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EMPOWERING FARMERS IN HUSOAK VILLAGE, HUBIKIAK DISTRICT FOR FOOD SECURITY THROUGH RENTENG WELL IRRIGATION SOURCE TECHNOLOGY DISSEMINATION

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Abstract

One of the important technologies to increase agricultural production is irrigation technology which can support plant cultivation systems and act as a water reservoir with a water pump machine support. The principle of several wells is to collect water for irrigation in a cylindrical reservoir that is connected to other reservoirs through a capillary tube. The purpose of this activity is to accelerate the food security system through the dissemination of well-conducted irrigation technology which functions in storing and distributing water, especially in the dry season. The method used in the implementation of this activity is socialization and training as well as assistance in making it well-conducted. The results of collaborative activities to build the nation through community service have a positive impact because they can provide sustainable solutions in improving the food security sector of farmers in Husoak Village, Hubikiak District through the development of knowledge related to irrigation systems and water needs for plants by paying attention to the needs of water and nutrients for plants.

Keywords: Acceleration, Dissemination, Food Security, Irrigation, Well-Conducted.

INTRODUCTION

Husoak Village, Hubikiak District is one of the areas in the Highlands Papua Province that is trying to be able to meet food needs independently. The whole of the Central Mountains region is currently still implementing a traditional farming system, in which local farmers only depend on nature for cultivating crops, so no technical cultivation techniques have been implemented so far. The planting system is carried out alternately and not continuously (Figure 1).

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Figure 1. Chili fields that do not apply cultivation systems (only planted, no cultivation techniques applied)

The impact due to the shifting cultivation system is land that is abandoned without being able to be used, especially if it takes place during the dry season. This happens because farmers are waiting for the arrival of the rainy season so that the land can be cultivated again.

The cropping system only takes place during the rainy season because the nature of the soil owned is sandy loam which is known to be unproductive in supporting local agriculture, coupled with the low local human resources which are one of the contributors to the poverty rate, causing high poverty rates in Papua (27 .33%) (BPS, 2022). Furthermore, the local government's low concern for the sustainability of the agricultural system being developed is seen from the lack of extension activities from the relevant agencies. The cultivation system that is applied is based on experience passed down from generation to generation without any agricultural knowledge acquired, even though the potential for sustainable agriculture is currently the foundation for human health amid the widespread use of chemical additives for plant growth and development, especially when the Covid pandemic hit. Therefore, the government's commitment to food security and community welfare is a central theme in the context of development activities (Sudirja, 2008).

The education levels of farmers in Husoak Village, Hubikiak districts are elementary, middle, and high school and most of them do not have formal education, then age certainly also greatly influences the ability to cultivate or farm which ultimately affects the income level of the community, considering that the main livelihood of the Jayawijaya community is farmers. . The low level of community income is known to trigger a high poverty rate in Husoak Village, Hubikiak District. Based on the results of the 2021 BPS survey, the percentage of poverty for the last five years 2017-2021 in Jayawijaya Regency was 37.09% (Denny, 2022). The poverty rate is seen from various aspects, especially the figure for the need for 2100 calories per person, per day, which if converted to Rp. 16,000, public consumption is determined by income which is known to be related to employment. While employment in the mountains is gardening. In other words, a higher poverty rate is due to less work activity.

It is known that one of the current global agendas is food security and poverty. Food security is very important for the development process. Failure to achieve food security will be identified with poverty and food insecurity. Therefore, the problem of food availability requires serious, planned, and careful handling. This can happen and last a long time in areas with minimal infrastructure and even human resources, such as Husoak Village, Hubikiak District, and

Jayawijaya Regency. One of the handlings of food availability is the construction of irrigation canals. Therefore, the government's commitment to food security and community welfare is a central theme in the context of development activities (Sudirja, 2008).

Development in the agricultural sector is directed towards efficient and resilient agriculture, bearing in mind that efforts to increase rice production to meet the food needs of an ever-increasing population have always been a top priority in agricultural development in Indonesia (Suwarno, 2010). Thus, the demand for better irrigation performance is increasing to support increased agricultural production to realize national food security and community welfare, especially for farmers (Angguniko & Hidayah, 2017).

The problem of water demand has so far been resolved with increased rainfall. Where, Wamena is an area with a high level of rainfall, which is an average of 1,900 mm a year and in a month there are ± 16 days of rain which is used as a solution for water-critical land (BPS, 2018). Until now, in general, agriculture in Husoak Village, Hubikiak District, has relied on the rain that falls, while it is known that plants besides needing fertilizer also need regular watering. This is related to the productivity of cultivated plants. The need for plant fertilizer is met by farmers by utilizing pig manure. Currently, the obstacle in the plant cultivation system in the Muda Mandiri farmer group is the limited ability of plants to supply water.

Water is one of the most important agricultural inputs. Surface water sources are currently the mainstay for irrigation water supply. However, not all areas with agricultural land can be served with technical irrigation sourced from surface water. The existence of groundwater is not limited by the administrative boundaries of an area so the management of groundwater resources requires thinking that is broad, holistic, and comprehensive. At this time the use of groundwater tends to increase so there is also a need for an increase in conservation and management efforts. One of them is through the construction of irrigation canals (Tuhuteru, et al. 2021).

The construction of irrigation canals to support the provision of national food is urgently needed so that the availability of water on the land will be fulfilled even though the land is far from surface water sources (rivers). This is inseparable from irrigation engineering efforts, namely providing water with the right quality conditions, the right space, and the right time effectively and economically (Sudjarwadi, 1990). The contribution of irrigation infrastructure and facilities to food security has so far been quite large, namely as much as 84 percent of national rice production comes from irrigation areas (Suroso et al. 2007).

So far, the large amount of abandoned land during the dry season is the main reason for helping to boost farmers' income by managing the water system in the farming system owned by farmers in Husoak Village, Hubikiak District. The existing land area is quite large, namely ± 1 Ha with the type of soil on agricultural land being sandy loam which in nature cannot store water for a long time.

Husoak Village, Hubikiak District has the potential to develop its traditional organic farming, that it is a traditional village that still has many limitations and has never received financial assistance or input from any agency or government, however, it is still trying to develop its agricultural potential for the sake of survival. they. Seeing these conditions, one of the focuses of implementing this community service activity is related to the production aspects of cultivated

plants. For this reason, the dissemination of the use of multiple wells technology must be implemented by supporting the procurement and development of agricultural irrigation sources in the form of multiple wells assisted by water pumping machines to meet the water needs of plants, especially in the dry season so that they can assist farmers in the process of cultivating crops.

This innovation is important to be needed in increasing plant growth and production, especially in sustainable agricultural cultivation systems in Wamena. With the increasing need for water in the context of intensifying and expanding rice fields, as well as the limited supply of water for irrigation and other purposes, especially during the dry season, the distribution and use of irrigation water must be carried out more effectively and efficiently (Muiz, et al. 2017). Good irrigation system management is needed to meet the water needs of agricultural land using a system of giving and distributing water appropriately so that all plants get the water according to their needs (Efendi et al. 2019).

One of the important technologies in increasing agricultural production is irrigation technology which can support crop cultivation systems and act as a water reservoir assisted by a water pump. The principle of multiple wells is to collect water for irrigation in a cylindrical holding tank connected to other holding tanks via a capillary tube. The advantages of multiple good irrigation systems are (Las, 2007):

- Efficient. Because sufficient irrigation is given to the main reservoir.
- The risk of water loss during distribution can be minimized because irrigation from the holding tanks can reach the plant root zone directly.

One of the methods in multiple wells for draining water from irrigation canals into wells or connecting from one well to another is to use a pipe as the media.

The use of groundwater for irrigation in Indonesia has relatively not provided maximum benefits, including efforts to improve the performance of groundwater irrigation networks (Prastowo, 2007). One of the efforts is through the construction of several wells, which are made to utilize groundwater sources for the supply of irrigation water. The existence of groundwater is not limited by the administrative boundaries of an area, so the management of groundwater resources requires thinking that is broad, holistic, and comprehensive (Tuhuteru, et al. 2021). At this time the use of groundwater tends to increase so there is also a need for an increase in conservation and management efforts. One way is through the construction of irrigation canals, such as by making joint wells.

It is known that the application of multiple wells is only carried out in irrigation areas, which are located in small watersheds (DAS) and/or watersheds that do not have water storage infrastructure such as reservoirs, ponds, and the like. However, in this service, the construction of joint wells on water-critical land is a source of livelihood for local farmers in Husoak Village, Hubikiak District.

The purpose of making joint wells is that they can be used as a medium for storing excess water during the rainy season to be utilized during the dry season, by maximizing the utilization of river discharge when it is abundant in the rainy season (Efendi et al. 2019). The purpose of making

joint wells is to assist farmers in supplying water for plant needs, especially for areas that have potential land resources that do not yet have adequate infrastructure.

The potential of land resources for agriculture in Papua is quite large. However, limited infrastructure, isolation from domestic and international markets, the uneven distribution of skilled human resources, bureaucratic obstacles, as well as the political situation, and security disturbances are disincentives for investing in Papua (Tuhuteru et al. 2021).

In Papua, agricultural land resources act as food producers as well as a source of income for farmers and the region, so efforts to develop agriculture need to be made. Utilizing the potential of this area's land resources in a directed and integrated manner has the opportunity to help grow organic farming centers that have been implemented by local farmers so far.

To meet the irrigation water needs of farmers in Husoak Village, Hubikiak District which is a critical land area that is difficult to get water during the dry season, it is necessary to conduct a study of alternative methods to maximize the utilization of excess water during the rainy season which can be used to meet crop water needs.

The purpose of this activity is to accelerate the food security system through the dissemination of irrigation technology for multiple wells. It is hoped that the results of this activity can be used to supply the water needs of the plants cultivated by farmers in Husoak Village, Hibikiak District without the farmers having to wait for the season.

IMPLEMENTATION METHOD

a) Place and Time

This community service activity was carried out in October-November 2022 on land owned by the Muda Mandiri farmer group with an area of ± 1 Ha, which is located in Kampung Husoak, Hubikiak District, Jayawijaya Regency, Papua.

b) Tools and Materials

The tools and materials used are builder's tools, water machines, and equipment (cables, plugs, faucets, bolts, nails, pipes, soil drilling equipment, and others). Meanwhile, the materials used are building materials (bus/medium-sized well ring, sand, stone, cement, pipe glue).

c) Implementation Stages and Methods

Methods of solving problems faced by farmers are carried out using comparative methods and socialization, followed by demonstrations and mentoring, monitoring, and evaluation. Details of the implementation of activities are:

1. Comparative and Socialization of "Accelerating the Competitiveness of Farmers in Husoak Village, Hubikiak District for Food Security through the Dissemination of Renteng Irrigation Technology".

The socialization activity was carried out to explain the purpose of implementing an irrigation system management program on critical land through empowering farmer groups in Husoak Village, Hubikiak District. This aims to provide knowledge to farmers regarding the importance of

water for plant growth in addition to providing broad knowledge regarding truly sustainable agriculture (Figure 2).

Figure 2. Brief Socialization Process with Farmer Groups

Water is one of the most important agricultural inputs. Surface water sources are currently the mainstay for irrigation water supply. In addition, it provides hands-on skills in the practice of constructing an irrigation system of multiple wells that have been designed according to the suitability of the existing land. Partner contribution is present when the implementation takes place.

In this socialization, institutional management will also be presented which is used to achieve the main objective of implementing activities, namely sustainable crop production through clear and directed institutions.

2. Manufacturing Practice (Demonstration)

How to make joint wells from determining the location, and mixing materials, to forming joint wells ready to flow water and become a storage container. The contribution from the partners is the preparation of the land which will be used as a trial plot for making joint wells.

3. Training

The training was in the form of an experiment in making a technology package for multiple wells in watering. Contribution from partners is in the form of the location of training activities. This process should be done with the help of a drill, it's just that the field conditions and the contours of the area make it impossible to use a drill due to the nature of the soil. Moreover, done by a small drill. So that this stage was initiated with dug wells to determine the main well which will distribute water to the multiple well buses. This digging process is carried out by taking a day with the depth achieved is ± 5 m from the ground surface.

After the well-digging process is carried out, the next step is to arrange the bus/well ring to avoid landslides on the wall of the well. The number of buses/rings used is 10 buses.

Furthermore, digging is carried out again to make joint wells according to the plan, with the distance of the joint wells to the main well being 15 m with the addition of 2 buses/well ring which on the ground floor is cemented because this only functions as a water reservoir, as well as the surface around the well. The number of joint wells made is 12 points.

After 1 joint well has been made, the next stage is the installation of pipes from the main well to the multiple wells which aim to drain water from the main wells to be stored and used in the process of watering plants. As long as the pipe installation is complete, the next stage is the installation of the electric cable from the farmer's house to the water machine which is located next to the main well (Figure 3).

4. Assistance

Assistance in the dissemination of irrigation technology for multiple wells on sandy loam soils for sustainable farming of food crops/horticulture.

5. Monitoring and evaluation

Monitoring and evaluation have been carried out since the activity ended by monitoring the implementation of the use of multiple wells when watering plants and monitoring the benefits of irrigation for partners.

In general, the following is a brief description of the process of making joint wells with partner farmers.

a) b) c) d)

Figure 3: Overview of the Assistance Process for Making Joint Wells; figure a) the process of digging the points of multiple wells, b) The process of moving Bis into the dug hole, c) a picture of one of the several wells that are ready to be cast and d) the pipe installation process

RESULTS AND DISCUSSION

1) Results of Outreach Activities with Farmer Groups

Socialization activities as well as the licensing process for partner farmers in the implementation of community service activities are carried out by informing the district government regarding the objectives and activity plans. The results of the discussion activities show that

The Hubikiak District government is happy and appreciates this activity and hopes that this activity can be seen by the local government so that it becomes the starting point in developing the traditional agriculture that has been implemented so far. This is because it is known that Hubikiak District is one of the Districts that plays a role in supplying vegetable ingredients to local markets to meet the needs of the people of Wamena in general. With the implementation of this activity, both partner farmers and the district government are expected not to depend solely on rainwater, and the process of cultivating plants can be carried out without waiting for rain. In addition, it is hoped that the Muda Mandiri farmer group can become a group of assisted farmers who are advanced and understand technology.

After carrying out the licensing process with the district government and the chairman of the Muda Mandiri farmer group, the next step is socialization as a form of introduction to the program with farmer groups, namely conveying the aims and objectives of implementing activities. It is intended that the members of the Mandiri Muda farmer group can adjust the time to be able to follow the practice of making joint wells by the implementation schedule.

2) Construction of joint wells

The implementation of manufacturing activities begins with the approval of the head of the farmer group by entering into an agreement on the willingness to carry out the service and selecting a location that is strategic and easy to reach by the community in carrying out the activity.

The implementation of making joint wells was attended by 1 farmer group consisting of 20 people consisting of 5-7 heads of families along with family members who were willing to help transport materials and tools imported from the center of Wamena City to be transferred to the farmers' experimental fields. This process is done with cooperation so this can be completed properly.

The process of making joint wells was carried out for 5 days, considering the unpredictable weather in Wamena, and also waiting for the readiness of water drillers to facilitate the process of casting joint good points.

It is known that the activity of making joint wells aims to help farmers in the process of fulfilling the water needs of crop plants when the dry season arrives, it is known that water is an important factor for plants.

It is known that the availability of water and water storage infrastructure greatly influences the resilience of irrigation water which has an important role in food security (Gohar et al. 2015).

The application of joint wells on critical land owned by partner farmers aims to collect water from secondary canals to meet crop water needs during the dry season so that cropping intensity increases (Kunaifi et al. 2011).

During the implementation, there were many questions raised by the farmers who were

present in the field during the implementation of these activities, one of which was the importance of water for plants. Whereas eating and drinking plants have been provided by nature. This is because the agricultural system applied by local farmers is an agricultural system that is still traditional and does not utilize any inputs. This is a challenge for the service team in increasing farmers' knowledge regarding sustainable traditional farming systems that are good for land productivity, crops, and farmer welfare. This challenge is used as an opportunity in the development of an organic farming system that has long been implemented in Wamena. Organic farming, which is known by the people of Wamena, is a cultivation system that eliminates any input, other than cow or pig manure (Inrianti et ai. 2019). So far the watering process in the cultivation system applied by local farmers has not been carried out and only hope for rain. This is because the type of soil in the research location is sub-optimal soil with the properties of sandy loam which has minimal capacity to store water, plus water sources that are difficult and have a deep reach.

3) Obstacles Encountered in the field

The obstacle encountered in the field is the lack of knowledge possessed by the community so in practice, it takes time the explanation the importance of water for plants, to the provision of water for plants in the dry season. This is due to the known low level of education of the local community, many farmers do not have formal education. All forms of activity are carried out based on experience. Even though it is known that the need for water in agriculture is very important. Good water management can increase agricultural yields (Sucipto, 2013)

In addition, the lack of infrastructure and the imbalance in regional development policies, especially in the agricultural sector, is a challenge for academics in disseminating knowledge.

4) Impact and Sustainability Efforts

The impact and sustainability of the implementation of this community empowerment activity are that the application of traditional agricultural systems needs to be maximized in the form of an integrated and sustainable organic farming system by the rules that have been set by taking into account the needs of plant water and nutrients for plants. In addition, the sustainability efforts that were obtained from the implementation of this training were the enthusiasm of farmers in improving cropping patterns with sustainable agricultural methods that have an impact on the surrounding environment and the welfare of farmers without depending solely on the rainy season. This aims to increase the productivity of plants and the surrounding environment. In the horticultural crop farming system, cropping patterns taking into account water requirements have not been widely implemented. Farmers often fail to harvest due to not estimating whether water is still available during flowering or not. In dryland areas, even farmers are only able to plant horticultural commodities during the rainy season, and during the dry season plant drought-tolerant commodities (Everyermas and Zamawi, 2015).

CONCLUSION

This collaborative activity to build the nation through community service has a positive impact because it can provide sustainable solutions to increasing the food security sector among farmers in Husoak Village, Hubikiak District. Farmer groups can develop knowledge related to irrigation systems and water requirements for plants so that they can improve existing agricultural systems by paying attention to water and nutrient requirements for plants. The percentage of the results of community service activities is 85% of the community farmer groups respond well to making irrigation systems that help with their current agricultural problems. This community service activity still needs to be carried out to increase knowledge for students, the community, and all farmers to continue to increase creation, creativity, and knowledge to create an independent and competitive society. In addition, it is hoped that it can be applied directly to cultivated plants.

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