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The implementation of rice's Good Agricultural Practices (GAP) in Panarukan-Situbondo

The implementation of rice's Good Agricultural Practices (GAP) in Panarukan-Situbondo

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Abstract. The level of dependence of farmers on chemical fertilizers and pesticides on rice plants can lead to soil nutrient degradation and pest resistance. Also, excessive use of chemicals in rice can leave a residue in the production of rice, thus affecting the food security of rice as a staple food of Indonesian society. Related to this, the government has begun to promote programs related to food safety, one of which is good cultivation techniques or often known as Good Agriculture Practices (GAP). The purpose of this study was to analyze the implementation of GAP for rice in Panarukan-Situbondo. Determination of respondents using a simple random sampling method as many as 60 respondents from two villages, Peleyan and Sumberkolak. While the analysis uses descriptive analysis with a questionnaire assisted. The results showed that the level of implementation of rice's GAP was at a medium level (66.65%). The highest GAP aspects are in the aspect of nursery and planting, and the two lowest aspects are conservation and soil cultivation, as well as integrated pest and disease protection aspects.

1. Introduction

As the population of Indonesia increases, the need for food, especially rice as the staple food, must also be increased to ensure food availability. The government has carried out many programs, one of which is the farming intensification program. Farming intensification is a program that aims to increase food production, especially rice, which includes five farming businesses, including the provision of adequate fertilizers and pest control. So that in the intensification program, chemical fertilizers are used to increase the need for nutrients needed by plants. Likewise, various chemical drugs and pesticides are used to suppress the presence of pests and diseases in plants.

The problem with the success of this farming intensification program is the high level of dependence of farmers on the use of chemical fertilizers and pesticides, including rice farmers in Situbondo Regency. As a result, the longer of chemical fertilizers and pesticides, the more their dosages, the more degradation of soil nutrient content and the resistance of pests to chemicals. Further, chemical residues found in rice production that uses chemicals, which of course will affect consumer food safety. Therefore we need a good cultivation technique program or known as Good Agricultural Practices (GAP).

GAP is a quality assurance program for food safety that applied to the farm. GAP is the application of a certification system for agricultural production processes that use advanced, environmentally friendly, and sustainable technology [1]. Regarding to the outline of GAP is the sustainable agriculture system, the use of chemicals must be in accordance to the recommended dosage. There are many benefits obtained from implementing GAP by farmers. Apart from preserving the environment,

producing safe and halal food, ensuring the welfare of workers, GAP also increases the competitiveness of food products in international trade.

Researches on the application of GAP in Indonesia have been done on various food crops and horticultural commodities. The degree of implementation of GAP for smallholder coffee farming is in a low category [2]. In sugarcane farming, the degree of GAP application is in the medium and high categories [3]. The degree of GAP application for garlic farming is in a low category [4]. Meanwhile, the degree of GAP application for organic rice shows a high category [5]; [6]; [7].

Based on the previous study, the application of GAP on food and horticultural commodities is quite diverse. However, so far, research on the application of GAP for rice has only been limited to organic rice, while lowland rice is still limited. Most of the rice consumed by the community comes from lowland rice and the number of lowland rice farmers is more than organic rice. the implementation of GAP is very supportive of the realization of sustainable agriculture, while the application of GAP is still less due to the lack of understanding of farmers about GAP [8]. The other research also explained that the application of MyGAP (Malaysian Good Agricultural Practice) for lowland rice is at a simple level because farmers only apply 9 elements out of 11 elements from MyGAP [9]. Therefore, the implementation of lowland rice GAP is necessary to realize food security and environmental preservation, as well as to achieve sustainable agriculture.

Research on the implementation of GAP for rice in Panarukan needs to be done because Panarukan is one of the areas in Situbondo with the highest rice production. Rice production in Panarukan District based on data from BPS Situbondo Regency in 2017 reached 37.787,30 quintals/year with a harvest area of 6.591,77 m^2. This research aimed to know how far the implementation of rice GAP principles that have been done by farmers. So that it can be used as a recommendation for stakeholders and related agencies in realizing sustainable agriculture and safe food supplies.

2. The research method

The research area was selected purposively (purposive method) in Panarukan, because of the rice production [10]. Respondents selected using a simple random sampling technique to 60 people from two villages, Peleyan and Sumberkolak, with 30 farmers in each village. This method was chosen based on the assumption of homogeneous sample characteristics and regions. According to Cohen, et.al, the larger of the sample is better, but there is a minimum limit that must be taken by researchers, which is 30 samples. Meanwhile, the data were collected by in-depth interviews technique using a questionnaire [11]. Meanwhile, the data were collected by in-depth interviews technique using a questionnaire.

The data analysis used in this research is descriptive analysis with the help of a Likert scale to analyze the implementation of GAP with the highest score of 3 and the lowest score of 1. A score of 3 shows that farmers always implement SOPs consistently, a score of 2 shows that farmers rarely/occasionally implement SOPs, and a score of 1 indicates that farmers do not implement SOPs. The SOP used refers to the ICM (Integrated Crop Management) for Rice issued by the Ministry of Agriculture [12]. According to FAO recommendations [1] which states that the implementation of GAP refers to integrated crop management. Aspects in ICM include land cultivation, superior varieties and quality seeds, nurseries, planting, intermittent irrigation, fertilization, integrated weed control, integrated pest and disease control, harvest and post-harvest.

The total score from the GAP implementation is divided into three criteria, high, medium, and low [3] to a scale range with the following intervals

$$interval = \frac{highest\ score - lowest\ score}{total\ of\ criteria} \quad (1)$$

So that the range of the GAP implementation score scale is obtained as follows in Table 1.

Table 1. The range of GAP implementation score scale.

Criteria	Total Score
High	≥ 86
Medium	61 – 85
Low	37 – 60

3. The implementation of rice's GAP

The level of implementation of lowland rice GAP in Panarukan, Situbondo is divided into 3 criteria, high, medium, and low. The study showed that the farmers' criteria for the implementation of lowland rice GAP in Panarukan were at medium and high levels. In detail, can be seen in Table 2.

Table 2. Criteria for farmers on the implementation of GAP for rice

Criteria	Total of Farmers	Percentage (%)
High	20	33,33
Medium	40	66,67
Low	0	0,00
Total	60	100,00

Table 2 shows that the average farmer is at a medium level, namely 67%. This means that most lowland rice farmers are still inconsistent in applying GAP to their farms. This does not mean that they do not know about SOP for lowland rice, because generally, they are members of farmer groups who always participate in extension and field schools on rice cultivation. It's just that farmers are still reluctant to change the conventional way of rice cultivation that they have implemented for years. This occurs due to a lack of understanding of the importance of applying GAP, fear of high attack by plant pests (OPT), and lack of confidence in the existence of a differentiator in increasing production [8]. The implementation levels of 9 GAP aspects can be seen in Table 3.

Table 3. The implementation levels of GAP aspects in Panarukan

No	GAP Aspects	Maximum Score	Farmers's Score	Level of GAP Implementation (%)	Criteria
1.	Conservation and Land Management	12	6,83	56,94	Medium
2.	Superior Varieties and Quality Seeds	9	6,33	70,37	High
3.	Nurseries	15	11,97	79,78	High
4.	Planting	9	6,58	73,15	High
5.	Intermittent Irrigation	9	6,53	72,59	High
6.	Fertilization	18	11,63	64,63	Medium
7.	Integrated Weed Control	9	5,95	66,11	Medium
8.	Integrated Pest and Disease Management	15	8,73	58,22	Medium
9.	Harvest and Post-Harvest	15	9,42	62,78	Medium
Total		111	73,98	100,00	

Table 3 shows the value of rice GAP implementation in terms of 9 aspects. Based on the results of the analysis, the level of rice GAP implementation in Panarukan at a medium level (66,65%). It means that the rice farmers in Panarukan have not consistently implemented GAP. According to [6], which states that the medium category shows that farmers only sometimes do most of the GAP aspects written in the SOP.

That table also explains that 4 aspects of GAP are in high criteria, namely superior varieties and quality seeds, nurseries, planting, and intermittent irrigation. Meanwhile, 5 other aspects of GAP are in the medium category, namely conservation and land management, fertilization, integrated weed control, integrated pest and disease control, and harvest and post-harvest.

3.1. Conservation and land management

The GAP concept is synonymous with environmental conditions, including land conditions [1]. Thus, conservation and proper land management also support the application of rice GAP. One form of land conservation that farmers can do is crop rotation [13]. Meanwhile, the recommended land processing is plowing twice and harrowing to get optimal processing results.

The implementation of GAP in the aspects of conservation and land management is 56.94% which is in the medium criteria. It shows that farmers are still not implementing this aspect consistently. The level of farmer adoption in the land processing subsystem is still low because they still apply conventional cultivation systems and do not apply GAP [4].

Farmers in Panarukan usually do rice-rice-rice crop rotation. Only a small proportion of them implement the rice-rice-maize crop rotation system. Whereas according to Carol et al [13] explain that crop rotation with various plants can improve soil structure with minimum tillage treatment. Padmini's research [13] adds that rice-rice-rice crop rotation does have a higher available P content compared to various crop rotations, but rice productivity is higher in various crop rotations. Thus, the selection of rice-rice-rice crop rotation will also have an impact on other GAP components, such as fertilization, weed control, or pest and disease control. It occurs due to the lack of knowledge of farmers about land conservation, so farmers are reluctant to change their cultivation methods. Meanwhile, farmers in Panarukan plowing the farm once due to limited water

3.2. Superior varieties and quality seeds

Superior varieties are the easiest technology to be adopted by farmers because this technology is cheap and its use is very practical [12]. So, farmers decide to have implemented superior varieties for their farming. Farmers in Panarukan have also used superior varieties by the conditions of their area. On average, they use ciherang, membramo, and IR-64 varieties.

In addition to superior varieties, certified quality seeds are also highly recommended because, in addition to growth, germination, and disease resistance, quality seeds will also provide high yields[12]. Farmers in Panarukan District use certified seeds for their farm because they realize the advantages of using certified seeds. Based on this, it is not surprising that the implementation of GAP for aspects of superior varieties and quality seeds reached a value of 70.73%, including in the high criteria.

3.3. Nurseries

The results showed that the value of GAP implementation in the nursery and nursery aspects was 79.78%, including in the high criteria. This aspect is also the highest aspect of the GAP implementation for lowland rice in Panarukan. It shows that farmers are accustomed to doing the nursery recommended by GAP because there is no too significant difference between conventional and GAP, so farmers are used to doing it.

3.4. Planting

Planting techniques that need to be considered include the age of the seeds ready for planting, the number of seeds per planting hole, and the spacing [14]. The level of implementation of GAP for the planting aspect, namely 73.15%, is included in the high criteria. This shows that farmers have consistently implemented GAP for planting.

Farmers in Panarukan apply the tile system planting technique with a spacing of 20 × 20 cm and 25 × 25 cm with a total of 3 seeds per clump. Following the recommendation [12] that the suitable planting technique for rice ICM is legowo row and tile system. Meanwhile, the age of rice seedlings

when they were transferred from the nursery to the paddy fields was already by the SOP, namely the age of 18-21 days after planting.

3.5. Intermittent irrigation

An irrigation system suitable for irrigated rice is intermittent irrigation, which is the arrangement of land conditions in alternating dry and inundated conditions [12]. The results showed that the level of implementation of GAP for the intermittent irrigation aspect was 72.59%, which is a high category. It shows that farmers in Panarukan have been doing intermittent irrigation consistently. Intermittent irrigation aims to make water use more efficient and increase crop yields because one of them can control pests [15].

3.6. Fertilization

The recommended fertilization is fertilization according to soil and plant conditions. For this reason, the Ministry of Agriculture [12] recommends a fertilization system using the aid of a tool, namely the leaf color chart (BWD) for N needs and paddy soil test kits (PUTS), as well as omission plots for P and K. However, guidelines for the minimum and maximum dose limits of fertilizer have also been provided to facilitate fertilizer application by farmers. Apart from chemical fertilization, organic fertilizers are also highly recommended to compensate for chemical fertilizers.

The results showed that the level of implementation of GAP for the fertilization aspect was 64.63%, namely moderate criteria. So far, fertilization done by farmers in Panarukan has used the maximum limit of fertilization guidelines without analyzing soil and plant nutrient needs first. It contradicts the research [4], [7], [6] that show the application of the fertilization aspect is on a high criterion because it is following the established SOP.

3.7. Integrated weed control

The presence of weeds on agricultural land greatly disrupts the productivity of the core crop, because weeds will seize soil nutrients needed by the nucleus plants. Therefore, it must control the weed in various ways, including perfect soil cultivation, managing water in the paddy fields, using certified rice seeds, only using crop residue compost and manure compost, mechanically using *gasrok*, and using herbicides when the weed infestation has occurred high [12].

The level of implementation of the integrated weed control aspects for farmers in Panarukan District was 66.11%, including in the medium criteria. There are 2 ways to control weeds by farmers in the Panarukan, chemically by using herbicides and manually using human labor. Farmers prefer to use herbicides because they are considered to be more effective at eliminating weeds.

3.8. Integrated pest and disease management

Integrated Pest Management (IPM) is a control approach that takes into account ecological factors so that control is carried out so as not to overly disturb the natural balance and not cause major losses [12]. Based on this, the recommended method of controlling pests and diseases is a combination of balanced natural and chemical methods, so that it can achieve environmental safety. Natural methods can use natural enemies of these pests and vegetable pesticides made from natural ingredients. Chemical methods use pesticides in the type, dose, and method of use that suits the needs.

The value of GAP implementation for the IPM aspect was 58.22%, including in the medium category. This value is the second lowest value from the implementation of GAP in Panarukan. It happens because farmers in Panarukan cannot escape the use of pesticides to control pests and diseases in their rice fields. Following the research [4] shows that the subsystem of the crop protection method is at low criterion. On average, farmers are reluctant to abandon the use of chemical pesticides because farmers still lack confidence in natural pest control that can reduce pest and disease attacks [8].

3.9. Harvest and post harvest

The implementation value of the harvest and post-harvest aspects in Panarukan District showed 62.78%, including in the medium category. In principle, the implementation of the rice harvest is following the GAP. Farmers can determine the age and characteristics of the rice ready for harvest, and they are very familiar with the harvesting procedures and tools used. It's just that they do not apply post-harvest and choose to sell directly to middlemen without prior post-harvest implementation. It happens because they need money quickly even though the selling price tends to be cheaper.

4. Conclusion

The conclusion of the research on the Implementation of Rice Good Agricultural Practices (GAP) in Panarukan-Situbondo, shows that the implementation level is medium with the percentage value of implementation reaching 66.65%. The lowest GAP aspects are conservation and land management aspects, as well as integrated pest and disease protection aspects. Meanwhile, the number of farmers apply GAP consistently was only 33.33%, and the remaining 66.67% had not applied GAP consistently.

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