IMPROVEMENT STRATEGY OF PORONG KANAL IRRIGATION NETWORK PERFORMANCE IN DELTA BRANTAS IRRIGATION AREA WITH SWOT ANALYSIS (STRENGTH, WEAKNESS, OPPORTUNITIES, AND THREATS)

Melani Fitri, Wasis Wardoyo and Theresia Sri S.
Department of Civil Engineering, Sepuluh Nopember Institute of Technology, Surabaya, Indonesia
E-Mail: [a]melanifitri85@yahoo.co.id, [b]dww279@yahoo.com, [c]theresia_sri_sidharti@yahoo.com

ABSTRACT

Delta Brantas Irrigation Area with total covering irrigated area 21,984 Ha, located entirely in Sidoarjo. Irrigation system performance in Delta Brantas Irrigation Area especially in Porong Kanal Primary Network tended to decline. So improvement strategy required in order to provide better irrigation services that fit the needs of the farming community. This problem can be studied by analyzing the existing condition, determining priority handling factors and a strategy for improving the irrigation network performance. From research results indicated that the degradation of the irrigation system performance in Delta Brantas Irrigation Area from 2012 to 2014 amounted to 3.66%. The priority handling factors that influencing the performance of Delta Brantas irrigation network are the condition of regulator structures, conditions of complementary structures, sewer condition, the completeness of operation and maintenance equipment, total personnel of operation and maintenance, personnel assignment of the operation and maintenance, legal status GP3A/P3A, institutional conditions of P3A, and P3A actively in search of irrigation networks, and P3A contribution to repair the irrigation networks. From SWOT analysis resulted a strategy position used to improve the performance of Porong Kanal Irrigation Network Delta Brantas Irrigation Area is turn-around strategy which minimizing the weaknesses to take advantage of opportunities.

Keywords : Delta Brantas Irrigation Area, irrigation networks performance, strategy.

I. INTRODUCTION

Development and management of irrigation systems require irrigation system performance monitoring activities This monitoring is carried out in the form of performance evaluation of an irrigation system set out in the Regulation of the Minister of Public Works No. 32/PRT/M/2007. Irrigation system performance evaluation is intended to determine the condition of the performance of the irrigation system that includes physical infrastructure, plant productivity, supporting facilities, personnel organization, documentation and institutional conditions Farmers Water User Associations (P3A).

In its development, the performance of irrigation systems tend to decrease. Some causes of performance degradation irrigation system according to Nurrochmad (2007)[2] as in the following description are irrigation damage because of less optimal network operation and maintenance; due to natural disasters; the reduced water carrying capacity; irrigated land conversion to non-irrigated; and lack of community participation in the management of farmers in irrigation networks .

Delta Brantas Irrigation Area is one of the largest irrigation area in East Java, with a total covering irrigated area 21,984 Ha. Delta Brantas irrigation area irrigated by two irrigation network, Mangetan Kanal irrigation network with extensive 11,390 Ha and Porong Kanal irrigation network with extensive 10,594 Ha.

During its development, the performance of irrigation systems in the Delta Brantas Irrigation Area especially Porong Canal irrigation networks tend to decrease. In degradation of irrigation system performance in Delta Brantas Irrigation Area can be studied by analyzing the existing condition of the irrigation system from 2012 to 2014. Then determine the factors that affect the performance of irrigation systems by spreading the perception and interests assessment questionnaire to farmers water users and managers of irrigation, and analyzed using the quadrant analysis. Next, determine the strategy pursued in order to improve the performance of irrigation systems Delta Brantas Irrigation Area using SWOT method.

II. LITERATURE REVIEW

Asset Management

Definition of asset management in general according to Siregar[6] is a series of activities associated with identifying what assets are needed, how to get, how to support and maintain, as well as disposal or renew it so that those assets effectively and efficiently to realize the target. Asset management goal is the efficient utilization and ownership, maintained economic value and objectivity in the supervision and control of allocation, use and transfer of assignment.

Asset management can be divided into five stages of work that are related to each other . The fifth stage includes an inventory of assets, legal, audit, asset valuation, asset optimization, and development of Asset Management Information System.

Irrigation

In the Regulation of the Minister of Public Works and Public Housing No. 30/PRT/M/2015[3] about the Irrigation System Development and Management, irrigation is a business of irrigation water provision, arrangement, and disposal to support the agriculture type of surface irrigation, swamp irrigation, underground water irrigation, pump irrigation and fishpond irrigation. Irrigation serves to support the agriculture productivity to increase the agricultural production in order to national food secure and society welfare, specially farmers, which realized through the sustainability of irrigation system. Irrigation system includes irrigation infrastucture,

irrigation water, irrigation management, institutional of irrigation management and human resources. Irrigation infrastructure consisting buildings and aquaducts with its complementary reffered as irrigation network.

Irrigation management regulated in Regulation of the Ministry of Public Works and Public Housing No. 30/PRT/M/2015[3] about the Irrigation System Development and Management, that the Minister have the authority and responsibility in maintaining the effectiveness, efficiency, and execution diciplines of development and management of primary irrigation system and secondary in irrigation area which covers more than 3,000 Ha, or in the irrigation area across the province, irrigation area across the nation, and irrigation area nationally strategic.

In the implementation of the operation and irrigation network routine maintenance, conducted by City Department of Public Works through Co-Administration of Operation and Maintenance (TP-OP) from the central government. Assistance are assignment of the central government to regional or village to perform certain tasks along with financing, infrastructures and facilities and human resources with obligation to report its implementation, and accountable to the central government by using the funds that provided by the Ministry of Public Works and Public Housing in the form of Special Allocation Funds, deconcentration funds and task fund.

Performance Assessment of Irrigation Network

Performance assessment of irrigation system is part of the irrigation management with the aim to monitor the functions and performance of all aspects of the irrigation system. This assessment is conducted by the manager of the Regional Irrigation in accordance with their respective authorities. Aspects assessed based on the Regulation of the Minister of Public Works No. 32 in 2007 [4]. Aspects of the irrigation network performance evaluation as in the following description.

1. The condition of the physical infrastructure that includes indicators such as the following description.
   a. The main building conditions
   b. Bearer channel conditions
   c. The building on the bearer channel conditions
   d. Sewer conditions
   e. Inspection road conditions
   f. Offices, housing offices and warehouse infrastructure conditions.
2. Plant productivity that includes indicators such as the following description.
   a. Irrigation water supply conditions (k factor)
   b. Realization of planting area conditions
   c. Rice productivity conditions
3. Supporting facilities that includes indicators such as the following description.
   a. Equipment of Irrigation Operation And Maintenance (OM) conditions.
   b. Transportation conditions.
   c. Office tools operation and maintenance of irrigation networks executive.
   d. Communication tools conditions.
4. Personnel organization that includes indicators such as the following description.
   a. Preparation of personnel duties and responsibilities of the operation and maintenance irrigation networks
   b. The organizational structure of the operation and maintenance irrigation networks
5. Documentation that includes indicators such as the following description.
   a. data book irrigation areas
   b. Maps and images of the irrigation network and the implementation of the OM image
6. P3A conditions that includes indicators such as the following description.
   a. Legal status IP3A / GP3A
   b. Institutional development conditions IP3A / GP3A
   c. Frequency conference / meeting Ulu - Ulu / P3A Village / GP3A with a representative office / branch irrigation
   d. P3A activity in following the irrigation network search
   e. P3A participation in improving irrigation and natural disasters
   f. Contribution of P3A in the improvement of tertiary irrigation network
   g. Participation of P3A in the planning and layout plan cropping patterns and irrigation water allocation

Validation Test

Validity test used to determine whether the questions in the questionnaire able to measure what is to be measured and the collected data is valid or not. If it scores all inquiries or questions prepared by the dimensions of the concept of correlated with the total score, it can be concluded that the measuring device has validity. Approach construct validity with Pearson Product Moment Correlation technique (Singarimbun, 1992) using the following formula.

$$r_{xy} = \frac{n\sum XY - \left(\sum X\right)\left(\sum Y\right)}{\sqrt{\left[n\sum X^2 - \left(\sum X^2\right)\right]\left[n\sum Y^2 - \left(\sum Y^2\right)\right]}} \quad (1)$$

With the following caption.

r_{xy} = product moment correlation coefficient between the item and the total score
n = number of respondents
X = a score of questions per item
Y = the total score
XY = multiplication score per item with a score total

Type of construct validity with product moment correlation technique, the test results are considered valid/invalid as described in the following description, according Nugriantoro et al.[5].

1. Valid if r ≥ rtabel (α : 1 % / 5 % ; n- 2)
2. Not valid if r < rtabel (α : 1 % / 5 % ; n- 2)

Reliability Test

According Sugiono[7], the internal consistency reliability testing, done by trying out the instrument once, and then the data were analyzed with specific techniques. Results of analysis can be used to predict the reliability of the instrument .

The reliability of a construct variable is said to be good (reliable), if it has a value of Cronbach 's Alpha (α) of ≥ 0.60, according Nugroho[1]. The higher this

coefficient (approaching one), the better this measure. Component reliability test conducted on the question of the condition of physical infrastructure, plant productivity, supporting facilities, personnel organization, documentation and farmer water user associations (P3A) .

Level of Interest and Perception Analysis

Level of interest and perception analysis is to determine the respondent's interest and perceptions level of performance and service. According Supranto[8], in this analysis there are two variables that are represented by the letter X and the letters Y, where X is the respondent's performance or perception level, while Y is the respondent's interest level. Based on the research results and the perception of the level of interest will result in a degree of correspondence between the interest level and the performance (perception) level of the services. Suistability levels is the comparison of the perception score (average scores of perception) with a score of interests (average score of interests), based on the following formula.

$$Tk_i = \frac{X_i}{Y_i} x\ 100\% \quad (2)$$

With the following explanation.
Tki = Suistability
Xi = Perception score (average score of perception)
Yi = Interest score (average score of interests)

Quadrant Analysis

This analysis is used to describe conditions of service. The service conditions can be described in four quadrants, the quadrant I, II, III, and IV. To be able to map the conditions of service in the form of quadrants, the method of calculation is done as follows.

1. Calculate the average total value of the perception levels and the average total value of the interest levels.
2. The average total value of interest levels is the figure that states limit the Y axis, while The average total value of perception levels is the X axis limits
3. Based on these boundaries can be determined criteria coordinates for each quadrant.

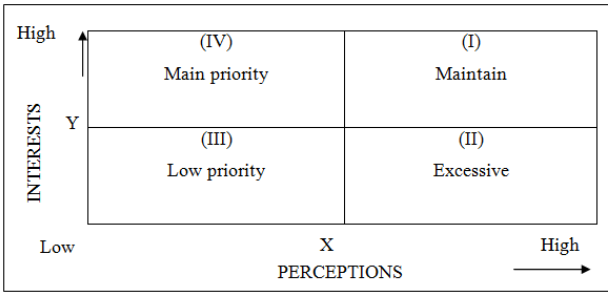

Figure-1. Perceptions vs Interest Quadrant

SWOT Analysis

SWOT analysis is way to make strategy formulations. In a SWOT analysis carried out comparisons between strategic factors internal and external to acquire strategies for each of these factors with the scoring. Based on the results obtained and determined focus on strategy.

III. METHODS

This study object is Delta Brantas irrigation area. Delta Brantas irrigation area is located in the district of Sidoarjo. Delta Brantas irrigation area has an area of 21,984 Ha covering 20 districts in Sidoarjo. Delta Brantas irrigation area get a supply of irrigation water from the Lengkong Dam which is administratively located in the Miriprowo village, Tarik district, Sidoarjo. Delta Brantas irrigation area is divided into two Irrigation Networks that originated from a Kepajaran devider structure of Lengkong Dam, which Porong Kanal irrigation network with an irrigation area of 10,594 Ha and Mangetan Kanal irrigation network with an irrigation area of 11,390 Ha.

The data collected are needed to support solving problems arising under the focus of research, which is secondary data and primary data. Secondary data that is needed are physical infrastructure, map of irrigation, network scheme water supply, water needs, personnel organization, and institutional P3A. And the primary data that is needed are Observation and field survey of irrigation networks, the draft Questionnaire for farmers and irrigation managers.

Process study is shown in the figure below :

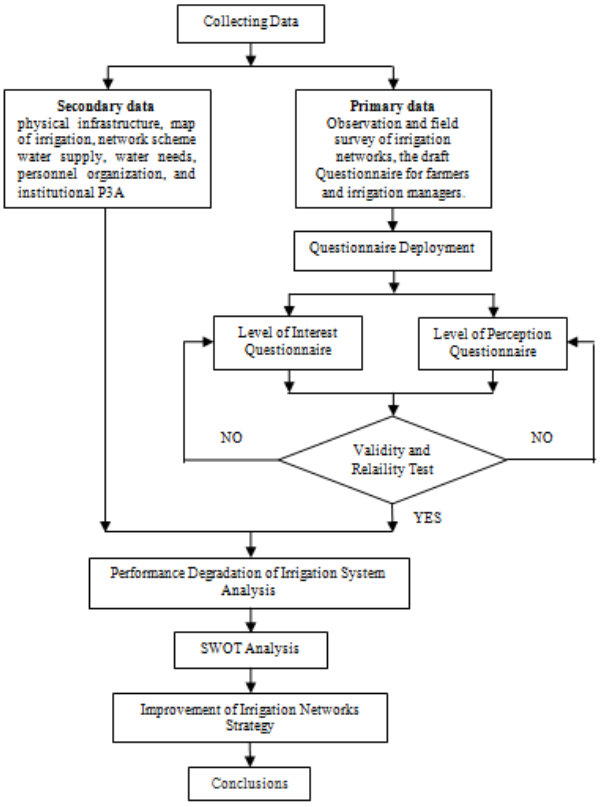

Figure-2. Process Study

IV. RESULT AND DISCUSSIONS

A. Performance Degradations of Irrigation Networks at Delta Brantas Irrigation Area Analysis

Performance degradation of irrigation networks analysis is intended to determine the magnitude of the decline in performance of irrigation system in Delta Brantas Irrigation Area. This analysis is comparing/ analyzing the performance assessment of irrigation network Delta Brantas Irrigation Area in 2012 to 2014.

Performance degradation of irrigation networks analysis using performance index data of Delta Brantas Irrigation Area obtained from BBWS Brantas. To be able to compare the performance index value of Delta Brantas

Irrigation Area, the percentage of the maximum - minimum boundary conditions and the percentage value of the portion used in the assessment of the performance index must be equal. Comparison of the performance index value of Delta Brantas Irrigation Area between 2012 and 2014 are presented in the following Table-1.

Table-1. Comparison of the performance index value of Delta Brantas Irrigation Area between 2012 and 2014

No.	Performance Indicator	Max. Boundary Cond. (%)	Min. Boundary Cond. (%)	Existing Cond (%)		Difference of Existing Cond. (%)
				In 2012	In 2014	
1.	Physical infrastructure	45	25	33,87	29,83	-4,04
2.	Plant productivity	15	10	10,84	11,90	1,06
3.	Supporting facilities	10	5	7,58	6,95	-0,63
4.	Personnel organization	15	7,5	9,90	10,30	0,40
5.	Documentation	5	2,5	3,95	3,35	-0,60
6.	Farmer Water User Associations (P3A)	10	5	5,90	6,05	0,15
Total		100	55	72,04	68,38	-3,66

From Table , we can see that the performance degradation index value of Delta Brantas Irrgitaion from 2012 to 2014 amounted to 3.66%. Performance indicators which experienced the performance degradation index value is in the following paragraphs.

1. Physical infrastructure
2. Supporting Facilities
3. Documentation

B. Factors for priority handling analysis

1. Validity and Reliability Test

Validity and reliability tests performed on the main survey the number of respondents farmers as much as 209 respondents and respondents irrigation officers as much as 28 respondents. Subvariable be declared invalid so that the correlation coefficient of each subvariable the respondent farmers must be greater than the numbers criticism (r) for the 209 respondents is 0,1358, while the correlation coefficient of each respondent officer subvariable on irrigation must be greater than the numbers criticism (r) to 28 respondents is 0,3739. Based on the answers of respondents in the main survey can be calculated correlation figures each sub variable interests and perceptions.

Table-2. Validity Test for Farmer Respondents

No.	Sub-variables	Correlation To Total Score			
		Percep-tions	Desc.	Inte-rests	Desc.
1.1	The main building conditions	0,444	Valid	0,431	Valid
1.2	The bearer channel conditions	0,274	Valid	0,544	Valid
1.3	Regulator structure conditions	0,520	Valid	0,485	Valid
1.4	Complementary structure conditions	0,612	Valid	0,519	Valid
1.5	Sewer conditions	0,519	Valid	0,523	Valid
1.6	Entrance conditions	0,739	Valid	0,434	Valid
1.7	Inspection road conditions	0,599	Valid	0,614	Valid
1.8	Housing office conditions	0,554	Valid	0,518	Valid
2.1	Water supply	0,365	Valid	0,467	Valid
2.2	Realization of planting area	0,511	Valid	0,555	Valid
2.3	Rice productivity	0,445	Valid	0,559	Valid
3.1	Completeness of OM equipment	0,570	Valid	0,472	Valid
3.2	Transportation	0,490	Valid	0,549	Valid
3.3	Office tools at branch/observer/UPTD	0,447	Valid	0,517	Valid
3.4	Communication tools	0,549	Valid	0,515	Valid
4.1	Arrangement and organization of OM	0,705	Valid	0,595	Valid
4.2	Total of OM Personnel	0,395	Valid	0,511	Valid
4.3	Personnel assignment about OM	0,496	Valid	0,495	Valid
5.1	Data book of Irrigation Area	0,602	Valid	0,500	Valid
5.2	Maps and image of Irrigation Area	0,745	Valid	0,457	Valid
5.3	OM Guidelines	0,639	Valid	0,441	Valid
6.1	Legal status GP3A/P3A	0,643	Valid	0,537	Valid
6.2	Institutional conditions of P3A	0,667	Valid	0,483	Valid
6.3	Frequency conference / meeting Ulu - Ulu / P3A Village / GP3A with a representative office / branch irrigation	0,657	Valid	0,424	Valid
6.4	P3A participated in improving irrigation and natural disasters	0,737	Valid	0,569	Valid
6.5	P3A actively in search of irrigation networks	0,601	Valid	0,466	Valid
6.6	P3A contribution to repair the irrigation networks	0,437	Valid	0,524	Valid
6.7	Pa Participation of P3A in the planning and layout plan cropping patterns and irrigation water allocation	0,559	Valid	0,539	Valid

Table-3. Validity Test for Irrigation Officer Respondents

No.	Sub-variables	Correlation To Total Score			
		Percep-tions	Desc.	Inte-rests	Desc.
1.1	The main building conditions	0,523	Valid	0,729	Valid
1.2	The bearer channel conditions	0,393	Valid	0,442	Valid
1.3	Regulator structure conditions	0,556	Valid	0,569	Valid
1.4	Complementary structure conditions	0,509	Valid	0,408	Valid
1.5	Sewer conditions	0,583	Valid	0,386	Valid
1.6	Entrance conditions	0,459	Valid	0,481	Valid
1.7	Inspection road conditions	0,676	Valid	0,523	Valid
1.8	Housing office conditions	0,611	Valid	0,430	Valid
2.1	Water supply	0,376	Valid	0,441	Valid
2.2	Realization of planting area	0,414	Valid	0,536	Valid
2.3	Rice productivity	0,461	Valid	0,581	Valid
3.1	Completeness of OM equipment	0,733	Valid	0,600	Valid
3.2	Transportation	0,440	Valid	0,459	Valid
3.3	Office tools at branch/observer/UPTD	0,502	Valid	0,460	Valid
3.4	Communication tools	0,405	Valid	0,457	Valid
4.1	Arrangement and organization of OM	0,418	Valid	0,645	Valid
4.2	Total of OM Personnel	0,414	Valid	0,615	Valid
4.3	Personnel assignment about OM	0,414	Valid	0,381	Valid
5.1	Data book of Irrigation Area	0,563	Valid	0,413	Valid
5.2	Maps and image of Irrigation Area	0,532	Valid	0,431	Valid
5.3	OM Guidelines	0,435	Valid	0,458	Valid
6.1	Legal status GP3A/P3A	0,409	Valid	0,381	Valid
6.2	Institutional conditions of P3A	0,707	Valid	0,621	Valid
6.3	Frequency conference / meeting Ulu - Ulu / P3A Village / GP3A with a representative office / branch irrigation	0,468	Valid	0,448	Valid
6.4	P3A participated in improving irrigation and natural disasters	0,464	Valid	0,513	Valid
6.5	P3A actively in search of irrigation networks	0,429	Valid	0,639	Valid
6.6	P3A contribution to repair the irrigation networks	0,685	Valid	0,429	Valid
6.7	Pa Participation of P3A in the planning and layout plan cropping patterns and irrigation water allocation	0,392	Valid	0,564	Valid

Based on Table-3, all the variables of interest and the perception's correlation number is greater than the number of correlation coefficient criticism, 0.1358 for 209 farmers, and 0.3739 for 28 irrigation officers. So all variables declared eligible validity. Reliability testing using the formula "Cronbach 's Alpha" with the results shown in the following Table-4.

Table-4. Summary Results of Reliability Testing

No.	Respondents	Variable		Desk.
		Perceptions	Interests	
1.	Farmers	0,9184	0,8931	Reliabel
2.	Irrigation Officers	0,8850	0,8876	Reliabel

In Table-4, it can be seen that the variable interests and perceptions have a Cronbach 's Alpha value is greater than 0.60, so that the variable is declared reliable.

Based on the validity and reliability of test results showed that all questions subvariable can be used to measure the same aspects and provide consistent results if done twice or more. Then in the opinion of the respondents, the factors based Performance Assessment of Irrigation Networks Guidelines (Regulation of the Ministry of Public Works No. 32/PRT/M/2007) can influence the performance of the irrigation networks.

2. Level of Interest and Perception Analysis

Level of interest and perception analysis is based on survey results for each respondent farmers water users and irrigation officers.

The results of level of interest and perception calculation shown in Table-5 and 6.

Table-5 Suistability of Interests and Perceptions level on The Farmer Respondents

No.	Sub-variable	Percep-tion Level	Interest Level	TKi
1.1	The main building conditions	3,68	4,23	87%
1.2	The bearer channel conditions	3,45	4,30	80%
1.3	Regulator structure conditions	2,61	4,42	59%
1.4	Complementary structure conditions	2,97	4,37	68%
1.5	Sewer conditions	2,99	4,30	69%
1.6	Entrance conditions	3,20	3,99	80%
1.7	Inspection road conditions	3,09	3,96	78%
1.8	Housing office conditions	3,03	3,98	76%
2.1	Water supply	3,56	4,38	81%
2.2	Realization of planting area	3,76	4,47	84%
2.3	Rice productivity	3,68	4,44	83%
3.1	Completeness of OM equipment	3,40	3,97	86%
3.2	Transportation	3,58	4,08	88%
3.3	Office tools at branch/observer/UPTD	3,19	4,02	79%
3.4	Communication tools	3,52	4,06	87%
4.1	Arrangement and organization of OM	3,42	4,13	83%
4.2	Total of OM Personnel	3,19	4,19	76%
4.3	Personnel assignment about OM	2,91	3,93	74%
5.1	Data book of Irrigation Area	3,28	3,88	84%
5.2	Maps and image of Irrigation Area	3,40	4,11	83%
5.3	OM Guidelines	3,26	4,02	81%
6.1	Legal status GP3A/P3A	3,21	4,24	76%
6.2	Institutional conditions of P3A	3,21	4,32	74%
6.3	Frequency conference / meeting Ulu - Ulu / P3A Village / GP3A with a representative office / branch irrigation	3,22	4,02	80%
6.4	P3A participated in improving irrigation and natural disasters	3,37	4,21	80%
6.5	P3A actively in search of irrigation networks	3,27	4,22	78%
6.6	P3A contribution to repair the irrigation networks	2,58	4,35	59%
6.7	Pa Participation of P3A in the planning and layout plan cropping patterns and irrigation water allocation	3,74	4,46	84%

Table-6 Suistability of Interests and Perceptions level on The Irrigation Officer Respondents

No.	Sub-variable	Percep-tion Level	Interest Level	TKi
1.1	The main building conditions	4,18	4,14	101%
1.2	The bearer channel conditions	3,68	4,32	85%
1.3	Regulator structure conditions	2,46	4,57	54%
1.4	Complementary structure conditions	3,82	4,43	86%
1.5	Sewer conditions	3,32	4,21	79%
1.6	Entrance conditions	3,04	3,68	83%
1.7	Inspection road conditions	3,29	3,64	90%
1.8	Housing office conditions	3,54	3,68	96%
2.1	Water supply	4,46	4,46	100%
2.2	Realization of planting area	4,46	4,61	97%
2.3	Rice productivity	4,46	4,57	98%
3.1	Completeness of OM equipment	2,46	4,43	56%
3.2	Transportation	3,39	4,04	84%
3.3	Office tools at branch/observer/UPTD	3,43	3,75	91%
3.4	Communication tools	3,50	3,82	92%
4.1	Arrangement and organization of OM	3,43	4,32	79%
4.2	Total of OM Personnel	2,57	4,50	57%
4.3	Personnel assignment about OM	3,11	4,25	73%
5.1	Data book of Irrigation Area	3,50	4,04	87%
5.2	Maps and image of Irrigation Area	3,43	4,11	83%
5.3	OM Guidelines	3,61	3,96	91%
6.1	Legal status GP3A/P3A	2,75	4,39	63%
6.2	Institutional conditions of P3A	2,21	4,57	48%
6.3	Frequency conference / meeting Ulu - Ulu / P3A Village / GP3A with a representative office / branch irrigation	3,14	4,21	75%
6.4	P3A participated in improving irrigation and natural disasters	2,82	4,18	68%
6.5	P3A actively in search of irrigation networks	2,25	4,39	51%
6.6	P3A contribution to repair the irrigation networks	2,18	4,46	49%
6.7	Pa Participation of P3A in the planning and layout plan cropping patterns and irrigation water allocation	3,61	4,61	78%

3. Quadrant Analysis for The Factors Priority Handling

This analysis is mapping the distribution of the level of perception and interest in the sub-variables according to the water user farmers and irrigation officers to the Cartesian coordinates. Then focus attention on the sub-variables are located in quadrant IV, which means those factors considered very important, but its implementation is still not satisfactory. Therefore, these factors become the main priority handling for improved performance of irrigation network.

The results obtained, as shown in Figure-3 below.

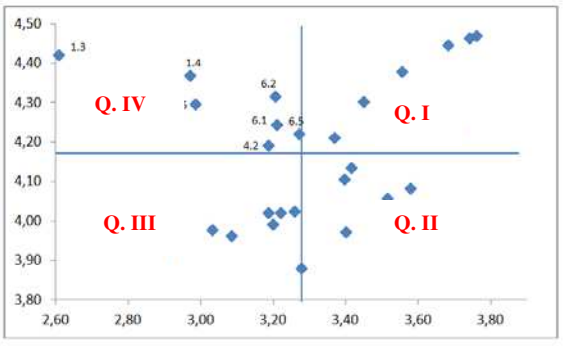

Figure-3 Cartesian Diagram for Suistability Level Farmer Respondents

According to farmers water users, factors that become a priority handling to improve the irrigation network performance especially in Porong Kanal Irrigation Canal, Delta Brantas Irrigation Area, is in the following paragraphs.

1. The condition of regulator structures (Sub Variable 1.3)
2. The condition of complementary structures (Sub Variable 1.4)
3. The condition of sewer (Sub Variable 1.5)
4. Total personnel of operation and maintenance/OM (Sub Variable 4.2)
5. The legal status GP3A/P3A (Sub Variable 6.1)
6. Institutional of P3A conditions (Sub Variable 6.2)
7. P3A actively in search of irrigation network (Sub Variable 6.5)

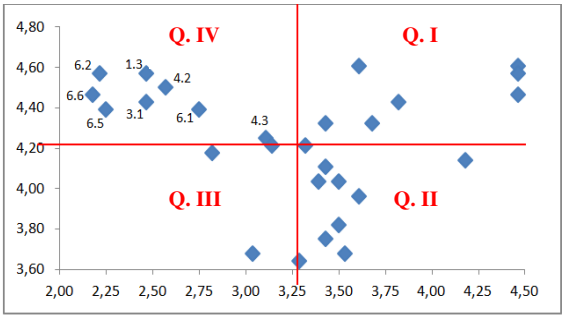

Figure-4 Cartesian Diagram for Suistability Level Irrigation Officer Respondents

Based on the results of the diagram, factors that become a priority handling to improve the irrigation network performance according to irrigation officers are as follows .

1. Completeness of operation and maintenance equipment (Sub Variable 3.1)
2. Total personnel of operation and maintenance (Sub Variable 4.2)
3. Personnel understanding of the OM (Sub Variable 4.3)
4. The legal status GP3A / P3A (Sub Variable 6.1)
5. The institutional conditions P3A (Sub Variable 6.2)
6. P3A actively in search of irrigation network (Sub Variable 6.5)
7. Dues P3A to repair irrigation networks (Sub Variable 6.6)

C. Strategy Formulation for Performance Improvement Analysis on Porong Kanal Irrigation Canal, Delta Brantas Irrigation Area

Based on the results of quadrant analysis as well as through interviews with the managers of irrigation as a respondent, the Commitment Officer (PPK) Irrigation of BBWS Brantas, Head of Unit Operations and Maintenance Department of Irrigation Works East Java Province, Head of Operations and Maintenance Department of Irrigation Works Sidoarjo Regency, the head of Prambon Technical Service Implementation Unit (UPTD), and the head Porong Technical Service Implementation Unit (UPTD), obtained information on the critical factors that indicate internal weaknesses and strengths, and external critical factors that indicate opportunities and threats for the performance of Porong Kanal Irrigation Canal on Delta Brantas Irrigation Area. These factors can be seen in Table-7 and 8.

Table-7. Internal Factors

No.	Internal Indicator	Description	*Strength* (S)/ *Weakness* (W)
1.	Organizations		
1.1	Duties and authority of irrigation management in Delta Brantas Irrigation Area	Duties and authority of irrigation management is good, and it's obvious to regulate irrigation management authority.	
1.2	Personnel Assignment of Operation and Maintenance	Personnel Assignment of Operation and Maintenance still dont understand about Operation and Maintenance Task.	W
1.3	Amount of human resources.	Amount of existing human resources are sufficient.	S
2.	Technical		
2.1	The main building conditions	Intake / weir in good condition and functioning properly	S
2.2	Divider/Tapping/ Divider-Tapping Structure conditions	Divider/Tapping/Divider-Tapping Structure conditions, partially damaged in the door or stuctures.	W
2.3	Bearee channel conditions	Most of the bearer channel condition is in good condition.	S
2.4	Sewer conditions	The condition of the sewer is damage so it does not work properly.	W
3.	Supporting facilities		
3.1	Completeness of operation and maintenance tools	Completeness of operation and maintenance tools is still lacking to support the activities of the operation and maintenance.	W
4.	Institutional P3A		
4.1	P3A legal entities	Many P3A still has not been legal entities.	W
4.2	Institutional conditions	Has not working well	W
4.3	P3A dues for networks repair	P3A dues for networks repair has not been fluently.	W

Source : Analysis Results

Table-8. Ixternal Factors

No.	External Indicator	Description	*Opportunities* (O)/ *Threats* (T)
1.	Government policy		
1.1	Funding OM and rehabilitation	Central government provide the funding for OM and rehabilitations.	O
1.2	Loan for capital farmers	Local governments provide the loan for capital farmers inthe form of revolving fund.	O
2.	Environments		
2.1	Water supply	Water supply is still insufficient to supply the needs of irrigation water	O
2.2	Transfer of farmer profession	Decreasing the number of farmers caused by transferring into other professions	T
2.3	Agricultual land conversion	The reduced area of agricultural land due to	T

		the conversion of agricultural land into residential / warehouse	
2.4	Lapindo Mud disaster	Reduced agricultural area as a result of Lapoindo mud disaster	T
3.	Agriculture		
3.1	Cropping repair	The possibility of improvement of cropping pattern adapted to the existing water supply	O
3.2	The new cultivation technology	The possibility of new cultivation technologies to increase agricultural productivity	O
3.3	Agricultural production price	The possibility of fluctuations in the price of agricultural products which cause crop yields disproportionate to the costs incurred.	T
3.4	Pricing and distribution of fertilizers	The tendency of rising prices of fertilizer and uneven distribution	T

Source : Analysis Results

After weighting for each internal and external strategic factors , then arranged alternative strategies for improving irrigation system performance using matrix circuitry Internal Factors Evaluation (EFI) and matrix External Factors Evaluation (EFE). Determination of the position of Irrigation System Performance is the stage I (The Input Stage) of the analytical framework to formulate a strategy .

1. Matrix EFI to know the internal strengths and weaknesses. In this matrix multiplication is done between the weight with the rating of each internal factors. The scores are then added together and the result is a total score of EFI, as listed in Table-9.

Table-9. Internal Factors Evaluation (EFI) Matrix

No.	Internal Factors Evaluation	Weight	Rating	Weight Score
	(Strength/S)			
1.1	Duties and authority of irrigation management in Delta Brantas Irrigation Area	0.0995	3.8	0.38
1.3	Amount of human resources.	0.0913	3.3	0.30
2.1	The main building conditions	0.0955	3.5	0.33
2.3	Bearer channel conditions	0.0955	3.5	0.33
	Strength Quantity	0.3818		1.34
	Weakness/W			
1.2	Personnel Assignment of Operation and Maintenance	0.0830	-2.3	-0.19
2.2	Divider/Tapping/Divider-Tapping Structure conditions	0.0913	-2.7	-0.24
2.4	Sewer conditions	0.0871	-3.7	-0.32
3.1	Completeness of operation and maintenance tools	0.0871	-2.7	-0.23
4.1	P3A legal entities	0.0955	-3.2	-0.30
4.2	Institutional conditions	0.0871	-3.0	-0.26
4.3	P3A dues for networks repair	0.0871	-2.7	-0.23
	Weakness Quantity	0.6182		-1.77
	Total Score	1		-0.43

Source : data processed

2. EFE matrix to determine the external opportunities and threats. In this matrix multiplication is done between the weight with the rating of each of the external factors. The scores are then added together and the result is a total score of EFE, as listed in Table-10.

Table-10. External Factors Evaluation (EFE) Matrix

No.	Eksternal Factors Evaluation	Weight	Rating	Weight Score
	Opportunities/O			
1.1	Funding OM and rehabilitation	0.110	3.3	0.36
1.2	Loan for capital farmers	0.096	3.2	0.31
2.1	Water supply	0.105	3.3	0.35
3.1	Cropping repair	0.105	3.3	0.35
3.2	The new cultivation technology	0.091	3.3	0.3
	Opportunities Quantity	0.507		1.67
	Threat/T			
2.2	Transfer of farmer profession	0.096	-2.8	-0.27
2.3	Agricultual land conversion	0.105	-3.3	-0.35
2.4	Lapindo Mud disaster	0.091	-3.3	-0.3
3.3	Agricultural production price	0.105	-2.5	-0.26
3.4	Pricing and distribution of fertilizers	0.096	-2.5	-0.24
	Threats Quantity	0.493		-1.42
	Total Score	1.00		0.25

Source : data processed

Summary results of the analysis of strategic factors of internal/external and internal/external factors evaluation matrix shown in Table-11.

Table-11. Summary of Weight and Weight Score Internal and External Factors

No.	Factors Evaluation	Weight	Weight Score
1.	Internal		
	Strength/S	0.3818	1.34
	Weakness/W	0.6182	-1.77
2.	External		
	Opportunities/O	0.507	1.67
	Threats/T	0.493	-1.42

Based on the summary results of the analysis of internal-external strategic factors shown in the Table-11, known to score weighting strengths, weaknesses, opportunities and threats. The difference in the score weighting strength with weakness is -0.43, is the internal weaknesses. While the gap in the score weighting opportunities with threats of 0.25 is at external opportunities. Results of the difference in the score of each internal and external factors incorporated into the strategy diagram in order to obtain the most appropriate strategies to improve the performance of irrigation network Porong Kanal Irrigation Canal on Delta Brantas Irrigation Ares as shown in Fig-5.

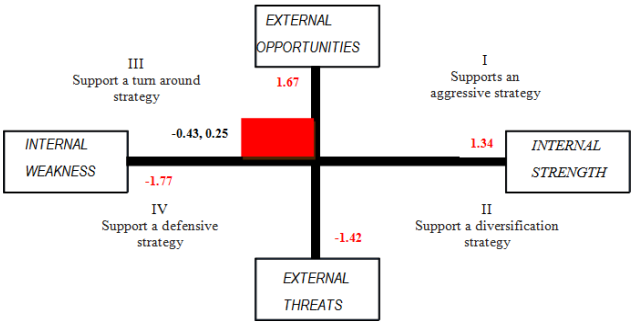

Figure-5 Strategy Diagram

From Figure-5, scores of weight lies in Quadrant III, meaning that alternative implementing turn around

strategy which minimizing the weaknesses to take advantage of opportunities. Therefor, the strategy should be applied in performance improvement are:

1. Propose the additional funding to improve divider/tapping/divider-tapping Structure and sewer, and holding operation and maintenance fixtures.
2. Training of personnel in order to understand the operation and maintenance task.
3. The gauge located on the building / tapping / for - tapping need to be calibrated so that accurate measurement results
4. Socialization, posting signs littering and impose fines to overcome the garbage on the tertiary network. In the secondary network, upheld the criminal code regarding sanctions dispose of waste in discharge channel/sewer.
5. Training and guidance the modern agricultural technologies operation of farming to increase agricultural productivity

V. CONCLUSIONS

Based on the results of this study the following conclusions are drawn.

1. Based on performance degradations of irrigation networks at Delta Brantas Irrigation Area Analysis, known that performance indicators which experienced the performance degradation index value is physical infrastructure, supporting facilities, and documentation.
2. Based on the quadrant analysis is known that according to the farmers, the priority factors that needs to be handled is the condition of regulator structures, conditions of complementary structures, sewer condition, amount of OM personnel, legal status GP3A/P3A, institutional conditions of P3A, and P3A actively in search of irrigation networks. Meanwhile, according to irrigation officers, priority factor that needs to be handled is the completeness of operation and maintenance equipment, total personnel of operation and maintenance, personnel assignment of the operation and maintenance, legal status of GP3A/ P3A, institutional conditions of P3A, P3A actively in search of irrigation networks, and P3A contribution to repair the irrigation networks.
3. Based on Strategy Formulation for Performance Improvement Analysis, strategy position suggested is turn around strategy which minimizing the weaknesses to take advantage of opportunities. Therefor, the strategy should be applied in performance improvement are:
   a. Propose the additional funding to improve divider/tapping/divider-tapping Structure and sewer, and holding operation and maintenance fixtures.
   b. Training of personnel in order to understand the operation and maintenance task.
   c. The gauge located on the building / tapping / for - tapping need to be calibrated so that accurate measurement results
   d. Socialization, posting signs littering and impose fines to overcome the garbage on the tertiary network. In the secondary network, upheld the criminal code regarding sanctions dispose of waste in discharge channel/sewer.
   e. Training and guidance the modern agricultural technologies operation of farming to increase agricultural productivity.

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