ACTIVE PARTICIPATION P3A IN
MANAGEMENT OF IRRIGATION NETWORK
GROUNDWATER (JIAT) IN REGIONAL AREAS
OF SURFACE WATER AT CENTRAL
SULAWESI PROVINCE, INDONESIA

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ABSTRACT
The active participation of Water User Farmers Union (P3A) is essential for increasing the production of food agriculture in Central Sulawesi Province, especially in rare areas of surface water. But in reality, the role of P3A is still limited and has not yet led to improved function and role to the development and management of irrigation. The purpose of this research is to develop P3A active participation model in asset management of irrigation network in Central Sulawesi Province, especially Sigi Regency. Method of data analysis in this research consist of determination of active participation model of P3A based on economics. The results show that the P3A policy model for optimizing irrigation handling in the handling of water scarcity with a more affordable cost management model is so effective that food agriculture production can increase. Thus the regulation or irrigation policy in this area developed is "OPIP Concept".

Keywords: Cost management model, Food agriculture, JIAT, P3A.

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1. INTRODUCTION
One of the focus of the Master Plan for the Acceleration of Indonesian Economic Development (MP3EI) for the Sulawesi corridor is food crops. The production of food crops is largely determined by irrigation systems, especially groundwater sources and network systems. Since, the over exploitation of ground water without proper recharge mechanism and
scanty rainfall, the water table of the open or dug wells in the region are being gone into deeper parts of the surface and many a times even some of them were dried up (Dinagara Pandi P, et al, 2017) [4]. Groundwater is relatively free from these disadvantages. It is advisable to augment surface resources with groundwater in view of its wider availability and scope for utilization as and where required. At the same time groundwater is a commodity which has to be sought for since its occurrence and distribution are confined to favorable geological formations and conditions (Dubba Vijay Kumar, 2017) [6]. Irrigation water management is limited, so it needs to be directed towards strengthening the water user organization. The management of irrigation system that aims to realize the water utilization in agriculture is conducted in a participatory manner and its implementation is done based on the participation of the community of Water User Farmers Association (P3A) (Sance Lipu, et al, 2014) [9].

The P3A organizational function is to encourage its members to regulate the efficient and effective use of water. This can be achieved given that the organization is a feature of social life consisting of networks, norms (beliefs) that can move the participation of group members to achieve common goals (Putnam, R. D, 1995) [7]. Asset management of groundwater irrigation network (JIAT) is one of the main supporting sectors for successful agricultural development, especially in order to increase food production. However, in the development of irrigation management performance has decreased caused by several things such as: maintenance activities, repair or maintenance of delayed irrigation networks (divert maintenance), human-caused damage and natural disasters, namely drought. They cause major damage to irrigation networks. The other is the availability of maintenance funds. Currently, the availability of operating funds and maintenance of irrigation networks has reached less than 50% of the need, resulting in many irrigation networks being un-maintained. The limited funds, facilities and O&M officers provided by the Government for the management and maintenance of irrigation network functions if not supported by the community will potentially lead to a decline in irrigation network conditions and at an advanced level may disrupt the function of irrigation networks in the distribution of irrigation water. And should play an active role in the O&M activities of irrigation networks are water users / farmers who benefit from the existence of irrigation networks, coordinated by each P3A in collaboration with the local Irrigation Unit / Observer.

P3A organization is a local organization that is a means of interaction and cohesiveness among members of the farming community as a social unit called water user farming community. This community facilitates its members to interact mutually support and institutionalized within a social organization and at the same time as a venue that embodies the interests of each member into a common goal at the local community level. This condition is also expected in the Province of Central Sulawesi.

Sigi regency is one of the areas for food crop production in Central Sulawesi Province. According to in Central Sulawesi there are several areas of technology that can be applied to improve the competitiveness of agricultural production. One of them is biotechnology that can be used to increase competitiveness in this case food technology. However, efforts to increase the production of food crops are still constrained by the limitations of irrigation networks (Agus Lamakarate, 2012) [1]. The existing irrigation networks still utilize surface water, which is limited spatially and temporally stated that + 40% of existing rice field area in Sigi Regency has not been reached by irrigation facilities. The constraints faced by farmers are the village irrigation network. The village irrigation network has only reached 60% that irrigates the rice fields. The irrigation network needs is related to the target to be achieved by Sigi regency concerning paddy rice production to 5.7 tons per hectare of 4.2 tons per hectare target in 2012 with a real area of 42,000 hectares (Balai Sabo, 2010) [3], that Gumbasa irrigation
With irrigation water sources supplied from the Palu basin. DAS Palu has an area of 3048 km\(^2\) with the main Sub Das, namely Sub Das Miu - Kulawi and Sopu - Gumbasa. Human plans for the agriculture and many industries which are mostly dependent on weather conditions. For defence, shipping, aero navigations and mountaining purpose, we need to predict the weather conditions. Also to get prepared for forthcoming disasters and natural calamities, the abrupt change in climate condition needs to be forecasted (Andreas Ariyanto Rangga, 2017) [2].

The Gumbasa irrigation area irrigates the agricultural area, with a potential area of 10,500 ha and a functional area of 7,922 ha. The Gumbasa irrigation network also serves 44,026 people living in 25 villages (5 subdistricts). Natural sediment disaster that ever happened to cause irrigation Gumbasa can not irrigate existing agricultural areas. Thus this study attempts to review how P3A active participation in the management of groundwater irrigation network assets.

2. RESEARCH METHOD

The research was conducted in Soulowe Village, Sigi District, Central Sulawesi Province. Sigi District is located in Central Sulawesi province with the capital of Bora located in District Sigi Biromaru. Kabupaten Sigi, approximately 90% of the population lives as farmers. Sigi District in Central Sulawesi Province is a potential agricultural area (food crops, horticulture, plantation, forestry, livestock, and fishery). The research sample includes Water User Farmers Association (P3A) and drilling wells used for groundwater irrigation sources. Technique of sampling proportional random sampling based on distribution at service area. The analysis of P3A active participation model in irrigation asset management is determined based on Law no. 4 / 2003 on Water Resources and Regional Regulations of Central Sulawesi Province. No.2 /2009 on Irrigation (Sance Lipu, Donny Mangitung, and Triyanti Anasiru, 2017)[10].

![Figure 1 Research sites in Sigi district](image-url)
3. RESULTS AND DISCUSSION

The water supply for groundwater irrigation network (JIAT) in Sigi Regency is sourced from 20 bore wells under the Public Works Department. Drilling conducted by P2AT in 1990-1994 in general drilling groundwater is only exploratory. As well as drilling located in Tinggede Sunyu (Oruna) located in District Marawola, Sigi Biromaru, and in Ngatabaru Village, drilling depth ranges from 60 to 200 meters. The purpose of this drilling for the provision of irrigation water with the discharge of pumping test results >20 liters/sec, the position of water level - 50 m up to 6 meters bmt (Balai Sabo, 2010) [3].

Based on groundwater drilling conducted by the Central Sulawesi Groundwater Development Project Section (Direktorat Pengelolaan Air, 2009) [4] it can be concluded that:

1. The drilling area is composed of units of coarse sand - fine sand, gravel, gravel, sand of clay and sandy clay. The units are not always found at each drilling point.
2. Groundwater aquifers are in depths of 30-90 meters bmt with resistivity ranges from 10-30 ohm-m and self potential values ranging from 30 to 110 mVolt.
3. High productive aquifers of groundwater found in layers of fine sand and fine sand. Groundwater aquifers are being found in coarse sand, coarse sand and gravel. Groundwater aquifers are low in the sand layer of clay. Generally a type of free aquifer with flow through porosity between grains with a maximum discharge of 20-190 liters/second (production well) and 2-60 liters/second (exploration well).
4. Based on the maximum discharge rate of pumping that exploratory wells in Pombewe Sigibiromaru area are feasible to be developed into production wells while for exploration well area in Lolu village and Bora village, Biromaru sub district is not feasible to be developed for production wells.

Figure 2 Model JIAT in Sigi district (I)
Based on the results of hydrogeological analysis that can be described the groundwater potential zone in CAT Palu based on the analysis of aquifer flow system. Groundwater potentials based on groundwater quantity and quality criteria are in medium to high class (Sance Lipu, et al, 2014) [9].

The use of JIAT in district Sigi Biromaru covers some villages that are not included in Gumbasa Irrigation Area. Although the quantity and quality is sufficient but the exploitation cost is high because it uses fuel for the water pump. To obtain the condition of groundwater irrigation network (JIAT) that can function well and smoothly in distributing irrigation water,
the active participation model of P3A in JIAT asset management in district Sigi Biromaru in the form of:

3.1. Maintenance

3.1.1. Periodic Maintenance
Periodic maintenance is maintenance and repair activities that are carried out regularly within a certain period of time planned and implemented by UPT hydrology and can cooperate with P3A by self managed based on the ability of the institution and can also be executed by contractual. The implementation of periodic maintenance shall be carried out periodically according to the conditions of Irrigation Network. Each type of periodic maintenance activity can be planned for different periods. It is recommended that irrigation network maintenance periodically be conducted simultaneously at least 2 times a year, which is done before the first planting season -(MT-1) and before the second planting season (MT-2).

The maintenance of periodic irrigation networks involves farmers' participation in P3A and Observer coordination, carried out from the primary, secondary and tertiary channels to prepare for the start of the growing season. Implementation of this maintenance activity should be accompanied by financing provided by the Government and supported by the community self-help. The regulatory system is carried out in consultation with farmers P3A / IP3A, except for heavy maintenance requiring certain technical aids and should be carried out contractually. Periodic maintenance can be divided into three, namely maintenance, maintenance that is repair and maintenance that is replacement.

3.1.2. Routine Maintenance
Routine maintenance is recommended by farmers of JIAT users in district Sigi Biromaru along the primary, secondary and tertiary canals through rice fields and agricultural land crops that benefit from irrigation water from the canal. While on the section / segment of primary and secondary channels that are not through the rice fields that benefit / use irrigation water from the channel is done by Irrigation network manager UPT Hydrology.

Farmer / P3A participation in routine maintenance activities on primary, secondary and tertiary channels is suggested by dividing and assigning responsibilities to the farmer / farmer farmers based on the ratio of the area of each wetland management, to the extent of obtaining the benefits Bigger / cultivated larger will get a larger share of routine maintenance responsibilities as well.

Figure 5 Profile of one drilling well and P3A in Sigi regency
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a) Formulation Model "cost management" for P3A Participation in JIAT Operational Costing

The socio-economic condition of farmers and the farming conditions of P3A members in Sigi Regency is a factor affecting group strength including IPAIR payment rate. Thus P3A organizations should have strong institutional and effective management of IPAIR. But the reality is not so, the management of IPAIR can be said not yet effective. It can be seen the level of payment of P3A members and the use of IPAIR. The IPAIR payment rate is still very low at <50%. Low IPAIR payment rates are not patterned based on the geographical position of the farm (P3A) on the secondary channel or by the year. This indicates that IPAIR payments are not due to factors of proximity to the location of farming from secondary channels, not because of the growing season or climatic conditions.

b) Regulation or Policy-Based Economics of JIAT

Based on several problems in the research location, the regulation or irrigation policy in this area developed is "OPIP Concept". Participatory Irrigation Operation and Maintenance Model (OPIP) is an innovative development of irrigation systems, which takes into account the needs of the farming community. In addition, OPIP also pays attention to the local technical, social, cultural, economic and environmental aspects as well as continuous and sustainable P3A empowerment. Existing irrigation management containers such as the Water User Farmers Union (P3A) / Association of Water User Farmers (GP3A) / Indoor Water User Farmers' Union (IP3A) can be enhanced in the operation and maintenance of established irrigation systems. This approach is the basis for OPIP development at the farm level in Central Sulawesi.

c) Participation Model of P3A in Handling of Water Scarcity

The process of constructing an OPIP Model that can be developed in the research area consists of 10 (ten) stages. The 10 stages are (i) preparation, (ii) social mapping, (iii) socialization, (iv) public consultation (v), establishing agreement, (vi) community group formation, (vii) tracking irrigation networks to be used As an object, (viii) mentoring TTG implementation, (ix) evaluation of effectiveness of assistance, (x) preparation of SPMK. At the preparatory stage, a literature study was conducted relating to the role of P3A in a participatory irrigation system. At the Social mapping stage, the socio-economic condition is assessed. The results are temporary conclusions for materials for socialization and public consultation such as a participatory irrigation system to stakeholders, namely Regional Government, Provincial Government and Community Water User Farmers Association.

The increase of public services based on information and communication technology (e-Government) requires a government organization to have strategic planning. One of the benefits strategic planning is that e-Government development becomes more targeted, effective, efficient and transparent in order to support good and clean governance (Suvendra Kumar Jayasingh, et.al.,2016) [11].

Public consultation is directed to produce a joint formula between the Government and the Peasants Community on participatory irrigation operation and maintenance systems (OPIP) that need to be agreed upon. Participatory surveys and designs are conducted as soon as the agreement is obtained. Socialization and community gathering and group formation are conducted to prepare the implementation of OPIP model concepts that have been agreed. OPIP test in the form of stimulant application of Appropriate Technology is done at the location specified in accordance with the agreement. Assistance and effectiveness evaluation results are conducted for the reference to strengthen the OPIP model. IPAIR management is closely related to the capabilities and potentials of the group. P3A has great potential for the
management of IPAIR, among others (Sance Lipu, Donny Mangitung, and Triyanti Anasiru, 2017) [10]:

1. P3A has an irrigation resource which is the source of water which is the main requirement in the operation. This need encourages farmers to work together to meet their water needs.

2. Members of P3A have the same goal is to obtain maximum production of farming. This effort can be achieved through in-between cooperation among members, including making plans for various activities that can benefit members.

3. Most members have a high sense of togetherness and mutual understanding that fosters activity.

4. CONCLUSION

1. The use of JIAT in district Sigi Biromaru covers some villages which are not included in Gumbasa Irrigation Area. Although the quantity and quality is sufficient but the exploitation cost is high because it uses fuel for the water pump. If any mechanical damage will cause an issue of magnitude corresponding to the degree of damage.

2. In order to obtain the condition of groundwater irrigation network (JIAT) that can function well and smoothly in distributing irrigation water, the active participation model of P3A in Kecamatan Sigi Biromaru in the form of: routine maintenance and periodic maintenance, formulation Model "cost management" for P3A Participation In JIAT Operational Costing, Regulation or Policy Based on Economics of JIAT, and model of Participation of P3A in Handling of Water Scarcity.

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