

Analyze the Figures Need Real Operations and Irrigation Maintenance Based on Irrigation Conditions (Case Study: Pakis Irrigation Area Malang District)

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Abstract— This research was done in five stages. In the first stage, a physical assessment of the irrigation network is taking inventory and a search for the entire component of the irrigation network. The second stage, evaluate irrigation network performance systems and operation cost analysis and irrigation network maintenance. In the third stage, a cost analysis is done at the second stage of the hectares. In the fourth stage, there is social factor analysis done on the real need for operations and irrigation networks maintenance in farmers opinion at the site using SPSS software. The fifth stage is done priority analysis of the cost of real operations and irrigation maintenance using the analytical hierarchy process method (AHP). Studies show a quality of irrigation system 77.94 (good condition), the cost of operation and the maintenance of irrigation networks in acres Rp. 7.163.413, analysis of analysis according to the opinion of the presence of the fountain of the water research is acquired ten less than ten, eight answers are good enough, three very good answers, four neutral answers. Analysis of operating costs and irrigation network maintenance shows operating costs and maintenance to be prioritized with a weight load of 0.313, 0.221, 0.102.

Keywords— Inventory, evaluation, cost, SPSS, AHP.

I. INTRODUCTION

Visually, it can be seen that the physical condition of irrigation networks decreases every year, which is marked by a large number of damaged irrigation networks. One of the causes of damaged irrigation networks is due to the lack of funds for operations, maintenance, and rehabilitation that should be provided by the local government. The assessment of the physical condition of the irrigation network in all irrigation areas was carried out in 2016.

One attempt to improve physical performance improvements in irrigation networks is to analyze the numbers of actual operating needs and maintenance of irrigation networks. In planning a number analysis of needs real operation and maintenance and rehabilitation of irrigation networks based on PUPR ministerial regulation No.12 of 2015 concerning exploitation and maintenance of irrigation networks.

Irrigated Pakis area is an irrigation area located in Pakis District, Malang Regency with an irrigation area of 726 hectares where The Pakis Irrigation Area is managed by the SDA Tumpang Technical Implementation Unit (UPT) Malang

Regency. The problems that occur in the research location areas follows:

There are several irrigation buildings conditions included in the category of severe damage, moderate damage, and damage light, and good condition (assessment based on PUPR ministerial regulation No.12 in 2015) so that it requires improvement and improvement in order irrigation network performance is always in good condition.

There are outlets in the irrigation system, these outlets come from tofu factory wastes and residential areas, this can cause siltation in the river in the event of rain conditions with large capacity at the study site

The objectives of this study are as follows:

Find out the weight of Irrigation Area network performance based on Minister of Public Works Regulation No. 12 of 2015, analyzing the costs of operating and maintaining irrigation and comparing the results of irrigation operations and maintenance based on the results of planning with the opinions of farmers using the research location

II. MATERIALS AND METHODS

2.1 Research Sites

The research location is the Pakis irrigation area located in Pakis District, Malang Regency. Based on the location of astronomy, the District of Pakis is located at coordinates 112 ° 17 '10.9 " - 112 ° 57'0.0" east longitude and 70 ° 44 "55.11" - 80 ° 26' 35.45 "south latitude with restrictions region as follows:

North : Singosari sub-district

East : Jabung sub-district

South : Tumpang sub-district

West : Malang city

In figure 1 shows the location of the study using google earth software:



Figure 1: Map of the research location

Table 1. Evaluation of the performance of irrigation networks

Indicator aspect	Weight results
Physical infrastructure	44.78
Cropping productivity	0.43
Supporting facilities	7.9
Personnel organization	11.9
Documentation	4
Association of water -using farmers	8.8
Number of weights	77.81

The results of the evaluation of irrigation network performance have a weight value of 77.81 so that the condition of the irrigation network is classified as good. The results of this evaluation are obtained by conducting an inventory of all indicators of irrigation networks in the field based on ministerial regulation number 12 of 2015 concerning the exploitation and maintenance of further irrigation networks.

3.2 Costs of operating and maintaining irrigation networks

Calculation of operating and maintenance costs for irrigation networks consists of the calculation of operating activities costs, routine maintenance activities, the cost of periodic maintenance activities, the cost of fostering and coordinating apparatus activities, the costs of training and training activities for water user farmer associations.

The costs of operation and maintenance of irrigation can be seen in Table 2 the cost of the number of real requirements for irrigation operations and maintenance.

Table 2. The cost of the number of real requirements for irrigation operations and maintenance.

Number	Sequence of activities	Cost (Rp)	Cost per hectare (Rp)
1	Operation	15683700	21,603
2	Routine maintenance	4463507530	6,148,082
3	periodic maintenance	689926301.5	950,312
4	Operation and maintenance	5169117531	7,098,394
5	coaching and coordination	17050000	23,485
6	Development and training of water- using farmers	14470000	19,931
	Amount activity costs	5200637531	7,163,413

Table 2 description as follows:

1. The cost column is obtained from the calculation of the budget for implementing the operation and maintenance of irrigation for one year.
2. The cost column per hectare comes from the cost column divided by the area of irrigation networks.
3. Column for the number of costs obtained from the total costs of operations and maintenance activities, coaching and coordination activities, and activities for fostering and training water user farmer associations.

2.2 Data collection

Researchers used primary data and secondary data in this study. Primary data is obtained by conducting direct searches on Pakis irrigation networks while secondary data obtained through questionnaire scatter, which involves the role of the relevant Dinas, namely UPT SDA Tumpang, SDAPU office in Malang Regency, and the collection of water user farmers in the research location. Secondary data used are data on water availability, data on planting area, maps of irrigation network schemes.

A. Research design

1. Inventory of irrigation networks and evaluate the performance of irrigation networks

Conduct technical audits on elements related to operations and maintenance of irrigation networks. Audit technical consist of physical infrastructure, planting productivity, supporting facilities, personnel organization, documentation, an association of water-using farmers.

2. Budget plan

Arranging the AKNOP irrigation network which consists of a matrix of needs, O & M work plan, and O & M RAB.

3. Design cost priority analysis using the analytical hierarchical process (AHP) method

The costs of operating and maintaining irrigation networks are then analyzed using the Analytical Hierarchy Process (AHP) method to obtain the priority of the costs of operating and maintaining irrigation networks

4. Analysis of the social aspects of the problem regarding the real need for irrigation operations and maintenance according to the opinion of the water user farmer group in the study location using SPSS software.

The evaluation of irrigation network performance evaluation and technical audit according to the view of the water user farmers' association of data irrigation networks was obtained by questionnaire answers from the researchers.

III. RESULTS AND DISCUSSION

3.1 Evaluation of irrigation network performance

The results of the evaluation of the performance of the irrigation network in the study location can be seen in Table 1. Evaluation of the performance of irrigation networks.

4. The column for the amount of cost per hectare is obtained from the column for the number of activity costs divided by the area of irrigation.

A. The priority weighting results of the operation and maintenance costs of irrigation use the analytical hierarchy process

Based on the results of quantitative research from 16 respondents, only 13 respondents were able to obtain the results of the assessment. The answers from the 13 respondents were screened which had the highest number of weights as an alternative cost of prioritizing irrigation operations and maintenance activities. The results of the AHP method can be seen in table 3.

Table 3. Results in the priority weighting of irrigation operations and maintenance costs using the Analytical Hierarchy Process (AHP) method

Criteria	Sub Criteria	Maximum weight
1	operation and maintenance costs	0.313
2	operation and maintenance costs	0.221
3	operation and maintenance costs	0.102

Based on the results of irrigation network performance evaluation criteria, the maximum cost of irrigation operation and maintenance and the minimum cost of irrigation operation and maintenance, irrigation operation and maintenance costs got the highest weight of the assessment 13 respondents amounted to 0.313, 0.221, and, 0.102

B. The results of the processed social aspects of the data are the problems of irrigation network evaluation according to the opinion of the association of water-using farmers using SPSS software

The results of the social aspect analysis used quantitative methods, with 98 respondents based on Slovin theory, with 29 questions using the Likert scale model. Of the 29 available questions, only 26 questions that passed the validity and reliability tests used SPSS software. Results obtained in the respondent's opinion 10 answers are not good, 8 answers are quite good, 4 answers are neutral.

IV. CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions

1. The cost of real costs for irrigation operations and maintenance is as big as Rp 5.200.637.531
2. The amount of the real need for irrigation operations and maintenance per hectare is equal Rp 7.163.413
3. The costs that must be prioritized are operating and maintenance costs according to the analytical hierarchy process method
4. According to the opinion of the research water user farmer association, the evaluation of the performance of the research irrigation network is quite good.

4.2 Recommendations

1. This research can be continued by conducting a thorough search on the irrigation system building with an area of 1000 hectares of irrigation area.
2. Further discussion of the effect of tofu factory drainage channels and residential settlements on the irrigation system at the study site should be added.

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