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Assistance Of Farmers In Utilizing The Consortium Of Endophite Bacteria And Organic Fertilizer As Well Organic Pesticides Based On Local Wisdom To Increase Rice Productivity In Rainfed Rice Land

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ABSTRACT

The "Sidodadi" farmer group in Demangan village, Sambi sub-district, Boyolali district consists of 15 members, which is a rainfed farmer group. Paddy productivity in rainfed lowland is quite low (2-3 tons/ha) compared to irrigated land (5 tons/ha). The use of a consortium of endophytic bacteria, organic fertilizers and organic pesticides based on local wisdom and the selection of varieties according to their designation can increase rice productivity. Rice farming in this farmer group does not yet have proper management, so assistance is needed.

The purpose of this service is to assist in the management of rainfed land so that their income increases.The problems of this farmer group are 1) Aspects of Production and 2) Aspects of management. Production aspects include (a) Technology Utilization Aspect: not having technology to increase rice productivity (b). Aspects of Soil Fertility: rarely use organic fertilizers (c) Aspects of Use of Varieties: rice varieties that are not suitable for allotment of rainfed rice fields.

The solution to the problems that arise is to assist farmer group members to use endophytic bacteria consortia, use organic fertilizers and organic pesticides based on local wisdom, use rice varieties that are suitable for sub-optimal rainfed land and farm management training.

This activity will be carried out in two places, 1) in the yard of the farmer group members and 2) in the paddy fields in Demangan village, Sambi sub-district, Boyolali Regency from July 2023 to December 2023.

The method used is 1) Farm management counseling and assistance, 2) Practice: making a consortium of endophytic bacteria, organic fertilizers and organic pesticides based on local wisdom 3) Cultivating organic rice in rainfed paddy fields, 4). Monitoring and evaluation.

The result of this community-based service activity is an increase in the skills of farmers in making endophytic bacteria, making local microorganism (MOL), making solid organic fertilizers, making liquid organic fertilizers and organic pesticides and selecting rice varieties that are suitable for rainfed lowland rice fields and its application in rainfed lowland rice cultivation.

Keyword: *endophytic bacteria, local microorganisms, organic pesticides, organic fertilizers, rainfed rice fields*

1. INTRODUCTION

Demangan Village is one of the villages included in the Sambi sub-district, Boyolali district, located approximately 6 km east of the capital of the Sambi sub-district. The rice fields in Demangan are all rain-fed rice fields. The “Sidodadi” Farmer Group in Demangan Village has 15 members.

Rainfed rice fields are rice fields which are irrigated by rainwater. Rainfed land can accommodate rainwater because the land is made flat and surrounded by canals (Sasa, 2002). The cropping pattern is generally rice once in the rainy season with a tapin system

then fallow. Sources of water in rainfed paddy fields apart from rainwater can be used river water as a source of water for plants. In order for water to be utilized as efficiently as possible by plants, water management techniques are needed. In addition to water management, organic matter management is very important in environmental management in rain-fed paddy fields (Sumanto et al., 2015).

Because water is a limiting factor in production, it is necessary to develop plant cultivation technologies that can utilize the potential of water resources as efficiently as possible. The development of farming in rainfed land faces a high risk due to low land productivity caused by factors such as: (i) erratic rainfall, which results in erratic planting times, (ii) plants often experience drought stress, (iii) nutrient content and low organic matter, (iv) weeds grow dominantly and are difficult to control and (v) the land is prone to soil compaction (Sumanto et al., 2015).

Besides the high cost of farming in rainfed rice fields, the productivity of the rice produced is relatively low so that the land is often not planted (Javanese=bero). The productivity of lowland rice in rainfed land is <3 tons/ha while in technically irrigated land it is more than 5 tons. For this reason, it is necessary to develop a technology that can increase rice productivity in rain-fed rice fields in addition to the use of appropriate rice varieties

The technology currently being developed is the use of endophytic bacteria consortia. This consortium of endophytic bacteria acts as a biological fertilizer that increases host capacity for nutrient uptake, increases production, reduces fertilizer costs and is environmentally friendly (Yanti et al., 2015). PGPEs produce many growth-stimulating hormones such as Indole acetic acid (IAA), gibbrelic acid (GA) and abscisic acid (ABA) and cytokinins which play a very vital role in promoting plant growth and alleviating biotic stress (Mayak et al., 2004; Perring , 2007; Arendt et al., 2013). Many researchers also reported that PGPEs protect plants from many damaging abiotic stresses such as salt (Mayak et al., 2004), flooding (Grichko and Glick, 2001), and drought (Mayak et al., 2004). PGPEs also increase the efficiency of water use directly or indirectly, fresh and dry weight and different physiological responses of plants, namely increasing the concentration of proline which acts as an osmoregulatory agent (Han and Lee, 2005). The Plant Growth Promotes Endophytes (PGPEs) in question include Bacillus sp., Azotobacter and Azospirillum.

The results of our research in 2022 in the National Competitive Applied Research (Aziez et al., 2022) by testing 3 varieties using a consortium of endophytic bacteria in the

village of Demangan, Sambi, Boyolali concluded that the Mekongga rice variety which is a special variety of dry land given a consortium of bacteria endophytes can significantly increase rice yields.

In rainfed rice fields, in addition to the use of endophytic bacteria, varieties that are drought tolerant and to overcome low fertility rates need to use organic fertilizers in sufficient quantities and at the right time of application of fertilizers.

Therefore, in this community-based PKM program, we socialize and train farmers' skills in making endophytic bacteria, local microorganisms, solid organic fertilizers, liquid organic fertilizers, and organic pesticides based on local wisdom to farmers with the aim of increasing rice yields in fed paddy fields. rain and farmer income can increase.

2. METHOD

Place and Time

This activity was carried out in Demangan village, Sambi sub-district, Boyolali district, from July 2023 to December 2023.

A. Stages in implementing the solutions offered in the field of Production:

Implementation method

The methods used were 1) counseling (lectures and discussions), 2) the practice of making a consortium of endophytic bacteria, 3) the practice of making local microorganisms (MOL), 4) the practice of making solid organic fertilizer based on local wisdom, 5) the practice of making liquid organic fertilizer based on local wisdom, 6) the practice of making organic pesticides based on local wisdom, 7) the practice of cultivating rice with the application of endophytic bacteria, organic fertilizers and organic pesticides that have been made, 8) practice of bookkeeping, and 9) monitoring and evaluation.

The overall activity stages that will be carried out are: 1) team coordination and preparation for the implementation of activities, 2) obtaining activity permits, determining the schedule for implementing activities; 3) preparation of lecture materials; 4) socialization of the program to the community and preparation of activity materials; 6) implementation of activities; 6) coaching and mentoring 7) monitoring and evaluation (internal and external).

Implementation:

1. Production of endophytic bacteria

Endophytic bacteria were prepared using chicken eggs, trasi and MSG/motto with a ratio of 1 chicken egg mixed with 10 grams of *trasi* and 10 grams of monosodium glutamat. The trick is to mix the three ingredients, then shake until evenly distributed. The next step is to place it in the sun for at least 8 hours per day for 15-30 days. Endophytic bacteria have become marked with a reddish yellow color on the bottle that was dried earlier. To use, 15 ml is enough to be mixed with 1 liter of water and sprayed on the leaves evenly.

2. Production of local microorganism bacteria (MOL) based on local wisdom

Dissolve sugar in 5 liters of hot water in a bucket. Dissolve the shrimp paste, sugar and bran in the bucket. Stir until evenly distributed, after which the water is cooled. Enter the papaya fruit extract that has been blended and added yeast tape, then closed tightly for 2 days. On the 3rd day, the lid is opened and shaken for about 10 minutes and closed again. On the 5th day the bacteria can be taken by filtering and then stored in bottles, then stored so that they are not exposed to sunlight.

3. Production of solid organic fertilizer based on local wisdom

Approximately 2 tons of cow dung is dried until cold. Then the cow dung is mixed evenly with the straw that has been cut into pieces. The incubation treatment is approximately 30 days, routinely doing a reversal every 5 days. Watering treatment is done to maintain humidity. If the compost is ripe with the following characteristics: stable temperature, black-brown color, crumb structure and no smell, harvesting is carried out and the compost is ready for use.

4. Production of liquid organic fertilizer based on local wisdom

The raw material is 1 kg of forage, washed and finely chopped, then the material is put into the bucket. Furthermore, as much as 1 kg of fertile soil is added to the bucket. After that, 100 grams of shrimp paste solution and 200 grams of brown sugar solution were added. Then 200 ml of bacterial solution was added to the bucket. Then the bucket is filled with water until it is full (4 liters). The mixture of ingredients is stirred for 5-10 minutes every day so that there is an exchange of oxygen in the fertilizer. After 12 days you will get fresh liquid organic fertilizer. The liquid in the bucket can be used as liquid organic fertilizer, while the filter residue that still contains

bacteria can be processed again into liquid organic fertilizer (Barutcular et al., 2015; Joseph et al., 2007).

5. Production of organic pesticides based on local wisdom

Empon-empon (turmeric, ginger, galangal, temu ireng and kencur) are cleaned and cut into pieces. Furthermore, the material that has been cut into pieces is then blended. The extract from the blending results is then put into jerry cans. The solution is then mixed with the bacteria resulting from group development every 30 liters plus 0.5 liters of bacterial solution, then closed tightly. For days 1 to 3, the solution is allowed to stand. On the 4th day until the 18th day every morning and evening it is stirred and the lid is opened. Day 19-22 the solution is allowed to stand in a closed state. On the 23rd day the solution can be filtered and can be stored in a closed state, then it is ready to be applied. Concentration of use is 2-3 cc/liter of water.

6. Organic rice cultivation practices based on local materials

Land preparation is done by plowing. After tillage and leveling, a canal is made (30 cm wide and deep). Rice seed nurseries are carried out on land in the field with a raised bed system. The nursery beds in the field are given a bamboo or wooden barrier to make it easier to transfer the seeds (transplanting). Planting distance is 20 cm x 20 cm. Provision of basic fertilizer

Basic fertilizer is organic fertilizer with a dose of 500 kg/ha. Seedlings are planted at the age of 21 days. The roots of the seedlings are immersed in the soil to a depth of 1-1.5 cm with a horizontal root position like the letter L, water conditions when planting *macak-macak.* Weeding about 3 times manually. To make weeding easier, first flood the fields with irrigation water up to 1-2 cm. Weeding was carried out 10, 20 and 35 DAP Water regulation is carried out in addition to fulfilling plant needs, to stimulate the growth and development of rice roots and increase the population of biodiversity. Harvesting begins when the seed coat at the top of the panicle is clean and hard and contains 80% of the seeds has a straw brown color (Ward and Jensen, 2014).

B. Stages in implementing solutions in the field of Management. Practicing bookkeeping in farming even though it is simple. Bookkeeping training starts from the beginning to the end of the activity.

C. Participation of Partners in Program implementation : Participate in determining the implementation date, Participate in counseling activities, Participate in training activities, Participate in MOM activities. And Participate in the marketing process.

D. Evaluation of program implementation and program sustainability in the field : Evaluation of program implementation is carried out twice, namely before and after implementation. This is to see an increase in skills for the target audience. The sustainability of the program is carried out by monitoring farming activities for the next season after the community service activities are completed.

3. RESULTS AND DISCUSSION

Counseling and practice on "Assisting farmers in utilizing a consortium of endophytic bacteria and organic fertilizers and pesticides based on local wisdom to increase rice productivity in cisterned rice fields" was carried out from July 2023 to December 2023. Counseling was carried out at the home of one of the target audiences attended by the head Demangan village. The counseling was attended by 15 representatives of farmer group members. The counseling program began with remarks by the head of the farmer group and continued by the Dean of the Faculty of Agriculture, Tunas Pembangunan University, Surakarta, and the last speech by the Head of Demangan Village. This activity also involved students from the Faculty of Agriculture, Universitas Tunas Pembangunan Surakarta.

After the remarks were finished, the presentation contained material by the main speaker Prof. Dr. Ir. Achmad Fatchul Aziez, MP. Materials include methods for making endophytic bacteria, local microorganisms, solid organic fertilizers, liquid organic fertilizers and organic pesticides based on local wisdom. After the presentation of the material was finished, it was followed by a question and answer session between the lecturer and the participants. Questions from the target audience revolved around how to make and the incubation period of the materials used for the propagation of bacteria, local microorganisme, solid organic fertilizers, liquid organic fertilizers and organic pesticides.

Organic fertilizer can be one of the right alternatives in overcoming this problem because of its function which can provide additional organic matter, nutrients, improve soil physical properties, and restore nutrients transported by crops, the use of organic fertilizers is expected to improve soil fertility. Liquid organic fertilizer contains high levels of macro and micro nutrients as a result of natural organic compounds containing active living cells and is safe for the environment and users. The form of liquid organic fertilizer in the form of a liquid

can make it easier for plants to absorb the nutrients contained in it compared to other fertilizers in solid form.

Endophytic bacteria were prepared using chicken eggs, trasi and monosodium glutamate (MSG) with a ratio of 1 chicken egg mixed with 10 grams of trasi and 10 grams of MSG. The trick is to mix the three ingredients, then shake until evenly distributed. The next step is to place it in the sun for at least 8 hours per day for 15-30 days. Endophytic bacteria have become marked with a reddish yellow color on the bottle that was dried earlier. To use, 15 ml is enough to be mixed with 1 liter of water and sprayed on the leaves evenly.

Organic pesticides are drugs for pest control using organic materials. The organic pesticides we did used materials found in the assisted villages, namely 0.5 kg of sabrang jackfruit leaves plus 1 seed of gadung, 0.5 kg of mahogany content, 0.5 meter brotowali stem, 0.5 liter solution of ginger galangal gadung and turmeric , 70% alcohol as much as 100 ml and 3 liters of water. These ingredients are fermented for 10 days, after which they are ready for use at a dosage of 0.5-1 liter in 15 liters of water.

Organic fertilizers are made in liquid form with the aim of making it easier for plants to absorb the nutrients contained in them compared to solid fertilizers. Giving liquid organic fertilizer can be done through the soil which is then absorbed by plant roots, and can also be through plant leaves to support optimal absorption of nutrients. The application of liquid organic fertilizer to these plants is expected to increase fertility, growth, and produce better quality plants.

Liquid organic fertilizer that we make using plants found in Demangan village and its surroundings, namely 0.5 kg of bean leaves, 0.5 kg of turi leaves, 0.5 meters of banana stems and their hearts, 0.5 kg of sprouts, 0.05 kg of bran .5 kg, ginger galangal, kencur turmeric solution 0.5 liters, molasses 0.5 liters, MOL which has been made 0.5 liters and cow urine 10 liters.

Figure 1. Making MOL

Figure 2. MOL

Figure 3

Figure 4.

Figure 3. Materials for the manufacture of organic pesticides
Figure 4. Materials for the manufacture of liquid organic fertilizer

Figure 5

Figure 6.

Figures 5 and 6. The chief executive and his team are making Liquid Organic Fertilizer made from local wisdom

Figure 7.

Figure 8

Figure 7. Visit to the farmer group leader's house
Figure 8. Wells for irrigating rice fields in rainfed rice fields

Figure 9.

Figure 10.

Figure 9. The practice of making organic fertilizer based on local wisdom.
Figure 10. Rice demonstration plots with the application of endophytic bacteria and organic fertilizers and organic pesticides based on local wisdom

4. CONCLUSIONS

The implementation of community service activities entitled "Assisting farmers in the utilization of endophytic bacteria consortia and organic fertilizers and pesticides based on local wisdom to increase rice productivity in cisterned paddy fields" has been carried out according to a predetermined plan. Overall, the counseling participants and practice participants welcomed and felt that this activity was very beneficial for the development of organic farming, especially organic rice which is being developed in farmer groups in Demangan village. The change that occurred after this community service activity was that members of farmer groups could make their own agricultural production facilities and did not have to buy them at relatively expensive prices.

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