Jatiluhur integrated irrigation system– Lessons learned related to participatory approach and implementation of existing regulations

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Abstract

Jatiluhur irrigation system (JIS) with command area of 240,000 ha is the largest contiguous technically irrigation system in Indonesia, unified the existing irrigation schemes built in 1923 (Salamdarma) and in 1925 (Walahar). The completed system has helped supporting the surplus of rice production in Indonesia during period of 1980s. However, in the recent ten years, expanding populations along with economic development intensified by deteriorating infrastructure increases the overall water requirements. It leads to increasing losses that difficult to manage, hence needs specific actions. Meanwhile, there is a practice adjacent to existing system, i.e. pump –irrigation, which indicates that the ratio of water usage per ton rice production is higher but it is considered illegal.

Mimicking the activity, a system of rice intensification in an area of 12 ha paddy field under JIS command area has been demonstrated to model a participatory approach among key actors, namely irrigation operator, agriculture field officer, and farmers. This collaborative mechanism on small scale irrigation holder has proved to increase water efficiency without hampering rice production. The model can be duplicated with persistent and commitment from key players and good condition of water resources infrastructures in a larger scale. Because of water as illustrated from the pump-irrigation is efficiently managed, actually the water in JIS is still adequate compensating from losses. Therefore, the regulation should also be aware of this situation and treated it without discriminating the status and circumstances and considered it in a planning.

Keywords: Jatiluhur irrigation system, participatory approach, pump-irrigation, system of rice intensification.

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1. Introduction

Integrated Jatiluhur irrigation system lies mainly within the West Java Province with main supply comes from Jatiluhur reservoir. It was the result of Jatiluhur Multipurpose Project that commenced in 1957. Increasing economic and demographic development particularly in Java Island increased the demand for rice as staple-food in Indonesia and incited Prof. Dr. W. J. van Blommestein to integrate the water resources in Java Island to support irrigation in the northern plain of Java Island (van Blommestein, 1949). The first development was the Citarum River Basin, combines nine rivers traversing the man-made canals and incorporated the existing irrigation systems into one hydrological boundary.

The development has proved beneficial to strengthen rice intensification and extension program of the Government of Indonesia. Since it was a multipurpose project, the benefits reveal from development are: (1) extension of irrigation area from 200,000 ha to 240,000 ha during wet season, and during dry season from 40,000 to 240,000 ha which means intensification of paddy cultivation from once per year to twice a year resulting additional rice production of 300,000 ton per year (Santoso, 1961), (2) raw water supply for domestic, municipal, and industry, (3) flood protection in the downstream of Citarum River, (4) hydro-electric power production, and (4) tourism.

Jatiluhur irrigation system (JIS) management has experienced several shifting of regulations, paradigm of management, and facing burden situation due to water stresses. Paradigm of integrated water resources management and autonomy of local government, among others are influencing the shifting of regulations. The precedent law dictated the management of water No. 11/ 1974 has been replaced by the law No. 7/2004 regarding water resources as part of reformation on water resources management in national level. Water requirements, not only for irrigation has been increasing for example in the eastern part of Jatiluhur irrigation system, and has emerged into hundreds of local irrigation using pumps collecting water either from existing irrigation canals or drainage.

This paper is presented to explain the situation of irrigation management in Jatiluhur particularly to pump-irrigation that has been practiced since 2000s adjacent to the existing integrated Jatiluhur irrigation system. The peculiar exercises have been increasing in number and lead to water conflict. In term of water resources management, it has higher efficiency of water use and local participatory approach is implemented. Based on similar perspective, the system is trying to be implemented in small scale land holder under Jatiluhur irrigation system to increase water efficiency as a model on participatory mechanism in irrigation management, hence, to give space on additional irrigation water requirement for pump-irrigation mechanism.

2. Jatiluhur Irrigation System

Jatiluhur irrigation system (JIS) is a technically integrated irrigation system covering a basin area of Citarum River and other rivers of about 12,000 km^2. The main supply is Jatiluhur reservoir and added by local rivers traversing three primary canals, namely the West Tarum Canal, East Tarum Canal, and North Tarum Canal. JIS has command area of about 240,000 ha with an average of 210% cropping intensity. The water usage for irrigation is by far the greatest, counted for 87% of total supply and particularly for irrigation is about 12,000 m^3/ ha/crop.

To reduce the peak demand of water, the initial cultivation period is divided into five tranches of water supply regulated from the Jatiluhur reservoir (Fig. 1). Cropping pattern in JIS is paddy-paddy-3rd crop starting from 1st of October. Water delivery services for different purposes including water for irrigation is managed by Jasa Tirta II Public Corporation (PJT II). The initial water requirement for irrigation is decided by irrigation committee, from district irrigation to municipality and finalized at provincial level in the form of Governor Decree. The irrigation water requirement is then adopted by PJT II to compute the overall water requirements in the whole system.

In a large irrigation system such as Jatiluhur, water conveyance losses, i.e. losses due to evaporation, percolation, etc in tertiary system was taken about 20%, in secondary canal 20% and main canal 10%, thus the total loses is 44%. Besides it, the major issue of losses is operational losses, i.e. delay of planting which causes water to be wasted. Many possible causes of delay planting, such as farmers do not have capital to initiate planting, no supporting machinery (such as tractor) or labor to do land preparation and cultivation, seeds, fertilizer, etc.

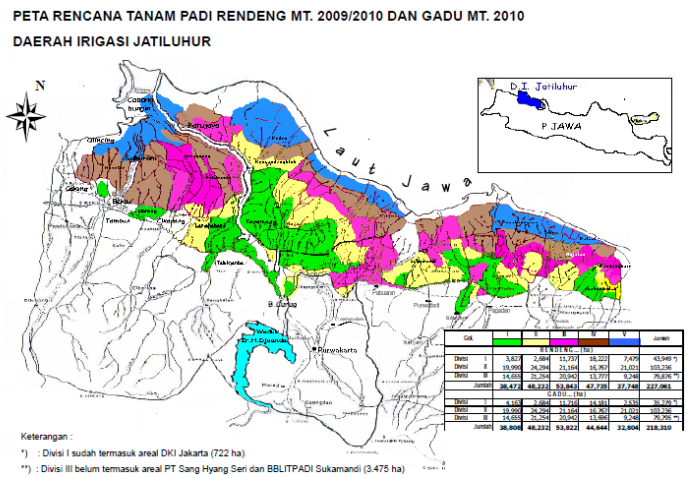

Fig. 1. Jatiluhur irrigation system in the jurisdiction area of Jasa Tirta II Public Corporation (Citarum River Basin and part of Ciliwung-Cisadane River Basin).

3. Pump-irrigation Activity

Pump-irrigation was started to emerge in 2000s, organized by local people to deliver water either to the existing JIS command area or to the new area parallel to the primary canals that formerly a command area of other irrigation systems. The water for pump-irrigation is extracted from the main canals, namely West Tarum Canal, East Tarum Canal, and North Tarum Canal (Fig. 2). It surfaced through different mechanisms, from the farmers that require water for their paddy fields which is not fulfilled from the existing system or merely business opportunity that organized by pump's owner. In the Bugis Main Canal (BMC), the pump-irrigation area has reached 1,504 ha (Table 1).

The existing command area of BMC is 37,000 ha. The canal is positioned in West-East direction splitting the irrigation area in the North and South sides of the canal. The existing command area of BMC is in the left (North) side, while at the right bank (South) the area is higher than the canal. The irrigation area at the

right bank is either non-irrigated land or is supplied by other system such as Cipancuh Irrigation System (called Southern Jatiluhur Irrigation System). The maximum capacity of canal that can be achieved is 25 m^3/s. Based on existing condition, the BMC additional to the existing command area of 37,000 ha has to fulfill irrigation water requirement to for the off-target area from the other irrigation systems such as Rentang and Cipancuh Irrigation Systems, not mentioning water demand from thousands of pump-irrigations along the canal. To meet the demands, PJT II regulates the water with intermittent method for the BMC region.

Pump-irrigation organization consists of pump's owner, pump's operator, and farmers. The organization leads by a pump's owner that usually a cleric and/or a wealthy local people in neighboring area. Pump operator has to manage a daily operation of the pumps and also acts as water regulator. The pump-organization is also acknowledged by the local community, village civil officers, and government officers who deal with agriculture activity.

Fig. 2. Pump-irrigation system in the Bugis Main Canal with command area adjacent to existing JIS.

The capital cost is provided by the pump's owner to build the pump station, and the cost for operation and maintenance including salary for pump operator originated from farmer contribution in the form of paddy (not in hard-cash) which is give out after harvesting. The pump's owner collects the contribution from the farmers. In average, the farmer contribution is 5 quintals per ha during dry season and around 4.3 quintals per ha during rainy season. The main cost for operation and maintenance of the pumps is for fuel (diesel). After deducting from the costs, the revenue is shared between pump's owner and pump operator in the ratio of 2:1. Because the farmers pay contribution after harvesting, sometimes farmers do not pay if they are not successful with the harvest.

Before starting cultivation, there is a routine meeting between farmers and local officer dealing with agriculture. The meeting discusses when should farmer starting the cultivation, which seed should be planted, and method of cultivation should be done. The pump's operator is also attending the meeting to get to know how to allocate water to the command area that he maintains. The farmers will ask to pump's operator or pump's owner that he/she wants his/her land to be watered. The system of allocating water is using intermittent method. The pump's operator will decide who/which paddy field will be supplied, thus

he also acts as water regulator. There is also sometimes dispute between farmers, mostly between downstream-upstream farmers. The dispute is handled by the pump's operator and minimized by routine check of water delivery.

In a sample case, during dry season (surveyed on 16th of July, 2008), for 21 ha of paddy field it requires around 7 l/s. It means the irrigation water requirement around 0.3 liter/s/ha less than regular irrigation water requirement supplied for the Jatiluhur irrigation system. Due to intermittent method, the efficiency of water supply is higher than continuous. In the paddy field, the water layer is lower than usual pattern of about 10 cm above ground. This practice proves to be more water effective and efficient than regular method. Water supply system in the pump-irrigation depends on the size of command area and type of pump. For the larger pump, the water supply is not continuous, after the fields have enough water, the pump is stopped. But for smaller pump the operation is continuous and the pump operator rotates the water services into the fields.

Table 1. Inventory of Pump-irrigation in the Bugis Main Canal (+ Kandang Haur Secondary Canal)

No.	Location	Area (ha)	Pump-cap. (l/s)	Note
1	Bugistua	50	50	Right
2	Mangunjaya	200	230	Left
3	Bugis	200	300	Right
4	B. Khr. 2-3	100	250	Right
5	B. Khr. 4a-6a	450	450	Right
8	B. Khr. 6-8	270	650	Right
9	B. Khr. 9-10	20	50	Right
10	B. Khr. 11-12	20	50	Right
11	B. Khr. 12-13	106	500	Right
12	B. Khr. 14	88	100	Right
Total Area (ha)		1,504		

Note: only part of data is presented.

4. Pilot and Demonstration Activity (PDA) of SRI in Irrigation Area under JIS

To comply with pump-irrigation system, since February 2010, PJT-II as water manager for JIS has tried to implement the system of rice intensification (SRI) in tertiary area under JIS. The demonstration area is located at B.Tt.5.k1 that is supplied by the East Tarum Canal. The total tertiary area is 12 ha, which is 8.55 ha is divided into 27 (twenty-seven) demonstration plots (Fig. 3). The activity, besides mimicking the pump-irrigation mechanism, it also developed a model of participatory irrigation mechanism among key actors, namely irrigation operator, agriculture field officer, and farmers, since the operational losses counted most of the losses.

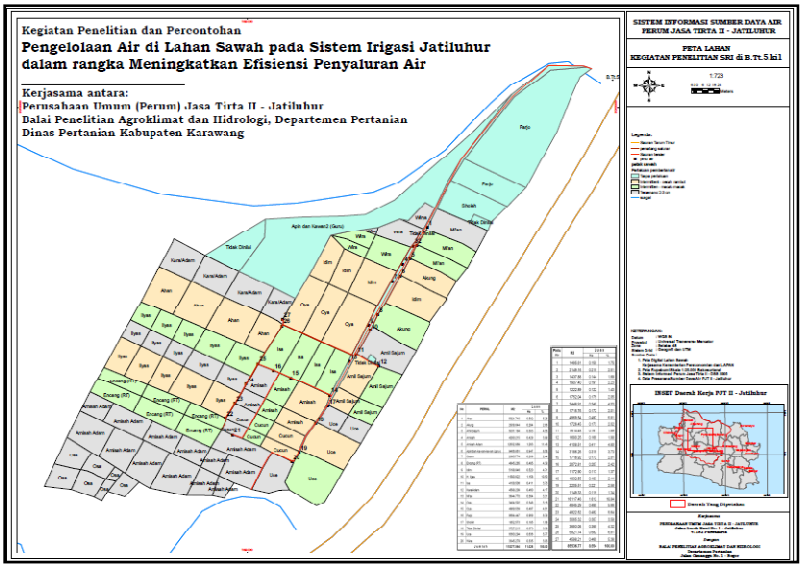

Fig. 3. Pilot and demonstration activity on system of rice intensification at area under JIS.

In each demplot, a measuring structure is set in order to quantify how many water is discharge into the land besides rainfall depth monitoring. There are 3 (three) types of irrigation applied: (1) continuous irrigation, common practices in the area (farmer's practices), (2) intermittent irrigation until the land crack at the surface, and (3) intermittent irrigation until only small layer of water remain in the land. The water layer is maintained within 2-3 cm above the ground. Three demplots out of 27 are applying organic fertilizer. The amount of organic fertilizer is 5 ton/ha which applied twice, 2.5 ton/ha before planting and 2.5 ton/ha after 25 days. For chemical fertilizer per ha of paddy field, the composition is: NPK 15% (Ponska) 300 kg : Urea 100 kg : SP36 50 kg. The chemical fertilizer is spread three times, before planting, a week after planting, and a month after planting. To reduce operational losses especially for delay planting, mechanism has been established among the key players, such as water operator, farmer, agriculture counselor, and seed providers, to adjust and adapt with recent progress. Before application, the infrastructure condition mainly canal and gate structure are refurbished to appropriately distribute and regulate water.

The PDA has proved that the water can be efficiently used without hampered the rice production. To minimize operational losses it requires: (1) active participation, persistent, and commitment among key players, (2) good infrastructure (canal, gate) condition, (3) intensive communication between farmers and water operator to adjust the water delivery based on actual requirement, and (4) government support on seed, fertilizer, and post-harvesting instruments. As a model, the PDA can be applied in a larger scale.

5. Implementation of Existing Regulation

Law No. 7 / 2004 regarding Water Resources clause 29(3) stated that the water services is first prioritized to fulfill the requirement for daily life and existing irrigation system above all other requirements. The farmers do not pay for irrigation water services. As common practices in the large irrigation system, Jatiluhur irrigation system requires more water to compensate physical losses, with specific attention on operational losses due to delay of planting. During water shortage, area under JIS is supplied by intermittent method, which is not necessary for the pump-irrigation organization to do so, because they maintain the system in the basis of "business" with family culture, to reduce operational costs by

effectively supply water according to the needs. Through active communication among themselves, it is a kind of participation from the community in the water resources management process. During dry season, when shortage is occurred, more intensive communication is done to minimize disputes.

Meanwhile, because the pump-irrigation usually extracted water from the given and upstream of canal, in the existing Jatiluhur irrigation system, downstream users of JIS felt that they had been treated unfair and concerned with the water availability to their fields. Because of water management as illustrated from the pump-irrigation example, actually the water is still adequate compensating from losses. It is an irony, when there are two systems (Jatiluhur and pump-irrigation) side by side only separated by the canal, which is one the water supply is guaranteed by the Government but the other not. The regulation told so and the regulation should also be aware of this situation. The regulation should be fair without discriminating the status and circumstances. The pump-irrigation should be accommodated according to the law system and considered for future planning.

6. Summary and Conclusion

Jatiluhur irrigation system is the largest contiguous irrigation system in Indonesia supporting the surplus of rice production in Indonesia during period of 1980s. The main supply is Jatiluhur reservoir and added by local rivers traversing three primary canals, namely the West Tarum Canal, East Tarum Canal, and North Tarum Canal. JIS has command area of about 240,000 ha with 210% crop intensity with water conveyance loss is counted for 44%, besides operational losses.

Pump-irrigation was started to emerge in 2000s, organized by local people to deliver water either to the existing JIS command area or to the new area parallel to the primary canals that formerly a command area of other irrigation system. Pump-irrigation organization proves to be more water effective and efficient than regular method. Pilot and demonstration activity is applied in the area under JIS adopting the pump-irrigation mechanism, to model a participatory irrigation mechanism among key actors, namely irrigation operator, agriculture field officer, and farmers. The PDA has proved that the water can be efficiently used without hampered the rice production. To minimize operational losses it requires: (1) active participation, persistent, and commitment among key players, (2) good infrastructure (canal, gate) condition, (3) intensive communication between farmers and water operator to adjust the water delivery based on actual requirement, and (4) government support on seed, fertilizer, and post-harvesting instruments. As a model, the PDA can be applied in a larger scale. To increase water efficiency, thus minimizing operational losses, it requires: (1) active participation, persistent, and commitment among key players, (2) good infrastructure (canal, gate) condition, (3) intensive communication between farmers and water operator to adjust the water delivery based on actual requirement, and (4) government support on seed, fertilizer, and post-harvesting instruments.

Law No. 7 / 2004 regarding Water Resources also encouraged people to actively participate in managing water resources. To have an efficient water management, it requires special handling, persistent operator, collaborative management and involvement from different structures of community as shown by the pump-irrigation system. Presently, the pump-irrigation is still considered illegal, but looking to the present example, it applies the ideal management of water effective and efficient organization, and based on participatory approach. The system should be justified by the rules and should be taken into consideration in future planning.

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