Communications of Innovation for Supporting Farmer Empowerment and Productivity in The Digital Era

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Abstract. Food crisis has become the nation's severe problem due to a significant decrease in rice production. This decline was thought to be closely related to empowerment and farmers' access to innovation communication, especially with digital communication technology in agriculture. So we aimed to analyze the determinants of productivity levels and design a digital innovation communication strategy to increase farmer empowerment and productivity. We used a survey to extract qualitative information from related sources. The results showed that the level of farmer empowerment directly influenced farmer productivity and indirectly influenced positively by the use of innovation communication technology (ICT), individual characteristics, farmer innovative activities, and vice versa, indirectly negatively influenced by environmental support. The role of digital ICT was significant in increasing farmer empowerment and productivity. Environmental support has a negative effect on farmer empowerment, meaning that dominance in the intervention of farmers leads to dependency or helplessness.

Keywords: communication of innovation, digital communication, farmer empowerment, farmer productivity.

1 Introduction

The decline in agricultural productivity, in this case food and horticulture, has occurred in several villages in Indonesia. The decline in productivity occurred in food and horticulture productivity was marked by the decline in rice productivity. Food, especially rice, is a severe problem in national life in Indonesia. There has been a significant decrease in rice productivity in the last five years, around 3.4% (BPS, 2019). This decline in rice productivity was thought to be closely related to the level of empowerment and farmers; access to innovation communication, especially with digital communication technology in agriculture. In this industrial 4.0 era, a basic downside in agricultural consultative services is that advisors or sources of knowledge develop innovatively, up-to-date and sensitive in the form of information on an ongoing basis. Facilitators are constrained by limited access to knowledge or the latest information that contains what farmers need due to key stakeholders and and policy makers on agriculture. This becomes a major concern if we see that the government has issued regulations that stipulate that agricultural research institutions are required to find and disseminate

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information about agricultural technology from upstream to downstream. The Innovation Center has the task of managing the development and improvement of the capabilities of agricultural facilitators through a continuous education process. The task of the facilitator will be more difficult and will not last, so an appropriate program is needed. Many things have been done but have not been able to solve the problem. Findings related to agricultural technology cannot be applied optimally [1]. The agricultural community empowerment program that has been carried out by many parties has not been able to solve the problems of the agricultural community. A participatory approach is needed to meet the needs of the agricultural community. Many studies concerning agriculture and technology by various parties were out there in the forms of ideas, technology, and knowledge. However, not all of those efforts find the actual problems faced by the farmers. As a result, the link between farmers and the government and the source of innovation is not facilitated. Stakeholders have their own needs that must be implemented and fulfilled. At a time when the community lacked extension workers as facilitators to meet their information needs, the Covid 19 outbreak came. As a result, it became increasingly difficult for extension workers to facilitate agricultural communities. The Covid-19 pandemic has not yet been completed, yet other types of variants have emerged which cause the length of time needed to return to normal for extension workers to facilitate agricultural communities. This incident forced the counseling to be done online or by using a cyber extension base on information and communication technology [2]. Digital non-formal education is very much needed and must be accustomed to during the post-Covid 19 pandemic because of the limited reach of the individual concerned in one face-to-face while the extension worker performs the function of a facilitator. The limited number of extension workers makes communication towards digital innovations supposed to be the solution to the problems so far. Therefore, farmers were given the education several times to access the information they need regarding issues related to agricultural problems they have via virtual meetings, video tutorials, or smartphone applications that have access to an internet extension.

Information processing theory will explain communication from a systems theory perspective, which usually comes from the data integration topic [3]. Communication system is a relationship of influence between one element with another element. The interaction that occurs is an interconnected unit as a system in sharing information. The theory of cybernetics is a communication science that includes the perspective of sharing information in a communication network system. Information system is a communication whose elements are interrelated so that it is a part that mutually influence each other in the process of sharing information continuously, so that they can support each other. This study deals with how the main actors and business actors in the agricultural sector innovate in obtaining and disseminating information by utilizing digital technology to meet the needs in the agricultural sector. [4]. The advantage of using big data technology from a communication perspective is that it can help humans to work and collect information quickly and make humans not have to do primary communication to be able to convey or disseminate information so that it can speed up the process. [5]. Results and evidence related to experiences and success stories in maximizing the use of information and communication technology have been shared by many researchers. [6, 7, 8, 9, 10, 11, 12, 13]. Regarding the use of information and communication technology in agriculture, there are still extension workers who think that the use of cyberextension is not suitable for many farmers in Indonesia. In addition, the infrastructure is also not evenly distributed to support cyberextension [14]. Even farmers feel that they do not have the right agricultural innovation information to support their work and enhance their capabilities. Innovations created and delivered through the

media online Cyber expansion, the impact of these innovations is difficult to measure individually. Those who embrace innovation find it difficult to feel the consequences of embracing innovation immediately [4]. The unavoidable consequence is the intertwining of social culture and values associated with the selected innovation. The impact of innovation consists of practical consequences. [4]. The shortage of knowledge on the market trend for holticultural commodities in terms of types, amount, and quality had become an issue in rising smallholders's farmer. In some areas people produce excessively, whereas there were scarcities of the items in other regions. The information regarding updated market trends is crucial because, in coming up with what crop to cultivate, correct and updated statistics is required to improve farming productivity. Through the analysis administrated by familiarizing big data to the agricultural sector, the community leaders may understand what selections to cultivate, wherever to seek out new financial gain prospects, and that produces provided are possible to satisfy consumer needs or to come up with commercial industry [15]. Therefore, farmers' lack of data concerning market demand may be resolved by providing the mandatory updated information within the cyber extensions plate created smart smallholder farmers to utilize cyber extensions in order that their capability thrive better than subsistence ones. People who use cyber extensions or able to utilize information via the internet have higher chance to achieve success in developing their farms even if they do not manage large areas. The dissemination of agricultural innovation faced difficulties because the gap in technological that might be due to the lack of infrastructure and socio-economic constraints [16]. The low stage of cyber extension usage via way of means of the farmer respondents could result from language barriers, high costs, and consequently the notion of holding the statistics and Communication Technology (ICT), despite its excessive capability benefits. Vital and pressing problems concerning variations in so many men's capabilities to access the information, we have a tendency to re to be resolved instantly within the current agricultural establishments and in the future [17]. Supporting issues, including research on the adoption of rice technology innovations, states that innovation communication factors play a major role that can affect technology adoption, where extension workers as agents of change receive positive appreciation from farmers [18]. Innovation communication is important to study because it can affect agricultural productivity in Indonesia, where productivity and access to information itself make farmers empowered and able to develop their agriculture in a sustainable manner so that agriculture in Indonesia could be advanced, not abandoned by the younger generation and reduces imports of raw materials and their processed products in Indonesia.

The research aims to analyze the determinants of productivity levels and design a digital innovation communication strategy to increase farmer empowerment and productivity. The scope of this research is about communication innovation, optimization of ICT, farmers using smartphones in the digital era, and agricultural productivity.

2 Method

This research activity has been carried out from December 2020 to March 2021 (for 5 months). The research was conducted in Bogor Regency by taking villages with agriculture and supporting infrastructure to use or access digital information. Determination of the location was chosen purposively. This study took the location as a sample of two research areas in West Java Province, namely Bogor Regency, by considering agricultural conditions in Bogor Regency.

The selection of research sites by considering the characteristics of agriculture in the research area. The characteristics of Bogor Regency in figures (2018) in 2017 in Bogor Regency, the harvested area of lowland rice was 89,637 Ha. The harvested area of upland rice was 1,325 Ha with productivity 60.33 Kul/Ha and 34.83 Kul/Ha, respectively. The production of lowland rice in 2017 was 540,800 tons and field rice 4,613 tons; Bogor Regency also has other agricultural businesses that are no less potent, such as fisheries and animal husbandry. Village elections are considered to be able to represent the community population that represents access to information in Bogor Regency.

The determination of the village as the research location was carried out intentionally based on the consideration that the village has and is implementing an agricultural empowerment program by considering: 1) gaining access to online information; 2) inhabited by the majority of people with the dominant livelihood in the food agriculture and horticulture sectors; 3) heterogeneous population characteristics in terms of education level, social status, and customs.

Tugu Jaya Village represents the population of rural areas in Bogor. The village has solid agricultural characteristics because it has advanced food and horticulture agriculture, is located quite far from the city of Bogor, and is on the border with Sukabumi Regency. TuguJaya Village has an Agricultural Technology Park resulting from cooperation between the agriculture department and IPB as a source of innovation. So it is necessary to investigate whether the development of agriculture in the middle of the city is influenced by innovation communication because it is close to the source of innovation and the availability of access to digital agricultural information. As an illustration, the farmers in this research area are divided into ten groups, each group consisting of five to eight people: most farmers who specialize in food and agriculture products and two clusters of girls farmers. Farmers group consists of agricultural extension and also the Agricultural Technopark within the village. The Agricultural Technopark served to support farmers and was a model for integrated agriculture. The instititution encompassed the agriculture (including holticultures), animal husbandry, and fisheries sectors. Potential commodities in Tugu Jaya Village were, among others, rice, eggplant, chili peppers, and long beans.

Field data collection techniques were carried out through observation, surveys, and interviews that were carried out on the target of the study. In survey research, information is collected from the sample using a questionnaire. Generally, the notion of a survey is limited to a study **that collects** data from a population sample to represent the entire population. Sample data were obtained through survey techniques supported by in-depth interview techniques. There are three objectives in the research, namely:

1. Knowing the dominant factors that influence farmers to adopt innovations among communities in Bogor Regency in the digital era

2. Analyzing the determinants that affect agricultural productivity and the level of empowerment among the people in Bogor Regency

3. Analyzing the role of innovation communication in productivity and community empowerment

In this study, the research population is the people who are directly involved in the empowerment program in West Java Province by taking locations in Bogor Regency. Population areas are heterogeneous in terms of area characteristics, namely highlands and

lowlands in rural and urban areas. At the same time, the probability technique used in determining the location was by selecting sample subjects based on a predetermined population area. Sampling was carried out by probability sampling. This sampling technique provides equal opportunities for each element (member) of the population to be selected as a member of the sample in the study. The location was chosen because, in Bogor Regency, there was an agricultural community that utilized internet technology. The population of this study was the number of farmers who received farmer cards in Tugu Jaya Village, District. The population of farmer card recipients in Tugu Jaya Village is 246 people.

The research sample was determined based on the population of the number of heads of families at the village level with a sampling technique based on the formula of Isaac and Michael. The selection of respondents was carried out by Cluster Random Sampling; the sample plan was taken by probability sampling, which is one of the sampling techniques that provides equal opportunities for each element of the population to be selected as a member of the sample. Random sampling or random from the population. Respondents selected as samples were proportional in number. A sample of farmers with food crops and horticulture farming was obtained with a proportion of 120 people in Tugu Jaya Village.

Primary and secondary data were used in this study. Primary data is information obtained by investigating the field in the form of: (1) the instrument is a questionnaire with a set of written questions to the sample to be answered. Questionnaires were given to 120 farmers in the field of food crops and horticulture in Tugu Jaya Village in Bogor Regency. (2) In-depth interviews are used as a data collection technique to support quantitative data conducted in the research using apt sources.

Information collection techniques included interview strategies, direct remark, and online information. Primary information was acquired with through conducting dependent interviews with key informants or sources. The informants had involved key informants leader and actors within the agricultural sector The primary informants were advisers from advice centers and community farmers, a total of 15 people, including; extension coordinator, an extension of the civil service, an employee of Agricultural technopark, the related department of the Ministry of Agriculture of the Republic of Indonesia, coordinator of the farmers' groups, secretary of the association of farmers' groups, two farmer group administrators, three farmer business actors, two young farmers, three village officials. Secondary data were obtained from the study reports, the city village office, and related government agencies. Sampling used was a technique where the sample was by means of a snowball method or by a referral system.

The information analysis method turned into completion through categorizing cluster statements and analysing them statistically to answer the problem. The commitment to indexing or compiling the statements and information was encouraged by the previous measures of government recommendation to distribute the information to the farmers. The information related to the farmer’s need and the form of messages and packaging that were convenience to the farmers need. All the collected data and information has been commited into specific labels: "questions of how to access the information," "digital information required by farmers," and "the utilization of digital media" the info was then gathered, analyzed, and concluded. The processed information transformed and then checked to validate the integrity and validity of the information. The validity of the information was performed through double checking by scrutinizing and studying all primary information from interviews and secondary facts.

3 Results and Discussion

3.1 Communications Of Innovation For Supporting Farmer Empowerment

The attempt to elevate the usage of digital information media had improved the development for agricultural extension in Tugu Jaya Village. The extension officials had an issue in commuting from the area that had relatively high case of Covid-19. This situation necessitate them to conform with the health protocol to visit Tugu Jaya Village, which had relatively low case. At times the extension workers were restricted from conducting face-to-face visits. The readiness of extension workers with the idea of digital agricultural information that was assisting the farmers through mobile phones or other digital communication media had become important to maintain the dissemination of agricultural innovation to Tugu Jaya Village. The situation is presently called the new normal; where the extension workers were hindered from visiting farmer agencies in Tugu Jaya Village, Cigombong sub-district, because of the Covid-19 pandemic. There was an urgency to utilize of digital media for coordinating with the farmer concerning extension program‘s schedules, calculations for the aid programs (e.g. fertilizers and seeds), and the cutting edge innovations to be included within the big data. The extension workers could convey numerous information without the limitation of time and space. In the of the community leaders' assembly concerning the extension's readiness to elevate the level of digital information use in the village, the Tugu Jaya Village Extension worker delivered the following statement:

"As an extension worker who assists farmers, especially in assisting farmers in this area (TuguJaya village), we have passed training related to the cyber extension. The cyber extension itself in this village has been supported by computer devices that have been connected to the internet network that can be used by farmer groups freely for farming purposes, located in the joint office of farmer groups. To collect data on farmers, we divided several groups based on the plants they cultivate, the area of land, and the number of workers. The data is used to distribute grants from the government according to the needs of farmers. Grants from the government can be from agricultural production equipment, fertilizers, seeds, and medicines for plants. In fact, it is assumed that the extension worker readiness for cyber extension is adequate; The problem lies in individual farmers who are generally old, so they are not proficient in operating gadgets. Gadget operations are carried out by farmers, and some even have to be assisted or guided by their relatives or families. In addition to the problem of individual skills, the problem is also in the infrastructure (the highlands of Tugu Jaya Village); the internet network is not evenly distributed." (CRI, 2021).

The information from the extension workers in Tugujaya Village then processed digitally so that it may be accessed openly, particularly by the farmers. This phenomena was also observed in other researches about establishing big data for agriculture [18, 19]. The extension worker statement regarding the farmers' issues in accessing digital information was complemented by the Tugu Jaya farmer group's coordinator, who plotted his land with chili. He stated that the information about his chili cultivated farm had been more comprehensive covering the legal consent, the land location, the amount of fertilizers needed, and the commodities. The interview with coordinator of the farmer organization were translated as follows.

"As farmers in this village, we have been inputted into data related to various things, including land ownership, arable area, types of plants worked, and also the number of workers. All of that

has been stored digitally by the extension worker and can be updated at any time. The purpose of the data collection is to facilitate the distribution of aid and materials needed on the land we are working on" (CEP, 2021)

based totally on entire data that were compiled from the important thing informants and associated resources, the popularity of extension retailers readiness for the virtual extension may be depicted through the coaching that were done as follows:

1. Extension workers had participated in some tutorials to improve their skill in utilizing digital extension media or cyber extensions related to agriculture and data management. Compilation of articles and literatures on agricultural technology and improvements, data entries associated with suitable technology within the cyber extensions and the past agricultural extension program that were carried out in cyber extensions.
2. Extension workers had organized village agricultural extension posts with computers connected to the internet for farmers so they can independently obtain information on agricultural innovation and access to useful resources and improve their agricultural practices.
3. Village extension workers had established a digital extension system, which include agricultural extension data that comprises farmers' information. This digital data containing the farmer's need and other related information will be supplied to the authorities (e.g. agricultural institutions) in order to distribute useful resource, specifically fertilizers and seeds. The fertilizer quota had become more organized, specifically according to the type of cultivated areas and commodities. In order to obtain beneficial resources, the farmers have to possess farmer ID and their entry have to be recorded in the big data. Farmer ID functioned as financial affairs management (savings, transactions, and mortgages) and requirement to get subsidies or other useful benefits. This farmer ID program had been in operation because since 2018 the data had been on the digital basis.
4. Extension workers had arranged numerous coordination groups according to their commodities via the Whatsapp® (WA) platform to organize, manage data associated with agricultural innovation, and provide sharing sessions for farmers.

consequently, it is able to be stated that the extension workers in Tugu Jaya Village have been equipped to expand the virtual extension to stand the new condition social. but, it seemed that the extension employees had to put into effect it via presenting technical steering to farmers on getting data, consulting, and sharing agricultural data with their fellow farmers.

A lot of improvement in extension workers' readiness to utilize the digital technology and make use of cyber extensions, since the preceding observation implied that extension workers had been unready to help farmers in using cyber extensions at that time [20]. The mentioned study concluded that it was essential to get simpler and quicker communication alternatives to manage the agricultural information [20]. In the meantime, there has been no longer an awful lot exchange with the cutting-edge condition defined concerning farmers' readiness and condition for the cyber extension. In popular, the extent of usage of cyber extension changed into nonetheless low due to farmers' lack of knowledge of the lifestyles and advantages of cyber extension and the shortage of right functioning of corporations as a medium for sharing data and information [18, 20].

3.2 The Effect Of Farmer Empowerment On Agricultural Productivity

The empowerment of farmers has consequences on the level of agricultural productivity. The consequences can also be seen from several factors that influence it. Consequences are difficult to measure. Individuals who accept new information discover that challenging to sense the effects of accepting new information and technology directly. Results and outcomes can not be avoided from the culture and values inherent in it [21]. Measuring the consequences and effects of farmer empowerment on agricultural productivity must first look at the factors that indirectly affect the level of productivity. These factors include individual characteristics, use of ICT, innovation activity, and environment support. The results show that there is a relationship between these factors. This can be seen from the path coefficient Determinants Of Farmer Productivity Levels in Figure 1.

Table 1. Result From Path Coefficient

	Real sample	Average	Standard deviaation	T Statstistic	P value
Innovation activities to farmer empowerment	0.159	0.168	0.121	1.314	0.189
Environmental support to farmer empowerment	-0.226	-0.199	0.112	2.013	0.045
Individual characteristic to Farmer empowerment	0.397	0.382	0.143	2.776	0.006
The use of ICT to farmer empowerment	0.465	0.461	0.070	6.650	0.000
Farmer empowerment to innovation activities	0.632	0.631	0.053	11.835	0.000

From the path coefficient, the results show that the level of farmer empowerment is directly influenced positively significant by the use of ICT and individual characteristics. The level of farmer empowerment is directly influenced positively, not significantly, by innovation activities (product, process, marketing). The level of farmer empowerment is directly influenced negatively by environmental support (Family, Village Government, extension worker, and infrastructure). Environmental support even makes farmers less independent (dependency).

This study showed that the level of farmer empowerment directly influenced farmer productivity and indirectly influenced positively by successively from the strongest: the use of ICT, individual characteristics, and farmer innovation activities. Farmer productivity is Indirectly negatively influenced by environmental support. This research shows that the role of digital innovation communication technology is significant in increasing farmer empowerment and productivity. Environmental support has a negative effect on farmer empowerment, meaning that dominance in the intervention of farmers leads to dependency or helplessness of farmers.

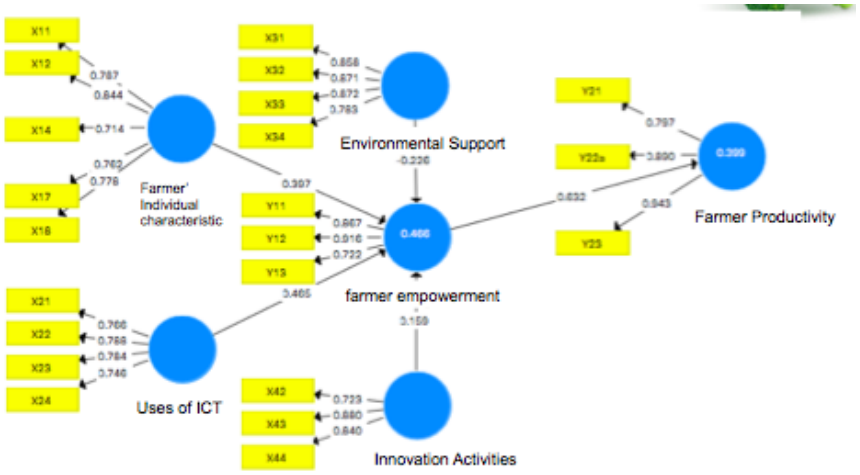

Fig. 1. Inner Model of Communications Of Innovation For Supporting Farmer Empowerment And Productivity.

Communication in this study is a way of how individuals use innovation and technology, not to spread and diffuse innovation only to how each party is ready to participate only in the communication itself. Previous studies [5, 6] state that communication technology media is very reliable in disseminating innovation without considering whether the information that is spread, especially in the agricultural sector, can be accessed by farmers like those in need. Cybernetic theory [3], which is related to decision-making theory based on the spread of information, does not adequately explain the Covid 19 pandemic era because decision making in counseling is done face-to-face and still has to wait for sources; the results of this study indicate that innovation activities are carried out in terms of communicating more impact on farmer empowerment and productivity. The results of this study are closer to the communication theory of innovation [5], where efforts are carried out by two parties, namely extension workers and farmers. Extension workers and farmers alike explore information related to the latest innovations in agriculture and capture information in obtaining information. The task of extension workers is to develop information to disseminate or produce an update (innovation) for agricultural needs.

3.3 Communication Strategy To Increase Farmer Empowerment

An effective digital communication strategy to increase farmer empowerment is carried out by determining goals, objectives, outputs, and innovation communication activities. The goal, in this research, was to become a role model for extension workers and agricultural business actors to assist how to apply of the idea of a cyber extension in information system on the village stage. Idea with research results indicators led to innovation communication by extension workers. This must be verified by field surveys, qualitative research, interviews, and focus group discussions (FGD).

The objectives was to discover the competence of extension officers and farming business actors to assist how to apply of the concept of a cyber extension database on the village to face digital technology era and identify digital information needs with messages and packaging that was

actually needed by farming actors. Thus it could encourage the realization of agricultural improvement within the digital era. This objective was carried out to obtain actual issues in the field and data that can answer existing problems by field surveys, qualitative research, interviews, and FGDs. The assumption of this goal is to get the appropriate alternatives on the issues to be able to overcome the problem of information dissemination by extension workers in the digital era.

This strategy aims to get recommendations for digital information needs with messages and packaging needed by farming business actors to be more effective to the realization of agricultural development in the digital era. The output indicator is the existence of research results that can increase knowledge related to digital agriculture cases in the era, which is verified through field surveys, qualitative research, interviews, and FGDs. The assumption is that the research results related to the case of innovation communication in increasing farmer empowerment can be a solution, especially in the digital era where extension workers have limited time to visit the farmers.

The needs of Tugujaya Village farmers was how the community can access digital information. Thus it related to the development of human resources, namely providing cyber extension training because the infrastructure already supports the availability of cellular signals and fast internet (Wifi). Tutorials to optimize the use of farmers' smartphones for productive activities that support their agricultural businesses. So that extension workers can easily provide counseling to the community because the community becomes more capable of accessing the information needed. Extension workers act as consultants to farmers for the information they have obtained from the reliable sources.

Counseling on digital developments was able to use internet applications. Digital video media or films with short durations can be used as a medium with a wide potential audience, namely media that is easily understood by audiences of various ages and education levels. Its manufacture was relatively easy because it can use a mobile phone/smartphone, it does not have to use a special camera, and the editing process can be done easily through the application on the smartphone. Extension workers had challenges keeping pace with technological developments, which have developed in a relatively short time. As an extension workers, they have to read a lot and study the changes that have occurred. Change is usually the cause of the emergence of new problems because the existence of an information system that is no longer limited by space and time can cause unexpected impacts. As an agricultural extension worker who has the task of disseminating agricultural technology, conveying new and innovative information to farmers. Creativity is needed to deal with problems that have no solution based on research and assessment results. Surely, it needs to be supported by the knowledge of the instructor, experience in the field, level of education, hard work, and discipline.

Farmers needed digital information with messages and platforms to further support agricultural development in the digital era [20]. Due to inadequate development problems, the existence of the internet for agricultural needs does not support access to the information needed. In utilizing and operating internet-based technology or gadgets themselves, farmers still experience difficulties, especially if they have to manage software updates and pay for software applications. Smartphones are only used to communicate with fellow farmers, including to share agricultural information. Some other research talked about comparable problem regarding principal weaknesses in ICT. Those are elements of restriction in their use in agriculture sector

[21, 22], for instance insufficient use of information by small dairy farmers in the dairy livestock in Africa [23].

Due to limitation in face-to-face consultation for the extension officers, information media is required to answer agricultural problems faced by the farmers. As explained by the TuguJaya group leader, the farmers need the following information:

1. The quota and requirements of fertilizer for farmers according to the cultivation area and commodities. If the farmers lack of the mentioned knowledge, the utilization of the fertilizers provided would be not optimally utilized, or worse, ineffective.

2. Appropriate and superior seeds, i.e. disease resistant seed, provided by the government aid from reliable and trusted sources that can be accessed digitally.

3. How to handle pests and plant diseases, i.e. the methods for pests and plant diseases management. For instance, pest and plant disease in chili plants, Fusarium wilt and anthracnose.

The application of Whatsapp® group in delivering digital information to the Tugu Jaya farmer groups, it had been considered practical. The farmers were more familiar in sharing information through the application. They could received the messages right after connecting to the internet on their phones. Other study also investigated the use of short messaging service (SMS) applications for gathering agricultural data [24]. The use of websites in providing accessible information had been considered impractical by the farmers. They felt overwhelmed bt web site's interface and complex information in it, in contrast, with Whatsapp®, the farmers could easily obtain the information that had been selected and filtered according to their needs.

The extension officers associated with the Agricultural Technology Park would link the sources of innovation with the subjects and performed dissemination of technology and information. The study concerning farmers in India implied that though there were many mobile applications used worldwide for various sectors, including agriculture, but their utilization remained limited [25]. A number of agricultural applications can potentially be utilized in agriculture and associated activities, as specified by their sources and uses. In India, there was a tremendous opportunities to utilize of smartphones to develop the agribusiness sector. The utilization of smartphones was crucial for rapid advancement and simple access to information for farmers. The software application was additionally mentioned by different authors who expressed that the users wished to be able to access information in real time [26]. There was a project designed to build an easy-to-use mobile application referred to as Agricultural Machinery Application value Analysis to optimise the utilization of agricultural machines on farm. Other study described the use of mobile application for selling banana by female farmers in Africa [27].

4 Conclusion

The results showed that some of the extension activities in this village were carried out online. In view of the digital age, in Tugu Jaya village, extension workers have been prepared for digital extension or cyber extension. Farmers in the village of Tugu Jaya have problems not being able to optimize their smartphones, in the case of Tugu Jaya Village due to infrastructure problems. The problem of technical maintenance has made farmers worse off. The results of this study showed that the level of competence of farmers directly influences the productivity of farmers

and is indirectly influenced successively by the strongest positive: the use of ICT, individual characteristics, innovation activities of farmers and vice versa, indirectly negatively influenced by environmental promotion. Research shows that the role of digital innovation communication technology is important in strengthening self-determination and productivity of farmers. Environmental support has a negative effect on the empowerment of farmers, which means that the dominance of "farmer intervention" leads to the dependency or impotence of the farmers. The information the farmers in Tugu Jaya village needed was information about the production facilities provided. that information including how to access them, as well as information on how to deal with pests and plant diseases according to the products practically put together by the farmer advisors to avoid selective exposure. Workers and farmer groups made use of information technology by coordinating the use of smartphones to share information about agricultural practices. Agricultural sector with digital innovation. Research and innovations can contribute to effective and sustainable agricultural development. Help consultants formulate alternative strategies for developing digital communication systems.

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