

The Application Level of the Standard Operating Procedures (SOP) on Organic Rice in the Village of Banjararum, Sub-District of Kalibawang, District of Kulonprogo

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Abstract—Organic farming is an alternative for environmentally friendly rice cultivation technology. The study aims to know the application level of Standard Operating Procedures (SOP) of organic rice and the different application level of organic rice SOP based on farmers demographic. There were 58 farmers involved in the census of Ngudi Rejeki Farmers Group. Data were analyzed using descriptive statistics. The results show that the application level of organic rice SOP was classified in high category especially in land preparation, planting, maintenance, nursery, and post-harvest. Even in the harvesting and seed selection, they were in very high category. Meanwhile, the place of seeding, replacing the dead seed, irrigation, and milling were still in the medium category. Some factors including formal education, production facilities access, market prices, and cosmopolitan levels led to the different application of organic rice SOPs. Conversely, the age of farmers, non-formal education, organic rice farming experience, and land area did not result in different SOP application of organic rice. It is recommended that farmers make dikes, use fertilizer when seeding, and have a good irrigation regularly. Formal education and cosmopolitan life style of the farmers became the main consideration for the group to obtain organic food certificates.

Keyword—Farmer demographics, Organic, Rice, SOP, the application,

I. INTRODUCTION

As an agricultural country, Indonesia has widely spread rice fields throughout the region. To increase land productivity, the government and farmers have made various efforts, including by using synthetic chemical fertilizers and pesticides known as the green revolution. However, the main problem faced by the farmers is agricultural land degradation due to the excessive use of synthetic chemical fertilizers and pesticides in 1984 - 1989 through the Bimas program. Based on the MDG's 2015, the seventh goal is to preserve the environment, with the ninth target to integrate the principles of sustainable development with national program policies and restore the missing resources. One of MDG's targets is to preserve agricultural land which is a staple food source for the community. The only alternative to restore the sustainability of agricultural land is organic farming, the type of agriculture known with the attempt to return to nature by avoiding the use of synthetic chemical fertilizers or pesticides [1]. Organic

farming in Indonesia has not been fully developed in the community, since there are only about 0.14 percent of paddy fields and gardens in Indonesia being planted organically [2]. In the effort to increase the production of organic farming, the government has launched a program to return to an organic way (going organic) in 2010. The development of organic farming in Indonesia throughout the period of 2008 to 2015 is still fluctuating and is in the low, but in 2015 there was an increase of 65% in the year 2014 [3]. Indonesian organic agricultural area that has been certified in 2015 reached 30.57% of the total area of organic farming (261,147.3 hectares).

Ngudi Rejeki Farmer Group in Banjararum Village, Kalibawang Sub-district, Kulonprogo District is one of the groups that has been implementing organic farming since 2006. The certificate of organic food production systems according to SNI 6729-2013 was obtained in 2014 for an area of 3.25 hectares which was valid until November 2017. The second certificate was for 12.45 hectares of land which was valid from March 2016 - February 2018, and the third certificate was for an area of 10.30 hectares which is valid from August 2016 - August 2019. Although the farmer group had obtained certificate of organic food production, they were able to apply different organic rice cultivations and were not always guided by the standard operating procedures that have been made by the group. The farmers were not always guided by standard operating procedures because they have different understanding of organic rice cultivation standards or the farmers still followed their previous habits. Therefore, it is necessary to study the application level of organic rice standard operating procedures by farmers in the Ngudi Rejeki farmer group, to know the different level of implementation of organic rice SOPs based on farmers' demography.

II. METHODS

This research uses descriptive method, which aims to analyze the collected data by way of describing [4]. Banjararum Village was purportedly selected as a research location since it is the only farmer group from 33 farmer groups in Kalibawang Sub-district which had organic rice production certificates in accordance with SNI 6629-2013 from the Organic Certification Institute (LSO) Persada in

Banjararum Village namely the Ngudi Rejeki farmer group. Organic rice certificates were valid from 2014 to 2019. The number of farmer respondents which was taken by census amounted to as many as 58 farmers from 68 members. Primary data were collected through interviews with the farmers. Seed selection, seeding, land preparation, planting, maintenance, harvest, and post-harvest were used as indicators of the level of application of organic rice cultivation with score range of one to five for each attribute. Criteria for score 1: very low; score 2: low; score 3: moderate; score 4: high; and score 5: very high. The overall application level of organic rice according to group Standard Operating Procedures with the score ranged 22-110 with the following criteria: a) score of 22.00-39.60: very low; b) score of 39.61-57.20 : low ; c) score 57.21-74.80 : moderate; d) score of 74.81 to 92.40 : high; and e) score of 92.41-100.00: very high. The data were analyzed by descriptive statistical method which described the contents of the table to provide an overview of the application level of organic rice cultivation. In addition, the demographic aspects of farmers to be used are: farmer age, formal education, non-formal education, experience of organic rice farming, organic farming, access to production facilities, and prices of organic rice on the market.

III. RESULTS AND DISCUSSION

A. Level application of organic rice

The application of organic rice Standard Operating Procedures (SOP) of Ngudi Rejeki Farmers Group consists of three main stages, namely: 1) Preparation; 2) Planting and maintenance; and 3) Harvest and post-harvest.

1) Preparation phase

Seed selection done by the farmers was good enough because all farmers had used "*Menor*" local superior varieties. Seed selection was done based on SOP. The farmers used seeds from previous harvests. If the seeds were not good enough to grow, they exchanged their rice with other farmers in the group. A high category in seed selection showed that the farmers were more likely to soak seeds in pure water or just slap them. However, only few farmers had selected seeds by mixing salt in soaking the seeds as recommended. Mixing salt in pure water baths was recommended by SRI system rice cultivation [5]. Seed germination activity had complied with the recommendation to soak the seeds for 24 hours and brood them for 12 hours. However, there were some farmers who soaked the seeds for 36 to 48 hours. The location of seeding was carried out in paddy fields which had been plowed, fertilized with compost 0.5-1 kg/m², without any beds. The results of the preparation phase research are presented in Table 1.

The high application level of organic rice was in land preparation stage. In plowing the rice fields, a tractor was used. After plowing, the rice fields were raked by all farmers. The farmer group did not recommend using cattle for plowing and digging the land because the farmers assumed that using machines would be faster. Moreover the farmers' cattle were being fattened for sale.

Table 1. Average score and category of application level of organic rice SOP at preparation stage

No	Activity	Average score	Application Category
1.	Seed selection:	8.76	Very high
a	Variety used	5.00	Very high
b	Seed selection	3.76	high
2.	Nursery:	10.71	high
a	Germination	3.59	high
b	Seeding place	2.86	moderate
c	Seedling age	4.26	Very high
3.	Land preparation	12.39	high
a	Replacing the dead seed	4.00	high
b	Type and dosage of basic fertilizer	4.17	high
c	Basic fertilization time	4.24	Very high

Most of farmers (55.17 percent) did basic fertilization according to group SOP. They used fermented manure more than 2.5 tons/ha, and the remaining fertilization was less than 2 tons and was not fermented. The use of many organic fertilizers would produce more tillers [6], but not excessively. This is supported by research done by [7] stating that the use of excessive organic fertilizer can reduce the growth and the production of tomato plants. As many as 44.83 percent of farmers used fermented fertilizers but less than 2.5 tons/ha farmers did not do fermentation. The reason why the farmers used fertilizer without any fermentation was that because the resulted product remained the same, and it was time and energy consuming. In addition, making their own fertilizer only require less than 2 ton/ha. The farmers considered that the land was fertile, easily attacked by disease, and it was too expensive to buy fertilizer.

Time for basic fertilization application with very high category was fertilizing 1-2 days after the land raked in accordance with the group SOP aiming to keep the fertilizer from being washed away and wasted by the current during plowing. However, 17.24 percent of the farmers did basic fertilizer 7 days before plowing, by considering that fertilizer was more pervasive and more evenly mixed and was easily planted with seeds. Nonetheless, there were some farmers who fertilized the land after planting. It was not recommended because rice seeds would break, and fertilizer did not penetrate the mud. The farmers had the wrong assumption as what Sutanto revealed that the use of fertilizer that is on time and sufficient will increase corn production three times. He also stated that mixing organic fertilizer with layer soil will produce a deep root system, good root collection, and high production [6]

2) Planting Stage

The application level of organic rice by the farmers in the planting stage was high that included the plant spacing indicator, the planting system, and the number of seeds. Only some farmers (39.66%) applied the plant spacing based in the group's recommendation 25x50 cm. Some farmers still applied various plant spacing, they were 25x40 cm (29.31%), 23x46 cm (24.14 %), and 20x40 cm (6.9 %). The member of farmer group had planted the land with wide spacing. The

wide plant spacing for *Menor* organic rice variety had been done by the member of farmer group. It was supported by Afiat who concluded that the wider plant spacing for local *Menor* varieties in Banjararum Village would increase the rice weight. Plant spacing of 25x40 cm produced rice weight of 4.32 tons / ha, while plant spacing of 20x40 cm produced 3.19 tons/ha [8]. The farmers assumed that it was not a problem to plant with dense spacing because the land was fertile enough and to avoid empty space. Most farmers applied break row (*jajar legowo*) cropping system type 4: 1 which had not been in line with the recommendation of break row type 2:1. Even worse, there were 20 percent of farmers who applied break row type 6:1.

Table 2. The SOP application level of organic rice at the planting and maintenance stage

No	Activity	Average score	Category
1.	Planting :	12.02	High
a	Planting space	4.02	High
b	Planting system	4.10	High
c	The number of seeds	3.90	High
2.	Maintenance :	18.63	High
a	Replanting	3.41	High
b	Fertilization 1	3.86	High
c	Weeding control	4.52	Very high
d	Pest control and		
e	diseases	3.84	High
	Irrigation	3.00	Moderate

The level of maintenance of organic rice plants by farmers had been in the high category that included refining activities, supplementary fertilization, pest controlling. Refining planting was 11-14 days. It was longer than the recommendation that is 7-10 days after planting. Even most refining planting was 15-18 days after planting. Supplementary fertilization was at the age of rice 15-60 days after planting using the urine of fermented beef with a dose of 600 ml / 14 l of water, and application intensity was 2-4 times, while the recommendation was 5 times.

Weed control was carried out by immersing weed in mud, but 43 percent of the farmer let the weeds float, and one farmer did not control weeds because there were not many weeds at that time. The farmers assumed that the weeds would die if they floated, and if they were immersed in mud they would damage the roots of rice plants. Most farmers used bio pesticides with a dose of 2.5 g / 14 l of water to control pests. Only a small percentage of the farmers did cropping rotations, simultaneous planting, predator usage, uprooting disease-stricken plants, traps, and capturing Plant Pest Organisms (OPT).

There were some farmers who used Natural BVR that was not recommended by the group, even though they are classified as bio pesticide. One farmer still used non-bio pesticide due to the severe attack. The recommendation for irrigation began at the age of 35 days after planting with 3 cm deep puddles. At the age of 35 to 55 days the soil was made flooded up 2 cm (*macak-macak*), and at the age of 56 to 90 days it was flooded again \pm 5 cm, and then the rice was dried for harvest. But 50

percent of the farmers did not do flooding after planting because of previous farmers' habits. According to the instructions of the Center for Agricultural Extension, the purpose of flooding at the beginning of planting until the age of 15 days so that the soil structure that has been obtained when tillage can be maintained. Flooding can also control the growth of weeds because weeds will be difficult to grow in shallow water. In the case of uneven land surfaces, the growth of weed should have been anticipated since the land processing, at the rake processing [9]. Farmers did not pay attention on the rules of irrigation with the consideration that the most important thing in rice fields is not always flooded and did not always dry and intermittent.

3) Harvest and Post-harvest

The recommended criteria for harvesting organic rice was to make 95% of the grain become pithy, panicle dry and yellow. However, most of farmers harvested rice at 90 % grain maturity. The maturity of rice grains was only 90 %, but it was still in the range of the recommendations from the Agricultural Research and Development Center that is 90-95% [10]. The farmers considered that 95% of the majority lead to a lot of rice fall out. The threshing stage of rice using Power thresher was conducted by all farmers, because not many grains were wasted, it was cleaner and it saved energy and time even though the threshing costs were quite expensive. Farmers rationally believed that the use of power thresher reduced about 3% of rice production [10]. Achievement activities categories of Harvest and post-harvest are presented in the following Table 3.

Table 3. The level of application of organic rice SOP in harvest and post-harvest activities

No	Activities	Average score	Application Category
1.	Harvest	8.95	Very high
a	Harvest Criteria	3.95	High
b	Threshing	5.00	Very high
2.	Post- harvest	13.71	High
a	Drying place	3.50	High
b	Storage place	3.66	High
c	Milling	2.84	Moderate
d	Packaging	3.71	High

Rice drying places were done in line with the group recommendations, namely by using a tarpaulin or drying floor specifically for organic rice, and to be separated from inorganic rice drying. Most farmers dried their grain with tarpaulin or floor drying inorganic rice which previously had been cleaned first. Drying of organic rice was close to inorganic rice, or interchanged use of tarpaulins and drying floors was still widely practiced by the farmers (29.3 percent). Farmers did not have enough space to dry separately and that they needed more workers.

The level of application at the post-harvest stage with storage indicator was categorized as high. There were 30.0 percent farmers who applied recommendations of the group to select the storage area that was not moist, and to be placed with a wooden base, and to be separated from inorganic rice.

However, most farmers (58.6%) did not use wooden bases and separated them from inorganic rice. Some farmers kept them in a humid place. Storage of organic grain was mixed with inorganic grain because they did not have wide space and it allowed them to control rat pests, and to keep from water due to the leaking roof of the house.

The application of organic rice SOP for grain milling stage was still in the medium category. Farmers milled rice in a public rice mill, using inorganic rice mills that had been cleaned up and sorted. A lot of farmers (44.8%) did not sort the grain when they milled because they used the rice for their own consumption. In addition they only milled a little amount of grain. Nevertheless, the application for packaging was in the high category. The majority of farmers used packages of inorganic rice, ex-urea & NPK fertilizer, and used chicken feed that had been cleaned and not perforated. Those sacks may not damage or pollute the rice by packaging did not carry OPT. The packaging containers used by farmers were not in accordance with the recommendations of the Agricultural Research and Development Center to use paper container materials, plastic sacks or gunny sacks. Sacks must protect the product from damage in transporting and or in storage [10].

The level of application of organic rice SOP conducted by farmers in group members of Ngudi Rejeki in Banjararum Village is categorized as high and is presented in Table 4.

Table 4. Percentage of achievement score on the implementation of organic rice SOP in the Ngudi Rejeki farmer group

No	Activities	Score	Average achievement	
			%	Category
1.	Selection of seeds	2-10	87.60	Very high
2.	Nursery	3-15	71.40	High
3.	Land preparation	3-15	82.60	High
4.	Planting	3-15	80.13	High
5.	Maintenance	5-25	74.52	High
6.	Harvest	2-10	89.50	Very high
7.	Post-harvest	4-20	68.55	High
		20-110	77.43	high

Overall, the level of application of organic rice SOP by farmer member of the Ngudi Rejeki Farmer Group is high, t 77.43%, even the application of organic rice cultivation in the selection of seeds and harvest is very high or in accordance with SOP of organic rice in farmer groups. The high level of application of organic rice cultivation in Banjararum Village supports [11] conducted in Bantul Regency; study in Ketapang Village, Semarang Regency [12]. However, the application of organic rice by farmers in Banjararum Village is better than farmers in Lombok Kulon Village, Bondowoso District [13]. Farmers who used an organic technology in rice farming amounting to 55.9 % is in the high category and 44.1% is in the medium category. Although it has been categorized as high, it is necessary to guide the farmers to make them understanding how to do the replacing of dead seed, to do irrigation and to make milling in line with the SOP of the farmer group or the recommendation of organic rice cultivation from the local office. In this way, it is expected that

the level of implementation of organic rice cultivation will increase to be followed by the increase of the rice production.

B. Differences in the application of organic rice SOPs based on farmer demographics

1) Age and education of farmers

The highest score for the application of organic rice SOP is produced by non-productive farmers (65-71 years) followed by 51-57 years old, 37-43 years old, 58-64 years old; and the lowest in the age group of 44-55 years. The score for applying organic rice to farmers at a young age is not lower than that of older farmers. The results of data analysis in table 5 show that age does not distinguish the way farmers apply organic rice SOP. As revealed by Sikandar conducting a research in Nalanda Village that the age of farmers did not differ in the level of application of organic rice SOPs [14], and the research in West Bandung District for vegetable commodities [15]. The formal education of farmers will differentiate the level of application of organic rice SOPs in Banjararum Village.

Table 5. The level of application of organic rice SOP based on age and education

No	Description	Score of application level
1.	Farmer age (year)	
a	65-71	89.00
b	58-64	85.29
c	51-57	86.27
d	44-50	82.77
e	37-43	86.00
2.	Formal education :	
a	Senior high school	87.92
b	Yunior high school	84.25
c	Primary school	81.84
3.	Non-formal education (time)*	
a	11-12	93.86
b	9-10	90.31
c	7-8	88.00
d	5-6	76.75
e	3-4	80.00

Remarks: * participate in counseling, and or training on organic rice farming

The high application of organic rice by farmers is followed by high education. Farmers who complete high school education will implement organic rice SOPs more in line with the recommendations of farmer groups than farmers who only completed junior high school. Likewise, farmers who completed junior high school have a higher level of application compared to farmers graduating from elementary schools. Farmers attending counseling and training of 11-12 times normally show high level of application. In addition, the low participation of farmers in extension activities was followed by the low level of application of organic rice SOPs. The number of farmers participating in counseling and training will distinguish the level of application of organic rice SOPs. The results of this study support the research by [15] concluding that the better the formal education and the more often farmers participate in counseling and training, the easier it is for farmers to cultivate organic vegetables so that there is a tendency for farmers to cultivate organic vegetables in accordance with SOPs. [16] study also revealed that one's

knowledge and education greatly influence his ability to adopt an innovation. Farmer participation in direct training has influenced and helped farmers make wise decisions [17].

2) Farming experience and cosmopolitan level

The time length to carry out organic rice farming leads to no different result in the application of organic rice SOP. Based on Table 6 it can be seen that the achievement of the application of organic rice SOP was 80.45 by farmers who had 3-4.4 years of experience in organic rice farming. In addition In addition, the achievement of the application of organic rice SOP of 84.36 was produced by 4.5-5.8 years of experienced farmers, and the achievement of the application of organic rice SOP of 92.30 was produced by 7.3-8.6 years of farming experience.

Table 6. The level of application of organic rice SOP is based on cosmopolitan life style and experience

No	Description	Score of application level
1.	Farming experience (year)	
a	8.7-10.0	93.75
b	7.3-8.6	92.30
c	5.9-7.2	82.95
d	4.5-5.8	84.36
e	3.0-4.4	80.45
2.	Cosmopolitan	
a	Very active sources: extension agents, farmer groups, other farmers outside the group, newspapers, magazines, internet	0.00
b	Active, sources: extension agents, farmer groups, farmers outside the group, newspapers, magazines.	94.83
c	Active enough, sources: extension agents, farmer groups, other farmers outside the group	89.52
d	Inactive, source: extension agent, farmer group	79.44
e	Very inactive, source: only from extension workers	73.50

Meanwhile, the cosmopolitan level of farmers associated with the many opportunities to obtain information related to organic rice farming will lead to high application of organic rice SOP. Farmers who actively seek information from extension agents, fellow farmers in groups and farmers outside the group, newspapers, and magazines had organic SOP implementation score 94.83 Farmers who are less active and seeking information only from extension agents and other farmers in their group, shows the lowest level of application of organic rice.

3) Land area, access to production facilities, and prices

The land area used for organic rice cultivation did not affect the level of application of organic rice SOP. In the area of cultivated land above 1 ha the farmers tends to apply higher organic rice SOP. The cultivated land area was 0.20-0.44 ha, the level of application of organic rice SOP was higher than the cultivated area of 0.45-0.68 ha.

Farmers who worked on large land area tried to get high production so that the level of application of their cultivation must also be better. Farmers working on narrow land area were motivated to get high production through better cultivation practices. The availability of production facilities and certainty of organic prices in the market affected the level of application of SOP for organic rice. The easier the farmers get production facilities, the higher the application of organic rice SOP.

Table 7. The effect of access to production facilities and prices on the level of application of organic rice SOP

No	Description	Level of application level
1.	Land area (ha)	
a	1.17-1.39	99.00
b	0.93-1.16	0.00
c	0.69-0.92	89.60
d	0.45-0.68	83.41
e	0.20-0.44	85.00
2.	Access to production facilities	
a	Very easy	90.09
b	Easy	88.86
c	quite easy	77.95
d	Not easy	77.00
e	Very not easy	0.00
3.	Price	
a	Always high and price certainty	93.20
b	The price is uncertain but always there	89.94
c	Always there but low prices	85.00
d	Not always there and uncertain	80.33
e	There is no guarantee	78.56

The ease to obtain organic fertilizer was because the farmers made their own fertilizer or bought it from group member farmers. Farmers used previous harvest to meet the need of seeds. If the harvest is not good enough for seeds, the farmers would buy from other farmers in the group. The level of application of organic cultivation by farmers in Ketapang Village, Semarang District was related to production facilities and selling prices [12].

The more certain and the high price of organic rice in the market, the higher the application of organic rice SOP by farmers. Organic rice sales was certain and routine to the Agriculture Office of Kulonprogo District through farmer groups, but the number of requests was not proportional to the amount of production produced by farmers. The results of this study support the findings of Mayrowani that farmers hope to get high prices for organic products after organic farmers land. Furthermore, it was also revealed that farmers were reluctant to plant organic farming because of the unclear market for organic agricultural products and the premium price obtained [18].

Based on the analysis in table 5 - table 7 it can be concluded that the level of application of organic rice SOP is different based on formal and non-formal education of farmers, experience of organic rice farming, cosmopolitan level, access to production facilities, and the price of rice on the market. This is in line with the results of research in West Bandung that the level of education of farmers and the

participation of farmers in extension activities have a positive effect on farmers' decisions in implementing SOP for organic vegetable farming systems [15].

IV. CONCLUSION

The level of application of organic rice SOP by farmer group members of the Ngudi Rejeki Farmer Group in Banjararum Village has been highly categorized in land preparation, planting, maintenance, nurseries, and post-harvest. The level of application of SOP harvest and seed selection are very high. There are differences in the application of organic rice based formal and non-formal education in applying organic rice, access to production facilities, market prices, and cosmopolitan levels. Meanwhile, the age of farmers, organic rice farming experience, and land area do not affect the level of application of organic rice SOP. It is recommended that farmers make dikes, use fertilizer when seeding, and conduct irrigation frequently. Formal education, cosmopolitan of the farmers became the main consideration for the group to obtain organic food certificates.

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