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The level of organic rice farming technology at farmer group in Ketapang village, Susukan sub-district, Semarang district, Central Java Province, Indonesia

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Abstract. The research was conducted to learn the phenomenon of the level of organic rice cultivation technology in the field at one of organic rice centers in Central Java Province, Indonesia. It was carried out using sample survey of respondents taken at 3 different of *Walisongo*, *Al-Barokah* and *Dewi Sri* farmer groups from organic rice farmer population in the village of Ketapang, Susukan sub-district, Semarang district. Primary data were collected quantitatively by distributing questioner to the respondent. Data were analyzed in order to evaluate the performance of inter-group observation and relationship of behavioral levels of organic rice cultivation. The results showed that the level of organic rice cultivation technology were high category (68.3%), moderate category (31.7%), and none less category, respectively. There was significant regression relationship $Y = 7.219 + 0.237 X_1 + 0.231 X_2$ ($R = 0.625$) between knowledge and attitude toward organic farming cultivation level. There was no significant difference in the application level of organic farming between *Dewi Sri* and *Al-Barokah* Farmer Groups (113.3^a vs 110.7^b), but the application level of organic farming both of *Dewi Sri* and *Al-Barokah* farmer groups were significantly ($P < 0.05$) different from *Walisongo* farmer group (95.5^b). It was concluded that the level of organic technology at farmer group was moderate to high category, but still requires further extension to be more equitable among farmer groups

Keywords : *organic, rice, technology, farmer group*

1. Introduction

Rice (*Oryza sativa* L) is a strategic commodity as rice is the main source of carbohydrates and its position as source of carbohydrates for Indonesians generally cannot be replaced by other carbohydrate sources such as corn, cassava, wheat or sorghum.

Based on pre-forecast figures issued by the Ministry of Agriculture in coordination with the Central Bureau of Statistics, rice production in 2016 reached 79.141 million tons of dry milled grain (DMG) or increased by 4.96% compared to the previous year's production [1]. The increase in production occurred in Java Island and outside Java Island, respectively, of 1.22 and 2.52 million tons. One government program through the Ministry of Agriculture is the development of 1000 Organic Farming villages, while the target by the Directorate of Food Crops is 600 villages [2].

Organic agriculture was developed to address the environmental degradation problems of non-organic farming that intensively applied in the past since the green revolution. The continuous use of



inorganic fertilizers leads to soil degradation characterized by decreased levels of soil organic matter [3, 4, 5]. Organic farming is a cropping production system based on biological recycling of nutrients, by means of crop and livestock wastes, and other wastes capable of improving fertility status and soil structure [6]. Organic farming strategy is to move the nutrients as soon as possible from the rest of the plant, compost, and manure into soil biomass which will be decomposed into nutrients in soil solution. The concept of organic farming is the law of return, the philosophy of feeding the soil to provide food for the plants (feeding the soil that feeds the plant) rather than feeding the plants directly.

Soil organic matter has an important role in determining the productivity of the soil, as it contains all the necessary elements of the plant, increasing the activity of soil microorganisms, providing loose soil structure, thus providing good aeration, high water storage, good root penetration, increased cation exchange capacity, lower nutrient leaching rates, in acid soils bind Al and Fe so that the availability of essential elements increases also neutralize the saline soils [7].

Organic farming is implemented by minimizing the use of synthetic fertilizers, pesticides, accelerated growth materials and other additives. To maximize the level of production possibilities, organic farming systems are implemented based on harvest rotation, residue yield, manure, green manure, waste from organic farming and pay attention to biological aspects of pest control to maintain soil productivity and support plant nutrients and control insects, and other pests [8].

Organic farming is a concern both by consumers and producers due to awareness of the dangers of using chemicals in practicing agriculture. Organic agriculture technology is available enough such as compost technology, biological fertilizer, organic pesticide, minimum or zero tillages [4]. The organic farming system can be integrated into integrated farming system, which is a system that combines the activities of agriculture, livestock, fishery, forestry and other science related to agriculture in one land, so it is expected to be one solution for increasing land productivity, development program and environment conservation, as well as integrated village development. This agricultural system will integrate the activities of the agricultural sector and its supporting sectors both vertically and horizontally according to the potential of each region by optimizing the utilization of existing local resources [9].

Ketapang Village is one of the villages in Semarang district of Central Java Province which was very successful in implementing organic farming. The success can be proven by farmer groups that have implemented organic rice cultivation either conversion stage or certified. In addition, Ketapang village farmer group has a marketing network both domestic and abroad. The research was conducted with the aim to evaluate the phenomenon of the application of organic rice cultivation technology in one of organic rice centers in Central Java. The results are expected to be a reference for the development of organic rice farming in a wider area.

2. Research methods

The research was aimed to evaluate the phenomenon of knowledge in the field so that the explanation between the theory and practice of the application level of organic rice cultivation technology in Ketapang village, Susukan sub-district of Semarang district. It was carried out using survey method. Survey was conducted on farmer population with sample of respondents taken from farmer group of organic rice farming. In addition, the survey was conducted to determine the causal relationships of the research variables as different observation groups at three different groups. The groups of respondents observed were 1) *Al-barokah* farmer group, 2) *Walisongo* farmer group and 3) *Dewi Sri* farmer group. Primary data were collected quantitatively by distributing questionnaire to the respondent. Meanwhile, secondary data were collected based on documents related to the research. Physical observation data were conducted on cropland and soil conditions.

The observed parameters were behavioral level of technology application including knowledge and skills of organic farming. Observations of soil conditions included organoleptic (color, texture), moisture content, solids, organic matter, ash, nitrogen and C/N ratio. The data were analyzed statistically using ANOVA to compare between observation groups and regression analysis to find

out the correlation between behavior of technology application level including knowledge, skills and attitude of farmers in organic farming cultivation.

3. Result and discussions

3.1. Respondents characteristic

Respondents characteristic (Table 1) were grouped into five categories, namely: 1. Farming experienced, 2. Nature of work, 3. Wetland ownership, 4. Yard ownership, and 5. Livestock ownership. Based on farming experience, the respondents were divided into farming experiences of less than 10 years, between 10-15 years and over 15 years. On the basis of the criteria of farming experienced, 51.66% of the farmers were more than 15 years experienced, 40.00% less than 10 years experienced and 8.34% between 10-15 years experienced. Meanwhile, based on the nature of the work about 68.33% and 31.67% of the farmers work as farmers and ranchers, respectively. Based on the ownership of paddy fields, 21.66%, 70% and 8.34% of the farmers were classified as farmers with paddy field less than 1000 m², between 1000-5000 m² and more than 5000 m², respectively. Meanwhile, based on the yard area ownership of 46.66%, 28.33% and 25.00% of the respondent farmers, respectively has a yard area with an area of less than 500 m², between 500-1000 m² and more than 1000 m². Based on livestock ownership about 73.33% of farmers respondents own poultry between 10-100 heads, 40.00% own goats/sheep between 2-10 heads, and 21.66% own cattle between 2-5 heads, respectively.

Table 1. Respondent characteristics Farmer Group in Ketapang village Susukansub-district

No	Identity of Respondent	Number of respondents	Percentage (%)
1.	Farming experienced		
	• <10 years	24	40.00
	• 10 – 15 years	5	8.34
	• >15 years	31	51.66
2.	Nature of job		
	• Farmers	41	68.33
	• Farmers-ranchers	19	31.67
3.	Wetland area ownership		
	• < 1.000 m ²	13	21.66
	• 1.000 – 5.000 m ²	42	70.00
	• >5.000 m ²	5	8.34
4.	Yard area ownership		
	• <500 m ²	28	46.66
	• 500-1.000 m ²	17	28.33
	• >1.000 m ²	15	25.00
5.	Livestock Ownership		
	• Cows (2-5 heads)	13	21.66
	• Goat/Sheep (2-10 heads)	24	40.00
	• Poultry (10-100 heads)	44	73.33

Table 1 shows that it is like agriculture in Indonesia, especially on the island of Java in general has problems of narrow land tenure. Increasingly reduced agricultural land and the splitting of land due to inheritance patterns make the interest of business in the field of agriculture less and less desirable. Narrow land tenure leads to lower profitability and lower farming efficiency. The problem of narrow land tenure for agricultural cultivation can be overcome by increasing productivity and business efficiency. Respondents characteristic (Table 1) require cultivation of integrated organic

agriculture into the hope of agricultural cultivation in a narrow field. The organic agriculture has improved livelihoods for smallholders while minimizing the use of external input [10]. Agricultural cultivation remains oriented to increase productivity by applying low-input technology that comes from outside, but utilizes as much as possible local resources and increases farmer's income [10]. The results of research by [11] indicated that organic farming practices can positively affect the economic resilience of farmers. However, organic farming practices have more complex problems than conventional farming practices in fostering farmer groups. Large and continuous requirements lead to the use of organic fertilizers more difficult than the use of inorganic fertilizers. Table 1 shows the low level of integration of farmers-ranchers (31.67%) with livestock ownership is also low, making it less able to support large and continuous requirements leads to the use of organic fertilizers.

3.2. Level of Organic Agriculture Cultivation

The farming experience of the respondents influenced the level of organic farming, where in organic rice cultivation 68.33% in the high category, 31.66% in the moderate category and none in the low category (Table 2). This condition indicates that the respondent has succeeded in developing self-behaving as a group of organic rice farming farmers. The high level of cultivation of organic agriculture of respondents supported by 83.00%, 15.00% and 16.66% attitude toward organic farming in high, medium and low category, respectively. However, this condition has not been fully supported by knowledge and skills in conducting organic rice farming. Knowledge and skill were dominant in the moderate category, 55.00% and 58.33% respectively, meanwhile the remaining were in the high category, 45.00% and 41.66%, respectively.

Table 2. Level of Organic Farming Cultivation

NO	Cultivation behavior	Amount of Respondent	Proportion (%)
1.	Knowledge of organic farming		
	• High	27	45.00
	• Medium	33	55.00
2.	Attitude towards Organic Farming		
	• High	50	83.00
	• Medium	9	15.00
3.	Skills of Organic Farming		
	• High	25	41.66
	• Medium	35	58.33
4	Level of Organic Farming Cultivation		
	• High	41	68.33
	• Medium	19	31.66
	• Low	0	0.00

The high attitudes of farmers' respondents to organic farming resulted in the decision of farmers to apply organic farming in their village. The higher the farmer's decision level for organic rice cultivation is higher the level of application of organic rice cultivation [12]. Although the level of knowledge and skills in the moderate category, but the development of organic rice farming in Ketapang village had been successful. Based on qualitative interviews with the head of farmer groups it was evident that the process and product of organic rice has been certified by the certification agency. Products and processes have been assured by the organic certification agency as organic rice

so that it is marketed at a higher price than non-organic rice. Good productivity was between 6-7 tons ha⁻¹ of DMG with the mainstay of local varieties of *Mentik Susu* and *Pandan Wangi*. Varied rice products are marketed in the form of premium ready-to-eat rice packaging at a good price of IDR 17,000 kg⁻¹ at the farm level for both domestic and overseas marketing.

The result of soil sample analysis showed that soil fertility was good, 3.91% C-organic, 0.26% N and 14.99 C/N ratio. This indicated that the implementation of the "Standard Operating Procedure - Good Agriculture Practice" has been carried out largely by joint members of farmer groups. The level of application of organic rice cultivation was related to the availability of production facilities and the selling price of the product [12]. The application of organic rice cultivation at the same time can apply low external input sustainable agriculture (LEISA) technology because it uses input from local resources either organic fertilizer or organic pesticide [13, 4]

The application of agricultural cultivation shown by the organic rice farming skills scores was influenced by the knowledge possessed and the attitude in approving the application of organic rice farming. There were significant regression relationship $Y = 7,219 + 0,237 X_1 + 0,231 X_2$ ($R = 0,625$) between knowledge and attitude toward skilled level of organic farming. Regression relationship showed positive significant regression coefficient ($P < 0.05$) both knowledge and attitude. This shows that organic rice farming may still be developed especially with equalization of knowledge level so that it may increase the skill in organic rice farming. Although the proportion of farmer respondents' attitudes was high in categories, attitudes often suggest a moderate relationship to behavior [14].

The level of cultivation of organic agriculture in the dominant organic rice cultivation in the high category but turned out to vary among members of the farmer group (Table 3). The farmer respondents consisted of three farmer groups, *Walisongo*, *Al-barokah* and *Dewi Sri*, respectively having an organic rice farming behavior score of 95.50; 110.72 and 113.28. The behavioral score of organic rice cultivation by *Walisongo* farmer group was significantly ($P < 0.05$) lower than *Al-Barokah* and *Dewi Sri* farmer groups. The behavioral scores of organic rice farming among *Al-Barokah* and *Dewi Sri* farmer groups were not significantly different. Total score of behavior of organic farming in line with the score of knowledge, attitude and skill of *Walisongo* farmer group was significantly ($P < 0,05$) lower than *Al-Barokah* and *Dewi Sri* farmer groups, but among *Al-Barokah* farmer group and group *Dewi Sri* farmers were not significantly different.

This shows that there was still a need for equitable distribution of knowledge, attitude and skills in organic rice cultivation so that all farmer groups can further develop the creation of the same organic rice farming cultivation. The development of agricultural technology is a complex process because it is influenced by internal and external factors [15]. Internal factors are derived from self-farmers themselves in receiving knowledge, encouragement attitude and willingness of application, while external factors are the availability of resources, information and technology. The future perspectives of the research is conducting an action research on increasing the level of organic farming Cultivation.

Table 3. Differences Score Behavior of Organic Farming between Farmer Group.

Farmer group	Knowledge	Attitude	Skills	Behavior
<i>Walisongo</i>	41.06 ^b	33.68 ^b	23.75 ^b	95.50 ^b
<i>Al-Barokah</i>	46.62 ^a	37.00 ^a	27.10 ^a	110.72 ^a
<i>Dewi Sri</i>	46.85 ^a	38.57 ^a	27.85 ^a	113.28 ^a

^a, ^b follow the values in the same column as significantly different ($P < 0.05$).

4. Conclusion

It was concluded that the level of organic rice cultivation technology was generally dominant in the high category (68.33%), the rest in the moderate category (31.66%) and none in the less category. The high level of application of organic rice cultivation was closely related to knowledge and attitude in the cultivation of organic rice farming. The level of cultivation of organic farming among farmer groups was still not uniform and therefore requires development. High attitudes towards organic rice

farming requires increased knowledge and skills for further development of organic paddy farming including integration support with livestock as source of organic fertilizer.

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