

The Application of Techno Ecology of Water System as an Effort to Fulfill Water Needs of Agricultural Irrigation for the Community of Water Use Farmers Association (Cases in Indonesia)

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ABSTRACT

The general objective of the activity which involves the Application of Techno Ecology of the Water System as an Effort to Fulfill Water Needs of Agricultural Irrigation for the Community of Water User Farmer Association of Bumijawa District, Tegal Regency as an effort to meet the needs of agricultural irrigation water and facilitate the downstream process of Techno Ecology of the Water System resulting from community research. this can improve the quality and competitiveness of the Techno Ecology based Water Science and Technology system, establish and strengthen the network between technology makers of the Techno Ecology of the Water System and the technology users who have problems raising water from the river to meet the needs of agricultural irrigation water and improve the welfare of the community agricultural irrigation water users resulting from the Techno Ecology of the Water System. The specific target to be achieved is to disseminate the Techno Ecology of the Water System to get the technology to lift water from the river with a depth of approximately 20 meters below agricultural land. The method used is through several stages in the application of technology to the community by implementing together with partners identifying irrigation water needs by counseling, designing and calculating Appropriate technology (TTG) design drawings, making Appropriate technology (TTG), operational assistance by implementers in operating Appropriate technology (TTG) in a sustainable manner. Dissemination of technology to the community / partners by disseminating information on appropriate technology to the community through joint implementation with partners from the manufacturing process to the use of Appropriate technology (TTG). Work procedures to support the realization of the methods offered, counseling, equipment design and manufacturing, equipment work procedures, Appropriate technology (TTG) dissemination, assistance. Partner participation in the implementation of the establishment of an Institutional Forum, mapping of water distribution layouts, development of water distribution layouts, Design of water systems, the process of preparing work procedures, participating in the extension of water use / distribution in the Techno Ecology of Water Systems. The target of the Techno Ecological Equipment of the BEWRAM Water System and POLITIRTA Reservoir as an irrigation water reservoir so that farmers can increase the productivity of agricultural products.

Keywords: Techno Ecology, BEWRAM Water System, POLITIRTA Reservoir, Agricultural Irrigation

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1. INTRODUCTION

Situation Analysis

The village of Gemplang Dukuhbenda is a contoured mountainous area, and settlement settlements spread in eight hamlets, namely Krajan, Bujil, Siketi Kidul, Siketi Gunung, Siketi Lebak, Gemplang, Wadasmalang, and Mekartani (Relocation hamlets). The height of the area varies, that is the highest of Gemplang Hamlet 2095 meters above sea level. From the height difference, the most difficult area for water is Gemplang because it is higher. The problem that arises is the presence of sufficient irrigation water in the rainy season, but when entering the dry season agricultural irrigation water is very deficient so that agricultural products are not optimal



Fig 1. Gemplang River Conditions

In Gemplang Hamlet Hamlet in the dry season taking agricultural irrigation water from other areas of the hamlet to get agricultural irrigation water supply, but it is not sufficient to meet the needs so that they have to take turns and discharge a little water so many do not get agricultural irrigation water. Gemplang Hamlet Dukuhbenda in the dry season takes water under the village which is 5 Km away. Gemplang Hamlet Dukuhbenda does not have a spring and there are no rainwater collection facilities for agricultural irrigation.



Fig 2. Agricultural land during the dry season

Generally in Gemplang Dukuhbenda Hamlet there are problems regarding the fulfillment of agricultural irrigation water. The most basic problem in the village is the lack of agricultural irrigation water in the dry season due to the absence of springs so that it affects agricultural productivity and cultivation.

In the management of agricultural land in Gemplang Hamlet Hamlet carried out by farmers who are divided into several institutions. Institution of farmers Gemplang Dukuhbenda Hamlet consists of a combination of the Water User Farmers Association (P3A) Dharma Tirta Situ Sejahtera and the Farmer Group Suka Makmur and women farmer groups and rural economic institutions namely:

Table 1. Institutional farmers of Gemplang Dukuhbenda Hamlet

No	Institutional	amount
1.	Water User Farmers Association (P3A)	1
2.	Farmers Group Loves Prosperity	1
3.	Peasant Woman	1
4.	Agricultural Cooperative	1

Source: Field observations (2019)

Table 2. Gemplang Dukuhbenda Hamlet Farmer Groups that need agricultural water

No	Farmers	Group Class	Number of Members	Land area (Ha)
1	Dharma Tirta Situ Sejahtera	Madya	104	119.5
2	Farmer Group Suka Makmur	Madya	106	115.3
	Amount		210	234.8

Source: Field observations (2019)

Partners in the proposed PPTTG activities in Gemplang Dukuhbenda Hamlet are the Dharma Tirta Situ Sejahtera Water User Farmer Association and the Farmer Group Suka Makmur.

Table 3. Business Fields of Gemplang Dukuhbenda Hamlet farmers

Dharma Tirta Situ Sejahtera	Farmer Group Suka Makmur
Vegetable Farming	Rice Cultivation
Managing Agricultural Irrigation Water	Managing Post Harvest
There is no TTG water system	There is no TTG water system
Not yet undertaken economic efforts regarding irrigation water drainage	Not yet undertaken economic efforts regarding irrigation water drainage

Source: Field observations (2019)

Problem

Based on an analysis of the situation of agricultural irrigation water in Gemplang Dukuhbenda Hamlet and the results of preliminary mapping of some local residents regarding the existence of agricultural irrigation water facilities that are still lacking and the presence of rivers under agricultural land of approximately 20 meters, then it can be formulated:

1. There is no technology used to raise agricultural irrigation water from rivers to agricultural land in Gemplang Hamlet Hamlet which has difficulty in irrigation water especially in the dry season to be distributed to the group's agricultural land.
2. Productivity of rice and vegetables decreases because there is no supply of water to agricultural land so that the water system technology is needed.

Seeing this reality, some residents of the PPTTG Mitra group who are farmers as farmers believe that it is impossible to manage agricultural land during the dry season due to the lack of water supply from water sources that can be used. Therefore, the productivity of rice and vegetables produced in the dry season is very little so that it affects the income of the farmers of Gemplang Dukuhbenda Hamlet, Bumi Jawa District, Tegal Regency. Another assumption is that water taken from nearby villages is only irrigation water that can be consumed, so it is unfortunate to use it on agricultural land. Another thing is for agricultural land requires a lot of water supply so that the efforts made to be very large to water vegetables and rice plants on agricultural land during the dry season.

2. METHOD

Program Socialization:

This activity was initiated by introducing the program to the Village Community of Gemplang Dukuhbenda, which is applying research results on how to meet water for areas that are mountainous contoured areas.



Fig 3. Program Socialization to the Community

Identification of Needs

Identifying the needs of the people of Gemplang Dukuhbenda Village, the most important thing is agricultural irrigation water so that sustainability as a vegetable producing region can be sustained.

Design

The design process begins with the identification of an agricultural irrigation water requirement that will flow from a height of 20 m from the agricultural land to an appropriate technology product using the BEWRAM method.

Making

After identification and design are obtained, the next step is the manufacture and assembly of the equipment. this method involves making tool components and arranging them into the most appropriate technology.

Operational

This step is carried out to determine the functional and operational success of the design and manufacture of technology to be applied.

Accompaniment

This step tries to find the best design alternative from several design choices for each problem to be solved. Several alternative concepts of irrigation water downstream for agricultural land and BEWRAM technology can be optimized.

3. RESULTS AND DISCUSSION

Manage and manage mountain river water sources using the techno-ecological media of BEWRAM water system, namely raising water from rivers with its own water power so that it can meet the water needs for agricultural land as shown below.

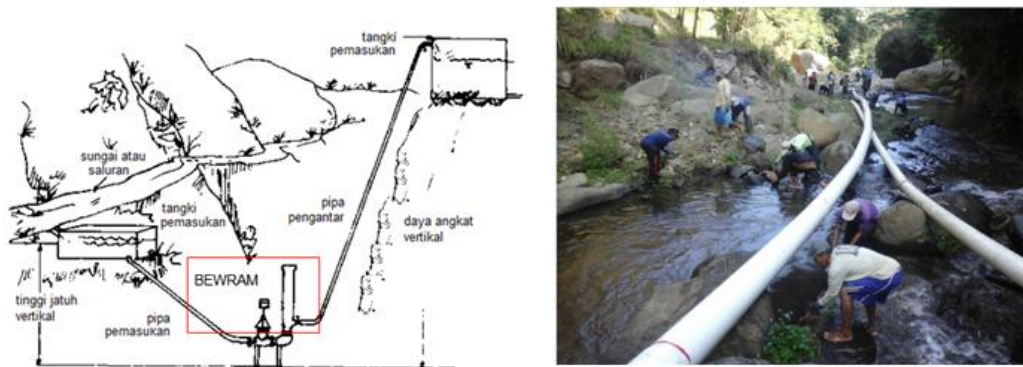


Fig 4. BEWRAM raises river water to agricultural land

Output targets of this activity are:

1. The techno-ecological media of the BEWRAM method of water system along approximately 1 km by using a 10 "diameter pralon of 100 sticks with a water discharge of 300 Liters / second. The existence of SOP for irrigation management to agricultural land as a proper irrigation water in the form of socialization of the importance of agricultural irrigation water distribution. The ecological technology of the BEWRAM water system is approximately 1 km long using a 10 "diameter pralon of 100 sticks with a water discharge of 300 Liters / second, And The existence of SOPs to utilize the ecological technology of the water system with the BEWRAM method and trouble shooting and maintenance if there is minor damage.

2. POLITIRTA embung of rainfed agricultural land for 20 irrigation water reservoirs in agriculture with each volume $(2 \times 1.5 \times 10) \text{ m}^3$. The existence of SOP for rainwater management using the POLITIRTA Embung method for rainfed, especially for the dry season. POLITIRTA embung rainfed agricultural land for agricultural irrigation water reservoirs of 20 pieces with each volume $(2 \times 1.5 \times 10) \text{ m}^3$.



Fig 5. Embung POLITIRTA as agricultural irrigation water reserves

Embung POLITIRTA is a water storage building that is built in a depressed area, usually outside the river. The purpose of making reservoirs is:

1. Provide water for irrigating plants in the dry season.
2. Increasing land productivity, planting period and farmers' income in rainfed land.
3. Activating farmer labor in the dry season.

4. CONCLUSION

From the above activities, it can be concluded that to meet the needs of irrigation water in Gemplang Dukuhbenda Village, Bumijawa Tegal Regency can be done in 2 ways namely raising river water and harvesting rainwater for annual crops. Thus the water needs will be met throughout the season and harvest of vegetable crops can be done every season.

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