

# Analysis of Youth Farmer Involvement in the Application of Good Agricultural Practices (GAP) of Organic Rice

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## Abstract

Food production from quality organic rice requires the existence of standards for organic good agricultural practices (GAP) followed and applied by all organic rice farmers. The application of these standards is often an obstacle for farmers because of their limitations in applying innovation technology in organic farming standards. Youth farmers are the next generation of agriculture who are more sensitive to changes in agricultural technology and innovation so that they can help development in organic rice cultivation. This research aims to determine the involvement of youth farmers in rural areas in the application of Standard Operational Procedure of Good Agricultural Practices (SOP-GAP) of Organic Rice and determine the effect of the application of SOP-GAP on organic rice production in Boyolali Regency. This descriptive research was conducted with the survey method and the data were analyzed using two stage least square. The results showed that there were only three variables that influenced the application of the SOP-GAP, namely land area, the role of youth farmers as facilitators and liaison. This finding shows the influence of the closeness of young farmers with the use of organic technology so that it can help in the application of SOP-GAP. Other findings also show that SOP-GAP has a weak effect on organic rice production. Various efforts need to be made to improve the role of youth farmers in developing organic rice, among others, by showing prospects and opportunities for high income from organic rice farming and emphasizing that agriculture can also be packaged and managed digitally by utilizing technology that is of interest to youth farmers.

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## I. INTRODUCTION

Organic farming is an agricultural system that does not use synthetic (inorganic) chemical inputs, but natural materials in the form of organic materials or fertilizer. The main goal is to produce clean and healthy products and environments (land and water). This system prioritizes the nutritional value, health, and economy of the product. Its consumers are certain circles (exclusive) and it does not really prioritize productivity [1]. Organic products in Indonesia that are currently developing are organic vegetables (such as carrots, cabbage, beans, and onions), organic fruits and organic rice [2].

Quality rice production from organic rice must meet the main principle of the Standard Operational Procedure of

Good Agriculture practices (SOP-GAP) of Organic Rice which prioritizes productivity, security, and the preservation of natural resources and the environment [3]. Organic farmers are obliged to apply SOP-GAP in each production process to ensure the products produced meet organic standards. The application of the SOP-GAP process in the production process includes the provision of agricultural inputs, application of cultivation techniques and post-harvest organic products very useful to increase production, quality and competitiveness of organic rice [4].

One way that can be applied to increase the production and productivity of organic farming is to apply new technologies, both local technology and findings from research institutions [5]. The speed in adopting technology today is influenced by

various factors, including the availability of information, the level of education and age of farmers [6]. People over 50 years old will generally be slower in adopting innovations. At a younger age, technology adoption goes faster as evidenced by the current millennial generation who more actively captures technological change, especially the use of gadget.

There were 800 hectares of land that applied an organic system in Boyolali Regency in 2010. The land is located in two districts, Mojosongo and Sambu [7]. The application of organic rice farming in Mojosongo District has been started since the early 2000s. Farmers in Mojosongo District are over 50 years old, so it is interesting to observe how they apply the technology adoption required in the SOP-GAP of organic rice. Another important thing is the role of young people who are the children of organic farmers in helping their parents to apply the SOP-GAP which will impact on increasing production and income of the farmers' families.

This research aims to determine the role of youth in the application of Standard Operational Procedure of Good Agriculture practices (SOP-GAP) of Organic Rice and determine its effect on organic rice production in Boyolali Regency. The previous research conducted by Sriyadi [3] on evaluating the application of organic rice SOP-GAP in Bantul Regency did not see the role of youth in helping farmers apply SOP-GAP. Other findings show that youth involvement in agricultural activities in general is decreasing, especially in the stages of land and seed preparation and cultivation. However, their involvement increases during the harvest [8]. More than that, [9] found that the role of youth was positive in empowering farmers in Yogyakarta. This research is expected to provide a clear view dimension to the role of youth in the application of SOP-GAP of organic rice to increase farmers' production and income.

## II. METHOD

There are several organizations involved in organic farming in the world. However, until now, they have not succeeded in setting uniform standards although they have achieved some progresses in this field. Some organizations use symbols to show consumers that they buy food that has been grown with true organic methods [10]. In Indonesia, organic farming standards currently refer to the Indonesian National Standards number 6729-2016 on Organic Agriculture Systems. Based on this, the descriptive research [11] in analyzing the role of youth in the application of the Standard Operational Procedure of Good Agriculture Process (SOP-GAP) of Organic Rice refers to the Indonesian national standard guidelines by involving the variable of characteristics of farming households and the role of youth in the regression equation to find out its effects on the application of SOP-GAP of organic rice. The farmers in Boyolali were selecting using snowball sampling. The data were collected using observation and interview assisted with a questionnaire. Mathematically, the variables that affect the commercialization of organic rice can be seen in the following equation:

$$GAP = \alpha_0 + \sum_{i=1}^4 \beta_i C_i + \sum_{j=1}^6 \beta_j N_j + \varepsilon_1 \quad (1)$$

$$Published\ by\ \varphi_0 + \varphi_1 GAP + \sum_{i=1}^4 \delta_i K_i + \varepsilon_2 \quad Co., Inc.$$

$$Y = \quad (2)$$

GAP is the level of application of organic rice SOP-GAP. GAP application is divided into three aspects (provision of inputs, cultivation, and postharvest) which are divided into thirteen subsystems. The application of GAP is measured by a scoring technique using a Likert scale. The scoring technique used is 0 for the answer that never matches, 1 for the answer that rarely matches, 2 for the answer that sometimes matches, 3 for the answer that often matches, and 4 for the answer that always matches. With a Likert scale, the variables used are described as statements that are indicators in the measurement of GAP application.

C is the vector of characteristics of the farmers' households. The characteristics of farmers' household consist of the age of the farmer (years), land area (Ha), farming experience (years) and level of education (years). N is the vector of the role of youth farmers in farming which consists of the role of youth as an initiator, facilitator, motivator, liaison, organizer, and analyst. This role is used to adapt youth to the role of agricultural extension workers [12]. Score 1 is given to youth who are the children of organic rice farmers aged 16-30 years who have a role in the application of organic rice SOP-GAP. 0 is given if there is no role of youth at all. Y is the vector of organic rice production;  $\alpha$ ,  $\beta$ ,  $\varphi$  and  $\delta$  are estimated coefficients; and  $\varepsilon$  is the residual that includes other factors outside the scope of the independent variables used for this analysis.

The model is estimated using two-stage least square with the instrumental variable to overcome heteroscedasticity. Multicollinearity between independent variables was examined using a correlation matrix. The linear model is used to test the marginal effect and the relationship between independent variables (autocorrelation) in the model. The significance of the statistical parameters was tested with the margin of error of 1%, 5% and 10%.

## III. RESULT AND DISCUSSION

Table 1 shows the results of the estimation of the factor models that influence the application of organic rice SOP-GAP in Boyolali Regency. Overall, based on the F test, the model equation is significant at a 90% confidence level with R<sup>2</sup> of 51.9%. This result also shows that there are 48.1% of other factors not included in the equation model. Other factors include training programs, supporting facilities and organizational and government policies. No multicollinearity was found in the model which indicated low correlation values between independent variables.

Table 1. Regression Results of Factors Affecting the Application of SOP-GAP

Variable	Coefficients		t-value
	Actual	Standardized <sup>(1)</sup>	
Constant	85,191		
Age	0,066	0,085	0.366ns
Land Area	8,062	0,467	1.757*
Farming Experience	-0,206	-0,120 <sup>(2)</sup>	-0.471ns

Education Level	-1,362	-0,535	-1.701ns
Initiator Role	4,839	0,350	1.565ns
Facilitator Role	8,188	0,545	2.899***
Motivator Role	1,303	0,084	0.275ns

Liaison Role	-7,213	-0,494	-2.110**
Organizer Role	0,984	0,060	0.274ns
Analyst Role	1,861	0,130	0.651ns
R <sup>2</sup>			0,519
F-test			2.047*

Remark: \* real at 90% confidence level, \*\* real at 95% confidence level, \*\*\* real at 99% confidence level, ns not significant

Based on the estimation results, there are three significant variables that influence the application of organic rice SOP-GAP namely land area, the role of youth as facilitators and liaison. Among the variables that have a significant influence, land area and the role of youth farmers as facilitators have a positive effect on the application of SOP-GAP. The larger land area increases the farmer's desire to do organic rice cultivation techniques because the land area indirectly affects the costs and income of [13] organic rice farming. Organic rice cultivation requires all input factors of production to be produced by organic farmers, so the cost to produce rice per unit area of land is also cheaper. Organic farming products have a higher price compared to the conventional one and this price can be obtained if farmers apply SOP-GAP of organic rice. Low input costs and high product prices on large land areas will provide maximum income for farmers, so they will continue to apply SOP-GAP to make their farming continues to provide large profits. Farmers with large land areas also benefit from the sustainability of businesses that can be carried out sustainably because organically cultivated soils have better conditions compared to soil conditions in conventional rice cultivation [14]. The positive role of youth farmers as facilitators in the application of SOP-GAP is more indicated by their helping farmers in finding information on application techniques which are the points in each SOP-GAP subsystem via mobile phones and the Internet. Farmer respondents in general are less able to operate the Internet and mobile phones to the maximum. Most of them only use the technology to communicate by making calls. Besides helping in operating the farmers' gadgets in the village, the organic farmers' children also help in finding new market resources for organic farmers. Online marketing becomes easier if done with the help of the Internet and social media really mastered by today's young generation.

The role of youth farmers as a liaison has a negative effect on the application of organic rice SOP-GAP. Youth farmers or children of organic rice farmers in Boyolali Regency are active in linking farmers with small traders. They usually buy products from farmers with unstable prices following changes in conventional rice prices. This happens because small traders do not dare to take price agreements with farmers. If

they think that the price of organic rice is too high and causes consumers to prefer conventional rice, small traders will prioritize buying and selling conventional rice. The role of youth as a liaison is also not shown by helping farmers access information from organic crop training centers. Youth farmers also have not been able to connect with institutions from outside groups of farmers such as farmer partners and non-governmental organizations. The findings in Table 1 above also show that the role of young farmers in the application of organic rice SOP-GAP in Boyolali is very minimal and it may also occur throughout Indonesia. Youth farmers as respondents in the research location cannot provide new ideas about the application of organic rice SOP-GAP in the area they live in even though they are more familiar with the use of technology that is currently developing (the role of the initiator). Neither they can provide motivation for farmers to obtain better income through organic farming (the role of motivator). Youth farmers do not help farmers around them develop their capacity and analyze any problems in applying SOP-GAP (the role of organizers and analysts).

Table 2 shows the effect of the application of agricultural SOP-GAP on organic rice production. No multicollinearity was detected in the model as evidenced by the low correlation value of each research variable. Overall, based on the F test, the model equation is significant at a 90% confidence level with R<sup>2</sup> of 68.5%. The R<sup>2</sup> value shows that there are 31.5% factors outside the model that affect organic rice production, including the type of technology used, weather and climate during the growing season. The estimation model shows that an increase in the application of SOP-GAP by one level causes an increase in the chance of increasing organic rice production by 56.907% SOP-GAP Application.

Table 2. Regression Results of Factors Affecting Farmer's Income

Variable	Coefficients		t-value
	Actual	Standardized	
Constant	1075.330		
SOP-GAP Application	56,907	.168	1.364*
Age	-27,474	-.105	-.694ns
Land Area	5113.756	.876	6.303** *
Farming Experience	-168,304	-.290	-1.967*
Education Level	-265,211	-.308	-2.117**
R <sup>2</sup>			0,685
F-test			10.416***

Remark: \* real at 90% confidence level, \*\* real at 95% confidence level, \*\*\* real at 99% confidence level, ns not significant

The results of the partial effect test using the t-test show that the application of SOP-GAP, land area, farming experience and education level significantly affect organic rice production. The age of farmers variable does not significantly affect their income. The application of SOP-GAP has a weak effect in the increase of organic rice production (real at a 90%



confidence level) because the adoption of SOP-GAP guarantees more quality of organic rice produced by farmers and food safety for consumers [15] [16] rather than increasing the quantity of products directly. The fertilizer sub-aspect is one of the points in the organic rice SOP-GAP, but the SOP- GAP regulates the feasibility of organic fertilizer to be applied to organic farming rather than regulating the amount of fertilizer that farmers must apply to their land. The coefficient value of the land area variable is positive by 5113.756 indicating that if land area increases, it will increase organic rice production by 5113.756 kg per unit of area planted. Land area is the main factor that is important in farming production activities. It affects the number of crops that can be planted by farmers in their area. The larger land area will result in the greater number of plants planted so that organic rice production is also greater. The amount of production will determine the income of organic rice farmers. This fact is consistent with the findings of Zikrina *et al.* [17] which shows the productivity of organic rice has a positive influence on the income of organic rice farmers.

The coefficient values of the farming experience and the level of education variables are negative of -168.304 and -265.211 respectively. This value shows that if there is an increase in the experience and level of formal education, farmers will reduce organic rice production. Farming experience is related to the habits of organic farmers in cultivating organic rice. Experienced farmers in the research location find it very difficult to change the way of cultivation practices based on the findings of new innovations. For example, the farmer respondents in Boyolali did not apply the use of the fermentation method to help manufacture organic fertilizer from animal waste and still chose to wait for the waste to dry by itself so that it could then be used as fertilizer. These results are consistent with the findings of Azam and Musarrat [18] showing the negative impact of the experience on farmers' decisions to access innovation for better agricultural productivity. Neither does experience have a positive effect on increasing organic rice production because farmers have difficulty in determining decisions in farming business even though there are examples of successful experiences in organic farming business. Farmers' decisions in cultivation are influenced by the availability of their capital and families as the closest people in adopting experiences to improve organic farming methods.

Formal education has a negative effect on organic rice production of organic rice farming because farmers who have higher formal education prefer to focus on working in other sectors which, according to them, provide a fixed salary every month. At the research site, some farmers also work as civil servants, teachers and factory workers. This also indicates that planting organic rice by some farmers is only used as a side job although this condition can be justified because there is free time for farmers when cultivating organic rice. Educated farmers should be able to increase and improve new innovations related to organic rice farming. Some researches also produce the same conclusions related to the role of education to increase farmers' incomes as done by [18]. Age variable has no significant effect on organic rice production. As the farmer's age increases, their ability to cultivate organic rice farming will decrease because their ability has begun to diminish. Until now, Indonesia has not been able to do

mechanization in every process of agricultural production. Most farmers still rely on simple technology to cultivate farming. The use of simple or manual technology requires more power for farmers. The increasing age undeniably reduces the power of farmers to cultivate. Older farmers generally do not have the will to produce more organic rice because the production is only for their own consumption, not for commercialization. Some farmer respondents even do organic farming as a form of side activity because they have retired from working as civil servants.

#### IV. CONCLUSION

The role of youth farmers in the application of SOP-GAP of organic rice is very minimal. Their roles as facilitators and liaison influence the application of SOP-GAP of organic rice. As a facilitator, youth farmers play a role in assisting farmers in finding information on how to do works in accordance with the SOP-GAP subsystem points using the Internet and mobile phones. The role of youth farmers as a liaison has a negative effect on the application of SOP-GAP of organic rice. Most of them only connect the farmers with small traders. Also, youth farmers have not been able to connect farmer groups with institutions outside such as training institutions, farmer partners and non-governmental organizations. The roles of youth farmers as initiators, motivators, organizers and analysts have no effect in the application of SOP-GAP of organic rice. The application of SOP-GAP has a weak effect on increasing organic rice production because it guarantees more quality of organic rice produced by farmers and ensures food safety for consumers rather than the increase of the quantity of products directly. Many things need to be done to improve the role of youth farmers in organic farming, especially the application of SOP-GAP of organic rice. Youth farmers need to be motivated with the prospects and opportunities for high income from organic rice compared to other agricultural activities and certain types of work. They are reluctant to farm because the income earned is far less than jobs in sectors other than agriculture. Therefore, youth farmers are more interested in other sectors. It is necessary to emphasize and accelerate technology in the management of organic farming because youth farmers are more connected to the Internet currently.

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