [10] whilst automatic titration (model Titroline 96, Schott) with 0.1 N NaOH to an end point of pH 8.1 was used to measure vitamin C expressed as mg·100g⁻¹ fresh mass [1]. All these two quality attributes were measured in triplicate and averaged.

2.4 Spectra data correction

Spectra data analysis was firstly performed to inspect spectra visualization and noise recognition. Noise, caused by light scattering were enhanced and corrected using mean normalization (MN), standard normal variate (SNV) and the combination of them (MN+SNV) methods.

2.5 Prediction model

Prediction models used to predict SSC and vitamin C of intact mangos, were developed simultaneously based on untreated raw and enhanced spectra data (MN, SNV, and MN+SNV). Prediction models were established using partial least square regression (PLSR) with 10 fold cross-validation [1].

2.6 Prediction model performance

Prediction models performances were judged for their accuracies and robustness using these following indicators: the coefficient of determination (R²), correlation coefficient (r), root mean square error (RMSE) and the residual predictive deviation (RPD) defined as the ratio between the standard deviation and the RMSE. The higher the RPD, the greater and robust the model to predict SSC and vitamin C of intact mango samples [5]. It is obvious that the good model should have high R² and r coefficient, low RMSE and few latent variables of PLSR [1].
3 Result and Discussion

3.1 Spectra features of mango

Typical diffuse near-infrared reflectance spectrum, after MN+SNV correction for intact mango samples in the wavelength range from 1000 to 2500 nm is shown in Fig.1. This spectra data shows the absence of quality parameters of mango samples which are derived from the absorbance bands that result from the vibration of molecular bonds of O-H, C-H, C-O and N-H with the infrared radiation.

![NIR spectra data of 58 intact mango samples after correction using MN+SNV method.](image)

Intact mango samples were irradiated using infrared electromagnetic radiation and their reaction including reflectance, absorbance and transmittance are captured and recorded. The different reaction of this diffuse reflectance spectra data was depend on main chemical composition, cell structure and other chemical or physical properties of the samples. A captured near-infrared spectra of a biological object consists of the response of the molecular bonds O-H, C-H, C-O, and N-H. These bonds are subject to vibrational energy changes when irradiated by NIR frequencies [6]. The NIR spectrum indicates the presence of organic materials such as sugar content, vitamin, acidity, and other parameters.

As shown in Fig.1, spectra data were corrected and enhanced using a combination of mean normalization and standard normal variate (MN+SNV) method. Mean normalization were enhanced spectral data by normalizing spectra to its ideal condition which is normally mean spectra whilst SNV spectra corrected spectra data by scaling spectra to its suitable scale from -1 to +1 [1], [11].

It is obvious that mango contains more than 80% of water, the presence of water contents can be seen in Fig 1. where the highest peak was observed at wavelength 1490 nm and 1920 nm which were associated with O-H bands. Furthermore, vitamin C which was constructed with C-H-O can be predicted in the wavelength range around 2100 – 2247 nm, 2312 nm, and 2380 nm.

3.2 Prediction models

The main part of near-infrared spectroscopy application is establishing calibration models used to predict quality attributes or chemical constituents of organic and biological samples. The most accurate and robust models were then transferred onto the NIR instrument for further quality evaluation. In this study, prediction models were developed using partial least square regression (PLSR). Prediction model consists of the relationship between the observed response variable $y$ (Y-variables: SSC and Vitamin C) and the independent variable $x$ (X-variables: NIR
diffuse reflectance spectra data). The primary information that can be gathered from the interaction of the near-infrared radiation with the biological object is its physical, optical and chemical properties.

Calibration and prediction result for SSC and vitamin C of intact mango samples were shown in Table 1 and Table 2 respectively. Obtained results show that NIRS seems feasible to predict both main quality parameters of intact mangos (SSC and vitamin C) with sufficient performance for SSC (RPD = 1.92 and r = 0.80) and excellent prediction performance for vitamin C (RPD = 3.53 and r = 0.96). Their prediction performances were significantly improved when spectra data were corrected by MN and SNV methods as shown in both Tables.

Table 1. SSC prediction performance using diffuse reflectance spectra data

<table>
<thead>
<tr>
<th>Spectrum</th>
<th>Statistical indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>R²</td>
</tr>
<tr>
<td>Raw</td>
<td>0.64</td>
</tr>
<tr>
<td>MN</td>
<td>0.66</td>
</tr>
<tr>
<td>SNV</td>
<td>0.72</td>
</tr>
<tr>
<td>MN+SNV</td>
<td>0.72</td>
</tr>
</tbody>
</table>

Table 2. Vitamin C prediction performance using diffuse reflectance spectra data

<table>
<thead>
<tr>
<th>Spectrum</th>
<th>Statistical indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>R²</td>
</tr>
<tr>
<td>Raw</td>
<td>0.63</td>
</tr>
<tr>
<td>MN</td>
<td>0.88</td>
</tr>
<tr>
<td>SNV</td>
<td>0.91</td>
</tr>
<tr>
<td>MN+SNV</td>
<td>0.92</td>
</tr>
</tbody>
</table>

Based on prediction results, both MN and SNV increased prediction accuracy and robustness. SNV seems provided more accurate than MN. The most accurate and robust prediction results were achieved when spectra data were enhanced and corrected using a combination of MN and SNV methods (MN+SNV). It provided maximum correlation coefficient r = 0.85 and RPD = 1.92 for SSC prediction and maximum r = 0.96 and RPD = 3.53 for vitamin C prediction. Scatter plot drawn for SSC prediction of intact mango samples was presented in Fig. 2.
In general, judging from prediction performance evaluation, NIRS can be used and improved by correcting and enhancing spectra data where in this study we use mean normalization (MN), standard normal variate (SNV) and combination of them (MN+SNV). The achieved RPD maximum was 1.92 which categorized as sufficient prediction performance. It can be enhanced and improved probably using a non-linear approach such as support vector regression (SVR).

Moreover, excellent prediction results were achieved when NIRS used to predict vitamin C of intact mango samples. It reached maximum \( r \) coefficient of 0.96 using MN+SNV spectrum. It improved from its initial prediction result using original un-treated spectrum where \( r = 0.81 \). Scatter plot derived from actual and predicted vitamin C was presented in Fig.3.
Fig. 3. Scatter plot between actual and predicted vitamin C of intact mangos using NIR spectra data

Based on regression curve derived from the best prediction models for SSC and vitamin C parameters, important and relevant wavelength for both main mango quality attributes were observed around 1418 -1435 nm, and between 2300 - 2415 nm as shown in Fig. 4.

Fig. 4. Important wavelength in near-infrared region for SSC and Vitamin C prediction.

4 Conclusion

NIRS can be applied as an alternative fast, non-destructive and robust method used to predict two main quality parameters of intact mango namely soluble solids content (SSC) and Vitamin C. Spectra correction using mean normalization (MN) and standard normal variate (SNV)
methods were significantly improved prediction accuracy and robustness. A combination of MN+SNV spectra correction provide the most accurate and robust prediction result with correlation coefficient $r = 0.85$ and RPD $= 1.92$ for SSC prediction, and maximum $r = 0.96$ and RPD $= 3.43$ for vitamin C prediction.

Acknowledgments

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REFERENCES


The Effect of Propolis and Non-Propolis Toothpastes on Salivary pH of Children of National Primary School (SDN) 62 Banda Aceh

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Abstract. Caries can be prevented by maintaining the cleanliness of the oral cavity. There are many ways to maintain oral hygiene, one of which is to brush the teeth with toothpaste. Many ingredients can stimulate salivary secretion, including propolis, a natural antibiotic with no side effects. Propolis can also reduce plaque on the teeth, which helps increase salivary pH. This study aimed to investigate the effect of using propolis and no propolis toothpaste on children’s salivary pH. The study used the quasi-experimental method. The subjects in this study were all grade 5 students of National Primary School (SDN) 62 Banda Aceh totaling 60 children, taken using purposive sampling technique. The subjects were then divided into two groups, with 30 students each: group I brushing teeth using propolis toothpaste and group II brushing teeth using nonpropolis toothpaste. The data were analyzed by employing a paired sample t-test. The results showed that there was a difference in the salivary acidity (pH) before and after brushing teeth using nonpropolis toothpaste with a mean difference of 1.02 (p=.000), whereas the acidity (pH) of saliva before and after brushing teeth with propolis toothpaste had a mean difference of 2.22 (p=.000). It can be concluded that the use of toothpaste containing propolis was more effective for increasing the acidity (pH) level of saliva. It is recommended that there be socialization in the use of toothpaste containing propolis as an effort to prevent dental and oral diseases (e.g. dental caries, gingivitis, and periodontitis).

Keywords: Cryptography, RSA, ElGamal, Public Key, Asymmetric

1 Introduction

Caries is a disease resulted from a demineralization process on the hard tissues of the teeth (enamel, dentine, cementum) due to bacterial activity in the oral cavity. Caries is one of the most common dental and oral health problems in the community. There are a number of causes of caries, one of which is bacteria. Bacteria breaks down the carbohydrate substrate attached to the oral cavity and then forms plaques. This bacterial activity will continue along with the rise of the acidity level (pH) of the oral cavity. This condition will eventually lead to decalcification of enamel, and white spot lesions will emerge that indicate the start of the caries process [1].

The 2013 Basic Health Research reported that 25.9% of the Indonesian population had tooth and mouth problems. It was also stated that 62.9% of the population in Aceh province experienced caries, and generally as much as 90.7% of the people brushed their teeth every day during the morning bath and afternoon bath while the proportion of people who brushed their
teeth every day after breakfast was only 12.6% and before sleep 20.7% [2]. In addition, the report of the Banda Aceh City Health Office in 2014 showed that dental and oral diseases ranked 14th out of the 20 biggest diseases with 4779 visits. According to the results of dental and mouth examinations in the 6-14 year age group in Banda Aceh in the UKGS activity, 34% of children suffered from caries [3]. The state of oral and dental health in the Banda Aceh City area has suggested that dental and oral health status is still a concern.

Saliva is a complex fluid produced by several salivary glands such as the parotid, submandibular, sublingual, labial, buccal, and palatal glands. Saliva has several functions, including protecting tissues in the oral cavity by mechanical cleaning to reduce plaque accumulation on the tooth surface, lubricating the teeth elements, providing buffer, preventing bacterial aggregation inhibiting the colonization of microorganisms, providing antibacterial activity, helping the tasting and digestive functions, and helping repair the tissues [4]. The function of salivary protection is strongly influenced by changes related to composition and viscosity, acidity, ionization, and salivary proteins [5].

The normal level of acidity (pH) ranges from 6.7 to 7.3. The degree of acidity and buffer capacity of saliva can be influenced by the rhythm of day and night (circadian cycle), diet, and stimulation of the speed of secretion. The effect of the circadian cycle shows that the acid level and saliva buffer capacity will be high when you wake up early in the morning, but then it will immediately decline. Also, 15 minutes after eating, the acid level and saliva buffer capacity will also increase due to mechanical stimulation, but after 30-60 minutes they become low. At night, the acidity and buffer capacity of the saliva will rise, but by midnight they will go down. During sleep, the salivary volume will decrease, the ratio of bicarbonate and hydrogen ions will also decrease to pH 4, and the bicarbonate concentration is low. The speed of salivary secretion can directly affect pH in the mouth; if the speed of salivary secretion increases, the salivary pH will also increase, and likewise, the speed of salivary secretion reduces, the pH of saliva also gets reduced. Such situations have an impact on the process of demineralization and remineralization of the teeth since repeated pH reduction will lead to a demineralization process and the onset of caries [6].

Childhood is the beginning of behavior development; therefore, during this period, children are usually most vulnerable to any internal and external influences. Not surprisingly, children are also quite vulnerable to changes in health status, including caries. Children aged between 10-12 years, according to the WHO, are generally more cooperative, and thus, any dental and oral health studies should target this age group [7].

Maintaining the cleanliness of the oral cavity will prevent the caries process. To maintain oral hygiene, one way is to brush the teeth with toothpaste. Many types of toothpaste on the market have different contents and functions [8].

Many ingredients can stimulate salivary secretion, one which is propolis. Propolis is one of the natural products produced by bees which can be useful as an anti-bacterial, antifungal, and antiviral agent. Various types of products from bees that are beneficial to health are mentioned in the Qur’an Surah Al-Nahl verses 68-69, which explains that Allah SWT (God) specifically introduced the benefits of bees and their products to humans to be used as a natural cure for various diseases. Propolis is also an antibiotic because it contains ferulic acid and bioflavonoids. In addition, propolis is also known as a natural antibiotic without side effects. Flavonoids in propolis have been shown to have antibacterial activity against Streptococcus mutans, one of the dominant bacteria in the mouth and the main bacteria that causes caries. Propolis can also inhibit the growth of plaque on the teeth so that the salivary pH can increase [9].

Findings of the study on Bacillus de Koch and other similar research showed that propolis has a bactericidal effect on bacteria that trigger the formation of dental caries [9]. Propolis also
has anti-inflammatory and antioxidant effects. The anti-inflammatory and antioxidant effects
can be utilized by applying propolis to toothpaste. Regular use of toothpaste every time one
brushes his/her teeth can help the effectiveness of propolis. The anti-inflammatory effect can be
used to reduce and treat oral thrush and other periodontal diseases while the antioxidant effects
are used as protection on the teeth and surrounding tissues against irritants [10]. Propolis is
widely studied as a remedy that can cure diseases and is more largely used in the form of liquid,
gel, or capsules. Propolis is currently used for general body health rather than for oral health.
Research on the use of propolis in oral health is still being performed as well as the packaging
process of propolis as an ingredient or drug to oral cavity health, such as toothpaste [11]. The
most expected propolis efficacy in toothpaste is that it can significantly inhibit the growth of
plaque-forming bacteria (antibacterial effect) although propolis also has other properties or
effects, such as anti-inflammatory for oral thrush and other periodontal diseases [12].

Departing from the above discussions, it is interesting to study further the effect of using
propolis and nonpropolis toothpaste on salivary pH among elementary students in Banda Aceh.
A large number of toothpaste circulating today makes it relevant for the study to investigate the
effect of toothpaste containing propolis. The importance of the study is that people can find out
which toothpaste has the best impact on the pH of saliva.

2 Methods

This study was conducted in August 2017, employing the quasi-experimental research
method with a pre-test and post-test only group design. The subjects of the study included all
grade 5 students of class VA and class VB of SDN (public elementary school) 62 in Banda Aceh
City, Aceh Province, with a total of 60 children. The subjects were then divided into two groups,
with 30 children each: group I (class VA) brushing teeth using a toothpaste containing propolis,
and group II (class VB) brushing teeth using nonpropolis toothpaste. The subjects were selected
by using the purposive sampling technique.

The measuring instruments included pH strips, a diagnostic tool, and a status card. The data
were analyzed by employing the paired sample t-test in the SPSS (level of significance= p<.05)
to determine the differences in changes in the acidity level (salivary pH) in the children before
and after brushing teeth using propolis and nonpropolis toothpaste).

3 Result

3.1 Univariate Analysis

The univariate analysis in this study included the salivary pH in the treatment group I and the
debris index in treatment group II, both before intervention (pre-test) and after the intervention
(post-test). The results of univariate analysis are presented in the following descriptions:

3.1.1 Level of Acidity (pH) of Saliva at Treatment I (Propolis Toothpaste)

Table 1 shows that before treatment (pre-test) all subjects had acidic saliva, and after
treatment (post-test), nearly all of them had normal pH of saliva.
Table 1. Results of salivary pH of treatment I

<table>
<thead>
<tr>
<th>pH of saliva</th>
<th>n</th>
<th>%</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>0</td>
<td>0</td>
<td>28</td>
<td>93.3</td>
</tr>
<tr>
<td>Acid</td>
<td>30</td>
<td>100</td>
<td>2</td>
<td>6.7</td>
</tr>
<tr>
<td>Base</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

3.1.2 Level of Acidity (pH) of Saliva at Treatment II (Non-Propolis Toothpaste)

Table 2. Results of salivary pH of treatment II

<table>
<thead>
<tr>
<th>pH of saliva</th>
<th>n</th>
<th>%</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>0</td>
<td>0</td>
<td>15</td>
<td>50</td>
</tr>
<tr>
<td>Acid</td>
<td>30</td>
<td>100</td>
<td>15</td>
<td>50</td>
</tr>
<tr>
<td>Base</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 2 depicts that before treatment (pre-test) all of the subjects had acidic saliva, and after treatment (post-test), however, half of them still had acidic saliva and another half had normal salivary pH.

3.2 Bivariate Analysis

The bivariate analysis aims to test the hypothesis of the study. The hypothesis is tested by calculating the mean difference in two groups with the paired sample t-test. The statistics of treatment group I and treatment group II is provided as follows:

Table 3. Statistics of salivary pH in treatment I and II

<table>
<thead>
<tr>
<th>p</th>
<th>t</th>
<th>p</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diff ± SD</td>
<td></td>
<td></td>
<td>Diff ± SD</td>
<td></td>
</tr>
<tr>
<td>pH of Saliva</td>
<td>2.22±2.11</td>
<td>-5.77</td>
<td>.000</td>
<td>1.02±1.06</td>
</tr>
</tbody>
</table>

Description: * = significant

The above table indicates that in the treatment group I, there was an increase in salivary pH before and after brushing teeth with propolis toothpaste with the average difference of 2.22. On the other hand, in the treatment group II, there was a decrease in salivary pH before and after brushing teeth using nonpropolis toothpaste with the average difference of 1.02. In both treatment groups, however, there was an increase in salivary pH which was statistically significant (p<.05).

4 Conclusion

the Propolis not only suppresses the growth of plaque bacteria, but also supports the successful treatment of periodontal diseases since propolis can help increase the body's immune system and heal damaged tissues or wounds, such as gum bleeding, postoperative wounds, or post-periodontal treatment [13].
In this study, toothpaste containing propolis was shown to be more able to increase the salivary pH compared to non-propolis toothpaste due to the addition of propolis active substances. Propolis is a natural product from bees; thus, toothpaste with propolis is of unlimited use not only for adults but also for children as it can help establish a life-conscious dental and oral lifestyle from an early age. Dental and oral health-conscious behavior should be introduced in childhood years so that it can become a life habit that will be carried out afterward. The findings in this study confirmed the benefits of having propolis in the toothpaste as propolis actively protects human teeth from bacteria, viruses, and fungi. The working speed and activity of propolis in inhibiting germ attacks are the hallmarks of propolis compared to other similar natural ingredients [12]. Propolis is a non-toxic natural product with many pharmacological properties. Some of the propolis contents identified are aglycones, cyanuric acid derivatives, and terpenoids. Flavonoids, the main contents of propolis, are known to have activity against oral microorganisms. Other biological activities in propolis include anti-inflammatory, anesthetic, and a protective cell for the mouth. Propolis contains antibacterial ingredients that can inhibit the growth of plaque-forming bacteria. Antibacterial components of propolis are polyisoprenylated benzophenone, galangin, pinobanksin, and pinocembrin [9].

REFERENCES

The Role of Supporting Institutions and the Problems of Vegetable Agribusiness Development in Aceh

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Abstract. This study was carried out to analyze the characteristics of vegetable farmers in Aceh on the condition of the supporting institutions they have and their influence on the development of vegetable agribusiness in Aceh. The method of analysis used is T-test between characteristics of supporting institutions and the level of productivity and income level of vegetable farming in Aceh. Through analysis towards farming of 50 farmers in 2 regencies of vegetable production centers in Aceh, the results showed that although the characteristics of supporting institutions in the development of vegetable agribusiness in Aceh were relatively poor, these characteristics significantly affected the level of productivity and income levels of vegetable farmers in Aceh. For this reason, it is necessary to improve the characteristics of supporting institutions in Aceh so that vegetable agribusiness develops well.

Keywords: Characteristics of Supporting Institutions, Vegetable Farmers, Agribusiness Development

1 Introduction

Supporting institutions may be in the form of government apparatus or advisory institutions, financing institutions, distribution and transportation institutions, research and education institutions, communication and information institutions. These institutions are crucial in the effort to create agribusiness integration to achieve agribusiness development goals. The existence of these supporting institutions is very important to create a strong and competitive agribusiness because it is an integral part of the agribusiness system [1].

Agribusiness development is a development which is an integral part with the development of related industries and services in a development area that includes five subsystems from upstream to downstream simultaneously and harmoniously [2], [3]. Besides achieving economic development, agribusiness development also has an impact on overall regional development, through increasing inter-regional dependence and developing competitive and comparative advantages of agricultural products.

Supanggih & Widodo (2013) stated that capital constraints, interest rate fluctuations, and lack of credit information are major problems faced by many farmers. Credit is needed by the farmers to increase production, product quality and increase investment to increase profits. Meanwhile, Isaac (2012) stated that credit would be given if the farming was profitable, feasible to cultivate, and low risk. Furthermore, credit is needed for investment capital, business development, and working capital.
Characteristics of supporting institutions that weak in the development of rural agribusiness require prioritizing on moral ethics and sustainable development goals to ensure the success of rural agribusiness [6].

Infrastructure policies, especially transportation and irrigation facilities, are a number of intensive government efforts in several regions. It is realized that these two infrastructures will quickly increase crop productivity and open up the isolation of the region so that the flow of goods and information can run without significant obstacle (Soekartawi, 1993:33). The availability of roads that are not supported by the infrastructure of the social environment (security) and the physical economic environment (high demand for a commodity) resulting comparative advantage that cannot be utilized optimally. For this reason, it is necessary to examine the farmers' access to supporting institutions and their influence on the level of production and income.

2 Method

2.1 Location, Object, and Scope

The study was conducted in Central Aceh and Bener Meriah; regencies of vegetable production centers in Aceh. The object of research is the vegetable farming development unit including farmers, factors that influence the performance of supporting the institution, including the number of sources of working capital, guidance, and counseling, road and transportation conditions, as well as communication and information facilities.

2.2 Population and Sampling Method

The research's population is the population which is become the scope of the research's conclusion [8]. Vegetable farmers, intermediary traders, supporting service providers, and agricultural extension agents are the target population.

Sampling is done by Multistage Random Sampling technique; a sampling technique which based on the population area and samples randomly stratified at the specified research location. Assuming the homogeneous farmer characteristics [9], and then each regency was sampled with the same amount of 50 farmers from 2 selected sub-districts, and each subdistrict was taken by 25 farmers from 2 selected villages. The number of sub-districts in this study was 4 sub-districts and 8 villages.

2.3 Analysis Method

To measure the effect of farmers' access to supporting institutions, T-tests are conducted between access to supporting institutions against income levels, and access to supporting institutions against vegetable productivity. It will be seen the inclination that exists between access to the services of supporting institutions and the level of income and productivity. Furthermore, a T-test will be conducted to distinguish the level of accessibility with the level of income and productivity owned by farmers. Access to supporting institutions is measured by farmers' accessibilities: a number of working capital institutions (X1); road and transportation conditions (X2); communication and information facilities (X3); coaching institution (X4).

Formulation of hypotheses is arranged as follows:
\[ \text{H}_0 = \text{there are no differences in the level of production and income of farmers based on farmers' access to supporting institutions.} \]
\[ \text{H}_a = \text{there are differences in the level of production and income of farmers based on farmers' access to supporting institutions.} \]

The criteria of decision making are as follows: null hypothesis (H\textsubscript{0}) is accepted if price $F_{\text{count}}$ smaller or equal with $F_{\text{table}}$ ($F_{\text{count}} \leq F_{\text{table}}$), and is rejected if $F_{\text{count}}$ bigger than $F_{\text{table}}$ ($F_{\text{count}} > F_{\text{table}}$).

3 Results And Discussions

3.1 Characteristics of Vegetable Farmer Supporting Institutions in Aceh

Table 1 below shows the characteristics of supporting institutions in the development of vegetable farming in Aceh. The access of vegetable farmers in Aceh to supporting institutions is very low. This can be seen from the relatively low amount of available working capital and a source of capital that is mostly sourced from their own capital (48.9%). This will make it difficult for farmers to develop their farms. The amount of capital resources that can be utilized by farmers is relatively low. On average, there are only 2 sources: their own capital or loan capital from another source, such as neighbors, middlemen, and the government. The role of the government in providing working capital is only 9.8 percent, therefore this must be increased again.

It can be seen from the table that farmers are experiencing capital limitations for further farming development. This can be seen from the total costs incurred in planting vegetables is Rp. 18,742,706.00/hectare with a planting area of 0.542 ha, therefore the amount of capital needed is Rp. 10,158,547, while the amount of available costs is Rp. 8,826,989, hence it can be said that farmers still need working capital as much as Rp. 1,331,558 (13.1%) or Rp. 9,915,717.00/hectare (52.9%).

<table>
<thead>
<tr>
<th>Supporting institutions</th>
<th>Central Aceh Regency</th>
<th>Central Aceh Regency ( \text{Averages} )</th>
<th>Bener Meriah Regency</th>
<th>Bener Meriah Regency ( \text{Averages} )</th>
<th>Aceh</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Working Capital (X\textsubscript{1})</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Capital Source</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Owner (%)</td>
<td>59.1</td>
<td>58.8</td>
<td>58.9</td>
<td>29.2</td>
<td>48.4</td>
</tr>
<tr>
<td>- Neighbour (%)</td>
<td>22.0</td>
<td>28.6</td>
<td>25.3</td>
<td>14.4</td>
<td>16.3</td>
</tr>
<tr>
<td>- Middlemen/Wholesaler (%)</td>
<td>6.9</td>
<td>12.1</td>
<td>9.5</td>
<td>54.8</td>
<td>8.7</td>
</tr>
<tr>
<td>- Government (%)</td>
<td>12.0</td>
<td>6.3</td>
<td>9.5</td>
<td>0</td>
<td>26.6</td>
</tr>
<tr>
<td>b. Total Capital (Rp/planting)</td>
<td>3958333</td>
<td>5794000</td>
<td>5594917</td>
<td>19540000</td>
<td>4578000</td>
</tr>
<tr>
<td>c. Total Source:</td>
<td>2.04</td>
<td>1.84</td>
<td>1.9</td>
<td>3.28</td>
<td>2.4</td>
</tr>
<tr>
<td>2. Distance to market (KM)</td>
<td>39.8</td>
<td>23.4</td>
<td>31.6</td>
<td>9.2</td>
<td>12.84</td>
</tr>
<tr>
<td>3. Transportation (X\textsubscript{2})</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Farm to market</td>
<td>1.9</td>
<td>1.6</td>
<td>1.8</td>
<td>2.7</td>
<td>1.8</td>
</tr>
<tr>
<td>- Road condition</td>
<td>1.9</td>
<td>2.5</td>
<td>2.2</td>
<td>3.0</td>
<td>2.2</td>
</tr>
<tr>
<td>4. Source of information (X\textsubscript{3})</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The distance from the farm to the market is relatively far at 19.3 km, with a motorcycle as transportation to the farm. Road conditions to the farm are dirt and hilly, making it difficult for farmers to bring crops, especially during rainy weather.

The amount of coaching is almost never officially available (1.2 times/year), if there is a technical difficulty, the farmer will ask other farmers (42%), and only 33% to the PPL, radio or newspaper, while the issue of price information 85% of farmers entrusted them to intermediary traders (middlemen/wholesaler), and only 7% of farmers mastered price information, the remaining, PPL, radio and newspapers are 8%. The high price information from merchants shows that the selling price of vegetables is controlled by traders, and farmers only as price takers.

Here there is an asymmetric flow of price information that causes price information to be hampered that should benefit farmers. Because only as a recipient of prices, the price fluctuations that occur tend to disadvantage farmers, this can be seen from farmers' difficulty to get good income when the selling price of vegetables is high, and the difficulty of farmers avoiding losses when the price of vegetables is low.

In Bukit sub-district, vegetables are very potential to be developed, and a very large role must be and can be done by regency and provincial governments. This is a sub-district that has the closest distance between the farm and the market, but they buy seeds and sell the product not to the nearest market (1 km), but to markets outside Aceh, but to North Sumatra Province which is over 400 km. Thus farmers' access to the nearest market operationally in vegetable farming in this sub-district cannot be optimized, because the inability (failure) of the market provides the things needed by vegetable farmers, so even though the level of productivity is high, cheap labor costs, fertile land, and experience farmers are good enough, but because of market failures to provide inputs and absorption of output, the costs of production and marketing output are high, and income levels are low. For this reason, the role of the government is needed to improve the function of the Bukit market.
Generally, communication facilities owned by farmers are television, which cannot directly solve the problems faced by farmers, and only a small percentage of farmers have cellphones and radios (1-2%).

3.2 The effect of Condition of Supporting Institutions on Vegetable Agribusiness Development in Aceh.

Farmers’ access to supporting institutions services is measured by: (1) the number of working capital institutions, (2) the amount of coaching, (3) road conditions, and (4) communication and information facilities owned by farmers. It will be seen whether there is a link between farmers’ access to the services of supporting institutions and the level of production and the level of income of farmers. The relationship of farmers’ access to supporting institutions with the level of production and the level of income of farmers is shown in Table 2.

Table 2. Probability of F Value towards Productivity and Income of Vegetable Farming in Aceh, 2017

<table>
<thead>
<tr>
<th>Types of Supporting Institutions</th>
<th>Probability F towards Productivity</th>
<th>Probability F towards Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Number of Communication and Information Facilities</td>
<td>0,000***</td>
<td>0,000***</td>
</tr>
<tr>
<td>2. Number of Coaching Participants</td>
<td>0,008**</td>
<td>0,000***</td>
</tr>
<tr>
<td>3. Village Road Conditions</td>
<td>0,000***</td>
<td>0,000***</td>
</tr>
<tr>
<td>4. Number of Working Capital Institutions</td>
<td>0,004**</td>
<td>0,000***</td>
</tr>
</tbody>
</table>

**: Significantly different, with \( \alpha = 0.10 \)

***: Significantly different, with \( \alpha = 0.05 \)

Supporting institution services are significantly related to the increase in income of vegetable farmers in Aceh. This can be seen from the significance value of the influence of supporting institutions services on income levels. The services of supporting institutions to production levels are significantly influenced by the number of coaching participants and the number of communication and information facilities. This shows that a good coaching pattern and increased access to information mastery will increase the production and income of vegetable farmers in Aceh.

Based on Table 2, it can be seen that all four sizes of supporting institutions owned by farmers will relate significantly to the level of production and income level of vegetable farming in Aceh. This is consistent with the statement of Gumbira [10], which stated that supporting institutions are very important to create agribusiness integration in achieving agribusiness development goals.

The actual condition shows that farmers experience capital limitation and lack of credit information, and this is a significant problem faced by many farmers. Ricketts & Rawlins [11] say that credit is needed to increase production, product quality and increase investment to increase income. Credit will be given if the farm is profitable, feasible to cultivate, and low risk.

Furthermore, Saragih [12] stated that credit is needed for investment capital, business development, and working capital.

The same result is obtained by Nakagawa [13] who stated that the limitations of cash and working capital have limited the ability of farmers to buy high-quality seeds and encourage farmers to borrow money from various informal financial sources such as Bandar (middlemen),...
input suppliers, friends or neighbors with small guarantees and high-interest rates. This condition has hampered the development of vegetable production and productivity in Southeast Asia in general and Indonesia in particular (including in Aceh).

The difficulty experienced by the farmers in providing intensive working capital in vegetable cultivation and other vegetable cultivation occurs not only in Aceh but also in cabbage farming in Solok, West Sumatra with 55% used their own capital [14], and on non-contracted vegetable farming in Java-West with 85.9% used own capital [15]. The limitations of farmers in providing capital and obtaining credit by Jigang [16] and Karmana [17] are referred to as structural and cultural weaknesses of farmers so that they have difficulties developing their farms.

A less harmonious relationship between some farmers and coaches arises because of differences in interests, where the coaches, in addition to giving training, they also participate in planting and selling vegetable farming products, and seeking program funds as a pilot project. When the pilot project funds come out, farmers are not involved again. This caused displeasure feeling and caused the farmers' trust in the coach to be reduced. This condition also caused confusion for some farmers. Coaching is needed because farmers need to get information on technology that continues to grow [18]. In addition, agricultural extension tasks should not only provide information on technology, but also information about market prices and the tendency to increase value added from processing vegetables that are in high demand.

The road assessed is the village road to the district market. Road conditions are said to be adequate if the road conditions are paved, inadequate if the road from the village to the district market is gravelly, and inadequate if the road is mixed with dirt, holes and muddy. Prayogo said that to improve the competitiveness of agricultural commodities facing free markets, the first thing to do is: farmers' access to supporting institutions, such as the construction and rehabilitation of infrastructure such as roads, and transportation facilities used.

There are 5 types of communication and information facilities that are measured: television, cellphones/mobile phones, agricultural films, radio, and newspapers. Generally, farmers have a television, few farmers use cellphones and rarely do farmers have agricultural film, radio and newspaper communication facilities. Farmer communication facilities are considered to be very complete if they have the 5 types of communication facilities and information above. Considered complete enough they have 3-4 communication facilities and information above; considered incomplete, if they only have 2 and 1 of the communication facilities above.

Infrastructure-related policies, especially transportation and irrigation facilities, are a number of intensive government efforts carried out in several regions. It is realized that these two infrastructures will quickly increase crop productivity and open up regional isolation so that the flow of goods and information can run flawlessly [10], [19].

Simatupang [20] stated that communication facilities that are not functioning properly will cause transmission of asymmetrical prices, restrained market information, and consumer preferences, transmitted technological developments, and not the good distribution of investment capital downstream to upstream agribusiness.

Based on the description above, it can be seen that all the supporting institution service factors are significantly related to the level of production and income of vegetable farmers in Aceh. This means that the better the conditions of supporting institutions owned by farmers, the higher the chances of achieving increased crop productivity and the income of vegetable farmers in Aceh. Thus it can be concluded that one way to increase the production and income of vegetable farmers in Aceh is through improving the conditions of supporting institutions owned by farmers.

Direktorat Jenderal Hortikultura, Kementerian Pertanian (2015)[21] identified several causes of low vegetable productivity in Indonesia: (a) lack of business institutional support and
marketing, (b) low on product competitiveness, (c) unfinished and equitable market structure, (d) the market information system is not quick, precise and effective, and (e) the low adoption of cultivation technology.

This is consistent with the statement of Soehardjo [2], as a system, the development of agribusiness requires certainty of the proper functioning of each subsystem and mutual movement between subsystems [10], [19].

If the linkages between subsystems are low, then the goals of agribusiness development to increase the income of farmers and other actors and guarantee the availability of food for the community will not be achieved. So that the hypothesis testing states that: The level of production and income of vegetable farmers associated with the services of supporting institutions owned by farmers, considered to be proven.

3.3 Problems in Vegetable Agribusiness Development in Aceh

Kasimin [3] stated that the problems faced by farmers in horticultural agribusiness development in Aceh are generally in the production subsystem and marketing subsystem caused by lack of production facilities and lack of support from supporting institutions. The conditions that arise will result in the interconnection between subsystems to become low and disconnected. This can be seen from the lack of working capital, the high attack of pests and diseases, and the unavailability of production facilities (seeds, fertilizers, and pesticides) at farmers. This is due to the high business capital for planting horticulture, while the ability of farmers to provide working capital is only 50%, while the rest of the farmers seek loans from middlemen, neighbors, relatives, and the government.

4 Conclusions

1. Characteristics of vegetable farmers supporting institutions in Aceh significantly affect the development of vegetable agribusiness in Aceh. With these unfavorable characters, the improvement of the characteristics of supporting institutions will accelerate the development of vegetable agribusiness in Aceh.

2. Improvement on the characteristics of vegetable farmers supporting institutions can be carried out through increasing the role of the government in providing working capital for farmers, enhancing market functions, increasing coaching and strengthening market information.

3. The problem of vegetable agribusiness development besides being influenced by supporting institutions is also influenced by the availability of production facilities.

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Effectiveness of Financing and Means Management on Educational Quality in Private Aliyah Madrasah Yapena Lhokseumawe City

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Abstract. Education funding is an important factor in the operational improvement of education quality. The study aims to determine the process of preparing education financing plans, implementation of education cost plans, and accountability for education funding in an effort to improve the quality of education at YAPENA High School in Lhokseumawe City. The study was conducted using the descriptive method with a qualitative approach. Data collection techniques with interviews and documentation studies. The subjects of the research data were the Head, Deputy Head of SMA (4 people), School Committee (3 people), YAPENA Foundation Management (3 people), and parents/guardians of students (3 people). The results of the study were, first, the preparation of the YAPENA High School financing plan was carried out routinely at the beginning of the year through a special meeting to prepare a funding plan for YAPENA High School education, and carried out before the school year began. The parties included the Principal, deputy headmaster, School Committee, Parents / Guardians of students, and YAPENA High School Foundation. The results of meeting decisions are documented to be used as guidelines in the financing plan finalization. Second, the implementation of the financing plan always uses plans that have been compiled. If there is an urgent matter so that it has to change the financing plan when the school year is running, then it must go through a meeting attended by parties who are involved in preparing the financing plan. In this meeting explained the reasons for changes in financing plans while still prioritizing the achievement of education quality. Third, accountability for the use of education costs is carried out transparently, so that the parties who participate in preparing the education financing plan can clearly see the flow of education costs and the quality of education.

Keywords: Financing, Facilities, Quality of Education

1 Introduction

1.1 Background

The reforms which began in 1998 resulted in a number of demands, including the regional autonomy stipulated in Law No.22 of 1999. As a further consequence of the law, Law No. 25 of 1999 concerning Central and Regional Financial Balance was also stipulated. The enactment of this law resulted in changes in the authority and freedom of the Regional Government in
managing the Government in the regions, except foreign policy, defense, justice, monetary and fiscal, religion, and the fields established by government regulations.

Regional Autonomy which has been officially implemented since 2001 also brings changes in the management of education, from centralistic to decentralized. The shift in education management from centralistic to decentralized raises a number of challenges in its implementation, such as the management of human resources, educational facilities and infrastructure, and ensuring the availability of the education budget needed through community participation.

In line with the development of education management, the term school-based management (MBS) emerged, with the aim of establishing schools in the management of education, both in terms of implementation, development, supervision, and financing of education. The essence of SBM implementation is to improve the efficiency, relevance, equity and quality of education, and to fulfill the principles of justice and democratization of education management. In SBM schools are required to have the ability to plan, implement, and evaluate and account for the management of education costs in a transparent manner.

SBM is not only applied in schools under the Ministry of Education and Culture, schools (Madrasah) managed by the Ministry of Religion, both state and private, also apply SBM. Based on this background, the authors are interested in conducting research on the Effectiveness of the Management of Financing and Education Facilities on the Quality of Education in Yapena Private Madrasas in Lhokseumawe City.

1.2 Formulation of the problem
The problems in this study are as follows:
1. How to manage education costs in Yapena Private Madrasah in Lhokseumawe City.
2. How is the effectiveness of cost management to improve the quality of education in Yapena Private Madrasah in Lhokseumawe City.
3. What factors are obstacles to the management of education costs in Yapena Private Madrasah in Lhokseumawe City.

1.3 Research purposes
Based on the problems that have been determined, the purpose of this research is to find out:
2. The effectiveness of managing costs and means to improve the quality of education in Yapena Private Madrasas in Lhokseumawe city.
3. Obstacles in managing education costs in Yapena Private Madrasah in Lhokseumawe city

1.4 Benefits of research
The results of this study are expected to provide the following theoretical and practical benefits:
1. Can contribute ideas in the management of educational institutions, especially the management of education costs in schools.
2. Can be used as a material consideration for schools in determining policies for managing education costs and facilities to be more effective.
3. For researchers, can add insight and knowledge in managing education costs.
4. For readers, this research can inspire further research related to the management of education costs.
2 Literature Review

2.1 Concept of Education Financing

Education financing basically is a process of allocating resources to activities or programs for implementing operational education, both directly and indirectly. Speaking of costs, there are three main things, namely: funding sources, use (allocation), and remaining budget.

Simple financing management can be interpreted as a process of carrying out activities to mobilize others, taking into account aspects of effectiveness and efficiency relating to acquisition (source), use (allocation), with a comprehensive goal starting from planning, organizing, implementing, supervising, and accountability.

Minarti [1] argues that: In general, management or management system of an educational institution including pesantren education must pay attention to several components, namely: curriculum management, student management, facilities and infrastructure management, public relations management, personnel management, and most importantly management finance. Financing management is one of the important components regarding all activities related to funding sources and management of activities with several overall objectives.

Marno & Supriyatno [2] provide a definition of financial management as the management of financial functions, namely the function of how the management is able to raise of funds and allocate (funds of funds) these funds so that the goals of educational organizations are achieved effectively and efficiently.

Simple financing management can be interpreted as a process of carrying out activities by mobilizing others, taking into account the effectiveness and efficiency aspects relating to acquisition, funding, with overall objectives starting from planning, organizing, implementing, supervising. Likewise, the management of education facilities and infrastructures of the pesantren starts from budget planning to supervision and accountability.

Education financing is also a process whereby available income and resources are used to formulate and operationalize educational institutions with regard to education and government financing programs and school administration. There are several factors that determine the financing of education including the size of an educational institution, the small number of students and teachers and the good or lack of facilities and infrastructure.

In connection with the above problems, Fattah [3] said that: Education funding is determined by various factors, namely: the size of a school, the number of students, the level of honorarium for teachers and lecturers in accordance with their respective fields of expertise or level of education, student ratios and teaching staff, teacher qualifications, population growth rates for developing countries and changes in payroll or income policies.

Correspondingly, Suhardan, Riduwans, & Enas [4] suggested that: "Education financing is intended for the implementation of learning activities in achieving the noble work ethic of the nation which is stated in the purpose of education. This goal is philosophical, broad, comprehensive, and fundamental in realizing the goal noble nation ".

In Law Number 20 of 2003 concerning the National Education System, it is stipulated that: Educational resources are a supporter and supporter of the implementation of education which includes education personnel, funds, facilities and infrastructure available or held and utilized by families, communities, students and the government, both stand-alone and together. In another article, it is stated that the availability and utilization of educational resources are carried out by the government, the community and the families of students. Whereas the financing of the implementation of educational activities in educational units organized by the government
is the responsibility of the government and those held by the community are the responsibility of the agency or individual who carries out the education.

The results of Jafar, AR, & Khairuddin[5] research conducted at the Nurul Islamic Boarding School in one of the sub-districts in Bireuen District showed that the financial management of pesantren was carried out by a wadir assisted by several staff and accountable to the pesantren leadership, which is mature, implementation and supervision until accountability is carried out accountably, considering that financial problems are a risky issue in public talks.

From the explanation above, the management of education funding is an important component that must be an in-depth study concerning the implementation of education in educational institutions in Aceh, especially pesantren education institutions in order to realize the vision and mission objectives and institutions that have been set in achieving education objectives according to the hope of the government and the people of Aceh.

Education financing is all the processes and ways to obtain financing (input) and expenditure (output). In connection with this problem, [6] stated that: Education financing is all types of activities in the delivery of education concerning efforts to find resources and those that will be used effectively in the administration of education. In line with this, Suryosubroto [7] also said that: Education financing is an activity to obtain financing managed for the expenditure of an educational institution, starting from planning financing activities, finding funding sources for planned activities, use, and supervision of the use of these costs.

Moreover, education is indeed the mandate of the 1945 Constitution, namely "every citizen has the right to education". Therefore, the Indonesian Government has budgeted or allocated a budget for education by 20% of the total State Budget (APBN). Likewise, the regional government, especially the Government of Aceh, each year sets a budget not only for formal education but also for non-formal education such as prayer hall and pesantren.

2.2 Educational Concepts and Infrastructure

One of the standards regulated in Government Regulation Number 19 of 2005 concerning National Education Standards is the Education Facility and Infrastructure Standards set out in Chapter VII Article 42 that:

1. Each education unit must have facilities that include: furniture, educational equipment, educational media, books, and other learning resources, consumables, and other equipment needed to support a regular and sustainable learning process.
2. Each education unit is obliged to have infrastructure which includes: land, classroom, leadership room of education unit, educator room, administration room, library room, laboratory room, workshop room, production unit room, canteen room, power installation and services, a gym, a place of worship, a place to play, a place of recreation, and other spaces/places needed to support an orderly and sustainable learning process.

The implementation of the SNP above, is regulated in the Minister of National Education Regulation No. 24 of 2007 concerning Standards of Facilities and Infrastructure for Primary Schools/Madrasah Ibtidaiyah (SD/MI), Junior High Schools/Madrasah Tsanawiyah (SMP/MTs), and High Schools/Madrasah Aliyah (SMA/MA). These facilities and infrastructure standards include:

1. Minimum criteria for facilities consisting of furniture, educational equipment, educational media, books, and other learning resources, information and communication technology, and other equipment that must be owned by every school/madrasah.
2. Minimum infrastructure criteria consisting of land, buildings, spaces, and power installations and services that must be owned by each school/madrasah.
Educational infrastructure is a facility that indirectly supports the course of the education process, such as yard, garden or school park, the road to school, school discipline, and so on.

2.3 Quality of Education

The agreement on the concept of quality is returned to the reference formulation or references, such as education policy, teaching-learning process, curriculum, facilities and infrastructure, learning facilities and education personnel in accordance with the agreement of the parties concerned.

Another view states that quality has two different concepts between absolute and relative concepts. In the absolute concept, an item is called a quality when it meets the highest and perfect standards. Whereas in the world of education the concept of absolute quality is elitist because only a few educational institutions will be able to offer high quality to students and only a few students are able to achieve it.

In a relative concept, quality is not an attribute of a product or service. Something is said to be quality if the goods or services meet the specified specifications. Therefore, quality is not an end goal, but as a benchmark for the final product of the specified standard. Quality definition, in relative concept, has two concepts, namely: (1) seen from the point of view of the producer, the quality is to measure based on the specifications specified, and (2) from the customer's point of view the quality meets the demands of the customer.

In the field of education, only relative concepts are often found. In this concept, the quality of education is usually measured in terms of its customers, both internal and external customers. Internal customers, namely principals, teachers, and other education staff. According to Sallis [8] to see quality from an external customer point of view there are three groups, namely: (1) students (primary external customers), (2) parents and government leaders (secondary external customers), and (3) markets work, government and the wider community (tertiary external customers).

The quality of education is not only determined by the school as an educational institution, but it is also still adjusted to the views and expectations of the people who tend to always develop along with the progress of the times. In connection with this problem, Sagala [9] suggests that successful schools are determined by the following factors: (1) teaching and learning activities, (2) the competence of teachers and education personnel to be improved, (3) learning facilities and equipment prepared, and (4) extracurricular activities.

Furthermore, Sagala [9] makes indicators of success in improving the quality of education will have an impact from various aspects, namely: (1) The effectiveness of the learning process is not just the transfer of knowledge, but rather emphasizes internalization developing cognitive, affective and psychomotor aspects and independence, (2) the leadership of the principal will encourage the realization of the vision, mission, target objectives through programs implemented in a planned, gradual, creative, innovative, effective, have managerial ability, (3) management of effective education personnel, (4) schools have a quality culture, (5) schools have a compact, smart and dynamic teamwork. Because education output is a collective outcome, not individual results in order to obtain competitive quality, (6) schools have independence, namely: the ability to work optimally by not being dependent on instructions from superiors and having potential human resources, (7) participation of school citizens and society. Linkages and involvement in schools must be high based on a sense of responsibility through loyalty and dedication as stakeholders, (8) schools have transparency, (9) schools have the will to change (management change). Change is an increase in positive meaning for better in improving the quality of education, (10) schools carry out continuous improvement evaluations and are an improvement process in improving overall quality, including organization, responsibility,
procedures and human resources, (11) schools have accountability as responsibility for the success of the school program that has been implemented, and (12) the school's output is emphasized to graduates who are independent and fulfill job requirements (qualified).

The quality of education must be strived to achieve progress based on a planned change. Improving the quality of education is obtained through two strategies, namely: (1) improving the quality of education that is academically oriented to provide a minimal basis in the journey that must be taken to achieve the quality of education required by the demands of the times, and (2) improving the quality of education oriented to essential life skills covered by broad, real and meaningful education. In relation to the strategy to be pursued, improving the quality of education is closely related to the relevance of education and assessment based on the actual conditions of the quality of education. The study of the actual situation is the starting point in traveling to an ideal situation which is preceded by a threshold as a minimum foundation and includes the quality of education that is accountable and which is marked by a benchmark as normal ideal.

The quality of education is not only determined by the school as a teaching institution but also adapted to what is the view and hope of the people who tend to always develop with the progress of the times. Based on this tendency, the community's assessment of the quality of school graduates continues to develop.

3 Method

This study uses the descriptive method with a qualitative approach. The use of this method is based on the research objectives that have been formulated, namely describing and analyzing the Effectiveness of the Management of Financing and Education facilities on the Quality of Education in Yapena Private Madrasas in Lhokseumawe City. Research subjects included Madrasah Heads, deputy heads of madrasah in the field of facilities, madrasah committees, Yapena madrasa management foundation, and parents of students. The research instrument used in this study is the interview guide to the research subjects. To maintain the validity of the data obtained by testing the credibility of the research data in accordance with the procedures in qualitative research. Sugiyono [10] said that "the data credibility test or the confidence in the results of qualitative research, among others, is done by extension of observation time, perseverance in research, triangulation and using reference material". Data collection techniques used in this study are interviews [10], observation, and documentation [11] The three methods are expected to complement each other so that the expected information is obtained. Data analysis uses the Miles and Huberman [10] stage that activities in data analysis are: Data reduction, which is summarizing, choosing key things, focusing on important things and removing unnecessary things. Thus the data that has been reduced will give a clearer picture. Presentation of data, which presents a set of information that is arranged which gives the possibility of drawing conclusions and taking action. Conclusions are drawn, namely, conclusions are made so that the data that has been analyzed and given interpretation or interpretation has meaning to then be compiled into descriptive sentences that can be understood by others and can inform about the results of the research.
4 Result and Discussion

4.1 Management of Education Costs and Facilities in Yapena Private Madrasah in Lhokseumawe City

Planning for the management of education costs and facilities in the form of the preparation of the Madrasah Revenue and Expenditure Budget Plan (RAPBM), held every year before the start of the education process at the Yapena Madrasah in Lhokseumawe city. The head of the madrasah actively participates in the madrasa deputy heads, committees, and the teachers compile the plan. Because this is a private madrasa, the Foundation also actively composes plans for managing education costs and facilities for the next year. The reference used is the vision and mission contained in the Yapena madrasa Strategic Plan.

Yapena Madrasah composes a number of madrasa activities that can be divided into madrasa activities that are directly related to students and other madrasah activities, such as madrasah formation which includes curriculum development, supervision, rakerdin, mentoring madrasah heads, teachers, and madrasa operational activities. In the RAPBM, it was also determined who was assigned to manage the cost of education in the madrasa, namely the treasurer as the manager of fees and the head of the madrasah as the management supervisor carried out by the treasurer. While to help the treasurer for certain matters a special team was formed.

If in the implementation of the cost there is a change in the implementation of the budget or work program, then the head of the madrasah immediately takes the policy and announces it to all interested parties by stating the reason for the changes implemented. As responsibility for the implementation of the management of education costs in madrasas, the treasurer is obliged to make daily, monthly and annual financial reports. The report made by the treasurer uses standard rules and is also used by the head of the madrasah as a supervision of the use of education costs.

4.2 Effectiveness of Management of Costs and Facilities to Improve the Quality of Education in Yapena Private Madrasah in Lhokseumawe City

In terms of input, management of education costs can be viewed from the suitability of work programs with the needs of madrasas and the acceptance of sources of financing for madrasas. If viewed from the suitability of the program or plan with the needs of the madrasah, then the management of education costs and facilities can be said to be effective because the programming (RAPBM) has been adjusted to the curriculum and needs of madrasas. Meanwhile, when viewed from the point of view of receipt of madrasah income sources, the management of education costs and facilities is still ineffective because the sources of income are less able to achieve the expected targets and are not received according to the planned time.

In terms of the process of managing education costs and facilities, it is also less effective, this is because in its implementation there is still overlapping management even though assignments and responsibilities for carrying out these activities have been determined in advance. Meanwhile, in overcoming the changes that occur can be said to be effective because it does not require a significant overhaul in the implementation of the cost plan and educational facilities.

In terms of output, management of education costs and facilities can be seen from several things, namely, reporting time, costs for managing costs and facilities, as well as the quality of the information provided. In terms of reporting time, it can be said that the management of education costs and facilities is quite effective because timely reporting and costs for managing education costs and facilities are relatively cheap. Whereas when viewed from the quality of the
information provided, the management of education costs and facilities can be said to be less
effective, because of the lack of transparency in the financial statements. The indicator can be
seen from the less reported as a whole per budget line for each financing plan that has been
prepared.

4.3 Constraints in the Management of Education Costs and Facilities in Yapena Private
Madrasas in Lhokseumawe City

In managing the costs and means of education in the Yapena Madrasah, the city of
Lhokseumawe, several problems were encountered, first, the funding sources (SPP) that were
not timely. Delays in obtaining costs are serious because the inconsistency in the cost of
education will affect the effectiveness of financing and other academic activities. This
phenomenon will have an impact on improving the quality of education.

5 Conclusions and Recommendations

5.1 Conclusion

1. Management of education costs and facilities at Yapena Madrasah in Lhokseumawe
city can be grouped into three stages, namely planning, implementing and evaluating.
2. Management of education costs and facilities in Yapena Madrasah in Lhokseumawe
city is not fully effective, this is seen from the point of input, process, and output of the
management of education costs.
3. In managing education costs and facilities, problems are encountered, namely
Madrasah income (SPP) which is often late for students to pay.

5.2 Suggestion

The results of this study gave birth to the following suggestions:
1. For the head of the Yapena Madrasah, to further maximize funding sources, it is
necessary to further activate the role of the committee since the preparation of the
Yapena Madrasah RAPBM to help find financing for Madrasas.
2. The government should be more active in providing socialization on the management
of costs and educational facilities to be more effective in supporting efforts to improve
the quality of education.

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Transformation of Local Wisdom Value as An Effort to Establish Nation Characters in Simeulue District

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Abstract. The framework of cultural transformation is structure and culture. This cultural transformation is a form of preservation of local wisdom in a particular society with the main goal is the culture is not extinct eroded by the current global culture. The problems in this study are (1) the role of local wisdom values in the formation of students' character, (2) Transforming the values of local wisdom as an effort to shape the nation's character in the learning process, and (3) Constraints in the transformation of local wisdom values as an effort to shape the nation's character in the learning process. This study uses a qualitative approach, while the type of research is descriptive. After the data has been collected through the interviews, then the data is analyzed qualitatively. Research results (1) Local wisdom culture is very instrumental in the formation of students' character, (2) The efforts to transform the values of local genius are carried out through the subjects of Cultural Arts and Crafts and according to the teacher, the character building of students this is the responsibility of all teachers. In addition, the formation of students' character through local wisdom values learning is carried out through extra-curricular activities under the guidance of Deputy Principal of Student Affairs, and (3) Constraints experienced by teachers in transforming the values of local wisdom is the absence of regulation from the local government regarding local content learning because in the Aceh education Qanun it is emphasized that learning local content in each type and level of education needs to be regulated by the governor regulation which until now has not yet come out. Conclusion: (1) That the values of local wisdom is very instrumental in the formation of students' character because it contains many useful advice in daily life, (2) The teacher's efforts to transform the values of local wisdom in the learning process as an effort to shape the character of students is through the subjects of Cultural Arts and Crafts and according to the teacher actually the character building of these students is the responsibility of all teachers. In addition, the formation of students' character through learning local wisdom values is done through extra-curricular activities, and (3) Constraints experienced by teachers in the absence of regulation from the local government regarding local content learning.

Keywords: Local Wisdom Value, Nation Character
1 Introduction

National education works to develop the ability and to shape of dignified national character and civilization in order to educate people, aims to develop the potential of students to become the believers and fear of God Almighty, noble, healthy, knowledgeable, capable, creative, independent and become a democratic and responsible citizen as stipulated by the Article 3 of Law Number 20 of 2003 concerning the National Education System.

Therefore, educators are expected to transform the values of local wisdom in each learning process across disciplines. Integrating the values of the nation's character in the learning process as an effort to reduce global influences that can damage students' character along with the current of modernization.

Culture cannot be separated from all patterns of community and cultural activity and also has a very vital role in the process of internalizing the values of life to the younger generation. However, along with the times, the existence of culture and cultural values possessed by the Simeulue community until now has not been optimal in the effort to transform the generation afterward.

Ranjabar [1] refers to the idea of Machfiroh [2] (the original source) said that judging from the plural nature of Indonesian society, it must be accepted that there are three cultural groups, each of which has its own style, namely: (1) Culture of ethnic groups, (2) Culture local general (regional culture), and (3) national culture. In this case, transformation is a shift of something in another direction or new without changing the structure contained therein, even though in its new form it has changed. The framework of cultural transformation is structure and culture. This cultural transformation is a form of preservation of local wisdom in a particular society with the main goal that culture is not extinct eroded by the current global culture.

Based on the problems stated above, this study examines in more depth about: Transforming local wisdom value as a nation character-building effort in the learning process. This is needed not only to fortify students from the negative influence of globalization but as an effort to preserve the culture of local wisdom itself.

2 Literature Review

2.1 Local Wisdom Transformation

Referring to the structure and level, local wisdom is at the level of culture. This is based on a socio-cultural scheme in Indonesia, which consists of a pluralistic society in social, cultural (multicultural) and economic structures. Ranjabar [1] refers to the idea of Machfiroh [2] (the original source) said that judging from the plural nature of Indonesian society, it must be accepted that there are three cultural groups, each of which has its own style, namely: (1) Culture of ethnic groups, (2) Culture local general (regional culture), and (3) national culture.

This is in accordance with the opinion of Koentjaraningrat [3] that local culture related to the term ethnicity itself is: "A human group that is bound by awareness and identity of cultural unity, in this case, the element of language is its trademark". Regarding local culture as local wisdom, Garna [4] said that local wisdom is part of a scheme of cultural levels. Local culture is complementary to regional culture and regional culture are essential parts of the formation of national culture.

In a broad sense, Garna [4] said that regional culture is not only revealed from the form and statement of a sense of beauty through mere art, but includes all forms and ways of behaving,
acting, and patterns of thought that are far in behind what looks like. Therefore, certain administrative areas can be a cultural area of a region or cultural region that includes several administrations, or in an administrative area will consist of a part of regional culture.

Reflecting on the 2004 earthquake and Tsunami that hit the province of Aceh, the Simeulue folklore is clear evidence of the importance of cultural transformation in the younger generation. The collective memory of the Simeulue community about the great Tsunami in 1907 known by the local community as Smong has been proven to save the Simeulue people from the Tsunami disaster.

The Aceh Tsunami in 2004 killed 170,000 people (Reuters, 10/28/08). Starting from an earthquake measuring 9.3 on the Richter scale that triggered a tidal wave with a speed of 2.5 km/sec which hit 13 countries along the Indian Ocean coast. Looking at other perspectives, the Tsunami that occurred in Aceh proved that the local wisdom of the Simeulue community about Smong as local wisdom managed to survive and be effective in dealing with natural disasters. Smong is an understanding of the past culture that has been collectively embedded in Simeulue society. Smong in its concrete form is a story (nanga-nanga, sikambang dance, or nandong traditional music) or traditional art in the form of singing. There are also pieces from the Simeulue folklore about Smong, a poem that is told as a bedtime story by the people of Simeulue, a bedtime tale.

The Smong term was known by the Simeulue community after the Tsunami tragedy on Friday, January 4, 1907. The earthquake followed by a massive tsunami that occurred in the Simeulue was still in the era of the Dutch East Indies. This Tsunami disaster was recorded in the Dutch book S-GRAVENHAGE, MARTINUSNIJHOF in 1916 which was translated into Indonesian. At that time the Simeulue community did not know about this Tsunami, the ocean that suddenly receded after the earthquake became an attraction for coastal communities because many fish were found stranded. The majority of the coastal population ran towards the beach and fought for the stranded fish, but surprisingly suddenly came a massive wave that rushed from the direction of the high seas, so most of the people died. Some survivors were eyewitnesses of the Smong incident and told it to the future generations to be careful of similar incidents [5].

The collective memory of the Simeuluenese about this Smong linked to the devastating Tsunami that hit Aceh Province in 2004 will be another condition. At the time of the 2004 Aceh earthquake and tsunami in the entire Simeulue District, more than 1,700 houses were destroyed by the tsunami, but the death toll was 6. It is estimated that in Simeulue the average population of one house is approximately 5 people, then the total number of people whose houses were hit by the Tsunami is more than 8,500 people or about 10% of the total population of Simeulue regency. This means that at that time there was a large-scale evacuation process in less than 10 minutes simultaneously in the entire coastal area of Simeulue island which has a coastline of 400 KM. Given that the telecommunication infrastructure in Simeulue regency was very limited, the mass mobilization event was an extraordinary event.

2.2 The Role of Teachers Transforming Local Wisdom Values as an Effort to Form Nation Character in the Learning Process

The success of a learning process is determined by the role and function of the teacher, as the spearhead of the learning process. This is as mandated by the Article 39 paragraph (2) of Law Number 20 of 2003 concerning the National Education System that: "Educators are the professionals who are tasked with planning and implementing the learning process, assessing
learning outcomes, conducting guidance and training, as well as conducting research and dedication to the community, especially for educators in universities”.

Furthermore, Article 40 paragraph (2) of Law Number 20 of 2003 concerning the National Education System explains more about the role of teachers as educators, namely: “Educators and education personnel are obliged to (a) Create an educational atmosphere that is meaningful, fun, creative, dynamic, and dialogical, (b) Have a professional commitment to improving the quality of education, and (c) Give an example and maintain the good name of the institution, profession, and position in accordance with the trust given to him or her”. Based on the article, it can be concluded that a teacher needs to increase his or her creativity in order to generate more enjoyable and meaningful learning so that students are motivated in learning.

Tirtarahardja & Sula [6] said that a teacher had the role and function stated below:
1. Teacher as an educator. A teacher is an educator becoming a figure, a leader for the students and people around.
2. Teacher as an instructor. A teacher helps the students to learn something unknown, to form the competency, and to understand the standard material learned.
3. Teacher as an adviser. A teacher is responsible for the great learning process based on knowledge and experience.
4. Teacher as a trainer. Teachers in their roles and functions as the trainers familiarize a number of skills to the students in the learning process.

In the activities of the teaching and learning process includes many things. Therefore, Sudjana [7] said: "The teacher's duty as a profession includes educating, teaching and training. Educating means continuing and developing the values of life and life itself. Teaching means continuing and developing science and technology. While training means developing skills among students. One that must be trained and formed by the teacher is about the character of students.

Munir [8] defined the character as: "A good pattern of thoughts, attitudes, and actions that are inherent in a person with a very strong and difficult to eliminate". In this case, Budimansyah[9] further explained that: "The essence of the character is goodness in the sense of good thinking, good filling, and good behaving." Added Megawangi [10] that: "Noble character is not automatically possessed by every human once was born, but requires a long process through care and education (the process of engraving). From some of these opinions showed that the role of the teacher as an educator is vital in shaping the character of students in accordance with the character of the nation.

The formation of the students' character is a form of transformation of the values of goodness by the teacher so that they have a Pancasila personality. Gaffar [11] referring to Kesuma, Triatna, & Permana [12] idea (the original source) defined character as: "A process of transforming the values of life to be developed in one's personality, so that it becomes one of the forms of behavior". Thus, it is expected that the creation of stable personality learners as stated by Prayitno & Manullang [13] that: Character is a more stable personal trait in the individual who is the basis for the appearance of behavior in high standards and norms.

Sumantri [14] defined character as: "Character and personality of a person are formed from the results of internalization of various virtues”. From this definition, Kesuma [12] provided the aim of character building for students is:
1. Strengthening and developing the values of life that are considered important and necessary, so that they become the typical personality as the values developed.
2. Advising students' behavior that is not in line with the values developed by the school.
3. Building a harmonious connection with family and society in implementing the responsibility of character education together.
The formation of the students' character must be continuously carried out by the teacher as the front guard who forms the nation's character so that students can ultimately behave in accordance with the noble values of the nation. There were no more brawls between students, alcohol, free sex, and other immoral acts carried out by the young generation in an effort to welcome the 100-year-old Golden Generation of independent Indonesia in 2045.

2.3 Objectives and Benefits of Research

2.3.1 Research Objectives
1. To determine the role of local wisdom values in the formation of students' character.
2. To transform the values of local wisdom as an effort to shape the nation character in the learning process.
3. To find out the constraints of transforming local wisdom values as an effort to shape the nation character in the learning process.

2.3.2 Research Benefits
1. The results of this study are expected to be useful in enriching the literature of scientific reading in an effort to support the development of social and cultural knowledge.
2. The results of this study are expected to support national development related to strengthening the culture of local wisdom.
3. For teachers, the results of this study are expected to be a theoretical contribution to transforming the culture of local wisdom in the learning process as an effort to characterize students.

3 Method

3.1 Research Methods

This study uses a qualitative approach, while the type of research is descriptive. The choice of approach and type of research is in accordance with the problems to be studied, namely the Transformation of Local Wisdom Value as an effort to form nation character in the learning process in Simeulue district. Simeulue regency is one of the districts located in those frontier, outermost and least developed regions often referred to as 3T (terdepan, terluar, tertinggal) regions, ± 300 miles from the west coast of Aceh province.

Figure 1: Maps that show the research location
3.2 Research Data Analysis Techniques

After the data has been collected through the interviews, then the data are analyzed qualitatively with the following steps: (1) Data reduction, namely simplification and selection of data in accordance with the problems to be studied, (2) Presentation of data, namely describing data that has been collected narratively, and (3) Drawing the conclusions/verification which are the final stages of the analysis of research data.

3.3 Research procedure

Data collection in this research has been conducted through the structured interviews based on the interview guidelines that had been prepared previously by the research team and Peer Group. Questions raised in interviews related to the transformation of local wisdom values as local character formation efforts in the learning process in Simeulue regency. The information that would be collected in this study includes. The strategy of the teacher transforming the values of local wisdom (local genius) as an effort to shape the nation character in the learning process. The information that will be collected includes:

1. Information requested from the Department of Education and Culture
   a. Local content material according to the regional potential.
   b. Local culture transformation program to the schools.
   c. The availability of the local culture educator in the school.
   d. The coordination with relevant agencies, such as the Aceh Traditional Council of Simeulue district.

2. The information required by the teachers
   a. Teacher's knowledge of the local wisdom culture in Simeulue district.
   b. Efforts to transform the culture of local wisdom in the learning process.
   c. Cultural transformation strategies of local wisdom in the learning process.
   d. Constraints faced in the transformation of local wisdom culture in the learning process.
   e. Communication with relevant agencies in connection with the transformation of local wisdom in the learning process.

3. Information requested from students
   a. Knowledge of students about the culture of local wisdom.
   b. Sources of knowledge of students about the culture of local wisdom.
   c. Students' perception of the culture of local wisdom.
   d. Students' perception of cultural transformation of local wisdom.
   e. Students' perceptions of the cultural degradation of local wisdom.

The steps of the research activities can be seen in Figure 2. Research Flow Chart
4. Result and Discussion

4.1 Research Result

This research was conducted in 3 (three) different high schools based on the characteristics of education unit including the advanced senior high schools (SMAN 1 East Simeulue), underdeveloped (SMAN 1 Central Simeulue), and less advanced (SMAN 1 West Teupah). The results of interviews with the teachers at the schools showed the following results.
Knowledge of the local wisdom culture found that not all high school teachers in Simeulue district had an adequate knowledge. Whereas, all this time the teachers have only taught the general culture both local, regional and national culture. Local culture taught by the teacher to students such as Mangasila dance (salt processing) and Mansinasa skills (pandan mat weaving), regional cultures such as Bungong Jeong dance, and national cultures such as dances from various regions in Indonesia.

The limitation of teachers' knowledge about the culture of local wisdom is due to the lack of socialization carried out by relevant institutions, for example the Aceh Traditional Council of Simeulue district. In SMAN 1 West Teupah, a cultural seminar has indeed been conducted, but the information received by teachers is still very limited. This was proved when the researchers mentioned some of the local wisdom cultures obtained from the results of previous studies, the teachers said they had just heard it without deep understanding. (Interview on 11-16 May 2018).

Therefore, from this research, it can be concluded that generally high school teachers in Simeulue district still have very limited knowledge about the local wisdom culture due to the lack socialization from the relevant agencies. This condition causes the teachers to be difficult in transforming the values of local wisdom to students in the learning process as an effort to characterize the nation character.

The effort of cultural transformation of local wisdom in the learning process found that according to the teacher who became the informant in this research, the nation character building became the responsibility of all teachers and was not charged to the certain teachers who were done through habituation. Associated with the transformation of the values of local wisdom that it is only done by teachers who gave more attention to the subjects of Cultural Arts and Crafts. However, the transformation effort is very much tied to the existing curriculum.

In this case, the transformation of local wisdom values only becomes the smallest part of the learning process. Teachers are not given an authority to improvise in the learning process and they are only pursuing a predetermined curriculum achievement target. (Interview on 11-16 May 2018).

Thus, it can be concluded that the effort to transform the values of local wisdom in the learning process as an effort to characterize students is only done a little by the teacher because according to them the formation of students' character is the responsibility of all teachers through learning. Associated with the culture of local wisdom that it is only the full responsibility of the Arts and Culture teacher.

The strategy of cultural values transforming of local wisdom is carried out in the learning process of Cultural Arts and Crafts through various art performances, both in the form of songs and dances and skills related to the life skills of students. In this case, the Cultural Arts and Craftsman teacher forms the small groups of students to practice certain arts.

Associated with the culture of local wisdom, the teachers of Arts and Culture could not cope with all the knowledge about it, only a small part is taught. The teachers assume that learning about the culture of local wisdom is only as a local content which is further regulated in the school curriculum. However, local content that has been taught is not related to the culture of local wisdom such as local language, Arab Malay, and German because of the availability of the human resource.

The teachers experience the constraints of transforming local wisdom in the learning process, especially through local content because it is related to the lack of regulation from the local government. According to the teacher, local content subject learning was applied to the Kurikulum Tingkat Satuan Pendidikan (school-based curriculum) in the previous period, but in the 2013 Curriculum, the teacher was no longer justified in teaching the local content subject because there must be a decree from the governor initially.
In fact, according to the teacher, local content learning is very helpful for them in fulfilling mandatory hours for teachers who have been certified because they have their own learning hours. However, with the enactment of the rule that local content learning must be based on the governor's decision, the learning process is temporarily stopped indefinitely.

The urgency of local content learning is realized by the teacher as an effort to characterize students who are rooted in the local wisdom of local communities but constrained by the absence of regulations that regulate it. Meanwhile, local content learning material which is inserted in the subjects of Culture and Workshops is only limited to the crafts and local dances of the Simeulue community.

The regulation of the implementation of local content learning as stipulated in article 44 of the Aceh Qanun Number 11 of 2014 concerning the Implementation of Education, paragraph (2) point b and paragraph (3), stated that:

• Paragraph (2) points b: Local content includes:
1. Local language
2. Aceh history
3. Tradition, culture and local wisdom
4. Skills education
• Paragraph (3), further provisions regarding school curriculum in all types and levels of education are regulated by the Governor's Regulation.

The efforts to transform the values of local wisdom in this learning process have often been communicated with various related institutions, such as the Simeulue Education and Culture Department. However, the response from the relevant agencies is constrained by the lack of regulation that regulates it. The teachers expect the Governor Regulation will be issued to regulate the process of local content learning so that teachers have a strong legal basis to implement it.

Based on the results of the researchers' confirmation to the Aceh Education and Culture Department related to local content learning in each type and level of education, it was found that it has not been implemented because the Governor Regulation is not yet to be issued. The Government of Aceh has established a Local Content Curriculum Development Team in Aceh province under the coordination of the Aceh Regional Education Council. The development team is currently conducting a local content curriculum study, then later it will be evaluated by another team before the Governor Regulation will be released.

This shows that the local learning subject processes have not been carried out at all levels and types of education in Aceh. It is caused by the regulation regulating it has not been realized, as mandated that the learning is regulated through the local governor regulation. Therefore, before the issuance of the regulation in Aceh province, there was no learning process about the local content subject.

5. Conclusion and Suggestion

5.1 Conclusion

1. The teacher realizes that the values of local wisdom are very instrumental in the formation of students' character because it contains much useful advice in daily life.
2. Teachers have been trying to transform the values of local wisdom in the learning process as an effort to shape the character of students through the subjects of Cultural Arts and Crafts and according to the teacher the character building of students is actually the responsibility of all teachers. In addition, the formation of students' character through the
learning of the values of local wisdom is carried out through extracurricular activities under the guidance of the Deputy Principal of Student Affairs.

3. The teacher transforms the values of local wisdom in the learning process as an effort to characterize students currently experiencing problems, namely the lack of regulation from the local government about local content learning because in the Aceh education Qanun emphasized that local content learning in each type and level education needs to be regulated by the Governor Regulation which until now has not yet released.

5.2 Suggestion

1. It is expected that the local government and other relevant agencies to issue the regulations on learning local content in each type and level of education immediately so that the teachers have guidance on learning as an effort to characterize students.

2. It is expected that the teacher is able to teach the values of local wisdom through various activities both curricular and extracurricular while the issuance of regulations on the learning of local content from the local government has not been released.

REFERENCES

The Contribution of Koni Towards Medal-Winning Athletes at Aceh Province

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¹amiruddin_ula@yahoo.com

Abstract. The role of KONI as a responsible organization towards medal-winning athletes that still had a lot of propositions. The common proposition that arise nowadays is the lack of the role of KONI as a responsible organization towards medal-winning athletes, as seen from the facts that occurred in Aceh Province there are still many athletes who are forced to live their lives with difficulties, so that they must leave the world of sports immediately to get a better life. This research attempted to reveal the contribution of KONI towards Aceh’s medal-winning athletes. The aim of this research is also to describe the contribution of KONI towards Aceh’s medal-winning athletes particularly. The approach used in this research is descriptive research. The data sources of this research sourced from the members of KONI Aceh and medal-winning athletes with the context of the contribution of KONI towards Aceh’s medal-winning athletes. The data collection used by using observation technique, interview, and questionnaire. In doing this research, the writer as an observer did not involve in the research at all in order to make the results trusted. The writer also used a camera as a needed tool, interviewed sheet, and questionnaire. Based on the results of this research, it can be explained that KONI Aceh had a high sense of contribution to medal-winning athletes. It showed on the giving of extra bonus to the medal-winning athletes and also coaching money to a record breaker athletes. The results of this research are in line with the results that the writer did to PON athletes, KONI claimed that PON athletes are given bonus as well and also an occupation to guarantee their lives in the future. It can be said that KONI Aceh had high attention and contribution towards medal-winning athletes.

Keywords: KONI, medal-winning athletes

1 Introduction

Number 03 the year 2005 which describes the national sports system that sports are part of the process and the achievement of national development goals so that the existence and role of sports in the life of society, nation and state must be placed in a clear position in the national legal system. The problems of sports both national and regional levels are increasingly complex and a related to the social, economic and cultural dynamics of the people and the nation and the demands of global change so that it is time for the government to pay attention to the whole by observing all relevant aspects, adaptive toward the development of sports and society, as well as legal instruments that is able to support the train and development of national and regional
sports at present and in the future. The process of handling sports cannot be handled anymore as simply, but it must be handled in more depth and professional.

The main task of the establishment of KONI is to plan, coordinate and carry out coaching and enhancement of the achievements of athletes, referees, coaches, and managers, in order to realize national sports achievements towards international achievement and strengthen national unity and resilience in order to elevate Indonesia's dignity in the international scene.

From most parts of Indonesia, the province of Aceh is one of the provinces that currently implement training sports athletes who stand under KONI. KONI is an institution that has the responsibility and authority as stipulated in the UU above to carry out synergic coordination vertically and horizontally in the framework of managing, developing and developing regional sports through improving the quality of sports. The context of sports, the province of Aceh is an area with a promising athlete potential where it is evident from the many achievements of sports that have been carved, such as PON in West Java Acehnese sports athletes have made achievements from various sports, such as from athletics, and archery. Behind the success of the athletes that have been achieved in each match, the role of the Aceh of KONI as an organization that is responsible for improving sports is very important to increase the athlete's performance so that the desired goals can be achieved and implemented as expected.

Based on the results of observations or data collection it can be explained that every athlete has a profession in different jobs, their work is largely a business which they choose themselves rarely because they are high-achieving athletes, the role of KONI is very minimal so it can be said KONI contribution to athletes achievement has not been run as it should, it can be based on various factors.

Based on the role of KONI as an organization that is responsible for improving performance, there are still many problems that occur. One of the problems that have arisen at this time is the lack of KONI’s organization for medal-winning athletes, based on the fact that the field occurred in Aceh Province there are still many athletes who are forced to life with difficulties, so they must leave the world of sports, whereas it is indeed detrimental to KONI Aceh as the organizer of Aceh sports, if medalist athletes no longer focus on training and more focus on finding the adequacy of daily life, surely Aceh will no longer be able to have superior athletes, it happens due to several things one of them the lack of awareness of KONI Aceh in today's outstanding athletes, on the basis of the writing above the author intends to do a paper of scientific work relating to the role of KONI with the title "The Contribution of KONI Toward Medal-Winning Athletes in Aceh Province"

2 Method

2.1 Types of Research

The types of descriptive research, in which a study that attempts to describe and interpret data, events, and symptoms (phenomena) that exist today. This is based on the opinion of Nazir[1] Descriptive research aims to make descriptive problems in society and the procedures carried out in society, as well as certain situations including the relationship of activities, attitudes, views as well as ongoing processes and influences from certain phenomena.

2.2 Population and Sample

The sample in this study consists of 2 people of KONI caretaker and 63 people of Acehnese athletes using a total sampling technique.
2.3 Techniques of Data Collection

Techniques of data collection in this study are:
   a. Observation
   b. Interview
   c. Questionnaire

2.4 Time and Place of Research

The research has been carried out at the KONI Aceh building on October 6, 2017, to completion.

3 Result and Discussion

3.1 The Result of Research and Discussion

Based on the results of data collection carried out by using instruments in the form of questionnaires of KONI contribution towards medalist athletes of Aceh Province, obtained the following data

Table 3.1.1 Data for Questions that KONI of Aceh Gives Care in the Form of Work.

<table>
<thead>
<tr>
<th>No</th>
<th>Answer options</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Strongly agree</td>
<td>28</td>
<td>43</td>
</tr>
<tr>
<td>2</td>
<td>Agree</td>
<td>21</td>
<td>32</td>
</tr>
<tr>
<td>3</td>
<td>Disagree</td>
<td>16</td>
<td>25</td>
</tr>
<tr>
<td>4</td>
<td>Strongly disagree</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

| Jumlah | 65 | 100% |

Based on the data in the table 3.1.1, it can be seen that for the KONI of Aceh questions giving care in the form of work is as much as 43% of respondents or 28 people strongly agree, 32% of respondents or 21 people agree, and the remaining 25% of respondents or 16 people disagree.

Table 3.1.2 Data for Questions that KONI of Aceh Provides Care in Bonus Forms.

<table>
<thead>
<tr>
<th>No</th>
<th>Answer options</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Strongly Agree</td>
<td>35</td>
<td>52</td>
</tr>
<tr>
<td>2</td>
<td>Agree</td>
<td>28</td>
<td>43</td>
</tr>
<tr>
<td>3</td>
<td>Disagree</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>Strongly Disagree</td>
<td>3</td>
<td>5</td>
</tr>
</tbody>
</table>

| Total | 65 | 100% |

Based on the data in the table 3.1.2, it was found that for the questions that KONI Aceh gives care in the form of bonuses is as much as 52% of respondents or 35 people strongly agree, 43% of respondents or 28 people agree, and the remaining 5% of respondents or 3 people strongly disagree.
Table 3.1.3 Data for Questions that KONI of Aceh Gives Attention Only to Athletes who achieve on PON Only.

<table>
<thead>
<tr>
<th>No</th>
<th>Answer options</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Strongly Agree</td>
<td>25</td>
<td>39</td>
</tr>
<tr>
<td>2</td>
<td>Agree</td>
<td>16</td>
<td>25</td>
</tr>
<tr>
<td>3</td>
<td>Disagree</td>
<td>12</td>
<td>18</td>
</tr>
<tr>
<td>4</td>
<td>Strongly Disagree</td>
<td>12</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>65</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Based on the data in the table 3.1.3 it was found that for the questions that KONI of Aceh gives attention only to athletes who excel in PON is as much as 39% of respondents or 25 people strongly agree, 25% of respondents or 16 people agree, 18% of respondents or 12 people argue that they disagree and the remaining 18% of respondents or 12 people strongly disagree.

Table 3.1.4 Data for Questions that KONI of Aceh Provides Assistance To Athletes Who Have Achievements.

<table>
<thead>
<tr>
<th>No</th>
<th>Answer options</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Strongly Agree</td>
<td>28</td>
<td>43</td>
</tr>
<tr>
<td>2</td>
<td>Agree</td>
<td>19</td>
<td>29</td>
</tr>
<tr>
<td>3</td>
<td>Disagree</td>
<td>9</td>
<td>14</td>
</tr>
<tr>
<td>4</td>
<td>Strongly Disagree</td>
<td>9</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>65</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Based on the data in table 3.1.4 it can be seen that for the question items whether Aceh KONI provides assistance to athletes who have achievements is as much as 43% of respondents or 28 people strongly agree, 29% of respondents or 19 people agree, 14% of respondents or 9 people disagree and the remaining 14% of respondents or 9 people strongly disagree.

Table 3.1.5 Data for Questions that KONI of Aceh Provides Assistance in Various Forms.

<table>
<thead>
<tr>
<th>No</th>
<th>Answer options</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Strongly Agree</td>
<td>34</td>
<td>52</td>
</tr>
<tr>
<td>2</td>
<td>Agree</td>
<td>25</td>
<td>39</td>
</tr>
<tr>
<td>3</td>
<td>Disagree</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>Strongly Disagree</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>65</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Based on the data in the table 3.1.5, it can be found that for the questions that KONI Aceh provide assistance in various forms, as many as 52% of respondents or 34 people strongly agree, 39% of respondents or 25 people agree, and 9% of respondents or 6 people strongly disagree.
Table 3.1.6 Data for Questions that KONI of Aceh can assist in the Future of Athletes.

<table>
<thead>
<tr>
<th>No</th>
<th>Answer options</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Strongly Agree</td>
<td>34</td>
<td>52%</td>
</tr>
<tr>
<td>2</td>
<td>Agree</td>
<td>22</td>
<td>34%</td>
</tr>
<tr>
<td>3</td>
<td>Disagree</td>
<td>3</td>
<td>5%</td>
</tr>
<tr>
<td>4</td>
<td>Strongly Disagree</td>
<td>6</td>
<td>9%</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>65</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Based on the data in the table 3.1.6, it can be seen that for the questions about the form of contribution given by KONI Aceh can help the future of athletes as much as 52% of respondents or 34 people strongly agree, 34% of respondents or 22 people agree, 5% of respondents or 3 people disagree and the remaining 9% of respondents or 6 people strongly disagree.

Table 3.1.7 Data for Questions that KONI of Aceh Gives Life Insurance for Every Athlete with Achievement.

<table>
<thead>
<tr>
<th>No</th>
<th>Answer options</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Strongly Agree</td>
<td>37</td>
<td>57%</td>
</tr>
<tr>
<td>2</td>
<td>Agree</td>
<td>19</td>
<td>29%</td>
</tr>
<tr>
<td>3</td>
<td>Disagree</td>
<td>3</td>
<td>5%</td>
</tr>
<tr>
<td>4</td>
<td>Strongly Disagree</td>
<td>6</td>
<td>9%</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>65</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Based on the data in table 3.1.7, it can be seen that for the question items whether the KONI of Aceh stated the availability of life insurance for every outstanding athlete is 57% of respondents or 37 people strongly agree, 29% of respondents or 19 people agree, 5% of respondents or 3 people disagree, and 9% of respondents or 9 people strongly disagree.

Table 3.1.8 Data For Question that KONI of Aceh Only Gives Attention to Outstanding Athletes.

<table>
<thead>
<tr>
<th>No</th>
<th>Answer options</th>
<th>Frequency</th>
<th>Percentage</th>
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</thead>
<tbody>
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<td>1</td>
<td>Strongly Agree</td>
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<td>57%</td>
</tr>
<tr>
<td>2</td>
<td>Agree</td>
<td>19</td>
<td>29%</td>
</tr>
<tr>
<td>3</td>
<td>Disagree</td>
<td>3</td>
<td>5%</td>
</tr>
<tr>
<td>4</td>
<td>Strongly Disagree</td>
<td>6</td>
<td>9%</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>65</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Based on the data in table 3.1.8, it shows that for the question whether the KONI of Aceh only gives attention to outstanding athletes is as many as 57% of respondents or 37 people strongly agree, 29% of respondents or 19 people agree, 5% of respondents or 3 people disagree, and 9% of respondents or 9 people strongly disagree.
Table 3.1.9 Data for Question that KONI of Aceh Never Gives Any Promises to Any Outstanding Athletes.

<table>
<thead>
<tr>
<th>No</th>
<th>Answer options</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
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<td>Strongly agree</td>
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<td>11</td>
</tr>
<tr>
<td>2</td>
<td>Agree</td>
<td>18</td>
<td>28</td>
</tr>
<tr>
<td>3</td>
<td>Disagree</td>
<td>31</td>
<td>48</td>
</tr>
<tr>
<td>4</td>
<td>Strongly disagree</td>
<td>9</td>
<td>14</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>65</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Based on the data in Table 3.1.9, it can be seen that for the question items that KONI of Aceh have never given any promises to every achieving athlete is as many as 48% of respondents or 31 people disagree, 28% of respondents or 18 people agree, 11% of respondents or 7 people strongly agree, and 14% of respondents or 9 people strongly disagree.

Table 3.1.10 Data For Questions that KONI of Aceh Will Only Provide Bonuses Without Any Bonds Against Achieving Athletes

<table>
<thead>
<tr>
<th>No</th>
<th>Answer options</th>
<th>Frequency</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>1</td>
<td>Strongly agree</td>
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<td>43</td>
</tr>
<tr>
<td>2</td>
<td>Agree</td>
<td>16</td>
<td>25</td>
</tr>
<tr>
<td>3</td>
<td>Disagree</td>
<td>5</td>
<td>8</td>
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<tr>
<td>4</td>
<td>Strongly disagree</td>
<td>16</td>
<td>25</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>65</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Based on the data in Table 3.1.10, it shows that for question that KONI of Aceh will only give bonuses without any ties to achievement athletes is as many as 43% of respondents or 28 people strongly agree, 25% of respondents or 16 people agree, 8% of respondents or 5 people disagree, and 25% respondent or 16 people strongly disagree.

Table 3.1.11 Data for Question that KONI of Aceh Provides Attention Only For One-sided Interest.

<table>
<thead>
<tr>
<th>No</th>
<th>Answer options</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Strongly agree</td>
<td>28</td>
<td>43</td>
</tr>
<tr>
<td>2</td>
<td>Agree</td>
<td>13</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>Disagree</td>
<td>15</td>
<td>23</td>
</tr>
<tr>
<td>4</td>
<td>Strongly disagree</td>
<td>9</td>
<td>14</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>65</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Based on the data in Table 3.1.11, it can be seen that for the question items that KONI of Aceh pays attention only to one-sided interests is as many as 43% of respondents or 28 people
strongly agree, 20% of respondents or 13 people agree, 23% of respondents or 15 people disagree, and 14% of respondents or 9 people strongly disagree.

Table 3.1.12 Data for Question that KONI of Aceh Gives Attention Because You Are the Medalist Winner in the National Championship.

<table>
<thead>
<tr>
<th>No</th>
<th>Answer options</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Strongly agree</td>
<td>21</td>
<td>32</td>
</tr>
<tr>
<td>2</td>
<td>Agree</td>
<td>19</td>
<td>29</td>
</tr>
<tr>
<td>3</td>
<td>Disagree</td>
<td>9</td>
<td>14</td>
</tr>
<tr>
<td>4</td>
<td>Strongly Disagree</td>
<td>16</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>65</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Based on the data in Table 3.1.12, it shows that for questions that KONI of Aceh to pay attention because you are the medalist winner in the national championship is as many as 32% of respondents or 21 people strongly agree, 29% of respondents or 19 people agree, 14% of respondents or 9 people disagree, and 25% respondent or 16 people strongly disagree.

Table 3.1.13 Data for Question that KONI of Aceh Gives Attention to Achieving Athletes at the Regional Level Only.

<table>
<thead>
<tr>
<th>No</th>
<th>Answer options</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Strongly agree</td>
<td>19</td>
<td>29</td>
</tr>
<tr>
<td>2</td>
<td>Agree</td>
<td>14</td>
<td>22</td>
</tr>
<tr>
<td>3</td>
<td>Disagree</td>
<td>19</td>
<td>29</td>
</tr>
<tr>
<td>4</td>
<td>Strongly disagree</td>
<td>13</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>65</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

According to the data in Table 3.1.13 about KONI Aceh’s question in giving attention to excellent athletes at the regional level itself was 29% of respondents or 19 respondents strongly agree to that information. Then, 22% or 14 respondents agree, 29% or 19 respondents disagree, and the remaining respondents which are 20% or 13 people strongly disagree with that statement.

Table 3.1.14 Data for Questions that KONI of Aceh prioritizes to excellent athletes in Sports Branches.

<table>
<thead>
<tr>
<th>No</th>
<th>Answer options</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Strongly Agree</td>
<td>34</td>
<td>52</td>
</tr>
<tr>
<td>2</td>
<td>Agree</td>
<td>16</td>
<td>25</td>
</tr>
<tr>
<td>3</td>
<td>Disagree</td>
<td>9</td>
<td>14</td>
</tr>
<tr>
<td>4</td>
<td>Strongly Disagree</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>65</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>
The data on table 3.1.14 showed that KONI Aceh’s question to excellent athletes in Sports Branches for being prioritized was 52% or 34 respondents strongly agree, 25% or 16 respondents agree, and the respondents who disagree was 14% or 9 respondents. The remaining respondents which were 9% or 6 respondents strongly disagree with the question.

Table 3.1.15 Data for Questions that KONI of Aceh gives attention just by words without maximum help.

<table>
<thead>
<tr>
<th>No</th>
<th>Answer options</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Strongly Agree</td>
<td>18</td>
<td>28</td>
</tr>
<tr>
<td>2</td>
<td>Agree</td>
<td>13</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>Disagree</td>
<td>25</td>
<td>38</td>
</tr>
<tr>
<td>4</td>
<td>Strongly Disagree</td>
<td>9</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>65</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Based on the data from table 3.1.15, it showed that 28% or 18 respondents strongly agree to the statement about attention given by KONI Aceh which is just by words without any maximum help. Next, 20% or 13 respondents agree, 38% or 25 respondents disagree, and the rest was 14% or 9 respondents strongly disagree with the statement.

Table 3.1.16 Data for the question that KONI of Aceh always provides attention towards achievement athletes.

<table>
<thead>
<tr>
<th>No</th>
<th>Answer options</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Strongly Agree</td>
<td>25</td>
<td>38</td>
</tr>
<tr>
<td>2</td>
<td>Agree</td>
<td>12</td>
<td>18</td>
</tr>
<tr>
<td>3</td>
<td>Disagree</td>
<td>12</td>
<td>18</td>
</tr>
<tr>
<td>4</td>
<td>Strongly Disagree</td>
<td>16</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>65</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Based on the data from table 3.1.16, it showed that KONI of Aceh always provides attention towards achievement athletes as many as 38% or 25 respondents strongly agree, 18% or 12 respondents agree, 18% or 12 respondents disagree and the remaining 25% or 16 respondents strongly disagree.

Table 3.1.17 Data for the question that KONI of Aceh always gives bonus towards achievement athletes to guarantee their future lives.

<table>
<thead>
<tr>
<th>No</th>
<th>Answer options</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Strongly Agree</td>
<td>28</td>
<td>43</td>
</tr>
<tr>
<td>2</td>
<td>Agree</td>
<td>16</td>
<td>25</td>
</tr>
<tr>
<td>3</td>
<td>Disagree</td>
<td>16</td>
<td>25</td>
</tr>
<tr>
<td>4</td>
<td>Strongly Disagree</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>65</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

According to the data from table 3.1.17, it showed that KONI of Aceh always gives bonus towards achievement athletes to guarantee their future lives as many as 43% or 28 respondents
strongly agree, 25% or 16 respondents agree, 25% or 16 respondents disagree and the remaining 8% or 5 respondents strongly disagree.

Based on the data from table 3.1.18, it showed that KONI of Aceh always gives support towards athletes’ achievement only for uncertain lure as many as 48% or 31 respondents strongly agree, 34% or 22 respondents agree, 14% or 9 respondents disagree and the remaining 5% or 3 respondents strongly disagree.

Table 3.1.18 Data for the question that KONI of Aceh always gives support towards athletes’ achievement only for the uncertain lure.

<table>
<thead>
<tr>
<th>No</th>
<th>Answer options</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Strongly Agree</td>
<td>31</td>
<td>48</td>
</tr>
<tr>
<td>2</td>
<td>Agree</td>
<td>22</td>
<td>34</td>
</tr>
<tr>
<td>3</td>
<td>Disagree</td>
<td>9</td>
<td>14</td>
</tr>
<tr>
<td>4</td>
<td>Strongly Disagree</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>65</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Table 3.1.19 Data for the question; due to the lack of achievement, whether Aceh KONI should still provide support for the athletes or not.

<table>
<thead>
<tr>
<th>No</th>
<th>Answer options</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Strongly Agree</td>
<td>28</td>
<td>43</td>
</tr>
<tr>
<td>2</td>
<td>Agree</td>
<td>12</td>
<td>18</td>
</tr>
<tr>
<td>3</td>
<td>Disagree</td>
<td>16</td>
<td>25</td>
</tr>
<tr>
<td>4</td>
<td>Strongly Disagree</td>
<td>9</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>65</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Based on the data in table 3.1.19, it can be seen that for the question; due to the lack of achievement, whether Aceh KONI should still provide support for the athletes or not, 43% of respondents or 28 people strongly agreed, 18% of respondents or 12 people agreed, 25% of respondents or 16 people argued that they did not agree and the remaining 14% of respondents or 9 people strongly disagreed.

Table 3.1.20 Data for the question of whether Aceh KONI should provide other alternatives for athletes’ future if they failed in achieving medals.

<table>
<thead>
<tr>
<th>No</th>
<th>Answer options</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Strongly Agree</td>
<td>34</td>
<td>52</td>
</tr>
<tr>
<td>2</td>
<td>Agree</td>
<td>25</td>
<td>38</td>
</tr>
<tr>
<td>3</td>
<td>Not Agree</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>Strongly Disagree</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>65</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Based on the data in table 3.1.20 it can be seen that for the question of whether Aceh KONI should provide other alternatives for athletes’ future if they failed in achieving medals, 52% of
respondents or 34 people thought strongly agree, 38% of respondents or 25 people agreed, 5% of respondents or 3 people argued that they disagreed and the remaining 5% of respondents or 3 people strongly disagreed.

3.2 Data of Observation Result

Based on data from research observations about Aceh KONI contribution for the high-achieving athletes, the writer can describe as follows:

Table 3.2.1 Observation about Aceh KONI contribution for PON medalist athletes.

<table>
<thead>
<tr>
<th>Type of Observation</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Job Recommendation from KONI</td>
<td>√</td>
</tr>
<tr>
<td>Supporting Money</td>
<td>√</td>
</tr>
<tr>
<td>Bonus</td>
<td>√</td>
</tr>
<tr>
<td>Try Out</td>
<td>√</td>
</tr>
</tbody>
</table>

Based on observations that the author has done, it can be concluded that the Aceh KONI has given attention or contribution to every outstanding athlete. This is proven by the table above that each athlete was given a job recommendation, supporting money, bonus, and try out to keep honing their skills.

3.3 Result of Interview

Based on the results of the interview that the author did to the Aceh KONI General Secretary, that is Mr. Nasir, the writer concluded that the Aceh KONI had a very high contribution for high-achieving athletes. It was shown by giving bonuses to medal winners as well as supporting money, and even additional bonuses to record breakers. In order to improve the athlete's achievement, the Aceh KONI did Reward and Punishment approach which means that if the achievement is better than the facilities provided would be better, but within a certain limit if the achievement continues to be lower, there is a possibility that the athlete would be replaced with an athlete or another branch.

Based on the result of interview conducted with Mr. T Rayuan Sukma, the chairman of LITBANG, the writer could explain that the result of the interview was exactly the same as what was explained by Mr. Nasir as Aceh KONI General Secretary which means that every athlete who had achievements at the PON and National Championship would still be given bonuses and job recommendation so that athletes could focus on their achievements without feeling fear of losing future especially in working area.

4 Conclusion and Suggestion

4.1 Conclusion

Based on the results of data collection and data analysis that has been carried out, some conclusions can be drawn as follows:

a. The KONI of Aceh officers has a high level of contribution for the medal-winning athletes.
b. The average respondent rated the KONI of Aceh officers has a high level of contribution for athletes who won medals with an average score of the result is 63% or in the high category.

c. The percentage of the level of contribution of the KONI of Aceh officers to the medal winners is 85% or in the high category, and the remaining 15% is in the medium category.

4.2 Suggestion

Based on the conclusions above, the authors propose some suggestions as follows:

a. To make athletes continue to get the best achievement, it is expected that KONI must provide future guarantees to high-achieving athletes.

b. For athletes to be able to train optimally and continue to develop their potential, it is hoped that Aceh KONI not only gives attention to those who win in PON, but that contribution is also given to athletes who win the championship in Kejurnas and other championships.

The KONI of Aceh and Aceh government should monitor athletes' potential so that athletes can maintain their condition.

REFERENCES

Leadership Level and Motivation of School Headship to Treatment of Teacher's Performance at High School 2 Seunagan

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2Prodi Magister Administrasi Pendidikan Universitas Syiah Kuala, Banda Aceh, Indonesia

Abstract. The research in this thesis is motivated by the leadership style of the principal. The most important element in realizing education progress in the school environment is the principal. Where the success of the school in improving the quality of education is the success of the principal in playing its role in the managerial side. A successful school principal is if he is able to understand the existence of the school as a complex and unique organization and is able to carry out the role of the principal as a person who is given the responsibility to lead the school. Furthermore, a very important element in education is the teacher. Teachers are a key element in the education system, especially in schools. So that with the leadership style of the teacher's principal, supervision and performance of a teacher will be a professional educator. The formulation of the problem in this thesis is how are the leadership style and motivation of the principal towards improving teacher performance at SMA Negeri 2 Seunagan. Research method: this research uses descriptive-analytic method with qualitative approach. The population in this study were all teachers at SMA Negeri 2 Seunagan. Data collection methods are in the form of conservation, questionnaire. Data analysis used is descriptive analysis. From the results of this study, the authors concluded that: (1) In his leadership the principal of SMA Negeri 2 Seunagan conducted several strategies to improve teacher performance, namely EDS (School Self Evaluation), Planning for teacher quality improvement in order to improve teacher performance. (2) The principal runs his function as a top manager, organizer, administrator, and supervisor so that he has carried out his duties well, giving encouragement to the teachers to actively work according to certain procedures and methods, so that the work runs smoothly and reaches the target. (3) A teacher does not only deliver the subject matter, but the teacher also motivates the students. At SMA Negeri 2 Seunagan, the teachers have provided motivation to the students, both those who have no achievements and those who have achieved achievements.

Keywords: Leadership Style, Motivation, and Teacher Performance

1 Introduction

The quality of education in a school organization is influenced by the quality of leadership of the principal. One of the strengths in the management of school organizations and the role to be responsible for dealing with change is the Principal Leadership, as a leader the Principal is required to be able to initiate new thinking in the process of interaction in the school
environment, in carrying out the process to achieve school goals in accordance with the demands of the times

A leader who is less instrumental in creating harmonious communication and providing employee coaching will cause a low level of employee performance. The role of an important leader to achieve desired organizational goals, including organizations in a school institution such as SMA Negeri 2 Seunagan, which has a lot of direct contact with services to academic civitas, namely students, teachers, employees, and other communities. fast, precise, easy and cheap.

State High School 2 Seunagan is one of the government agencies serving under the Education Office that aims to educate the nation intensively and continuously is an absolute thing that must be continued and programmed As one of the schools in Nagan Raya District, as a government institution carrying out its tasks, of course, the size of the teacher's performance can be seen from the results (output) and the ability to carry out their main tasks and functions

Leadership style is a behavior norm used by someone when a person tries to influence the behavior of others. Leadership style is a consistent pattern of behavior that is shown by the leader and is known by others when the leader tries to influence the activities of others.

Motivation is a potential force that exists in a human being, which can be developed by itself, or developed by a number of external forces. With the motivation of teachers, they will be able to form high morale. The ability of teachers based on motivation will encourage them to show strong behavior so that they can be directed to achieve certain goals. This orientation certainly leads to the role of the teacher who is required to act professionally.

Work motivation can be defined as influential conditions that generate, direct and maintain behaviors related to the work environment. The work environment in question is school, school as an organization in which there are a number of people who work together in order to achieve goals. As a result of one motivational action is the achievement of work performance of the organization as a whole.

Thus the success of the teacher in carrying out the task because of encouragement/motivation as a sign of what has been done by the teacher has touched the needs. Teachers who are motivated in work will lead to job satisfaction because the needs of teachers who are fulfilled encourage to improve their performance.

The importance of teaching performance in improving optimal student learning achievement is one of the external forces that can be used by a teacher to carry out his influence in teaching. Increased work must be accompanied by high motivation. Working without motivation is certainly very boring because there is no driving force. Motivation is giving or driving that creates excitement for someone to work together, integrated and all efforts to achieve satisfaction.

In building good teacher performance and quality it is necessary to have leadership techniques in achieving these goals. As an effort to maintain harmonization, the welfare of teachers and adjust to the situation and conditions of subordinates. Based on some of the descriptions above, it can be said that the principal's leadership style and teacher's work motivation are important factors in influencing teacher performance.

The right leadership style desired by subordinates is behavior that is seen as a source of satisfaction, both for present interests and needs and for a better and brighter future. In relation to the behavior of these leaders, there are two things that are usually done to subordinates, namely the behavior of directing and supporting behavior. Both norms of behavior are placed on two separate and distinct axes so that it can be known that various leadership styles are in accordance with situations and conditions that can affect the performance of the teacher. Based on observations while the researchers saw there were several problems that occurred in SMA.
Negeri 2 Seunagan namely, there were still some Teachers who refused orders and policies from superiors, it was seen by some teachers who preferred to be outdoors during teaching hours and the imbalance between regulations written with implementation in the field. Based on this condition, this study entitled "The Influence of Leadership Style and Motivation of Principals on Teacher Performance at State 2 Public High School".

1.1 Problem Formulation

Based on the description above, the problem in the research which is the formulation is whether the leadership style and motivation of the principal affect the performance of the teacher at SMA Negeri 2 Seunagan?

2 Literature Review

Leadership is defined in individual traits, habits, ways of influencing others, interaction, position in organization and perception of legitimate influence and moving the behavior of others and doing.

According to Wahjosumidjo [1] Leadership is translated into terms of traits, personal behavior, influence on others, patterns of interaction, cooperation relationships between roles, the position of one administrative office, and perception of others about legitimacy influence”.

Leadership style contains understanding as a manifestation of the behavior of a leader, which concerns his ability to lead. Leadership style basically is a manifestation of the behavior of a leader, which concerns his ability to lead. The embodiment usually forms a certain pattern or form. In carrying out his leadership a leader cannot be separated from the existence of a style or often referred to as a leadership style.

According to Obiwuru, Okwu, Akpa, & Nwankwere [2] states that the concept and definition of leadership and style may differ from one person, or situation, to the other. The word "leadership" has been used in various aspects of human resources such as politics, businesses, academics, social works, etc. Previous views about leadership show it as personal ability.

From the statement above it can be concluded that the concept and definition of leadership and style may be different for each person. The word "leadership" has been used in various aspects of human business such as politics, business, academia, social work, etc. so leadership shows it as personal ability. The essence of leadership is following (followership), the willingness of others or subordinates to follow the leader's wishes, that is what causes a person to become a leader. In other words, the leader will not be formed if there are no subordinates.

Pahrudin [3] revealed that performance is the result achieved by a person after carrying out his duties in accordance with the responsibilities in order to achieve the stated goals. whereas according to Zahraini [4] states that performance is a form of personal creativity carried out based on their duties and functions as workers.

The Principal's leadership greatly colored the working conditions. Policies, social influences with teachers and students and also their actions in making various policies, these conditions also have an impact on the performance of teachers. Thus there is a positive relationship between the principal's leadership and the performance of elementary school teachers. This can be said also the better the leadership of the principal increases the teacher's performance.

Ismail [5] suggests that: performance is the result achieved by a person according to the size that applies to the work in question, meaning that if a person's behavior gives results that are in accordance with the standards or criteria that are standardized by the organization, then the performance is good and if otherwise means poor performance, or in other words standard
setting is needed to know whether employee performance is in line with the expected goals, while also seeing the magnitude of deviations by comparing actual work results with expected results.

The approach used in this study is a quantitative approach. According to Sugiyono [6], quantitative approaches are research data on quantitative approaches in the form of numbers and analysis using statistics. The reason researchers use a quantitative approach is that researchers intend to eliminate subjectivity in research. This study uses the assessment instrument survey method. This method is used to determine the influence/relationship between independent variables and dependent variables.

3 Result and Discussion

The principal of SMA Negeri 2 Seunagan has carried out his duties well, giving encouragement to the teachers to actively work according to certain procedures and methods, so that the work runs smoothly and reaches the target.

To be able to carry out their duties properly, a school principal must have skills not only in the field of administration, but also must have the ability to lead, organize, be able to provide motivation and encouragement to teachers, education personnel, and students to study harder so that students can get good performance and the success of the school will also increase quickly.

In order for these things to happen, a school principal must have three types of skills. First, organizational skills. A tangible manifestation of this skill is how the school principal is able to formulate the school's vision and mission which is further elaborated in an educational program whose implementation is structured in such a way in an organizational framework organized in a neat and systematic education program. Both human skills, namely the skills to cooperate, motivate and lead. And third, technical skills, namely skills in using knowledge, methods, techniques, and equipment to complete certain tasks.

As for the things done by the principal in improving teacher performance at SMA Negeri 2 Seunagan as follows:

1. Self Evaluation for Improving Teacher Performance in Seunagan Senior High School 2

State High School 2 Seunagan has conducted School Self Evaluation (EDS). The implementation of EDS every year, which is carried out by the School Development Team (TPS) consisting of school principals, representatives of teachers, representatives of school committees, representatives of parents, and supervisors. The existence of School Self Evaluation (EDS) makes State High School 2 Seunagan have internal tools or instruments that can be used to evaluate their performance, can find out where their level of achievement is seen from Minimum Waiter Standards and National Education Standards, can know their strengths and weaknesses for certain and can prioritize improving the quality of teachers in the State High School 2 Seunagan.

2. The Principal Plans to Improve the Quality of Teachers of State High School 2 Seunagan to improve teacher performance

The strategy of the headmaster of planning to improve the quality of teachers of State High School 2 Seunagan is carried out by making plans for improving the quality of teachers by multiplying it to the school's vision, mission, and planned goals. Planning is carried out by involving all school academics including involving teachers in determining the program or future plans. The planning carried out by the principal has also been based on needs analysis and job analysis.

3. Principals Implement Teacher Quality Improvement in order to improve teacher performance
The strategy of the principal in carrying out the improvement of the quality of teachers of State Seunagan Secondary School 2 was carried out by involving teachers in scientific forums (seminars, training courses, workshops, workshops and courses), further studies, revitalization of MGMP, welfare benefits, provision of supporting facilities such as provision of internet facilities to access new information, purchase new books that support teacher performance and include teachers in professional certificate programs.

4. Principals Implement Monitoring and Evaluation

The principal's strategy to carry out monitoring and evaluation of the improvement of the quality of teachers of State High School 2 Seunagan is carried out by evaluating the development of teacher quality. The evaluation carried out is by supervising the education of the teachers. There are three supervision techniques used: class visiting techniques; private talks and group discussions. While the approach used is direct (directive) and indirect (nondirective). The objectives and aspects evaluated are teacher attendance (attendance), teacher performance, student achievement and development, class notes, in this case, are daily, weekly, monthly to semester tests, syllabus and teacher's RPP. In addition to using education supervision, the school head also conducts assessments using an assessment format that has been standardized by the government known as the Performance Appraisal List (DP3)

The constraints faced by the principal to improve the quality of education are that there are still teachers who are low in awareness of the quality of teachers, the lack of competent teachers and the lack of teachers as needed. Whereas the solution taken by the Principal of State High School 2 Seunagan in overcoming the obstacles to improving teacher quality is by continuously communicating and campaigning on the culture of education quality for teachers who are still low in awareness and applying for teachers through the Seunagan District Education Office, as well as by appointing honor teacher to overcome teacher shortages.

4 Conclusion

In accordance with the research that has been done and the discussion about the leadership of the principal in improving teacher performance, the authors draw the following conclusions:
1. In his leadership, the principal of SMA Negeri 2 Seunagan conducted several strategies to improve teacher performance, namely Eds (School Self Evaluation), Planning for teacher quality improvement in order to improve teacher performance
2. Principals carry out their functions as top managers, organizers, administrators, and supervisors so that they have carried out their duties well, which is to encourage teachers to actively work according to certain procedures and methods so that the work runs smoothly and reaches the target.
3. A teacher does not only deliver the subject matter, but the teacher also motivates the students. At Seunagan State High School 2, the teachers have given motivation to the students, both those who have no achievements and those who have achieved

REFERENCES


Education Management at Ma’had Darurat Tahfizh Al-Ikhlas

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Abstract. Education management is an activity or the series of activities in the form of a management process of cooperation with a group of people who join in an educational organization to achieve the educational goals that have been set beforehand to be efficient and effective. The purpose of this study is to describe the management of educational institutions in terms of personnel management, curriculum, students, facilities and infrastructure, and financing. This study used the descriptive method with a qualitative approach. Data collection was done by reducing data, presenting data, and drawing conclusions. The research subjects were the chairman of the foundation, the head of the dayah (mudir), the head of the madrasah, the deputy head of the curriculum and student affairs, the general treasurer, the boarding caretaker, and the teachers at Ma’had Darurat Tahfizh Al-Ikhlas. The results showed: 1) Personnel management was formed by the Darurat Tahfizh Al-Ikhlas Foundation to carry out learning activities. The Foundation formed a board of ma’had, then the board of directors appointed madrasa administrators. 2) Management of madrasah curriculum (MIT, MTsT, and MAT) under Ma’had Darurat Tahfizh Al-Ikhlas has implemented the 2013 curriculum which has been combined with the ma’had curriculum. Ma’had Darurat Tahfizh Al-Ikhlas has developed the curriculum by combining the ma’had curriculum with the national curriculum. 3) Management of students at Ma’had Darurat Tahfizh Al-Ikhlas begins with recruitment through new student admissions (PPDB). Students take the selection held by the pesantren. Placement of new students will be grouped into learning classes according to gender, level, and direction. 4) Management of facilities and infrastructure follows the standard of educational facilities and infrastructure. Ma’had Darurat Tahfizh Al-Ikhlas facilities are generally divided into two types, namely dormitory facilities, and madrasa facilities. 5) The source of funding for Ma’had Darurat Tahfizh Al-Ikhlas comes from SPP, BOS, donations, and waqaf (endowment). Financing management is managed by the foundation and management of the ma’had or madrasa. The management of the foundation does not have a RAPBS but the use of the budget is used according to the needs that have been set by the foundation.

Keywords: Education Management, Personnel, Curriculum, Students, Facilities and Infrastructure, Financing.
1 Introduction

Modern Islamic Boarding Schools (pesantren) have education programs that are self-organized (independent) where the program contains formal, non-formal and informal education processes that take place throughout the day in one dormitory. So, it can be understood that Islamic boarding schools are institutionally or institutionally developed to make their impact effective, not only as a boarding school as a place of learning but as a life process itself, character formation and resource development. Broadly speaking, the hallmark of modern pesantren is to prioritize education in the formal school system and the emphasis of modern Arabic and English [1].

The management of education applied in the pesantren is the result of a combination of general education management with Islamic education as developed around the community. As it has been explained that the new trend of Islamic boarding schools in the framework of renovating this new system can be seen in the education system of Islamic boarding schools which are becoming familiar with the scientific method so that they are more open to developments outside themselves, diversification of programs and activities and can function as community development centers.

From some of the above discourses related to the efforts of pesantren in integrating the pesantren curriculum with formal education, the Islamic boarding schools which are an integral part of Islamic education institutions must immediately pay attention to the officers who have involved in carrying it out, as well as their commitment and sincerity in creating changes and developments in the management of an institution.

Ma’had Daarut Tahfizh Al-Ikhlas is one of the modern Islamic boarding schools in the province of Aceh. The pesantren was established in the aftermath of the 2004 Aceh earthquake and tsunami. At that time, Ma’had Daarut Tahfizh Al-Ikhlas only received tsunami victims. who lost a parent or family during a disaster. Education taught in Ma’had Daarut Tahfizh Al-Ikhlas focuses on mastering the knowledge of the Qur’an.

It was in 2011 that Ma’had Daarut Tahfizh Al-Ikhlas began to establish its own school, considering a large number of children who wanted to study the institution. Seeing graduates and alumni from this pesantren, the community was enthusiastic to deliver their children to study at Ma’had Daarut Tahfizh Al-Ikhlas in the hope of mastering religious science, especially the science of the Qur’an.

In a relatively short period of time precisely in 2015, Ma’had Daarut Tahfizh Al-Ikhlas already had 3 formal institutions starting from the basic level, namely the Integrated Ibtidaiyyah Madrasah (MIT), the intermediate level Integrated Islamic Madrasah (MTsT) and the upper-level Integrated Islamic Madrasah (MAT). This is a brilliant achievement that was successfully obtained by this pesantren. Now Ma’had Daarut Tahfizh Al-Ikhlas already has students from all regions/districts and there are even foreign students from Malaysia.

Based on the analysis and study above, the author wants to conduct a more in-depth study of the pesantren through research entitled “Management of Education in Ma’had Daarut Tahfizh Al-Ikhlas.

2 Method

The research approach uses a qualitative approach with descriptive methods. Collecting qualitative research data can be done in a variety of settings, various sources, and various ways. The stages of the implementation of qualitative research are (1) stages of orientation, (2) exploration activities, and (3) stages of member check [2].
This research was conducted in Ma'had Darurut Tahfizh Al-Ikhlas Aceh Besar, starting from 1 February 2018 to 22 May 2018. The subjects of this research were the chairman of the foundation, mudir ma'had, head of the school, deputy headmaster in the curriculum, treasurer, and boarder. This research was carried out with the technique of direct observation (observation), dialogue (interview), documentation study.

Analysis of the data used refers to the Miles and Huberman method cited by data analysis in qualitative research, carried out at the time of data collection, and after completion of data collection in a certain period. Miles and Huberman stated that activities in data analysis, namely data reduction, data display, and conclusion data drawing/verification [2].

3 Result and Discussion

a. Personnel Management Ma'had Darurut Tahfizh Al-Ikhlas

Personnel management is a series of collaborative processes ranging from planning, organizing, mobilizing and supervising in the personnel field by utilizing existing resources effectively and efficiently. Planning activities are the initial stages compiled by the foundation. This institution is managed by the Darurut Tahfizh Al-Ikhlas Foundation. The foundation formed the ma'had management first, then the ma'had committee appointed madrasa administrators. The management of Ma'had Darurut Tahfizh Al-Ikhlas consisted of mudir, vice mudir, secretary ma'had, treasurer public, parts, and caregivers. Madrasa administrators, namely the head of the madrasa, are appointed by the mudir as the person in charge of learning activities at the madrasa.

Personnel Ma'had Darurut Tahfizh Al-Ikhlas is distinguished by education and non-education personnel a) educational staff consisting of educators, managers of education and supervisory units, b) educators consisting of mentors, instructors, and trainers; and c) managers of education units consist of principals, directors, chairmen, chancellors, and leaders of non-school education units [3]. Determination of education and non-education personnel is based on school management standards.

b. Curriculum Management Ma'had Darurut Tahfizh Al-Ikhlas

The curriculum at Ma’had Darurut Tahfizh Al-Ikhlas follows a modified national curriculum based on the vision and mission of the institution. The curriculum applied is the curriculum of Ma’had and the national curriculum (curriculum of KTSP and Curriculum 2013). The main program is Tahfizul Qur'an and Tadris Lughatul Arabiah or English Conversation. This program is included in the curriculum structure starting from the MIT, MTsT and MAT levels to integrate the two curricula.

Ma’had Darurut Tahfizh Al-Ikhlas belongs to the category of D-type Islamic boarding schools, namely Islamic boarding schools that run Islamic boarding schools and at the same time school and madrasah systems. This typology refers to 1979 Minister of Religion issued Regulation No. 3 of 1979 which revealed the form of Islamic boarding schools [4].

c. Management of Students Ma’had Darurut Tahfizh Al-Ikhlas

Need analysis is the determination of students who will be accepted by educational institutions (pesantren). The activities carried out in this step are: Planning the number of students who will be accepted and compile the student activity program. Ma'had Darurut Tahfizh Al-Ikhlas determined the number of students based on available facilities.
The student recruitment schedule is once a year before the new school year. The recruitment is through new student admissions (PPDB). Students who have registered will be selected. The test aims to see the ability of students. Prospective students who get the best results are declared to have graduated at Ma'had Daarut Tahfizh Al-Ikhlas.

New learners will participate in the orientation for the first 3 days at the madrasah so that students can get to know more about the learning environment. New students will be grouped into learning classes according to gender, level, and majors (MAT). During Ma'had students will get facilities that can support the learning process.

d. Facilities and Infrastructure Management of Ma'had Daarut Tahfizh Al-Ikhlas

Educational facilities are all facilities at Ma'had Daarut Tahfizh Al-Ikhlas including equipment, complementary materials, and furniture that are directly used in the teaching and learning process. Ma'had Daarut Tahfizh Al-Ikhlas provides buildings, classrooms, chair tables, as well as teaching media tools, libraries, school offices, UKS, parking lots, and computer laboratories. Infrastructure facilities at Ma'had Daarut Tahfizh Al-Ikhlas are almost completely available, only a few facilities have not been built such as the OSIS office and the science laboratory.

The educational infrastructure is a facility that indirectly supports the course of the education or teaching process, such as pages, school parks, roads, school rules, and so on [5]. Overall these facilities have been provided by Ma'had Daarut Tahfizh Al-Ikhlas.

Procurement of facilities and infrastructure is carried out in stages based on priorities. Facilities and infrastructures that are prioritized for learning, dormitory, office, and facilities will be built one by one depending on budget availability.

e. Financing Management Ma'had Daarut Tahfizh Al-Ikhlas

Educational funding is basically a process of allocating resources to activities or programs for the implementation of educational operations or in the teaching and learning process in the classroom. The source of the budget for Ma'had Daarut Tahfizh Al-Ikhlas comes from SPP, BOS, donations, and waqaf. SPP is the cost quoted from students used for learning needs.

Matters relating to financing management include: planning education budget, education financing, implementation of the education budget, and education financial accountability, as well as inspection and supervision of the education budget [6]. Budget Ma'had Daarut Tahfizh Al-Ikhlas is deposited in general Treasurer. The general treasurer distributes the budget to each institution as needed. The use of SPP budget will be reported only to the foundation. Specifically for the use of BOS funds, the reporting mechanism by submitting accountability reports to the Ministry of Religion and the board of directors.

Procurement of facilities and infrastructure is carried out in stages, sourced from development funds, donations, and waqaf. SPP is only used for daily learning operational needs. Development funds are charged to new students when receiving new student registration (PPDB).

4 Conclusion

1. Personnel management was formed by the Daarut Tahfizh Al-Ikhlas Foundation to carry out learning activities. The Foundation formed a board of ma'had, then the board of directors appointed madrasa administrators. The board of ma'had consists of mudir, vice
mudir, secretary ma’had, general treasurer, parts and caregivers. Madrasa administrators such as the head of the madrasa, the deputy head of the madrasah, the head of the administration and the treasurer are responsible in the madrasah.

2. The curriculum management at Ma’had Daarut Tahfizh Al-Ikhlas follows a modified national curriculum based on the vision and mission of the institution. The curriculum applied is Curriculum ma’had and national curriculum (KTSP curriculum and Curriculum 2013).

3. Management of students at Ma’had Daarut Tahfizh Al-Ikhlas begins with recruitment through new student admissions (PPDB). Students take the selection held by the pesantren. The highest grades of students will be accepted according to the available quota.

4. Management of facilities and infrastructure follows the standards of educational facilities and infrastructure. Facilities Ma’had Daarut Tahfizh Al-Ikhlas is generally divided into two types, namely dormitory facilities, and madrasa facilities. Dormitory facilities include the bedroom, bathroom, dining room and kitchen. Facilities needed by madrasas include teacher facilities and student facilities.

5. The financing management of Ma’had Daarut Tahfizh Al-Ikhlas comes from SPP, BOS, donations, and waqaf. The budget is managed by the foundation and management of the ma’had or madrasa. The use of the budget does not have a RAPBS but is used according to the needs set by the foundation.

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Patchouli Oil Farming: An Alternative to Poverty Alleviation through Smallholders Business

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Abstract. Patchouli oil farming is a farming business that has been carried out for many years in Aceh Province. This business was one of the most favored businesses, but now it has become one of the less desirable farming business because the selling prices fluctuations have discouraged farmers to continue the production. Therefore, this study examines the feasibility of patchouli cultivation as a source of smallholders' income by using business feasibility indicators. These indicators include B/C Ratio, Payback Period, and Return on Investment (ROI). The data collected through surveys based on the prepared questionnaire then analyzed qualitatively and quantitatively. The calculation result is B/C ratio of 1.9, ROI of 50.4% and a payback period of 7.9 months. The results of the analysis obtained indicate that the business is feasible to develop as a business for smallholders because it is profitable and has a payback period of investment in just one planting period. Furthermore, the fluctuations in patchouli oil prices did not make this business unfit to develop because this study found that the business was a feasible event when the selling price of patchouli oil was at the lowest level. However, the interest of smallholders to re-develop this business still needs to be improved and the socialization to promote this farming business as a source of income for smallholders needs to be employed as one of the local government policies in poverty alleviation efforts.

Keywords: Patchouli Smallholder, Business Opportunity, Poverty

1 Introduction

Your Aceh is a province that is known as a rich region based on the number of natural resources available. However, Aceh is still a region in Indonesia with a high poverty rate. According to BPS (Badan Pusat Statistik), in March 2018 the percentage of the poor in the province is 15.97% while the percentage at the national level is only 9.82%. Furthermore, the central government implements small business empowerment to reduce poverty level, hence, the program also implemented at the provincial and district level. Developing small business highly related to local commodities. Tambunan [1] studied on role of micro and small enterprises confirm that the enterprises significantly important for poverty alleviation in the
region (province). Moreover, the study specifically mentions that the variation of the role due to crucial inputs such as raw materials, technical assistance, etc.

Some local commodities with unique characteristics, high quality and much needed by industry at the national level as well as export commodities such as patchouli oil, have not yet received an adequate touch on the upstream-downstream chain so that they have not had a positive impact on improving the welfare of the community. In Indonesia, patchouli is the main producer of essential oils that are exported to various countries such as France, Singapore, the United States, England, Germany, India, Spain, and the Netherlands, for the cosmetics, perfume, soap, medicine and others industries. Indonesia is a supplier of 90% of the world’s patchouli oil needs and 70% of them has come from Aceh.

Aceh Patchouli has the advantage of having patchouli alcohol (PA) above 30%. Besides that Aceh's patchy and strong patchouli oil has been accepted by the international market, so even though some other provinces such as Sulawesi have the most patchouli oil production, they still need Aceh patchouli oil to be mixed before being exported. Even so, the superiority of Aceh patchouli oil has not yet seen an impact on improving the welfare of patchouli farmers in Aceh.

Currently, farmers produced their patchouli oil traditionally and they used drums as a refining boiler which led to the low productivity and quality of patchouli oil. The oil produced from this reactor is only 1-2% of the terma (dried patchouli leaves and stems) with an average PA content of 28%, high acid content, burnt smell and high impurity content [2]. This low quality causes the selling price of patchouli oil to be relatively cheap because it cannot be used directly by the industry of patchouli oil derivative products such as the perfume industry, cosmetics, aromatherapy, etc. without further processing. Fluctuations in the market price of patchouli oil at the level of farmers that tend to adversely affect the decline in Aceh patchouli production. Patchouli farmers do not produce optimally, even some of them transfer land functions to other commodities that offer higher prices. Patchouli oil exporters also shifted their demand to patchouli from Sulawesi because Aceh's patchouli oil supply was smaller than the amount of patchouli oil demanded by patchouli oil importers on the international market.

The number of patchouli farmers, land area and patchouli oil production and fluctuations in the price of Aceh patchouli oil at the farm level in recent years are shown in the following figure.

![Figure 1. Patchouli Oil Production, Land Area and Number of Patchouli Farmers in Aceh Province Year 2014 - 2016 (Kg, Ha, KK)](image)

Source: Direktorat Jenderal Perkebunan (2016)[3]
The decrease in patchouli area and the reduced number of farmers cultivating patchouli cultivation (as shown in Figure 1) which caused a decrease in the amount of patchouli oil production in Aceh Province, raises the question of whether fluctuations in patchouli oil market prices affect the feasibility of patchouli farming in Aceh province? For this reason, it is necessary to conduct research on investment feasibility studies on patchouli oil cultivation and refining in Aceh, considering the demand for Aceh patchouli oil, especially as an export commodity most in demand by patchouli oil importers worldwide, as recognized by PT. Haldin, one of Indonesia's essential oil exporters.

2 Literature Review

The increasing demand for perfume and cosmetics and fashion trends has made the export prospects of essential oils even greater, such as Patchouli Oil, Vetiver Oil, Citronella Oil, Cananga Oil, Cubeb Oil, Cajeput Oil, Lemon Grass, Cloves Oil, Sandalwood Oil, Nutmeg Oil, Pepper Oil, and Cinnamon Oil. This can be seen from the tendency of world market demand which tends to increase. Essential oils are widely developed by the United States, France, Britain, Japan, Germany, Switzerland, the Netherlands, Hong Kong, Ireland, and Canada. With the opening of the global market, more opportunities for developing essential oil markets in regional and international markets are increasingly open. This condition certainly opens up great opportunities for SMEs and companies to develop essential oil businesses in Indonesia [4]. Sari & Hartono [5] study of the dynamics of Indonesian patchouli oil exports to the United States as the world's largest importer of patchouli oil also showed good performance from Indonesian patchouli oil exports, this was marked by positive export trends and positive Trade Specialization Index and the largest market penetration index (IPP). The results of this research also show that Indonesia's patchouli oil export competitiveness is strong.

According to Rusli [6] in general, patchouli oil agroindustry in Indonesia has not shown excellent performance, the main problem faced is the instability of production and quality. This condition is due to the fact that most of these efforts are carried out very simply in terms of the selection of planting locations, cultivation techniques, and processing the results. This also happened in Aceh. The problems faced by patchouli farmers in Aceh generally are in 4 subsystems, namely the Upstream off-farm agroindustry, Cultivation on-farm agroindustry, Downstream agroindustry and Supporting industries. The results of research conducted by Taha & Alam [7] to find out the income and feasibility of patchouli oil industry in Lumbutarambo Village, South Banawa Subdistrict, Donggala District, shows that patchouli oil industry business is worth cultivating with an R/C value of 1.18, with business income (net) of Rp.15,950.375, per month.
Furthermore, Ermiati & Indrawanto [8], analyzing the feasibility of farming and patchouli agroindustry, showed that patchouli oil refining agroindustry of three superior varieties showed favorable and viable results. This is indicated by the positive NPV, the IRR is higher than the prevailing bank interest rate (12% / year) and B/C Ratio > 1. Each value for the three varieties namely Lhokseumawe, Tapak Tuan and Sidikalang is NPV Rp. 28,593,027, -; Rp. 40,269,140, -; and Rp.27,607,139, -. For IRR Value: 9.46%; 11.84% and 9.24%, and B / C Ratio of 2.44; 3.03; and 2.39. This has an impact on patchouli oil production and Aceh patchouli farmers' income [2].

The patchouli oil distillation analysis conducted by Pujianto, Ferichani, & Barokah [9] in Brebes District shows that at the medium business level as in CV. Nilam Kencana Jaya in Bantarkawung found the value of business profitability of 33.90%, which was obtained by a business profit of Rp. 800,149,264.5, - with a total business cost of Rp. 2,359,672,735.5, -. Furthermore, Unteawati et al.[10] analyzed patchouli business in the highlands and lowlands, namely in the City of Agung Timur, Tanggamus District and in Tanjung Bintang, South Lampung District. The calculation results show that patchouli oil business in the highlands and lowland is financially feasible, namely the NPV value of Rp. 15,594, 676, Net B/C ratio of 2.34, and IRR of 82% for lowlands. And the NPV value is Rp. 4,479,803, Net B/C 1.29, and IRR of 19% for highlands. The results of the feasibility analysis of patchouli farming and patchouli distillation small industries conducted by Hendrastuti, Eriyatno, Rusli, & Soedarsono [11] in Kuningan District also showed feasibility for patchouli farming and distillation, which was obtained by farming profits of Rp. 14,019,145, - per year, and indicator value: NPV of Rp. 12,130,935; B/C Ratio 1.35; PBP for 4.97 months, and IRR of 14.60%. Whereas in the small patchouli distillation industry a profit of Rp.318, 192,265 per year is obtained; NPV of Rp. 295,374,174; B/C Ratio 1.85; PBP for 1.62 months, and IRR of 62.73%. In this study, the price agreement between the selling price of patchouli from farming and the purchase price of patchouli by the small refining industry is at the price of Rp. 967,344.

Business feasibility analysis uses investment criteria Benefit Cost Ratio, Payback Period Net Present Value, Return on investment, Internal Rate of Return, also used in various previous studies [12]–[21].

3 Method

This study uses primary data in the three districts of Aceh Province, namely Gayo Luwes District, South Aceh District, and Aceh Jaya District. The consideration of the location of the study was because statistically the highest production of patchouli fruit in this region. Primary data were obtained from 60 respondents in this case patchouli farmers and patchouli oil refiners through interviews using questionnaires. The determination of the research sample was done by purposive random sampling (random aim). Interviews were also carried out on a number of Acehnese patchouli oil collectors and exporters to support a qualitative analysis of the results of this research. To strengthen the data analysis, secondary data also sourced from the Aceh Plantation Agency are used both at the district level and at the provincial level.

Analysis of research data using a quantitative approach. Quantitative analysis to see the profits (profits) of Aceh patchouli farmers using a profit approach [22]. To see whether this farmer's business is feasible or not as a small business that has economic added value, business feasibility indicators are used including, Net Benefit Cost Ratio (B/C ratio); payback period (PBP), and Return on investment (ROI), Internal Rate of Return (IRR) and Net Present Value (NPV) [22]–[28].
Net Present Value (NPV) is the difference between the total present value of benefits and the total present value of costs, or the number of present values of additional net benefits over the life of the business [26]. The NPV value greater than 0 (NPV ≥ 0) or positive value indicates an indication of business feasibility. Mathematically NPV can be formulated as follows:

\[
NPV = \sum_{t=0}^{n} \frac{B_t - C_t}{(1+i)^t} - \sum_{t=0}^{n} \frac{B_t}{(1+i)^t}
\]

\[NB = \text{Net Benefit (Benefit-Cost)}\]
\[B = \text{Annual Revenue} \times \text{OCC (Opportunity Cost of Capital)}\]
\[C = \text{Annual Cost} \times \text{OCC (Opportunity Cost of Capital)}\]
\[i = \text{discount factor (14%)}\]
\[n = \text{year (time)}\]

Net Benefit-Cost Ratio (Net B/C ratio) is the ratio between net benefits that are positive and net benefits which are negative for assessing the level of efficiency of use of costs (Kadariah, 1988). Net B / C value is greater than one (Net B/C > 1) as an indication of business feasibility. Mathematically it can be stated as follows:

\[
\frac{NETB}{C} = \frac{\sum_{t} B_t - C_t}{\sum_{t} C_t - B_t} \frac{1}{(1+i)^t}
\]

\[B_t = \text{Benefit at time t}\]
\[C_t = \text{Cost at time t}\]
\[i = \text{Discount Factor (14%)}\]
\[t = \text{Project period}\]

Return on Investment (ROI) analysis is used to determine the ability of capital invested in all assets to generate profits from an investment. Can be calculated using the following formula:

\[
ROI = \frac{\text{Net income}}{\text{Investment}} \times 100\%
\]

For investment feasibility, ROI is above 5%.

Internal Rate of Return (IRR) is the percentage of interest rate that will produce a cash flow value to 0. So IRR is the internal interest rate of the results of the investment carried out. The IRR value ≥ i, the business can be run and if the IRR ≤ i, it should not run. Internal Rate of Return can be calculated by the formula [26]:

\[
IRR = i_t + \frac{NPV_1}{NPV_1 - NPV_2} (i_2 - i_1)
\]

\[i_t = \text{discount rate when NPV is positive}\]
\[i_2 = \text{discount rate when NPV is negative}\]
\[NPV1 = \text{NPV is positive}\]
\[NPV2 = \text{NPV is negative}\]

Payback Period (PBP) is a method to measure how quickly an investment can return [29]. PBP feasibility value is smaller than required (investor). If there is no provision for this, the
smaller the PBP value, the better because the faster the time needed for investment returns. Payback Period can be calculated:

\[ PBP = \frac{Total\ Investment}{Profit\ Per\ month} \]

4 Result and Discussion

The results showed that the average respondent had a patchouli planting area of 7000 M2 (0.7 Ha). To carry out patchouli farming as well as patchouli oil refining, with this area, on average farmers need working capital of Rp. 22,550,000, - with an average income level of 47,520,000. The average production of patchouli oil produced by farmers on an average land area of 0.7 ha is 110 kg of patchouli oil, with an average profit level of Rp. 24,970,000. The following table shows farm income and patchouli of respondents.

Table 1. Average Farming Revenue and Distillation of Respondents' Value

<table>
<thead>
<tr>
<th>Patchouli Oil Prices at the Farmer Level</th>
<th>Price per kg (Rp)</th>
<th>Production Average (Kg)</th>
<th>Revenue (Rp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highest price</td>
<td>560,000</td>
<td>110</td>
<td>61,600,000</td>
</tr>
<tr>
<td>Average price</td>
<td>432,000</td>
<td>110</td>
<td>47,520,000</td>
</tr>
<tr>
<td>Lowest Price</td>
<td>380,000</td>
<td>110</td>
<td>41,800,000</td>
</tr>
</tbody>
</table>

Source: primary data (calculated, 2018)

Indicators of Farming and Patchouli Refinery Feasibility are shown in Table 2 below:

Table 2. Indicators of Farm Business Feasibility and Refining of Respondents’ Patches

<table>
<thead>
<tr>
<th>Indicator Description</th>
<th>Highest price</th>
<th>Average price</th>
<th>Lowest Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profit</td>
<td>Rp. 39,050,000</td>
<td>Rp. 24,970,000</td>
<td>Rp. 19,250,000</td>
</tr>
<tr>
<td>Net Benefit/ Cost Ratio</td>
<td>2.4</td>
<td>1.9</td>
<td>1.6</td>
</tr>
<tr>
<td>Payback Period</td>
<td>5 months</td>
<td>7.9 months</td>
<td>10.2 months</td>
</tr>
<tr>
<td>Return on Investmen (ROI)</td>
<td>159,1%</td>
<td>101,7%</td>
<td>74,4%</td>
</tr>
<tr>
<td>Internal Rate of Return (IRR)</td>
<td>150,9%</td>
<td>93,6%</td>
<td>70,3%</td>
</tr>
<tr>
<td>Net Present Value (NPV)</td>
<td>Rp. 29,490,000</td>
<td>Rp. 17,130,000</td>
<td>Rp. 12,120,000</td>
</tr>
</tbody>
</table>

Source: Primary data (calculated, 2018)

Test results on investment feasibility show that patchouli farming and refining in Aceh Province, it meets the indicators of business feasibility. Nonetheless, what is interesting is the fact that farmers recognize the conversion of land from patchouli to other plantation commodities such as oil palm, as well as other volatile plants such as fragrant lemongrass, which are perceived to offer higher prices. Farmers' recognition of this is due to the very high changes in the market price of patchouli oil offered, sometimes very high, which encourages farmers to
produce, but at certain times, with various reasons from buyers (traders/collectors), farmers get offers a very low price. This is very disappointing, making farmers lazy to continue farming and refining patchouli. For information, patchouli oil products are not normal categories of goods which, if available in small amounts, cause prices to become expensive, otherwise, if there are large amounts of prices, they become cheap. According to one of the patchouli oil exporters interviewed, explained that if the amount of patchouli oil is available at the community level more, then the price offer from the buyers (exporters) is actually higher than if the patchouli oil stock is in small quantities. Thus, when farmers get a sharp price drop due to over-stock reasons, there are indications of a market price game at the farmer level, which may be done by collectors (small or large), or even by exporters indirectly.

The results of this study show that the conversion of land from patchouli farming to other commodities is not expected to be due to investment in patchouli oil farming that is not economically feasible. The calculation results show that even at the lowest level of patchouli oil selling price, patchouli oil farming still meets the value of the investment feasibility indicator, with an average value of farm income of 41,800,000, - and the profit obtained by farming is Rp. 19,250,000, - per production cycle.

Although the analysis of patchouli oil farming shows economic feasibility, the decline in prices can affect the motivation of farmers to cultivate patchouli. Patchouli cultivation takes 8 months to harvest, and a grace period of 3-4 months for land can be replanted so that at the lowest price level, farmers only get an average net income of Rp. 1.6 million per month, while UMP-Aceh (2017) is Rp. 2.5 million. Of course, this condition can affect the behavior of farmers in planting patchouli. Farmers will be easy to replace the types of plants that are cultivated if the market offers a more profitable price. For this reason, it is necessary to determine the optimization of the sale price agreed at the farmer level. By using the data obtained in this study, the selling price of patchouli oil at the farmer level will be optimal at the price of Rp. 480,000 per kg. At this price level, with an average production of 110 kg and an average land area of 0.7 Ha, farmers will get a net income of Rp. 30,250,000 per production cycle or an average of 2.52 million per month. This is expected to encourage farmers to remain consistent to do patchouli cultivation

5 Conclusion

The Patchouli smallholding is a good alternative for poverty alleviation because the business feasibility study shows a very good result. The calculation verified that even at the lowest selling price, farmers able to gain profit from the business.

Policy Implication

• Creating a unique program on Patchouli smallholders development which enlightens the farmers on the business opportunity of the patchouli farming hence encourage the farmers to develop the business side of the agricultural product.

• The government can use patchouli farming as the alternative program to reduce poverty while at the same time creating and developing a featured product for the leading sector of the Kabupaten’s economic development.

• The government needs to apply regulation for a minimum price of patchouli to maintain sustainability of the society.
Acknowledgment

We are very grateful to Project Penelitian Unggulan Universitas Syiah Kuala, 2018 that support this research financially.

REFERENCES


The Development Strategy of Customary Institutions Utilization of Keujruen Blang (Association of Water User Farmer; GP3A) in Increasing Rice Production in Pidie Regency

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Abstract. Keujruen Blang is a person who has particular abilities in agricultural management and arrangement and served as assistant of village head in prospering the farmers. Keujruen blang have criteria such as persevering personality, discipline, experienced and master the customary law of agriculture. This thesis describes the results of research on the customary institution's utilization of Keujruen Blang: Gabungan Perkumpulan Petani Pemakai Air (Association Of Water User Farmer; GP3A) in increasing rice production in Pidie Regency. This research is important to be carried out because the existence of Keujruen blang is really needed by the peasant community in the farming activities of rice fields. This study uses descriptive qualitative and quantitative methods; the research method used to create an overview of the situation or event with the accumulation of data obtained. Based on the results of the study, it is known that the role and function of Keujruen Blang in driving the cooperation of the peasant community not yet maximized. What already done is only carrying out pragmatic routine activities, so as a result it does not touch on the subject matter of the decline in the spirit of Gotong Royong (mutual cooperation). Members of Keujruen Blang are not yet aware of their main task; the motivator of the peasant community. Besides, Keujruen Blang also hasn't owned the notary registration as an institution that is legally recorded in the district. The institution does not have a clear vision, mission and goals and the lack of facilities and resources available in the district in improving the ability of the institution's capability. The non-optimal function of the irrigation system also becomes a major obstruction to the development of Keujruen Blang. Besides, other problems are related to the weaknesses of local leadership, lack of educating organizational structure, lack of government participation, and part of the substance of the customary rules are less relevant to the conditions of the peasant society nowadays. In order to minimize the problems that occur in Keujruen Blang, it requires a traditional leadership reorientation from the fixed role (the implementation of routine tasks only) to the role of a agent of change, who is able to reform the organization, improve irrigation, raise awareness of the peasants and the government, and redefinition of customary rules and Keujruen Blang.

Keywords: Keujruen Blang, Pidie Regency, Rice Production
1 Introduction

Keujruen Blang has a function, authority and responsibility to manage the water management in the rice fields fairly and orderly so that all farmers in the area get the same treatment. In other words, Keujruen Blang is a Geuchik helper in Gampong in accordance with the area of authority by area of rice fields in Gampong area. Related to that, it is necessary to do further research on the development strategy of the utilization of customary institution of Keujruen Blang / Gabungan Perkumpulan Petani Pemakai Air (Association of Water User Farmer; GP3A) in increasing farmer production result in Pidie Regency.

1. How are roles and functions customary institution of Keujruen Blang in increasing farmer production result in Pidie Regency?
2. How are development strategies of utilization customary institution of Keujruen Blang in increasing farmer production result in Pidie Regency?

2 LITERATURE REVIEW

2.1 Customary Institutions

The customary institution is a component of a social structure which is oriented in cultural values, by respecting the preservation of natural resources and the sustainability of their environment in improving their welfare and survival in accordance with their respective fields, in order to achieve the development objectives. These roles have been internalized within a community group based on their knowledge, values, and norms on an object of life.

2.2 Keujruen Blang

Keujreun Blang is a farmers community of paddy fields where it has the legal basis, duties, and authority listed in a Government Regulation No. 22 of 1982 on Water Regulation and Presidential Instruction No. 2 of 2004 on The Development Water User Farmer. Keujruen Blang is referred to the Gabungan Perkumpulan Petani Pemakai Air (Association of Water User Farmer; GP3A). The presence of Keujruen Blang is considered as one of local wisdom.

2.3 Irrigation

Irrigation is a watering activity on agricultural land that aims to create moist conditions in the root of plants to meet the water needs for plant growth. What is meant by irrigation are activities related to the effort to watering rice fields, lands, plantations and other agricultural businesses such as swamps, fisheries? The effort mainly involves the making of facilities and infrastructure for distributing water to the fields regularly and disposing of excess water that is no longer needed to meet agricultural purposes.

2.4 Benefits of participation of Customary Institution in the Process of Environmental Management and Production Improvement

In addition to providing valuable information to decision makers, community participation can also reduce the likelihood of community willingness to accept the decision [1]. The opportunity of community participation is an educational process in terms of community
empowerment in order to recognize problems, identify needs and be able to determine the solution of the problem in accordance with the potential and available resources.

2.5 Legal Basis of Costumari Institution Utilization of Keujruen Blang in increasing farmer production result in Pidie Regency

The enactment of Law No. 18 of 2001 on Special Autonomy for the Province of Nanggroe Aceh Darussalam can be used as broader legal protection for the province to freely manage the development based on the characteristics of a region, in all aspects, both religion, education, economy, and cultural custom.

3 Objectives and Benefits of Research

3.1 Research Objectives

Based on the background of the problems and discussion of the literature above, then the objectives of the research are:

a. Analyzing roles and functions customary institution of Keujruen Blang in increasing farmer production result in Pidie Regency.

b. The arranging strategic formulation in development strategies of utilization customary institution of Keujruen Blang in increasing farmer production result in Pidie Regency.

3.2 Benefits of Research

This research is conducted in terms of the preparation of Thesis as a partial fulfillment in completing the study on Magister of Agribusiness Study Program, Faculty of Agriculture, Syiah Kuala University and also as a science application for writers. The results of this research are expected to be useful to increase knowledge, and as input to the government to be the basis of consideration of strategy of increasing customary institution utilization of Keujruen Blang/Gabungan Perkumpulan Petani Pemakai Air (Association of Water User Farmer; GP3A) in improving farmer welfare in Pidie Regency in the future.

4 METHOD

4.1 Population and Sample of the Research

In accordance with the purpose of research, then that will be used as research population is all customary institutions Keujruen Blang in Padang Tiji, Batee, and Muara Tiga Pidie sub-districts. The population in this study is all the administrators of Keujruen Blang customary institutions in these three sub-districts. Purposive sampling technique is used for the determination of sample respondents that is as much as 10 percent (population 126 people, sample 12 people).

4.2 Data Collection Techniques

The data in this research consist of primary data and secondary data. Primary data will be collected using in-depth interview techniques and observation. Observations will be conducted directly to all activities of the data source (customary institution of Keujruen Blang) more closely so that any phenomena related to the problem can be recorded in detail.
4.3 Data Analysis Model

The method used in this research is descriptive method and quantitative method. Nazir [2] explains that the descriptive method is a research method to describe the situation or event with the accumulation of obtained data. The data have been collected and then analyzed using descriptive and quantitative approach.

4.4 SWOT Analysis

SWOT Analysis is a favorable, effective, and efficient analytical tool and can see all possible future changes through a systematic approach through the introspection process into, both negative and positive [3].

SWOT Matrix is a tool for compiling strategic factors of a business field that can clearly illustrate how external opportunities and threats facing a business sector can be cultivated with its strengths and weaknesses.

5 Results and Discussions

Based on the problem and the formulation of research objectives, as well as the results of data processing, the following section will be discussed research results.

a. Roles and functions of the customary institution of Keujruen Blang

Based on the results of the research in Padang Tiji, Batee and Muara Tiga sub-districts of Pidie District, the Keujruen Blang function and authority that has been run only based on previous habits or Keujruen Blang experience, it is not a guideline on written rules in qanun of customary institutions. So that the function of Keujruen Blang in the three sub-districts is only in maintaining water supply and taking care of khanduri, whereas in the settlement of disputes are under coordination with Kaushik, of course, this is with consideration Keujruen Blang under the authority of keuchik.

Keujruen Blang in Padang Tiji, Batee, and Muara Tiga sub-districts have not played an active and functioning role, because the research area still faces the problem of insufficient water availability for rice farmers, thus affecting rice production.

In the harvest season, the average production of paddy with a source of water from irrigation is good, it appears that the production level is different from the water source from the poor irrigation management by Keujruen Blang. In Muara, three planted area with the harvested area is higher than Batee's but the Batee harvest higher than Muara Tiga. This is caused by the water consumption that has not been maximized by the farmers in that sub-district.

Farm production is strongly influenced by water flowed into the rice field, but in the rainy season water management is not so influential, this is because in the rainy season the farmers do not face watering problems.

b. Roles and functions of the customary institution of Keujruen Blang in increasing farmer production result

From the results of the research, it is known that the role of Keujruen Blang in mobilizing the cooperation of the farmer community has not been maximized in overcoming the problem of decreasing the spirit of gotong-royong in Keujruen Blang. What Keujruen Blang does is merely performing the tasks of a pragmatic routine, so that it does not touch the main cause of the decline in the spirit of gotong-royong. The decline of mutual cooperation is caused by the lack of optimum services provided by Keujruen Blang to the farmers in the form of adequate
agricultural water availability and the weakening of internalization of the values prevailing in Keujruen Blang which done by farmers.

c. The formulation of the development strategy of the utilization of Keujruen Blang

The strategy formulation of role and function of Keujruen Blang in Padang Tiji, Batee, and Muara Tiga consists of three stages. 1) the input stage that contains basic input information (identification and analysis of internal and external factors) needed to formulate the strategy. 2) the matching stage consisting of Internal-External (IE) analysis and SWOT analysis based on the results of Stage I. 3) the decision-making stage by evaluating the alternative strategies based on the SWOT analysis to find priority strategies in utilizing the Keujruen Blang.

Alternative strategies in increasing the role of Keujruen Blang in maintaining the water usage for the farming community is carried out to achieve the objective of increasing the role of Keujruen Blang in maintaining water consumption for farmers in order to increase rice production, it needs a set of facilities; the role and function enhancement strategy. Through the implementation of these strategies in a directed and planned way, it is expected that the Keujruen Blang will grow and develop so that it can be relied upon and trusted as a strong Keujruen Blang capable in self-sufficiency. There are 6 (six) strategies of utilization of Keujruen Blang: (1) Strategy of Increasing Utilization of Keujruen Blang (2) Strategy of Conductive Climate Development for Empowerment and Development of Keujruen Blang (3) Strategy of Structuring the Institutional Structure of Keujruen Blang (4) Strategy for Empowerment and Management Development of Keujruen Blang (5) Empowerment and Cooperation Development Strategy or Partnership of Keujruen Blang (6) Capacity Building Strategy for Keujruen Blang

From those six strategies above, it can be concluded that Keujruen Blang has a role and function which really should be increased its utilization so that the strategy can increase the capacity of the management in increasing the production of a rice farmer in Pidie District.

6 Conclusion and Recommendations

6.1 Conclusions

Based on the results of the discussion, there are several conclusions:

1. Roles and functions performed by Keujruen Blang in mobilizing the cooperation of farmers have not been maximized in overcoming the problems of rice fields, the decreasing on the spirit of gotong-royong in institutions Keujruen Blang.


6.2 Recommendations

Strong legal protection is needed for all customary institutions at the district level in accordance with Qanun of NAD Province Number 7 of 2000 on the implementation of
customary life in Aceh province. Thus each customary institution will have clear functions and
duties and have good mechanisms in establishing customary institutions. It needs to be a clear
division of labor and duties between customary institutions and related agencies so that every
task carried out has a clear responsibility as well.

REFERENCES

Accumulation of Pb and Zn in mollusk bivalves, Geloina erosa and its growth patterns in mangrove ecosystem of Reuleung, Aceh Besar District, Indonesia

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Abstract. Heavy metals, Pb and Zn were detected and analyzed in the soft tissue of mollusk bivalvia, Geloina erosa and in water and sediment from the mangrove ecosystem of Reuleung, Aceh Besar District, Aceh during the end of December 2017. G. erosa were taken from 3 observation stations by purposive sampling captured during low tide. Concentrations of Pb and Zn in water were lower than those in sediment, the soft tissue of G. erosa. All detected heavy metal concentrations were higher in sediment than in tissue of G. erosa. Pb levels were found highest at 12.995 mg/kg in sediment, while Zn content was 45.045 mg/kg. The accumulation of Pb in G. erosa was found very small at 0.0001 mg/kg, whereas the accumulation of Zn in G. erosa was found at 32.139 mg/kg. The G. erosa growth pattern showed a negative allometric pattern (b<3), this reflects a long-term accumulation of Pb and Zn by a shell of G. erosa.

Keywords: Heavy Metal Zinc, Lead, Geloina Erosa, Growth Patterns.

1 Introduction

The mangrove forest is one of the ecosystems in coastal areas and in the area live various aquatic biota, especially bivalves. Bivalvia is a group of shellfish, which have a soft body and are protected by two shells that are cupped, as in Geloina erosa (G. erosa). Like other bivalve inhabitants of ecologically stable local environments, G. erosa can defined as a K-strategist [1]. The growth of shellfish includes growth of muscles, length of shell and can be interpreted as a process of length, weight or increase in volume of an organism. Shellfish have a food source in the form of plankton, the availability of plankton in the waters will indicate the level of aquatic fertility. Local residents in the area around of the Reuleng River is also called "lokan".

These shellfishes are found along the Reuleung River watershed, which is dominated by mangrove ecosystems that are habitat for these shellfishes. Groups of shellfish from the Corbioculidae family associated with mangroves such as G. erosa [1], [2]. The reduction of
mangrove forests along the Reuleung River watershed, mainly due to the conversion of mangroves into various needs including settlement, roads, transfer of functions and utilization of mangrove wood for various purposes. As a result of land conversion, it causes damage to mangrove forests so that the habitat of *G. erosa* is gradually decreased. If this condition continues, it is feared that *G. erosa* resources from this area will decline and it is not impossible that one day it will become extinct.

Until now, there are still limited references and information that can be used as a reference for ecological studies both on the distribution and pattern of growth of *G. erosa* in the waters of Reuleng River watershed, so that the resources of this shellfish are almost forgotten. In terms of economic value, this species is quite strategic to be developed in the future, especially this species is one of the species of aquaculture. The entry of pollutants from the area around the Reuleung River is feared that it can affect to the life of *G. erosa* in the mangrove ecosystem. Pollutants can come from household waste, agriculture, small industries such as workshops and others can contribute heavy metals into river waters.

Based on the above conditions, this study was conducted to determine the content of heavy metals (Pb and Zn) and the growth pattern of *G. erosa* which are living in mangrove ecosystems of Reuleung. This is due to the importance of shellfish resource potential in the waters of the Reuleng River as well as germplasm, consumption, and sources of livelihood [3].

2 Materials and Methods

This research was conducted in July 2017, *G. erosa* sampling was taken at the lowest tide in the mangrove forest area along the Reuleng River which was divided into three stations based on the distance of mangrove vegetation. The research location was shown in Figure 1. Determination of sampling points was conducted by purposive sampling. Shellfish samples were immediately collected by scraping the *G. erosa* habitat area using a small machete. Determination of sampling time was based on the tidal pattern, where the sample was taken at the lowest tide. Sampling of shellfish using a line transect method with a length of 30 meters and a 15 meter interval, each line transect consists of three plots measuring 1 x 1 meter.

Water and sediment sampling was carried out by taking it directly from the river with a hand set, then put into a sample bottle (Pyrex) that has been labeled according to observation station and transported to the laboratory for the analysis process. Heavy metal content in water and accumulation in *G. erosa* and sediment was analyzed using Atomic Absorption Spectrophotometer, Shimadzu AA 630 [4] after being destructed using the Toxicity Characteristic Leaching Procedure method [5].

Soft tissues of shellfish were separated from the shell and washed with distilled water. Soft tissue was dried in an oven dryer at 70 °C. After drying completely, they were powdered in a mortar. Digestion for soft tissue was carried out according to the Toxicity Characteristic Leaching Procedure method [5].

Sediment samples were dehydrated at 70 °C to a constant weight, then powdered in a mortar. Subsamples of 0.5 g were weighed, 2 ml of concentrated hydrofluoric acid, 2 ml of conc. HNO₃ and 1 ml of H₂O₂ were mixed with the subsamples. Microwave digester was used for digestion. After cooling, solutions were put into 25 ml calibrated flasks and were diluted with deionized water to the mark. After that, filtration and analysis of metal concentrations conducted by Atomic Absorption Spectrophotometer, Shimadzu AA 630 [6].

The length of the shellfish was measured starting from the anterior end to the posterior end of the shellfish, the width of the shellfish measured from the dorsal part to the ventral part of the shellfish, the thickness of the shellfish measured from the top of the shell to the edge of the
lower shell. Body weight measurements were carried out by weighing using analytical scales on body weight of *G. eros*. Body weight measurement was carried out by weighing *G. eros* using an analytical balance (ACIS, BC-500).

The growth of shellfish can be known through an analysis of the relationship of shellfish length to the body weight (total weight), which was analyzed through the equation (1) and (2) below [7].

\[ W = aL^b \]  
\[ \log W = \log a + b \]

W = total weight (g); L = shellfish length (cm); a = Constanta; b = exponential.

![Figure 1: Research location.](image)

3 Result And Discussion

a. The concentration of heavy metals (Pb and Zn) in the water phase and sediment

Analysis of Pb and Zn concentration were carried out at each research station, with samples taken including *G. eros*, sediment, and concentration heavy metals in the water phase. The results of the analysis showed that Pb and Zn ion were found in trace amounts (0.0011 - 0.0012 mg/L) in water phase in mangrove ecosystem of Reuleung, far below the Indonesian river water quality standard. Pb and Zn concentrations in sediments were found in varying amounts (8.246-12.995 mg-Pb/kg and 32.371-45.045 Mg-Zn/kg) and exceed the quality standards for heavy metal content in sediments and river biota (Table 1). These results indicate that Pb and Zn content in sediments of the mangrove ecosystem of Reuleung has exceeded the Indonesian river water quality standards (>0.005 mg/kg). The highest Pb level in sediment was found at Station 1 which reached at 12.995 mg-Pb/kg and the highest Zn level in sediment was at Station 3 (45.045 Mg-Zn/kg). The value of Pb and Zn found in sediment samples was still below the quality standards set by ANZECC ISQG-Low [8]. A bad condition of estuary greatly influences the presence of heavy metals dissolved in sediment. Higher activity around estuary both on land and in the estuary area, the level of heavy metals can also increase.

The presence of these two metal ions in the water phase and sediment also affects the accumulation of these two metals in *G. eros*. Pb was not found to accumulate in *G. eros*, but Zn was accumulated in high concentrations (32.139 Mg-Zn/kg), especially in Station 1.
Table 1. Concentrations of Pb and Zn metals in the water phase, sediments, and shellfish from Reuleng River mangrove ecosystem

<table>
<thead>
<tr>
<th>Station</th>
<th>Sample</th>
<th>Unit</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Pb</td>
<td>Zn</td>
</tr>
<tr>
<td>ST-1</td>
<td>Water</td>
<td>mg/L</td>
<td>0.0012</td>
</tr>
<tr>
<td></td>
<td>G. erosa</td>
<td>mg/kg</td>
<td>0.0001</td>
</tr>
<tr>
<td></td>
<td>Sediment</td>
<td>mg/kg</td>
<td>12.995</td>
</tr>
<tr>
<td>ST-2</td>
<td>Water</td>
<td>mg/L</td>
<td>0.0012</td>
</tr>
<tr>
<td></td>
<td>G. erosa</td>
<td>mg/kg</td>
<td>tr</td>
</tr>
<tr>
<td></td>
<td>Sediment</td>
<td>mg/kg</td>
<td>8.246</td>
</tr>
<tr>
<td>ST-3</td>
<td>Water</td>
<td>mg/L</td>
<td>0.0012</td>
</tr>
<tr>
<td></td>
<td>G. erosa</td>
<td>mg/kg</td>
<td>tr</td>
</tr>
<tr>
<td></td>
<td>Sediment</td>
<td>mg/kg</td>
<td>9.212</td>
</tr>
</tbody>
</table>

tr=trace

3.2 Growth Pattern of G. erosa

G. erosa was only found in 2 observation stations, namely station 1 and station 2, while the presence of G. erosa was not found. The mangrove land at station 3 has been reclaimed due to road development activities which caused G. erosa population to disappear in this station. Relationship between length and the total weight of G. erosa at each observation station in the mangrove ecosystem of Reuleng River is presented in Figure 2.

![Figure 2. G. erosa growth pattern at Station 1 and 2.](image)

The observation results showed that the value of b for the equation of shell length and shells total weight at the two observation stations showed the same growth pattern. The value of b at Station 1 was 0.3051 with a determination coefficient (R^2) of 0.9982, while at Station 2, the value of b was found at 0.2296 with a coefficient of determination (R^2) of 0.9353. The value of b obtained was lower than 3. This indicated that the growth or the increase in weight of shells at two research stations was slower than the increase in the length of the shell. Therefore, the pattern of growth of G. erosa shells in Reuleng River Mangrove Ecosystem was allometric negative. This growth pattern was found to be the same as the five species specific growth of Ostreidae (Crassostrea virginica, Crassostrea gigas, Crassostrea iridescens, Crassostrea angulata, and Ostrea edulis) that collected in the other part of Kuala Gigieng estuary, Aceh.
Besar District [9]. If the value of b<3, the rate of total weight increment and increase in shell length that occurs is unbalanced where the process of increasing shell length that occurs is more dominant when compared to the increase in weight [10]. Furthermore, if the value of b>3, it means that the growth of shell weight is faster than the growth of its length (positive allometric), whereas if the value of b≠3 is a balanced weight and length (isometric). Males and females do not affect to the the length and weight of aquatic biota. Dar et al.[7] reported that no significant difference relationship between males and females to the length and weight of cyprinid fish, Schizopyge esocinus. G. erosa is a sexually dimorphic animal [11], but because of no differentiation of external organs between male and female in shells, the sex of juvenile larvae and shellfish is difficult to distinguish [12]. The sex is usually distinguished by morphological appearance and color of gonads [11] as the gonadal structure changes as age and the body increase. G. erosa population in the station observation area has one cohort with two length classes and an asynchronous spawner [3]. The increase in the length of G. erosa shell occurs very rapidly in young individuals. The shell in the young phase is very thin, making it easier for a faster lengthening process. In this phase, efforts to improve the length and thickness of the shell are preferred. After efforts to improve the growth of shell length and shell thickness take place, then continued with the growth phase of the body [3].

4 Conclusions

This study focused on two heavy metals (Pb and Zn) that have been estimated in G. erosa as well as in water and sediment from Reuleng River mangrove ecosystem. The G. erosa dwell on the sediment along the Reuleung River watershed, which is dominated by mangrove ecosystems. Abundant and easy to collect, this species makes a favorable choice of biomonitoring for Reuleung River watershed. The highest Pb levels found in sediments were 12.9950 mg/kg, while the highest Zn levels in sediments were 45.0450 mg/kg. Zn content accumulated in G. erosa was 32.1390 mg/kg, while Pb levels were found to be very small at <0.0001 mg/kg. The pattern of growth of G. erosa shells in Reuleng River Mangrove Ecosystem was allometric negative (b<3), this reflects a long-term accumulation of Pb and Zn by shell of G. erosa.

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Geospatial Information and One Map Policy: Challenges and Opportunities in Innovation and Competitiveness of Entrepreneurship of Industrial Revolution 4.0

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Abstract. More and more businesses are looking for types of data and the analysis of new forms in order to remain competitive in running their business. Various innovations have been and continue to be developed in an attempt to extend the reach of market places and also to take advantage of existing data sources including lately using geospatial data. On the other hand, the government of Indonesia in 2016 has introduced one map policy. The use of geospatial data and one map policy are a form of synergy in creating digital innovations and development entrepreneurship. This article presents a study related to the use of geospatial data and the one map policy in creating opportunities and challenges of innovation and development of the entrepreneurship. The use of geospatial data can bring up an important source of information in both traditional data analysis as well as data analysis. Geospatial data analysis tool to synergize with other data that can be integrated with product analysis and business innovation development opportunities, allowing the users this data will continue to evolve. The enactment of a policy map and the use of geospatial data available will create economic efficiency and will simplify the process of licensing effort because the geographic and location information, i.e. geocoding can be easily obtained. The reference base map as the basis for decision policy will improve the accuracy of location-related information from a variety of economic activities. This condition will provide certainty in an attempt, by itself will create new entrepreneurship in order to anticipate the industry disruption 4.0 era.

Keywords: Innovation, Geospatial Data, One Map Policy, Entrepreneurship.

1 Introduction

More and more businesses are looking for different types of data and the analysis of new forms in order to remain competitive in running their business, including the use of geospatial data. In the last two decades, thematic mapping of Earth surface has undergone a revolution as the result of advances in geographic information science and remote sensing, combined with Global positioning system (GPS), it usually called as geospatial technology. Geospatial technology has developed rapidly and is widely used for various purposes of which it related to
geographic location. This article presents the results of a review and thoughts related to geospatial technology in innovation business in the Industry Revolution 4.0 [1]. The industry Revolution 4.0 is characterized by a fusion of technologies that is blurring the lines between the physical, digital, and biological spheres [2].

Eighty percent of current information related to spatial or geographic component and research shows that approximately 80% of all decisions in the public sector are based on dereferenced data [3]. This means that all information related to the location or place of geographical position or spatial data and it can be treated as an entity that can be managed using geospatial technology. It cannot be denied that the utilization of geospatial data currently entering an era of not very rapidly, not only limited to utilization to the field of geography, however other fields especially on the areas related to the utilization of natural resources and territorial.

Business one of the fields that utilize geospatial data needs to realize that the ease of access to information will make it easier for geospatial data in planning the deployment location of business, understand the spatial location associated with the form region, the infrastructure that has been built, proximity to markets that can distance is calculated, and the landscape of the region which will add more detailed information about the location. Another advantage that geospatial data can be updated in real-time.

Integration of remote sensing data and geographic information systems (GIS) which is the main component in the geospatial technology has a very good ability in visualizing geospatial data. The elements contained on the surface of the earth can be decomposed into several layers or geospatial data coverage. This layer with the surface of the earth can be reconstructed again or modeled in the form of the real three-dimensional world [4].

1.1 geospatial technology for business and marketing, is it benefit?

A popular use for geospatial analysis in marketing is segmentation of the market. The market in the era industrial Revolution 4.0 is facing a challenge. The challenge is how we can get benefited from it. The geospatial technology could answer this question, for example, if we run a business related to the location the goal is to divide customers into groups with common characteristics (unique). These customers may have demographic data (i.e., gender, income) and/or lifestyle and even behavior (i.e., buy) the same features. The goal is to use this segment to help improve promotion and retention, and to get new customers. For example, imagine a sports goods company that uses demographic data such as age, gender, and income, together with a history of purchases, to develop the rest. By analyzing this data, the company has identified the target segments and what innovation can be made.

In geospatial technology, one can add to the mix a geospatial data that can help companies maximize promotional activities and target new customers. The company can enrich the collection of data using data geocode from the zip code associated with your current customers (e.g., information from loyalty cards) to help visualize the place customers in this segment. A map that combines this data along with the location of the store help companies visualizes the distribution of target segments around his shop to see customers clustered geographically. If so, the business analyst can create new derivative variables are called range, i.e. the distance between zip codes and a variety of store location [5].

The company can then look for another woman (using third-party data) that meet the profile of the segment and is in a group within a 15-mile radius from the shops. Retailers can then determine which stores will benefit from promotion-targeted. In general, geospatial technology can improve the management of assets to facilitate the law enforcement agencies to sharpen the risk analysis, expand transportation planning and logistics, and to sharpen the strategic location
determination. Various types of geospatial technologies that can contribute to innovation in the business to meet industry 4.0 era [6].

1) Remote sensing Data-image data is collected from a camera or sensor platforms space or air. Some commercial satellite imagery provider offers high-resolution images even to less than a meter which can be used to monitor the area in more detail.

2) Geographic information systems (GIS): a series of software for mapping and analysis of georeferenced data on the Earth's surface, otherwise known as geospatial data and others.

3) Global Positioning System (GPS) satellite network: who can give you the exact coordinates of the location to the civil and military users with the proper receiver equipment.

4) Internet Mapping Technologies: software programs such as Google Earth and web features like Microsoft Virtual Earth changed

As illustrated in figure 1, the geospatial technology will encompass all aspects of the business with geospatial reference.

![Figure 1. Geoweb and Geospatial Technology coverage](https://www.geospatialworld.net/wp-content/uploads/2017/02/jyostnas-blog.jpg)

Source: https://www.geospatialworld.net/wp-content/uploads/2017/02/jyostnas-blog.jpg

1.2 one map policy, government of Indonesia

The Government in the near future will publish a policy map (one folder policy). One policy map integrating 85 thematic map that had the responsibility of 19 ministries and agencies. This policy starts from the publication of presidential Regulation (Regulation) number 27 years 2014 National Geospatial Information about the network (JIGN). This President Decree then followed the publication of the Regulation No. 9 the Year 2016 on the acceleration of the implementation of the policy on One Map at the level of accuracy of a map scale of 1:50,000.

One policy map would make the overall economic activities become more efficient. Even with this, there is one map, will facilitate the process of licensing effort. This makes the popular indexes such as the ease of doing business (EODB) or ease of trying also helped. Based on the accuracy of the data, these policies can reduce overlapping granting permission that is often the cause of conflicts. "One map can be likened to such infrastructure in drawing up the policy. The existence of a single map, policy formulation including related licensing decisions can be based on data that is accurate," said the Deputy President's Staff Office II Republic on Indonesia, Yanuar Nugroho. The same map reference base will improve the accuracy of location-related information from a variety of economic activities. This condition will provide certainty in business. "Evidence or geospatial information that is either expected to be able to help the Government in granting time pruning different types of licensing," he added. With a single
policy map expected logistics pertaining to distance, space and infrastructure can be more efficient. In addition, the logistics performance index ranked Indonesia also expected could be going up.

According to the World Bank Group (2018) [7] that there are five pillars of a policy map. First, data utilization regulations related policies for the benefit of investment and location information. This is to avoid overlapping land use permits. "The second pillar is the institutional readiness for ministries and agencies as well as local government geospatial information dissemination in order. The third pillar of the technology, how to connect to geoportal," said he. The fourth pillar is not less important are the pillars of the standard to ensure that the required data and will be used meets the national standards. The fifth pillar is the readiness of the human resources (HR) in order to operate and utilize every available data in one policy map. The four pillars will not be the way. When are the quality and quantity of baseball there is a human resource? Approximately 20,000 HR required for geospatial. Without a strong Human Resources later ruled a foreigner, "he said. What does the impact of this policy on the entrepreneurship and innovation? The impact will be a challenge that the government will release the regulation to ease the business to get access to the spatial data in the form of more detail scale. A businessman can identify easily the location and potential business will be created.

2 Business Intelligent

Another development in business development using geospatial data-what it is called a Business Intelligent [8]. Business intelligent is a technology-driven process for analyzing data and presenting actionable information to help executives, managers, and other corporate end users make informed business decisions. Business Intelligence is a widely used management term which refers to the applications and technologies available that gather and analyses data about the company’s operations. Managers are therefore able to make more informed decisions about the current and future aspects of the company by understanding historical trends and operations. Geospatial data is usually used to define data and the associated technology that has a geographic or locational component – such as coordinates, address, city or postal code. Combination of Geospatial data with Business Intelligence, we may improve decision making which can lead to new revenue opportunities, improved cost visibility, and better risk management. There are many systems and sensors on the market that can capture geospatial information – we believe that the real value lies in the end result – this is why we sell solutions and not just products. 3D Laser Mapping, for example, is committed to helping customers be successful.

Figure 2: Flow chart of Business Intelligent Process [9].
3 Challenges And Opportunities

The Fourth Industrial Revolution has the potential to raise global income levels and improve the quality of life for populations around the world. However, the question to be raised is how prepared we are in facing this era. To date, those who have gained the most from it have been consumers able to afford and access the digital world; technology has made possible new products and services that increase the efficiency and pleasure of our personal lives. To date, for example, booking a flight, buying a product, making a payment, listening to music, watching a film, or playing a game—any of these can now be done remotely, and it using technology that support geographic location.

The challenge in the future is, can technological innovation will also lead to a supply-side miracle with long-term gains in efficiency and productivity? Transportation and communication costs will drop, logistics and global supply chains will become more effective, and the cost of trade will diminish, all of which will open new markets and drive economic growth. As we realize that the Industrial Revolution 4.0 will also profoundly impact the nature of national and international security, affecting both the probability and the nature of the conflict. The history of warfare and international security is the history of technological innovation, and today is no exception.

Neither technology nor the disruption that comes with it is an exogenous force over which humans have no control. All of us are responsible for guiding its evolution, in the decisions we make on a daily basis as citizens, consumers, and investors. We should thus grasp the opportunity and power we have to shape the Industrial Revolution 4.0 and direct it toward a future that reflects our common objectives and values.

The challenge facing related geospatial technologies for current utilization is the readiness of the human resources and technologies that can propel an acceleration in creating entrepreneurship in accordance with the demands of national development within the mission of long-term national development 2015-2025. There are several points that can be expressed in the utilization of geospatial data for the acceleration of the development and business development among other related Geospatial Business: planning the future, utilization of Geospatial Data in the entrepreneurship and innovation-based spatial data. To meet the above challenges, the necessary studies related to the utilization of geospatial technologies.

4 Conclusion

Geospatial data analysis tool to synergize with other data that can be integrated with product analysis and business innovation development opportunities, allowing the users this data will continue to evolve. The enactment of a policy map and the use of geospatial data available will create economic efficiency and will simplify the process of licensing effort because the geographic and location information, i.e. geocoding can be easily obtained. The reference base map as the basis for decision policy will improve the accuracy of location-related information from a variety of economic activities. This condition will provide certainty in an attempt, by itself will create new entrepreneurship in order to anticipate the industry disruption 4.0 era.

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