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ANALYSIS OF THE ADOPTION OF ORGANIC FARMING INNOVATIONS IN PAGERWOJO DISTRICT, TULUNGAGUNG REGENCY

Fadli Mulyadi[1]., Septian Maulana Putra[1]., and Aulia Nadhirah[1].
[1]Agricultural Faculty, Brawijaya University, in Malang, East Java - Indonesia
*E-mail of the correspondent author: fadli.mulyadi@ub.ac.id

ABSTRACT: *The objectives of research are; (1) to analysis the adoption of organic farming innovations in Pagerwojo District, Tulungagung Regency, and (2) to determine the level of income from the adoption of organic farming innovations. Research is conducted in Pagerwojo District Tulungagung Regency, from April to August of 2020. Method of research is survey and sampling technique is simple random sampling. Result of research indicates that the application of organic vegetable farming in Pagerwojo District, Tulungagung Regency is divided into four categories, which are: conventional category for very low application rate, knowing- organic category for low application rate, interest-in-organic category for moderate application rate, and toward-organic category for high application rate*
KEYWORDS: adoption, innovation, organic farming

INTRODUCTION

Environmental impact due to the use of chemicals in agriculture also pushes forward sustainable agriculture technology. Such agriculture must qualify requirements such as ecologically mature, economically sustainable, equitable, humane, and flexible (Reijntjes, et al, 2006). One interpretation of this agriculture into agriculture system may take form as organic agriculture (Mutiarawati, 2006). Organic agriculture is a term that is consistent to the environmental friendliness and producing healthy food. It is highly expected that environmental impact due to the use of chemicals in agriculture field may be avoided (Sutanto, 2002). Organic farmers only use non- synthetic product for organic production. It may warrant the care for environment and also offer food and fiber free from usual chemicals usually used in the commercial food production (Giovannucci, 2007; Wright, et al, 2012). Therefore, organic agriculture can be said as the base for agriculture result production, the base for animal breeding, and the base for natural ecology balance (Rosenow, et al, 1996).

Organic farming applications have a significant effect on farmer productivity and income. Farmers who are more concerned with the application of organic agriculture, have higher productivity and income compared to farmers who apply conventional agriculture (Mulyadi, et al. 2014). Organic agriculture is an agricultural system that is environmentally friendly and produces healthy food, free from drug residues and deadly chemicals. Organic agriculture, in fact, has become a traditional wisdom / knowledge that is cultured among farmers in Indonesia. However, this organic farming technology began to be abandoned by farmers when intensification technology that relied on agrochemicals was applied in agriculture. Since then, farmers have become the target of agrochemical intake and depend on external parties. After the issue of environmental impacts arising from the use of chemicals in agriculture, organic

farming technologies that are environmentally friendly and produce healthy food are starting to be given more attention

Organic agriculture which is easiest to apply and measure among farmers includes the use of organic fertilizer, the use of local variety seed, the control of pest and disease using organic pesticide, and the separation of land, and also water source for organic agriculture from conventional agriculture (Sutanto, 2002).
The objectives of research are to analysis the adoption of organic farming innovations in Pagerwojo District, Tulungagung Regency.

1. METHOD OF RESEARCH

Location of research is determined "*purposively*" by considering that the location of research is an agriculture center in Tulungagung Residence. Duration of research for primary data collection is 5 months, from April 2020 to August 2020.

The allocation of sampling is using *simple random sampling* as sampling technique. Following is the equation of this sampling:

$$n = \frac{N}{N.d^2 + 1} = \frac{6038}{(6038 \times 0.1)^2 + 1} = 98$$

Where :
n = the number of total sample
N = the number of total population
d = the determined precision for 10 %

Data are collected with field study. It means that data are acquired directly by observation and by taking the data from research object. To understand the adoption of organic farming innovations, it is then the author giving questions to be answered by respondents. Different score is given for every answer. Highest score is five and lowest score is one. Score from each respondent is summed to determine the category. According to Suparman (1990), class interval is determined as following:

$$C = \frac{Xn - Xi}{K}$$

where:

C = Class Interval
K = Number of Class Xn = Maximum Score Xi = Minimum Score

Result of this calculation is used to determine the category of the adoption of organic farming innovations rate as shown in the Table 1.

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Table 1. Measurement scale of the adoption of organic farming innovations rate

Research Objectives	Scoring				
	(1)	(2)	(3)	(4)	(5)
1. To identify the adoption of organic farming innovations rate.	Never	Once	Sometimes	Often	Always
Adoption category	Convent	Tor	Minor	Major	Organic

The income from organic farming is using mathematic equation as following:

$$I = P_y . Y – (r_1x_1 + r_2x_2 + r_3x_3 + wx_4 + Z_2)$$

where:
I = farming income
(Rp) X_1 = land rent
rate, etc. X_2 = seed
cost (Rp)
X_3 = nutrition and pesticide costs (Rp)
X_4 = the expended worker wage
(HOK) r_1 = ith input price (Rp)
W = worker wage (Rp)

The comparison between organic and non-organic vegetable farming income is made by One-Way Analysis of Variance. The proposed hypothesis is as following:

$H0 : \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$
H1 : minimally, two averages are different.

Note:
μ_1 = the average of conventional vegetable farming income.
μ_2 = the average of vegetable farming income in the application category of know-organic.
μ_3 = the average of vegetable farming income in the application category of interest-in-organic.
μ_4 = the average of vegetable farming income in the application category of toward-organic.
μ_5 = the average of vegetable farming income in the application category of pure-organic

RESULTS AND DISCUSSION

2.1The identification of adoption of organic farming innovations in Pagerwojo District, Tulungagung Regency

The identification of adoption of organic farming innovations in Pagerwojo District, Tulungagung Regency involves five adoption rates which are then converted into five categories of adoption of organic farming innovations. These categories are conventional category for very low adoption rate, knowing-organic category for low adoption rate, interest-in-organic category for moderate adoption rate, and toward-organic category for high adoption rate. The percentage of farmers in any adoption rates is shown in Table 2.

The identification of adoption of organic farming innovations as indicated in Table 2 can be explained as following: 8.16 % farmers apply conventional farming; 53.06 % farmers apply conventional farming but with knowledge about the adoption of organic farming; 19.39 % farmers apply conventional farming but with interest in the adoption of organic farming; 19.39 % apply conventional farming but manage toward the adoption of organic farming. Indeed, no farmers have actually applied organic vegetable farming.

Table 2. Total of adoption of organic farming innovations in Pagerwojo District, Tulungagung Regency

Variables and indicators	Frequency (%)				
	Never (1)	Once (2)	Sometimes (3)	Often (4)	Always (5)
1. Organic seeds	31,12	30,10	10,71	26,53	1,53
2. Conversion of organic land	60,2	2,04	27,55	3,06	7,14
3. The use of water source	40,31	11,22	29,08	11,22	8,16
4. Maintenance of soil fertility	21,63	13,06	41,22	21,43	2,65
5. Control over pest, disease and weed	24,23	16,84	26,02	28,83	4,08
6. Treatment of harvest and post-harvest	54,59	16,33	17,86	4,59	6,63
Average frequency	38,68	14,93	25,41	15,94	5,03
Rate total	20 - 35	36 - 51	52 - 67	68 -83	84-100
Frequency	8,16	53,06	19,39	19,39	0,00
Adoption rate	Very low	Low	Moderate	High	Very high
Adoption category	Convent	Tor	Minor	Major	Organic

Note:
Convent : Conventional
TOR : Know-Organic
MINOR : Interest-in-Organic MAJOR : Toward-Organic
ORGANIC : Pure Organic
*Source: Result of Primary Data Processing

The absence of respondent farmers who have applied pure-adoption organic farming may be caused by trend that farmers only know about and agree with organic farming but they do not understand about techniques of organic farming. Unavailability of market for organic farming harvest is a main

reason why the farmers hesitate themselves from applying pure-organic farming. The limited land and resource have forced farmers to do farming to supply to conventional market. Local official has contributed the land to be the trial land for organic farming, but farmers cannot cultivate it well because they still cannot share the time and effort because the location is far away from the location they cultivate daily.

3.2 Farming Analysis in Pagerwojo District, Tulungagung Regency

Farmers in Pagerwojo District mostly cultivate rice and maize crops to meet their daily needs. Increasing public awareness of health has made many farmers in Pagerwojo sub-district adopt organic systems. The higher the public's awareness of health, the higher the demand for organic rice. This is an opportunity for farmers in Pagerwojo District to adopt an organic farming system. But there are also some farmers who still use conventional farming systems. This organic adoption is divided into four categories, namely the very low, low, medium and high organic adoption category. This category is based on the results of the analysis that has been carried out in accordance with conditions in the field.

Farming analysis is divided into several analyzes that can be used to see how feasible a farmer is to cultivate his farm in the research location. Farming analysis can be seen from the amount of production costs, revenues, profits and later it can be seen how much the feasibility of farming activities in Pagerwojo District. In this analysis, the farm analysis for farmers with very low, low, medium and high levels of adosion to organic farming systems is compared.

1. Analysis of Production Costs

Production costs consist of fixed costs and variable costs. Fixed costs for rice and corn farming consist of costs for using seeds and depreciation of tools. Meanwhile, variable costs consist of costs for pupu, pesticides and labor. Following are the production costs for rice and maize farming in Pagerwojo District, which are classified into four categories in absorbing the adoption of organic farming systems, presented in the table below.

Table 3. Rice and Corn Farming Production Costs in Pagerwojo District, Tulungagung Regency.

No.	Kategori Adopsi	Padi			Jagung		
		Biaya Variabel (Rp)	Biaya Tetap (Rp)	Total Biaya (Rp)	Baya Variabel (Rp)	Biaya Tetap (Rp)	Total Biaya (Rp)
1.	Very low	19.220.533	1.987.267	21.207.800	12.749.672	1.775.466	12.525.138
2.	Low	18.781.284	1.962.784	20.744.068	18.042.289	1.064.804	19.107.092
3.	Moderate	23.840.191	1.988.853	25.829.045	15.135.285	1.793.193	16.928.478
4.	High	17.368.595	1.993.433	19.362.027	20.546.819	1.756.989	22.303.808
Average/Hectare		**19.199.546**	**1.869.075**	**21.068.621**	**10.486.643**	**1.743.287**	**12.229.930**

Source: Secondary data processed, 2020

Based on the table above, it can be seen that the average rice plant has a total production cost for cultivation of IDR 21,068,621 per hectare. The high category for the adoption of organic farming systems has the least cost compared to the other categories. This proves that farmers in Pagerwojo Subdistrict who have adopted an organic farming system with a high category can save costs for cultivating rice plants.

Meanwhile, corn crop farming has an average total production cost of IDR 12,229,930 per hectare. In contrast to rice plants that adopt organic farming systems which have lower costs compared to other categories, in maize cultivation, the adoption of organic farming systems in the high category has the highest total cost compared to other categories, namely IDR 22,303,808. This is because the labor costs incurred for the cultivation of maize with the adoption of high category agricultural systems are greater than other categories. The difference in the addition of treatment for organic farming system crops also causes higher labor costs.

2. Acceptance Analysis

Revenue is the entire amount of money that the farmer gets from selling his products and is expressed in rupiah. Revenue from rice cultivation is in the form of organic dry grain which is sold by farmers to wholesalers and middlemen. Meanwhile, revenue from corn cultivation is organic whole corn that can be consumed. The following is the revenue for rice and maize farming in Pagerwojo District which is classified into four categories in absorbing the adoption of organic farming systems presented in the table below.

Table 4. Acceptance of Rice and Corn Farming in Pagerwojo District, Tulungagung Regency

No.	Kategori Adopsi	Padi			Jagung		
		Volume (kg)	Harga (Rp/kg)	Total Penerimaan (Rp)	Volume (kg)	Harga (Rp/kg)	Total Penerimaan (Rp)
1.	Very low	6.832	4.000	27.329.193	7.963	3.067	24.419.753
2.	Low	9.002	4.392	39.541.328	8.108	3.430	27.808.619
3.	Moderate	8.603	4.654	40.035.585	8.069	3.558	28.707.739
4.	High	8.242	4.847	39.947.703	7.969	3.794	30.237.898
Average/Hectare		**8.603**	**4.496**	**38.681.861**	**7.451**	**2.838**	**21.148.292**

Source: Secondary data processed, 2020

Based on the table above, it shows that the average revenue for rice farming by adopting an organic farming system in Pagerwojo District is IDR 38,681,861 per hectare with a sales volume of 8,603 kilograms. Rice farming by adopting an organic farming system with the moderate adoption category received the largest amount of revenue, namely Rp. 40,035,585, - with a sales volume of 8,603 kilograms. Adoption of agricultural systems in high category rice farming has a total income not much different from the medium category level, namely IDR 39,947,703 with a sales volume of 8,242 kilograms and a selling price of IDR 4,847 per kilogram. It can be seen that the high selling price can be an opportunity for farmers to continue to be able to apply the organic farming system so that it can increase production when cultivating rice plants because of the high selling price compared to other categories.

The average total revenue of maize at the research location was IDR 21,148,292 per hectare. Revenue from maize farming that adopts an organic farming system with a high category has a higher profit than an organic farming system with other categories, namely Rp. 30,237,898, -. This shows that the big opportunity for farmers to cultivate organic maize is due to the high selling price for organic maize, which is IDR 3,794 per kilogram.

3. Advantages

Profit is the excess of total revenue compared to the total cost of production. The profit obtained by farmers in Pagerwojo District is an advantage when the commodity production is considered to be traded as a whole. The following are the advantages for rice and maize farming in Pagerwojo District which are classified into four categories in absorbing the adoption of organic farming systems as presented in the table below.

Table 5. Profits of Rice and Corn Farming in Pagerwojo District, Tulungagung Regency

No.	Kategori Adopsi	Padi			Jagung		
		Total Biaya (Rp)	Total Penerimaan (Rp)	Keuntungan (Rp)	Total Biaya (Rp)	Total Penerimaan (Rp)	Keuntungan (Rp)
1.	Very low	21.207.800	27.329.193	6.121.393	12.525.138	24.419.753	9.894.615
2.	Low	20.744.068	39.541.328	18.797.260	19.107.092	27.808.619	8.701.527
3.	Moderate	25.829.045	40.035.585	14.206.540	16.928.478	28.707.739	11.779.261
4.	High	19.362.027	39.947.703	20.585.676	22.303.808	30.237.898	7.934.090
Average/Hectare		**21.068.621**	**38.681.861**	**17.613.241**	**12.229.930**	**21.148.292**	**8.918.362**

Source: Secondary data processed, 2020

Profits for rice cultivation in Pagerwojo District show an average of IDR 17,613,241. Rice cultivation that has implemented an organic farming system with a high category shows the highest profit compared to other categories, namely IDR 20,585,676. This shows that the potential to continue developing organic rice plants in Pagerwojo District is very good for improving the welfare of farmers. Corn farming in Pagerwojo District shows an average profit of IDR 8,918,362. The advantages of applying organic farming systems in the medium category are more profitable than applying organic farming systems with high categories. Low production and high labor costs for corn farming have resulted in not optimal profits.

4. R / C Ratio

R / C Ratio is a measure of the feasibility of a farm which is assessed based on a comparison of its production income and cost. The following is the R / C ratio for rice and maize farming in Pagerwojo District which is classified into four categories in absorbing the adoption of organic farming systems presented in the table below.

Table 6. R / C Ratio of Rice and Corn Farming in Pagerwojo District, Tulungagung Regency

No.	Kategori Adopsi	Padi			Jagung		
		Total Biaya (Rp)	Total Penerimaan (Rp)	R/C Ratio	Total Biaya (Rp)	Total Penerimaan (Rp)	R/C Ratio
1.	Very low	21.207.800	27.329.193	1,29	12.525.138	24.419.753	1,68
2.	Low	20.744.068	39.541.328	1,91	19.107.092	27.808.619	1,46
3.	Moderate	25.829.045	40.035.585	1,55	16.928.478	28.707.739	1,70
4.	High	19.362.027	39.947.703	2,06	22.303.808	30.237.898	1,36
Average/Hectare		**21.068.621**	**38.681.861**	**1,84**	**12.229.930**	**21.148.292**	**1,73**

Source: Secondary data processed, 2020

Based on the table above, it shows that the average R / C ratio of rice farming in Pagerwojo District is 1.84, where farming is considered feasible to continue to be cultivated because the R / C ratio is more than one. The R / C ratio in rice farming with the adoption of organic farming systems in the high category shows a figure of 2.06 where the feasibility of farming is very profitable for farmers and can improve the welfare of farmers in Pagerwojo District. Meanwhile, for corn farming, the average R / C ratio shows a value of 1.73 which means that corn farming is also considered feasible because the value is more than one. Corn farming by adopting high category organic farming systems still has a low R / C ratio compared to other categories. The adoption category that had the largest R / C ratio was the moderate adosiation category of 1.70.

2. CONCLUSIONS AND SUGGESTIONS

2.1 Conclusions

1. The identification of adoption of organic farming innovations in Pagerwojo District, Tulungagung Regency is dividend into four adoption of organic farming rates, which are: conventional category for very low adoption rate, knowing-organic category for low adoption rate, interest-in-organic category for moderate adoption rate, and toward-organic category for high adoption rate.
2. The profit for rice cultivation in Pagerwojo District shows an average of IDR 17,613,241 and corn farming in Pagerwojo District shows an average profit of IDR 8,918,362.

2.2 Suggestions

1. The adoption of organic farming innovations in Pagerwojo District, Tulungagung has not yet achieved the category of genuine organic application but it has potential to reach this category. Therefore, the enthusiasm toward this category shall be kept by giving knowledge about organic food either for farmers or community.
2. The specific organization must be founded as the partner for farmers to monitor farmers during the adoption of organic agriculture and as the connecting bridge between farmers as producer and community as consumer.
3. Government plays important role in enforcing the application of organic farming in Pagerwojo District, Tulungagung Regency either by making policy related to this issue or by providing structure and infrastructure.

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