Development of Local Potentials Through Efficiency of Aloe Vera Farming in Sleman

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Abstract. This study aims to analyze the profit efficiency of aloe vera farming in Pakem, Sleman Regency. The approach used in this study is Stochastic Frontier Analysis (SFA) with the Stochastic Translog Profit Frontier model. The results show that the average profit efficiency of aloe vera farming is still not optimal, which is 43.64%. Moreover, the results also show that younger farmers were more efficient than older farmers. In addition, the variables of education, the number of families, and the number of people financed are not significant to profit efficiency.

Keywords: Profit efficiency, Stochastic Frontier Analysis (SFA), Aloe Vera Farming

1 Introduction

Production efficiency is very important because it reflects the performance of the business. This encourages researchers to identify the performance of a business unit using an efficiency approach. The development of studies on efficiency has increased in recent years. The latest research on efficiency uses the profit efficiency approach. The concept of efficiency aims to measure the ability of a business unit to gain profit with its optimal profit limit [1].

The concept of profit efficiency is better than cost efficiency for evaluating the company's overall performance because this concept is able to identify errors both from the output (sales) and input (prices) [2]. Moreover, profit efficiency can represent overall efficiency conditions (production and cost efficiency). Thus, if a business unit profit is efficient, it will also be efficient in terms of costs and production scale [3]. Then, many studies on profit efficiency have been carried out, one of which is in agriculture such as rice farming [4][5][6][7], vegetable farming [8], and corn farming [9].

The development of efficiency studies in the agricultural sector is very important to discuss. It is because of the benefits of the agricultural sector which can support the lives of many people and provide special benefits in the health world such as for medicines and raw material needs in the industrial sector. One type of agricultural sector that also important is aloe vera. Aloe vera plant is a multifunctional plant, used as an ornamental plant, health food ingredient, industrial material, and medicinal plant [10].

This type of aloe vera plant is called an amazing plant or miracle plant because its benefits have been developed in developed countries. This plant can be used as a superior commodity considering the benefits and economic value is high enough. Until now, most Aloe Vera plants are processed into food and beverages [11]. In addition, the leaves of this plant contain

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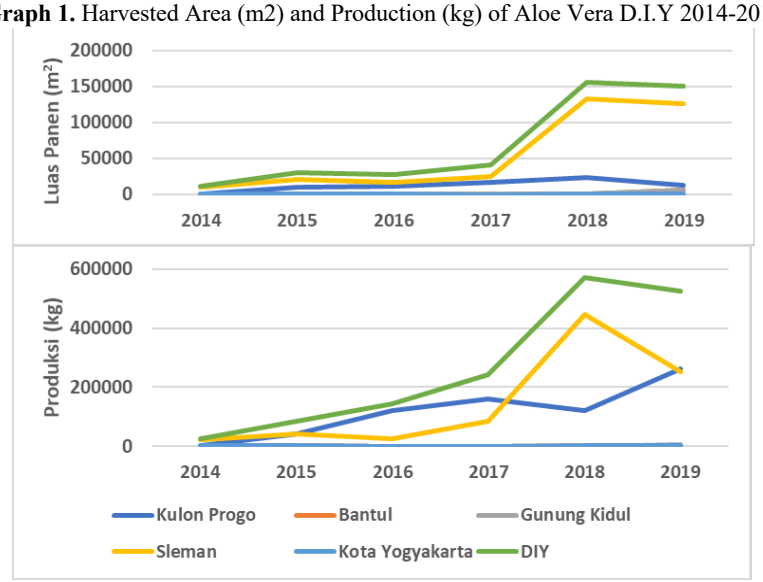
compounds of carbohydrates, proteins, lignin, saponins, aloin, tannins, glucomannans, enzymes, vitamins A, B1, B2, C, E, and minerals that react in synergy [12]. Because of the benefits of aloe vera, there will be more farmers who will cultivate this type of business. It also encourages researchers to research from the economic aspect with efficiency measurements to determine the performance of farmers.

Province of Daerah Istimewa Yogyakarta (DIY) is an area with a fast-growing aloe vera plant. BPS Yogyakarta (2020) noted that in 2018, the harvested area of aloe vera plants increased by 11.5 hectares or 281% compared to the previous year. This was also followed by harvest production which increased by 328 tons or 136% compared to 2017. Even though in 2019 it experienced a slight decline. Graph 1 shows that Sleman Regency has the highest contribution of the land area and total production of aloe vera in D.I.Y Province. In 2018 and 2019 the contribution of aloe vera harvested area in Sleman Regency was almost 85%, while production decreased from 447.5 tons (78.5%) in 2018 to 252.5 tons (48%) in 2019 (BPS Yogyakarta, 2020).

Graph 1. Harvested Area (m2) and Production (kg) of Aloe Vera D.I.Y 2014-2019



BPS Yogyakarta (2020)

According to Kusumawaty et al. [13] states that if viewed from the production potential and price, aloe vera commodity has very promising prospects. However, in the marketing subsystem of aloe vera agricultural products, there are various problems such as the market's ability to receive aloe vera production is still limited. The marketing area and quantity are limited so the farmers reduce the amount of production. In this situation, it is important to analyze the efficiency of aloe vera cultivation and its future prospects.

Study about efficiency using the Stochastic Frontier Analysis approach usually considers other variables than input factors. In the case of agriculture, some variables are considered such as age, education, or family size. These variables are thought to affect the inefficiency of the agriculture business. According to Pilar et al. [14] when included in the model, it is called the inefficiency effect function. Nganga et al. [15] states that the higher the education owned by the business owner, the higher the efficiency of their business. It is also in accordance with

the result of the study in corn farming and rice farming [9][6][7]. However, Anang et al. [16] states different results, because the higher the level of education, the lower the efficiency.

Moreover, previous studies state that business owners with a younger age can increase their business efficiency [8][17]. While other studies state the opposite result that younger business owners tend to have a negative influence on the efficiency of the business profits [6][16]. Then, according to Manurun et al. [18] states that the number of people financed by corn farmers in Tuban has a negative impact on business efficiency, which is different from Sari et al. [19] who states that the number of people financed has a positive effect on the business's efficiency of cocoa plantations in Lampung. In addition, Yusuf [20] states that the number of families is able to encourage the level of efficiency of farming in Ciamis to be more efficient. However, Susanti et al. [21] states different results regarding the efficiency of the lobster business in Lombok that the number of families has a negative effect on business efficiency.

Based on a review of previous research, education, age, number of families, and number of people financed are considered as factors that are thought to affect business efficiency. Therefore, this study will identify the efficiency of aloe vera farming profit in Pakem District, Sleman Regency. This study uses the stochastic frontier analysis method. This method is used because it produces calculations about the value of efficiency and the value of the factors that affect the level of efficiency [22]. The results of this study are expected to become a consideration for aloe vera farmers, aloe vera entrepreneurs, and policymakers to develop their business potential based on profit efficiency analysis and factors that affect profit efficiency.

2 Method

This study uses profit efficiency stochastic frontier analysis (SFA) which is an approach to efficiency analysis using statistical calculations or value estimation using error rates [23]. This study uses cross-section data obtained from interviews and questionnaires. The data consists of output variables, input variables, and inefficiency variables. Sources of primary data obtained from the sample of 35 aloe vera farmers in Pakem, Sleman. The model used in this study is written in the following equation:

$$Ln\left[\left(\frac{\pi}{w_3}\right)+\left|\frac{\pi}{w_3}^{min}+1\right|\right]=\alpha_0+\alpha_j\ Lny_{j.i}+\sum_{l=1}^{2}\beta_l\ Ln\left(\frac{w_{s.i}}{w_{3.i}}\right)+\frac{1}{2}\sum_{j=1}^{2}\alpha_j\ Lny_j+\frac{1}{2}\sum_{s=1}^{4}\sum_{r=1}^{3}\beta_{s.r}\ Ln\left(\frac{w_{s.i}}{w_{3.i}}\right)Ln\left(\frac{w_{r.i}}{w_{3.i}}\right)+\sum_{j=1}^{2}\sum_{s=1}^{2}\rho_{js}\ Lny_{j.i}\ Ln\left(\frac{w_{j.i}}{w_{3.i}}\right)+\beta_l\ t+\frac{1}{2}\ t2+\sum_{l=1}^{2}\beta_l\ Lnx\ .t+v_i-u_i$$

$$u_i=\sum_{k}^{4}\delta_k Z_{k.i}+\epsilon_i$$

With:

θ_n = Minimum Absolute Value of Aloe Vera Business Profit *n*. constanta

$\theta_{n=}\left|(\pi_n)^{min}\right|+1$

π_n = Total *Profit* of Aloe Vera Business *n*
w_i = Input cost *j* of Aloe Vera Business *n*
y_i = Total output *k* of Aloe Vera Business *n*
t = Time (technology)
u_i = Controllable error factor
v_i = The random error factor that uncontrollable

3 Result and Discussion

2.1 Respondent Characteristic

Table 1. Respondent Characteristic

Age	Percentage	Number of families	Percentage	Education	Percentage	Land area (m^2)	Percentage
35-40	17.14%	1	2.86%	SMA	57.14%	<20	28.57%
41-45	25.71%	2	5.71%	D3/S1	42.86%	20-50	54.29%
46-50	17.14%	3	25.71%			50-100	5.71%
51-55	22.86%	4	45.71%			>100	11.43%
56-60	11.43%	5	20.00%				
61-65	2.86%						
66-70	2.86%						

(Primary data processed, 2021)

The age of aloe vera farmers is relatively varied at various age levels. However, table 1 shows that there are no farmers under 35 years old. Regarding education, all respondents have a high school educational background and above. In addition, aloe vera land ownership is relatively small, because 83.86% of respondents own land under 50 m^2.

2.2 Profit Efficiency

Table 2. Maximum Likelihood Estimate (Translog Model)

	Coefficient	Standart Error	t-value
LN (Y)	17.360	3.653	4.753**
LN ((W1)/(W3))	1.687	9.350	0.181
LN ((W2)/(W3))	16.045	13.025	1.232
1/2ln(y)2	-0.703	0.217	3.249**
1/2LN(W1/W3)2	1.346	0.403	3.34**
lnw1/W3*lnw2/W3	-0.439	0.249	-0.177
1/2ln(w2/W3)2	0.283	0.294	0.962
lny*lnw1/w3	-0.234	0.205	-1.139
lny*lnw2/w3	0.026	0.183	0.141
T	-1236.147	1.933	-639.514**
1/2(T)2	1424.267	1.298	1097.516**

	Coefficient	Standart Error	t-value
T*Y	-90.478	19.928	-4.541**
T*ln(W1/W3)	0.294	107.258	0.275
T*ln(W2/W3)	-192.832	148.244	-1.301
Education	-0.003	0.078	-0.044
Age	0.013	0.005	2.398**
Number of family	0.050	0.061	0.824
Number of people financed	0.023	0.066	0.348
Sigma^2 (σ^2)	0.035	0.009	3.716**
Gamma (γ)	1.000	0.190	5.255**
log-likelihood			9.109

**significant by 5%

(Primary data processed, 2021)

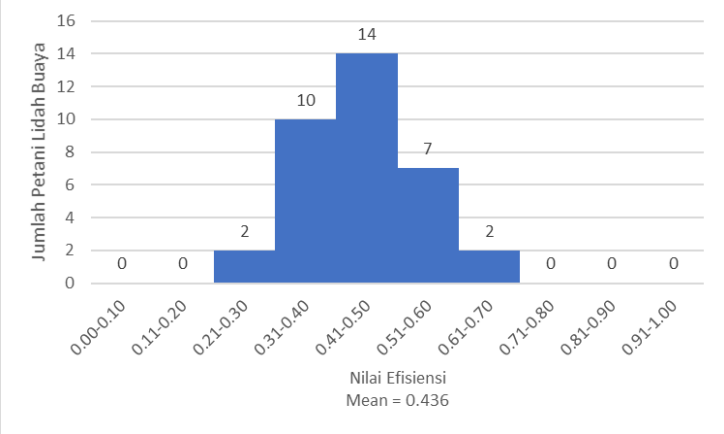
Based on the results in Table 2, the Maximum Likelihood Estimate shows that the parameter value is sigma-squared (σ2) which shows the total variance of the inefficiency effect (ui) and noise effect (vi). The calculation results obtained that the 2 t-value is 3.716 which means it is significant with a coefficient of 0.035 so it can be concluded that the model used is correct and the ui and vi errors spread normally [21]. Based on the value of gamma (γ), t-value shows 5.255 and means significant with a coefficient of 1.000. This can be interpreted as the influence of the inefficiency effect is dominant on the model.

Previous research shows that increasing age will increase the efficiency of business profits, due to experienced business owners [17][24][15]. In contrast to the results of this study where the age coefficient has a positive and significant sign of 0.013. It indicates that younger aloe vera farmers are more efficient than older aloe vera farmers. According to Tahir et al. [25] the reason that can explain this result is that even though the farmers are old, they will not necessarily use the farming technology or modern tools.

Then, other variables, such as education, number of families, and number of people financed are not significant in influencing the profit efficiency of aloe vera farming in Pakem District. However, the education variable has a negative value in line with the research conducted by previous researchers [17][24][26]. While the variable number of families and dependents has a positive value of 0.05 and 0.023. his is different from what Aligori [27] states that households with large families are more efficient, most likely because they are trying to achieve higher incomes. Children in the household who are quite old will contribute significantly to household farming activities.

Family members can be counted as workers. However, when family members involved in the business are generally teenagers and still of school age, they are not very motivated to participate in the business. Assuming this work is only limited to helping the head of the family to use their time. In the case of aloe vera farming, 83.86% of respondents own land under 50 m2. It becomes the reason that the number of families who can be additional labor less needed because of the small area.

Graph 2. Efficiency Value



(Primary data processed, 2021)

Graph 2 shows that Aloe Vera Farmers in Pakem District have varying efficiency values. Most were dominated in the range of 40%-50% and 30%-40% as much as 68.57% of the total respondents. Overall, aloe vera farmers have a relatively low average value of profit efficiency, which is 43.64%. This implies that there is a profit inefficiency of 56.36%. Based on this, it can be concluded that the maximum potential profit of 56.36% is lost due to inefficiency.

Efficiency is a relative measure and is actually abstract. In daily practice, an individual producer will realize the essence of efficiency only if the inefficiency they experiences actually results in a number of measurable losses. In aggregate, the ongoing inefficiency in a fairly long time will be very detrimental. Socially, there is a waste of scarce resources along with the increasing demand and the process of degradation.

Actually Sleman Regency has the largest production contribution to aloe vera farming compared to other districts in D.I.Y. Based on this condition, there are several ways to develop the potential of aloe vera farming. In terms of output, the aloe vera harvest can be processed into several derivative products so that there is added value and increases profits. The varying efficiency values between farmers indicate that there is no homogeneous expertise. Based on this condition farmers need to share their experiences and expertise with each other. It can be more structured within the organization or cooperative. Furthermore, the large area of harvested land and the total production of aloe vera in the Sleman Regency has the opportunity to attract cooperation with external parties or investors. Thus, aloe vera farming in Sleman Regency can be further developed through collaborative programs. In addition, when production can be managed both in quantity and quality, it can create opportunities for export or cooperation with companies.

4 Conclusion

The result shows that the profit efficiency of aloe vera farmers in Pakem District, Sleman Regency is still relatively low, because the value is 43.64%. Based on this, further improvements are needed both in terms of input and output factors. Thus, higher efficiency

can be achieved. Furthermore, the results show that younger aloe vera farmers are more efficient. This is because younger farmers have more skill and knowledge over farming technology than older farmers. In addition, the variables of education, number of families, and number of people financed do not have a significant impact. However, the education variable has a negative effect in accordance with the theory which states that education will reduce inefficiency. The results of the study provide managerial implications to overcome the value of profit efficiency that has not been maximized. Business owners and stakeholders may consider improving the skills and performance of young farmers through training and development programs. In addition, it is also necessary to motivate older farmers to be open to the development of agricultural technology. Furthermore, it is necessary to create an organization to facilitate farmers in sharing expertise, sharing solutions to their business problems, and developing product diversification. The potential for cooperation with companies and investors also needs to be empowered to develop the business potential of aloe vera. This study conducted limited on Pakem District with a limited number of respondents. Further studies can develop the number of sample sizes in a different farming area or different types of farming production.

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