International Journal of Science and Research (IJSR)
ISSN: 2319-7064
ResearchGate Impact Factor (2018): 0.28 | SJIF (2019): 7.583

Adoption Level of the Use of Organic Fertilizer for Lowland Rice in Cikoneng Subdistrict Ciamis

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Abstract: ***The use of manure fertilizers (inorganic) tends to be excessive because it is not based on the analysis of plant nutrient requirements, because it needs efforts to increase the use of organic fertilizer as an alternative to maintaining soil fertility. A series of studies related to the use of organic fertilizer have been carried out in Cikoneng District, Ciamis Regency. The research objectives of this survey approach are: (1) to describe the level of adoption of farmers in the use of organic fertilizer for lowland rice, (2) analyze the factors that influence the rate of adoption, and (3) find a formula for increasing the use of organic fertilizer for lowland rice. The sample was determined randomly following the Isaac and Michael formula of 70 respondents. Data were collected using a closed questionnaire that had been tested for validity and reliability. The results of the study show: (1) the adoption rate of farmers is in the medium category, (2) the characteristics of innovation have a significant effect (α = 0.05) on the level of adoption of organic fertilizer use in lowland rice, (3) strategies that can be taken to increase the use of organic fertilizer are with more intensive counseling about the manufacture and benefits of using organic fertilizers***

Keywords: adoption, organic fertilizer, innovation characteristics

1. Introduction

Soil fertility is a very determining factor in the success of crop cultivation, especially lowland rice. The use of chemical fertilizers in some areas is very high and poorly controlled because it is not based on an analysis of nutrient requirements for plants. On the other hand, the use of organic fertilizer as an alternative has not been done much by farmers. According to Regulation of the Minister of Agriculture No. 130 of 2014 concerning the need for subsidized fertilizers for food crops in 2017, inorganic fertilizers (Urea, SP-36, ZA, NPK) amounted to 6,209,237 tons, while organic fertilizers were only 721,512 tons. This indicates that inorganic fertilizer is still dominantly used by farmers. Based on BPS data of Ciamis District in 2017, the total area of harvested lowland rice is 140,178 Ha.

According to the Food Crop Agriculture Office of Ciamis District (2013), a total of 26 districts run rice cultivation which is a staple farming for farmers. Of 34 subdistricts in Ciamis District, only a few subdistricts have recognized and implemented organic rice cultivation systems, including Lakbok, Rancah Banjarsari, Cikoneng,Cihaurbeti, and Panumbangan Districts. Cikoneng as one of the potential subdistricts of lowland rice has an area of around 740.26 hectares (BPS Cikoneng, 2017).

According to the Agriculture Program of 2015, the level of application of organic fertilizer is still around 25 percent even though organic fertilizer is one component of the PTT technology package that was developed from 2002, yet farmers have not used organic fertilizer as an alternative to increasing soil fertility. Based on field monitoring and secondary data obtained, supporting facilities such as markets, production input kiosks, rice mills are quite widely available. The materials needed to make organic fertilizers such as cow dung, rice husks, straw and others are also available based on a large number of farmers and ranchers in Cikoneng Subdistrict.

However, technological innovations in organic farming have not yet been fully adopted by farmers. There is no denying that changing a habit is not an easy job, especially if it has a big risk because it is associated with sociocultural issues. Farmers' understanding of technological innovation requires mental readiness to make a decision to adopt it. Therefore, we need an in-depth research entitled the level of adoption of farmers in the use of organic fertilizer for lowland rice in Cikoneng Subdistrict. The objectives of this research were to: (1) describe the level of adoption of the use of organic fertilizer for lowland rice, (2) analyze the factors that influence the level of adoption of the use of organic rice, and (3) find models and strategies to increase the level of adoption of organic fertilizer for lowland rice in Cikoneng Subdistrict, Ciamis District.

2. Framework

Acceptance of innovation is determined by many factors, such as factors that originate from the attributes of the innovation itself, the recipient's characteristics, or other factors. Organic fertilizer is a technology that is recommended as an alternative fertilizer and additional fertilizer to improve soil fertility. In this research, these factors will be examined on how much effect on the application of organic fertilizer for lowland rice farmers in CikonengSubdistrict, Ciamis District. The effects of research variables hypothetically are presented in Graph 1.

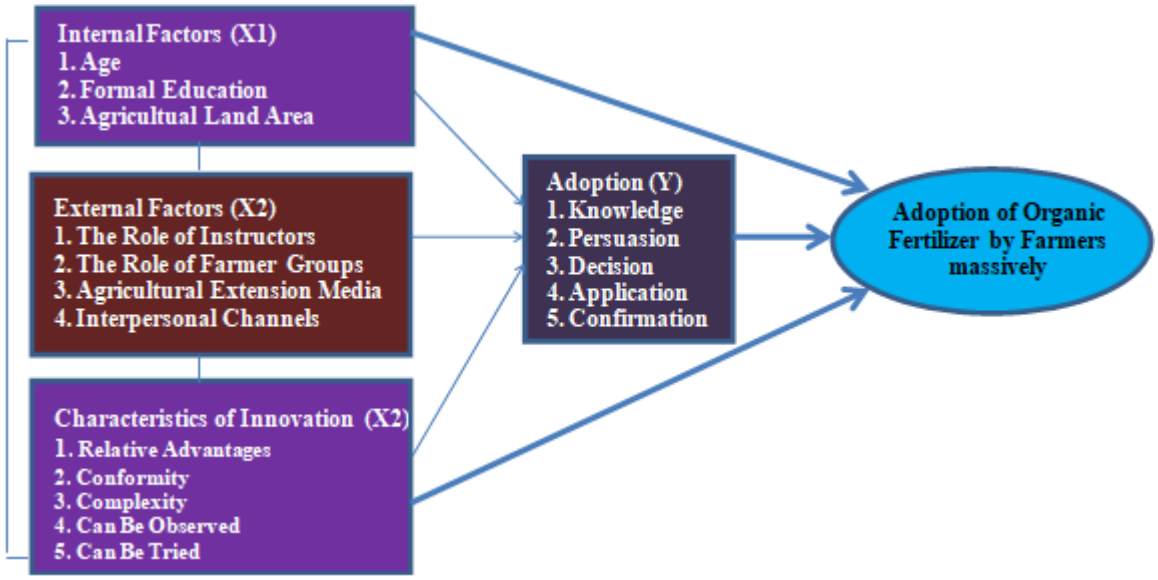


Figure 1: Hypothetical Framework for Research Variables

3. Research Methodology

The research was conducted for three months (April 22 to July 26, 2019) in the villages of Gegempalan and Sindangsari, Cikoneng Subdistrict, Ciamis District. The research population was farmers from eight groups of food crop farmers with a total of 233 people. The sample selection method is random sampling. Respondents were selected at random who were believed to be able to represent the true population. The sample size in this research were 70 people and counted proportionally for each group.Before being used, the instrument in the form of a questionnaire was tested for its validity and reliability with the results of the Cronbach's Alpa 0.979 test, which means that the questionnaires have high reliability so that it could be used as a data collection tool. Likewise, the validity test using the Pearson Correlation formula showed that all 48 items submitted had r> 0.3 so that all questions submitted are valid.The data collected consists of primary and secondary data. Primary data were obtained directly from respondents through interviews and field observations. While secondary data were obtained from books, scientific journals, farmer group documents, and BPP reports of Cikoneng Subdistrict. The collected data were analyzed descriptively using multiple linear regression. Data analysis was performed using the *SPSS version 21* computer software program.

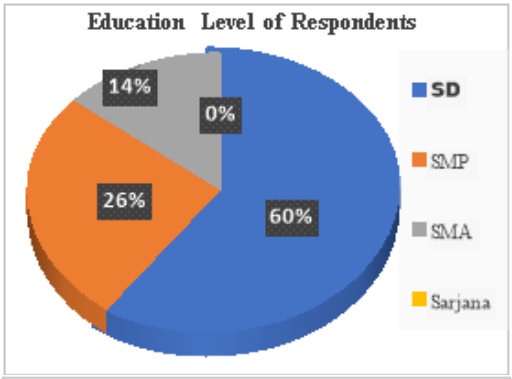
4. Results and Discussion

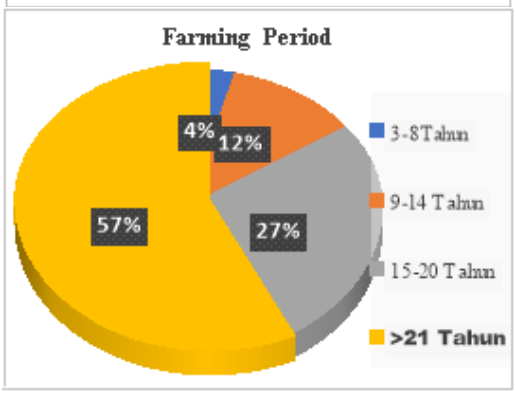
4.1. Regional Characteristics

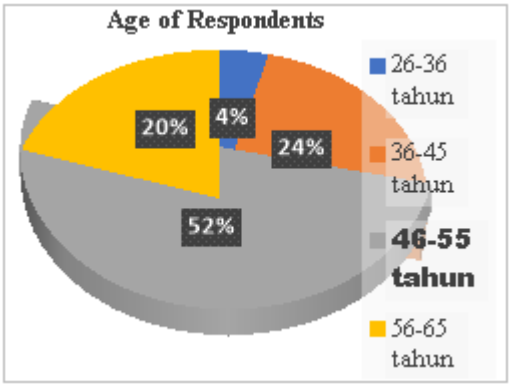
Cikoneng Subdistrict is located in the western part of Ciamis District with an altitude of 300 - 600 m above sea level and the distance between Cikoneng Subdistrict and the capital of Ciamis District is around 10 km. According to Junghuhn, the average temperature in a year reaches 26.8 °C with a height of 0 -700 m above sea level has a hot climate zone with a relatively good drainage system, particularly areas where the soil contains sand and has sufficient slope. Land characteristics in Cikoneng Subdistrict have varying acidity (pH) soil which is around 4.5 - 6.5. The area of land in Cikoneng Subdistrict is 6,077 Ha consisting of 1,114 Ha of rice fields and 4,963 Ha of dry land.The population is a very potent resource in agricultural development. As of the end of October 2018, the total population in Cikoneng Subdistrict was 56,402 people. Based on gender distribution, the total population in the District consists of 30,173 men and 26,226 women.

4.2. Characteristics of Respondents

Characteristics of respondents are very diverse. Internal characteristics include age, level of education and farming period. Characteristics of respondent are presented in the graph as follows:







Graph 1: Characteristics of Respondents

Graph 1 shows that the majority of respondents were around 46-55 years old (52%). According to the Indonesian Ministry of Health (2009), age is divided into nine categories. However, the categories used in this research were only four categories, namely early adulthood (26 -35 years), late adulthood (36-45 years), early elderly (46 -55 years) and late elderly (56-65 years). Based on the graph above, the majority of respondents' age is classified in the early elderly category by 52%. Age is one aspect that is related to a person's physical and psychological abilities. Someone who is old tends to have decreased working spirit along with decreased farming management and individual potential. The education level of the majority of respondents was relatively low, namely elementary school (60%). The low level of education of respondents affects the mindset of respondents on how to respond to a new thing. Technology transfer usually requires a high level of knowledge, attitude and skills. According to Soekartawi (2005), farmers with higher education are relatively faster in implementing technology adoption. Conversely, low-educated farmers are rather difficult to adopt new technologies quickly.The experience of the farming period is calculated from the time the respondent makes farming as their livelihood, even though in this case it is only a side job. Most respondents have more than 21 years of experience in farming, which is categorized as very experienced (57%). Variations in the distribution of farming periods of respondents had a positive impact on farmers who are still new in farming to exchange ideas about what has been cultivated so far.Sudrajat (2018) suggested that the importance of experience for a farmer is related to the mindset of the farmer in the use of agricultural land. Farmers who are experienced in conducting farming activities will have a broader insight into the cultivation of lowland rice fields compared to novice farmers who do not have experience or skills about processing lowland rice fields.

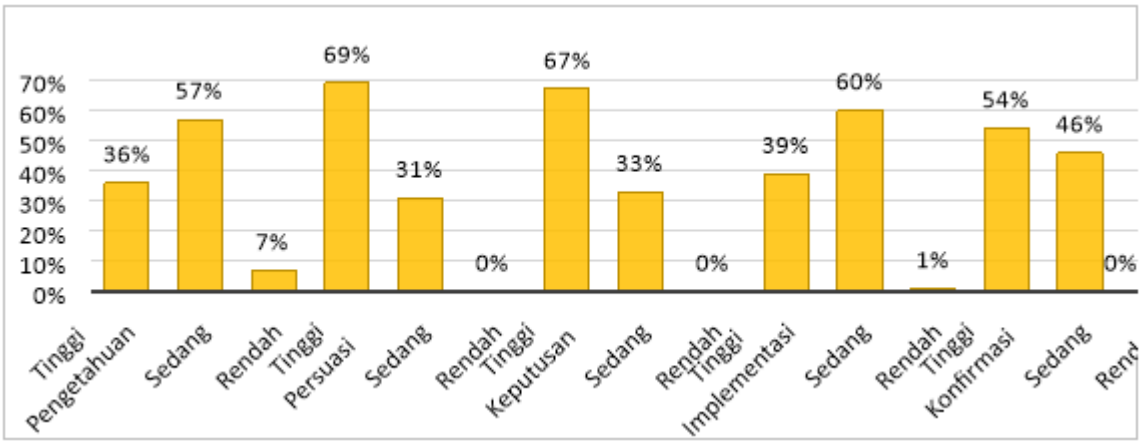
4.3. Adoption Level of Organic Fertilizer

Adoption level of respondents to the use of organic fertilizer is divided into three categories. Most respondents (81.43%) were categorized as moderate as presented in the following table:

Table 1: Adoption Level of the Use of Organic Fertilizers

No	Category	Number	%
1	Low	00	0.00
2	Moderate	57	81.43
3	High	13	18.57

The table above shows that the use of organic fertilizer by farmers still needed to be improved. According to information from several farmers, they claimed they did not know the benefits of using organic fertilizer. The adoption process steps of the use of organic fertilizer for lowland rice in the research sites are presented in the following graph:



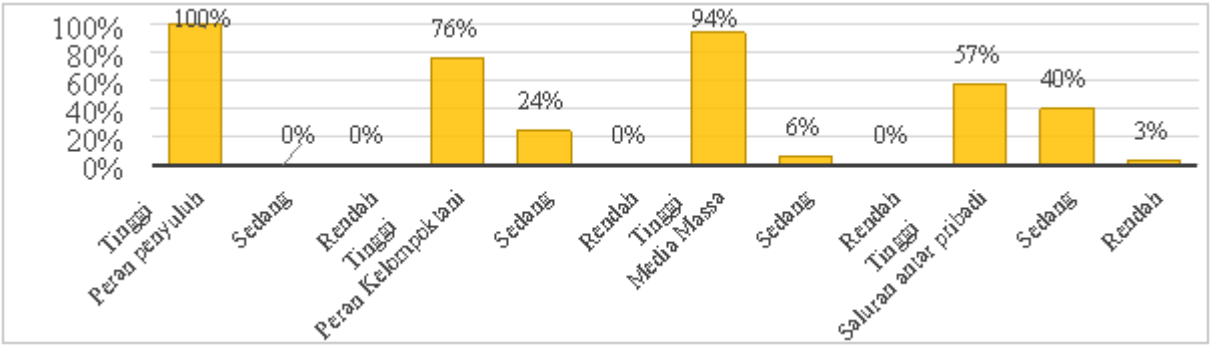
Graph 2: The adoption process step of organic fertilizer use

Based on the graph above, it is known that the stages of the adoption process that were rated highly by the majority of respondents were; persuasion stage (69%), followed by the decision stage (67%), the implementation phase (60%), and the confirmation stage (54%), while the majority of respondents considered that the stage of providing knowledge was in the medium category. These results inform that the persuasive process carried out by the extension agents has actually been successful. However, they are less able to utilize organic fertilizer due to the lack of farmers' knowledge, especially if they have to make it themselves. This condition is in line with Effendy, L. and Sudiro's research (2019) which concluded that internal characteristics including the level of education affect farmers' participation in the use of fertilizers which indicates that increasing farmers' awareness of the use of organic fertilizer needs to be conducted first.The decision stage was in the high category (67%). This shows that farmers accept

the use of organic fertilizer as recommended, especially for recommendations that are easy to implement. The decision to accept the use of organic fertilizer in accordance with the recommendations is not only determined by the landowner alone but also harvest workers have a role in the decision to accept the use of organic fertilizers for lowland rice.The implementation indicator was in the medium category (60%) which means that farmers have not fully used organic fertilizer as an alternative fertilizer to maintain soil fertility. Farmers usually apply the use of organic fertilizer limited to certain activities with the consideration that inorganic fertilizer is difficult to obtain because farmers generally still rely on chemical fertilizers to guarantee yield production.The confirmation stage was in the high category (54%) which means that farmers are not sure that they want to use organic fertilizer by seeking information from other parties first.

4.4. External Factors

The performance of external factors on participation in the use of lowland rice fertilizer showed that most respondents rated participation in the use of organic fertilizer in the high category. Details of the performance of each of the external factor indicators on partition are presented in the following graph:



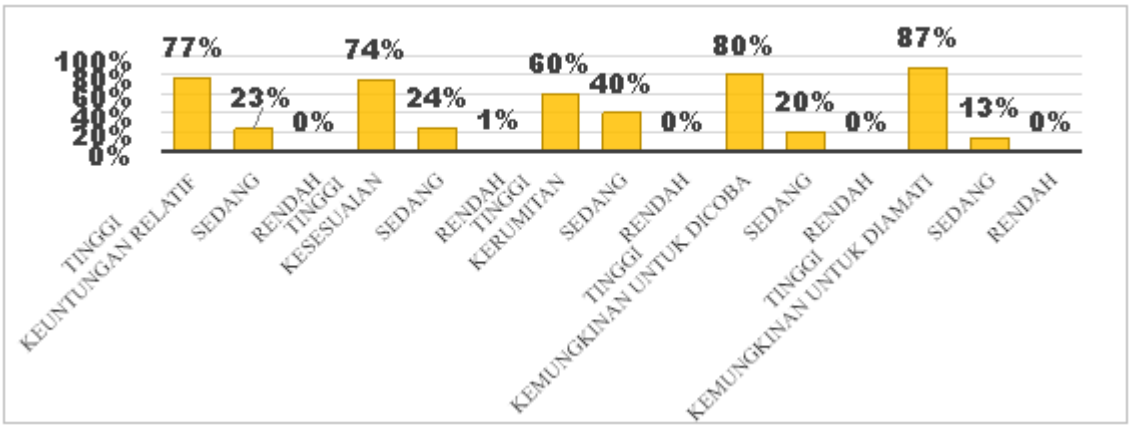
Graph 3: Performance of external factors

Information: Tinggi (high), Sedang (moderate), Rendah (low)

Graph 3 above shows that the majority of respondents rated the role of extension agents (100%) and the role of the media (94%) were in the high category. This is due to the support and role of extension agents as farmer facilitators in the field help farmers in crop cultivation activities where the role of extension workers can be seen from the extent to which extension agents provide guidance, evaluating farmers' activities during rice cultivation, facilitating farming and the ability of extension workers to discuss so that farmers are willing to consult about problems encountered in conducting farming. Besides, farmer groups as a learning forum for farmers carry out their functions in the periodic meetings of each group.The process of providing information by extension agents through farmer groups was considered important by farmers, also the interpersonal and mass media channels were in the high category. Furthermore, the interpersonal relationship was in the high category (57%) which means that the activeness of farmer group members who attend the group meetings is quite meaningful in providing understanding to farmers.

4.5. Characteristics of Innovation

The characteristics of innovation indicate that most respondents rated all the characteristics of innovation were the high category. The characteristics of innovation including relative profitability, suitability, complexity level, likely tried, and likely observed (60-87%) were also in the high category as presented in the following graph:



Graph 4: Performance of innovation characteristics in the use of organic fertilizers
Sumber : Analisis Data Primer 2019

Information: Tinggi (high), Sedang (moderate), Rendah (low)

The attribute of likely observed was in the high category with a value of 87%, followed by a likely tried (80%), and relative profitability (77%). This shows that by applying the use of organic fertilizer, lowland rice will provide benefits both economically and technically. Rogers (1983) states that the greater the relative benefits felt by adopters, the faster the innovations are adopted. The suitability attribute was also in the high category (74%). This shows the suitability of the use of organic rice fertilizer which is recommended with the use of organic fertilizer which is usually done by farmers. If seen from the experience of farming, generally farmers have sufficient experience in the cultivation of lowland rice. However, there are still some adjustments to the recommendations that need attention, such as the suitability of the process of preparing and administering doses of fertilizer. Rogers (1983) also explains that if innovation is contradictory or incompatible with the values and norms adopted by the adopter then the new innovation is not easily adopted. The attribute of the complexity level of innovation was also in the high category (60%) which means there are variations in the level of complexity in each process of providing organic fertilizer to lowland rice both in the preparation process and the process of applying organic fertilizer in lowland rice cultivation. With the ease of the preparation process and the availability of abundant raw materials, farmers increasingly understand the cultivation of effective rice and based on sustainable agriculture. This is in line with Rogers (1983) that the easier an innovation is to be understood and understood by adopters, the faster the adoption process. These results could conclude that the attribute was easily observed to be the highest indicator (87%). This shows that before applying the use of organic fertilizer in lowland rice, farmers need to first observe the process, the results, to the benefits of the innovation. This is in line with Rogers (1983) that the easier someone sees the results of innovation, the more likely the innovation is adopted by the community.

4.6. Factors Affecting Adoption Level of Organic Fertilizers

This research examines the factors affecting the adoption level of farmers in the application of organic fertilizer in lowland rice. The results of the regression analysis showed that the independent variables were: internal factors (X1), external factors (X2), and characteristics of innovation (X3) to the dependent variables (Y), namely the level of adoption where the results obtained are presented in Table 2.

Table 2: Results of Analysis of Research Variables

Coefficients[a]				
Model	Unstandardized Coefficients		Sig.	Descriotion
	B	Std. Error		
(Constant)	1.013	.272	.000	
Internal factors	-.006	.022	.782	Have no significant effect
External Factors	.060	.067	.377	Have no significant effect
Characteristics of Innovation	.564	.101	.000	Have significant effect

Source: Analysis of Primary Data 2019

Based on the table above, of the three variables analyzed, only the characteristics of innovation had a significant effect (α = 0.05), while internal and external factors had no significant effect. Thus, the regression equation model is $Y = 11.013 + 0.564X_3$.

Description:
Y = Farmers' Adoption Level
X1 = Internal Factors
X2 = External Factors
X3 = Characteristics of Innovation

Table 2 above shows that the factors that significantly affect (∂ = 0.05) on the level of adoption of organic fertilizer (Y) are the characteristics of innovation (X3) with a coefficient of 0.564, while internal factors (X1) and external factors (X2) have no significant effect. According to the regression equation Y = 1.013 + 0.564X3, it can be said that if the innovation characteristics or attributes are constant or zero (0), the adoption level of organic fertilizer was 1.013. An increase in one unit of innovation attributes will increase the adoption of organic fertilizer by 0.564. Furthermore, these results prove that the attribute of innovation in the form of organic fertilizer determines farmers to accept or apply organic fertilizer on their farms. This result can also be interpreted that the better the farmers' perception of the innovation attributes of organic fertilizer, the greater the chance of the adoption of organic fertilizer in lowland rice. This is in accordance with the theory stated by Rogers (1995) that innovation will be more easily accepted by the community if it has the characteristics of innovation that provides benefits both in economic terms and satisfaction that can be accepted by the community. The results of this research also support the research of Mardikanto (2007) which states that the speed of adoption is influenced by many factors, one of which is the properties of innovation itself, both inherent in innovation and extrinsic properties and environmental conditions. The results of this research also support the research of Rangkuti (2007) and Dyah (2012) which suggest that the characteristics of innovation affect the adoption of innovation.The explanation described above leads to a strategy to increase the adoption of the use of organic fertilizers in lowland rice cultivation in Cikoneng Subdistrict. The strategy that can be done is to start holding a demonstration plot of lowland rice about the application of organic fertilizers on farmers' land so that they can immediately observe, starting from planning, implementing, to observing the results. By holding sample plots on farmers' land, they play the role as actors or trying it themselves, not just observing or just being the object of innovation. The further benefit of demonstration plots is that farmers are more confident because they are directly involved in it. Furthermore, in the implementation of the demonstration plots, farmers were given knowledge and skills regarding organic fertilizer through regular extension agents while observing the development of the demonstration plots. Through this strategy, the use of organic fertilizer in lowland rice cultivation in Cikoneng Subdistrict is expected to increase.

5. Conclusion

Based on the results and discussion, it can be concluded that: 1) Most respondents are around 46 - 55 years old (52%) with the education level of elementary school (60%) and have more than 21 years (57%) farming experience, with moderate adoption level of organic fertilizers; 2) The adoption level of organic fertilizer is significantly affected (ά = 0.05) by the properties of innovation, namely: the process and results can be observed and tried, providing relative benefits, following the local conditions, and having a low level of complexity; and 3) The strategy to increase the use of organic fertilizer is to perform a demonstration plot using organic fertilizer in farmers' rice fields, followed by routine extension activities on organic fertilizer.

6. Acknowledgement

Authors would like to thank professional colleagues, lecturers of the research program on the sustainable agriculture for their encouragements and assistances to complete this research. Authors would also like to thank Fajar Gumelar for their assistance in conducting this research and the Director of the Bogor Agricultural Development Polytechnic for the opportunity and provided support.

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Lampiran

Output Analisis

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.001	.303		3.303	.002
	Age	-.011	.016	-.074	-.709	.481
	Education Level	.013	.026	.059	.502	.617
	Total Area	.023	.020	.120	1.160	.251
	External Factors	.059	.068	.094	.872	.387
	Attribute	.541	.103	.586	5.255	.000

. Dependent Variable: Adoption level

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.157	.187		16.915	.000
	Age	-.060	.031	-.247	-1.954	.055
	Education Level	.084	.049	.235	1.708	.092
	Total Area	-.017	.040	-.055	-.422	.674
a. Dependent Variable: Attribute						

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.934	.124		23.743	.000
	Age	-.046	.020	-.274	-2.253	.028
	Education Level	.099	.033	.403	3.035	.003
	Total Area	.008	.026	.039	.311	.757
a. Dependent Variable: Adoption						

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.026	.266		3.859	.000
	External Factor	.059	.067	.093	.886	.379
	Attribute	.557	.097	.603	5.721	.000
a. Dependent Variable: Adoption						

Reliability Statistics

Cronbach's Alpha	N of Items
.979	48