Quest Journals
Journal of Architecture and Civil Engineering
Volume 9 ~ Issue 9 (2024) pp: 71-81
ISSN(Online) : 2321-8193
www.questjournals.org

Research Paper

A Maintenance Cost and Work Performance Analysis on Irrigation Network at Kaubun Irrigation Area of East Kutai Regency, Indonesia

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ABSTRACT: *An irrigation network maintenance is an effort to maintain and secure the irrigation network to be always ready and well functioned. In facilitating its operational implementation and maintain its sustainability cycle, it can be attained through maintenance, repair, prevention, and security activities that must be conducted in continuity. The Kaubun irrigation area is one of the irrigation areas under the authority of central government with area length of 1,150 Ha (standard area) and 736 Ha (functional area), located in the East Kutai Regency. The Kaubun irrigation area has 1 (one) weir or dam and 2 (two) main canals. The irrigation network maintenance has not been carried out in routine and periodical ways either by the East Kalimantan Provincial Government or by the East Kutai Regency Government. Sediment accumulation is one of the main problems found in the secondary irrigation canal and able to cause canal blockage, reduced water flow capacity and increased infrastructure damage.*

This research was carried out by evaluating the Irrigation Network System and observing several factors causing channel damage with a guidance from regulation of Minister of Public Works and Public Housing Number:12/PRT/M/2015 on date 6 April 2015, regarding Exploitation and Maintenance of Irrigation Network. Result of the research showed that recapitulation of the work performance index for Kaubun Irrigation Network System was obtain the largest optimum value in Physical Infrastructure aspect with an index value of 29.01. Meanwhile, the result from main treatment priority by employing Analytic Hierarchy Process (AHP) method found the Physical Infrastructure aspect has a limiting value of 0.462. Finally, the routine and periodical maintenance costs for the Kaubun irrigation area is IDR.3.753.835.675.00

KEYWORDS: *East Kutai Regency, Work Performance, Maintenance Cost, Irrigation Network*

R*eceived 09 Sep., 2024;* ***R****evised 23 Sep., 2024;* ***A****ccepted 25 Sep., 2024 © The author(s) 2024.*
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I. INTRODUCTION

In an attempt to maintain and increase agricultural production especially for staples such as rice and secondary crops, specific attention required to the irrigation facilities and infrastructure for make these facilities works (keep functional) and have a service life that in accordance to the initial development plan. As an effort for maintaining function and service life of the irrigation network, any operation and maintenance of the irrigation network must comply to the PUPR Ministerial Regulation No.12/PRT/M/2015 regarding The Exploitation and Maintenance of Irrigation Network. [1]

The irrigation system influenced by several aspects of: a) physical infrastructure; b) planting productivity; c) supporting facilities; d) personnel organization; e) documentation; and f) P3A organization (*Perkumpulan Petani Pemakai Air* or Water User Farmer Association/WUA).

Maintenance of irrigation network is the effort to maintain and secure the irrigation network to be ready and always well-function for facilitating any work operational in the field, by keeping its sustainability through maintenance, repair, prevention and security activities that must be carried out continuously.

PU-PERA Ministerial Decree No:12/PRT/M/2015 regarding Exploitation and Maintenance of Irrigation Network stated that irrigation is business of providing, regulating and disposing irrigation water to support agriculture activities, with several types of irrigations are surface irrigation, swamp irrigation, underground water irrigation, pump irrigation and pond irrigation. While provision of irrigation water defines as determination of

water volume per unit of time that allocated from a water source for an irrigation area based on time, quantity and quality according to the needs for supporting agriculture activities or other needs. [1]

A work performance assessment based on PUPR Ministerial Decree No.12/PRT/2015 acts as indication in an effort to describe irrigation system management through six (6) parameters of: 1) Physical Infrastructure; 2) Planting Productivity; 3) Supporting Facility; 4) Personnel Organization; 5) Documentation; and 6) P3A Organization (Water User Farmers Association/WUA). [1]

Kaubun irrigation area is one territory from all irrigation areas under the authority of central government with total area of 1,150 Ha where the functional area extends to 736 Ha and the working area is located in East Kutai Regency area. Kaubun Irrigation area has one weir/dam and two main canals in which unfortunately the irrigation network maintenance has not conducted in routine and periodical schedule either by the East Kalimantan Provincial Government or by East Kutai Regency Government.

Sediment accumulation. One major problem found in the secondary irrigation canal is sediment accumulation. Sediment like mud, sand and other organic materials can settle inside the channel over time. This accumulation can cause blockage in the water channel, reduce water flow capacity and increased infrastructure damage.

Vegetation Blockage. Wild vegetation or aquatic plants that grow around or inside the secondary irrigation canal can cause blockage or obstruction to water flow, reducing capacity and efficiency of the canal. This problem makes local community file a complaint about significant loss of water in the primary and secondary canals of Kaubun irrigation area. As a result, the downstream area has no water coming from the dam, and this condition has last for years without appropriate treatment to overcome this problem. In addition, no study or survey had been conducted by the relevant agencies in dealing with this problem.

So far, discussions related to Work Performance Analysis and Maintenance Cost of Irrigation Network in Kaubun Irrigation Area of East Kutai Regency have not been carried out much by researchers, therefore the study problem postulate in this study are: 1) What is the result of Kaubun Irrigation System Work Performance assessment index based on PUPR regulation no.12/PRT/M/2015 which conducted in the main canal and secondary canal of Kaubun irrigation area?, 2) How is the management of the Kaubun irrigation system as treated by Analytic Hierarchy Process Method?, 3) How much routine and periodical maintenance is required for the irrigation network in Kaubun irrigation area?

II. LITERATURE REVIEW

2.1. Water Irrigation

According to Regulation of Minister of Public Works and Public Housing of Indonesia Number 12/PRT/M/2015 regarding Exploitation and Maintenance of Irrigation Network, as a replacement to prior Regulation of Minister of Public Works Number 32/PRT/M/2007 regarding the Maintenance Operation (MO) of Irrigation Network, Irrigation defines as the provision, regulation and disposal of irrigation water to support agriculture activities, with some of irrigation types mentioned like surface irrigation, swamp irrigation and others. [2]

One of the major necessities for agriculture activities, particularly for staples such as rice field is water irrigation, and a good irrigation system is expected to increase crops productivity by fulfilling water needs of plants and agriculture fields. From overall perspective, the current condition from the irrigation network is not equipped with buildings acted as water distribution regulator, or to control excess water and protect it from damage. As a result, any improvement made to irrigation areas always appear vulnerable to future damage. There are several factors that able to cause damage to the irrigation network such as upland irrigation areas are located on hillsides with highly susceptible to landslide or the lowland irrigation areas experience high level of sedimentation carried by rivers as the impact of already damaged condition from the watershed area.

2.2. An Irrigation Management

Hofwegen as cited in Roni Kamaruddin stated irrigation and drainage network management activities consist of three categories of:

1. Activities in relation to management organization such as decision making, mobility of resources also communication and conflict resolution.
2. Activities in relation to water such as water procurement (ground water or surface water), water allocation, or distribution and disposal of excess water through the drainage network.
3. Activities in relation to building or network as water controller such as planning and design, construction also Operation and Maintenance (*Operasi dan Pemeliharaan/* O & P).

In general, irrigation management has a purpose to optimizing function of the irrigation network to achieve an optimum agricultural production with minimum costs. More detailed explanation of the irrigation management objectives is described by Uphoff in Roni Kamarudin as mentioned below [3]:

1. Increase the agriculture production as achieved through extension of planting area, increase planting intensity along with its harvest.
2. A smooth mobility among resources.
3. No conflict occurs between water users (both from user at upstream or downstream area) and the manager.
4. Perfection of the water distribution system to be equal and fair, with accurate reliability and predictability as well as providing water on time (not late or decrease).
5. Have sustainable cycle in its resources whether the land, water, materials or human resources to ensure an optimum production continuity.

Based on the Law number 7/2004 regarding Water Resources, its network management at primary and secondary level becomes the responsibility of the government, and the tertiary level will be carried out by farmers. To obtain satisfactory result, management must be able to comply with applicable regulations to make the irrigation system maintains its sustainable cycle. [4]

From Law Number 7 of 2004 regarding Water Resources and put into further description in Government Law Number 20 of 2006 regarding Irrigation, in article 1 paragraph 4, stated that Irrigation system includes irrigation water, irrigation infrastructure, irrigation management, irrigation management institutions and human resources. [4,6]

In support with this discussion, Morden et.al in Murtiningrum introduced comparative indicators to compare the work performance between irrigation systems. This indicator is not comparing a value with specific target but more to give better attention to things that are generally found in an irrigation system such as water, land, finance, and production. The work performance indicators for Irrigation Area (IA) are divided into three types; a) process indicator, b) output indicator, and c) impact indicator. Degradation in work performance occurs due to the simultaneous influence of physical network degrading and low operational and maintenance work performance. Most degradation of the physical condition of irrigation network is related to damage in irrigation canal/channel where there are numbers of damaged sluice gates and high sedimentation in waste channels especially at the tertiary level are found. [5]

2.3. The Work Performance and Condition of Irrigation Physical Infrastructure

Physical condition from the irrigation network greatly influences the work performance of the irrigation system, where these physical conditions are including condition of primary canal, secondary canal, and the complementary buildings (water slope or *terjunan*, cross building, water bridges and others), division building, division-diversion building, diversion structures and debit measuring building.

Network infrastructure reliability is the core of irrigation activities. Reliability of irrigation network infrastructure is characterized by an effective and efficient process of the service of water tapping, flowing, dividing and distributing to service areas regardless of method and time. Ways and time in providing water are depend on the network manager based on the layout of planting and the planting pattern. Damage in the irrigation network will result in disruption of service functions so the irrigation water cannot be received by the service area in full capacity.

Small defect or minor damage has a definition of any physical damage to the building but does not interfere with process of tapping, channeling, distributing and providing irrigation water to the service area. A moderate damage characterizes as damage that can disrupt the delivery process which is not in accordance with demand, whereas severe damage is characterized by irrigation water not being received by the service area at all. The hierarchy in providing irrigation water to the service area starts from the main building (dam/weir), channels, division building/diversion structure, division-diversion building, water controller/water discharge building and measuring building.

2.4. Criteria and Weight of Work Performance Assessment of Irrigation Network

In the implementation of work performance assessment for understanding the irrigation network condition (with status level of Very Good, Average and Poor), there are several criteria that must be considered, a compliance to regulation of PUPR Minister No.12/PRT/M/2015, and the analysis of the work performance assessment to the irrigation network can be conducted by applying 6 (six) performance aspects of: Physical Infrastructure with maximum weight of 45, Planting Productivity with weight of 15, Supporting facilities with weight of 10, Personnel Organization with weight of 15, Documentation with weight of 5, and P3A/WUA with weight of 10. [1]

2.5. Classification of Wok performance Assessments to Irrigation Area

The workperformance assessment of irrigation system can be calculated under 6 (six) parameters of: physical infrastructure, planting productivity, supporting facilities, personnel organization, documentation, and P3A/WUA. The irrigation system workperformance index is the sum of each parameter value through the following classification:

- Workperformance index of 80-100 : Very Good Workperformance Classification
- Workperformance index of 70-79 : Good Workperformance Classification
- Workperformance index of 77.5 : Optimum Workperformance Classification
- Workperformance index of 55-69 : Less Optimum Workperformance Classification
- Workperformance index of < 55 : Poor Workperformance Classification and requires further attention

2.6. Real Necessity Number for Operational and Maintenance Activities of the Irrigation

Theoretical basis in this study contains theories related to research of number analysis for seeking the real needs for operating and maintaining the irrigation network.

1. The Irrigation Network System in Indonesia

According to Indonesia's Government Regulation Number 20 of 2006 regarding Irrigation, it is clearly stated in article 1 that irrigation is business of providing, regulating and disposing irrigation water to support agriculture with types include surface irrigation, swamp irrigation, underground water irrigation, pump irrigation and pond irrigation. [6]

There are several general definitions related to irrigation such as [7]:

- Irrigation areas is one territorial unit that receives water from an irrigation network.
- Irrigation network is the channel, building and its complimentary structures as one single unit required for supply, distribution, delivery, use and disposal of irrigation water.
- A primary irrigation network is a part of irrigation network consisted of main building, primary channel/canal, drainage channel, diversion building, division/diversion building, diversion structure and the complementary buildings.
- A secondary irrigation network is a part of irrigation network consisted of secondary channel/canal, drainage channel, division building, diversion/division building, diversion structure and the complimentary buildings.
- A tertiary irrigation network is a part of irrigation network with function as the water service infrastructure in tertiary plots consisted of tertiary channel/canal, quarterly canal/channel and its waste channel, tertiary box, quaternary box and its accessories including a pump irrigation network whose service area is the same as the tertiary area.

2. AKNOP (*Angka dan Kebutuhan Nyata Operasi dan Pemeliharaan*/Real Number for Operational and Maintenance Needs) Component

A financial planning, operation management, and maintenance management, apart from the finance activity in the field needs to be supported by office and administrative activities. Therefore, financial planning, operational management and maintenance management are divided into several component as stated below. [8]

- Management of Operational and Maintenance Implementation (O&M Management) is management activities that must be carried out by the Treasury Official Work Unit.
- Management of Operational and Maintenance Implementation is supporting activities of the operation and maintenance implementation to the surface irrigation network by the field level manager (Technical Implementation Unit/Observer).
- Surface irrigation network operation activities are surface irrigation network operation activities carried out in the field.
- Surface irrigation network maintenance activities are surface irrigation network maintenance activities carried out in the field.

2.7. Analytical Hierarchy Process (AHP)

The working principle of AHP is simplifying a complex, unstructured, strategic and dynamic problems into its parts and arrange these elements into a hierarchy. Next, the level of importance from each variable is stated in numeric form (subjectively) regarding the importance of that variable when compared to other variables.

According to Saaty, there are several basic principles for problem solving by the Analytic Hierarchy Process (AHP), which classified into several stages of: Decomposition (Hierarchical Arrangement), Cooperative Judgement (Consideration), Synthesis of Priority (Priority Synthesis), and Logical Consistency (Logical Consistency). Furthermore, the Analytic Hierarchy Process (AHP) has basic axioms that must be fulfilled: Reciprocal Comparison, Homogeneity, Dependence and Expectation. [9]

III. RESEARCH METHOD

3.1. Location of the Research

The location of this study is in the Kaubun irrigation area with length of 736 Ha. Kaubun irrigation area uses Kaubun Dam as its water source. In more details, the image of research location along with its irrigation network is displayed in Figure 1 below, a map of Kaubun irrigation area location based on Google Earth imaging.

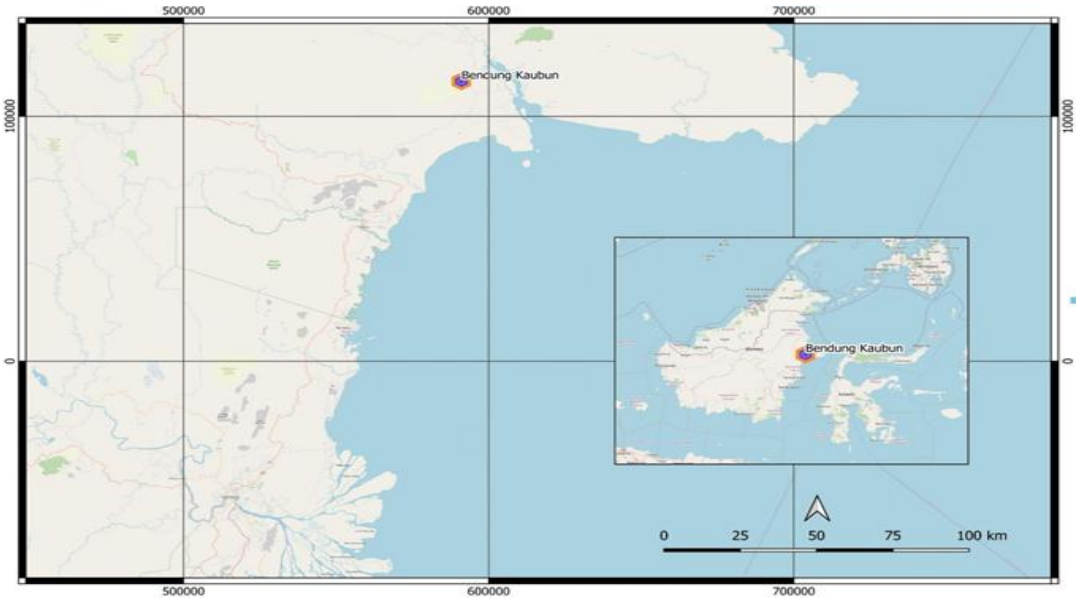

Figure 1: Site Map of Research Location

3.2. Type of Research

The type of research approach for this study is qualitative descriptive research. According to Sugiyono a descriptive research method can be used to determine the existence of independent variables, either only one or more independent variables appear without making comparisons on the variables themselves and looking for relationship with other variables. A descriptive method is a method aims to find out the nature and deeper relationship between two variables through observation to certain aspects in more specific way to obtain data that appropriate or relevant to the existing problem with the aim of the research; where the data will be processed, analyzed and undergo further processing by conforming the basic theories that have been studied to enable a conclusion to be drawn from the data [10]. This research uses a descriptive method with target at evaluating operational work performance of irrigation network in the Kaubun irrigation area, East Kutai Regency.

3.3. Type of Research Data

In preparing this research, supporting data is very necessary for the completeness of this study. Type of data consists of primary and secondary data. Data obtained from direct measurement from the research location referred as the primary data, while data from relevant government agencies that previously already carried out measurements referred as the secondary data. The primary data collected from the research location was in the form of tracking data and direct inventory at the location to see the physical condition of the irrigation network of Kaubun irrigation area. Meanwhile, the secondary data was collected from related agencies such as from the River Regional Unit of Kalimantan IV Samarinda along with other related technical agencies.

3.4. Data Analysis

Data analysis was carried out by evaluating the existing irrigation network system in Kaubun irrigation area of East Kutai Regency. This research was held by observing several causal factors of the damage in the water channels, as guided by regulation of Minister of Public Work and Public Housing (Number: 12/PRT/M/2015 on 6 April 2015 regarding Exploitation and Maintenance of Irrigation Network in Appendix II, article 2.5.1 concerning Monitoring and Evaluation) which stated the evaluation is carried out on the function or work performance of current irrigation through network tracing and field testing (trial run). In the implementation of the irrigation network work performance assessment, it was conducted based on Letter of Coordinating Minister for Economic Affairs Number: S-44/M.EKON/02/2016 dated on 26 February 2016 regarding Data Collection and Development of Irrigation Systems about the substance of which includes direction from Minister of Public Works and Public Housing for conducting a work performance assessment of an Irrigation System as a whole (from the main system to the tertiary system). For carrying out the work performance assessment, each component are described into assessment factors mentioned below:

1. Current Condition of the Physical Infrastructure
   A general description of the infrastructure condition around the irrigation area which will be used as data in the implementation of tracing or making inventory data of the irrigation network (existing channels and buildings).
2. Planting Index

Land suitability for the types of plants around the irrigation area by providing the assessment measures whether in quantitative or qualitative measures.

3. Supporting Facilities
   Facilities that support the maintenance and development of the irrigation areas according to their functions.
4. Personnel Organization
   Management function in relation to OP irrigation system activities including the limitation of employee responsibilities.
5. Documentation
   Captures the geographic coordinate data by GPS device and taking the current digital photo; also filling out an inventory form whose data must be obtained from the field. In brief, data completeness starts from detailed engineering design to post-development documents.

3.5. Research Flowchart

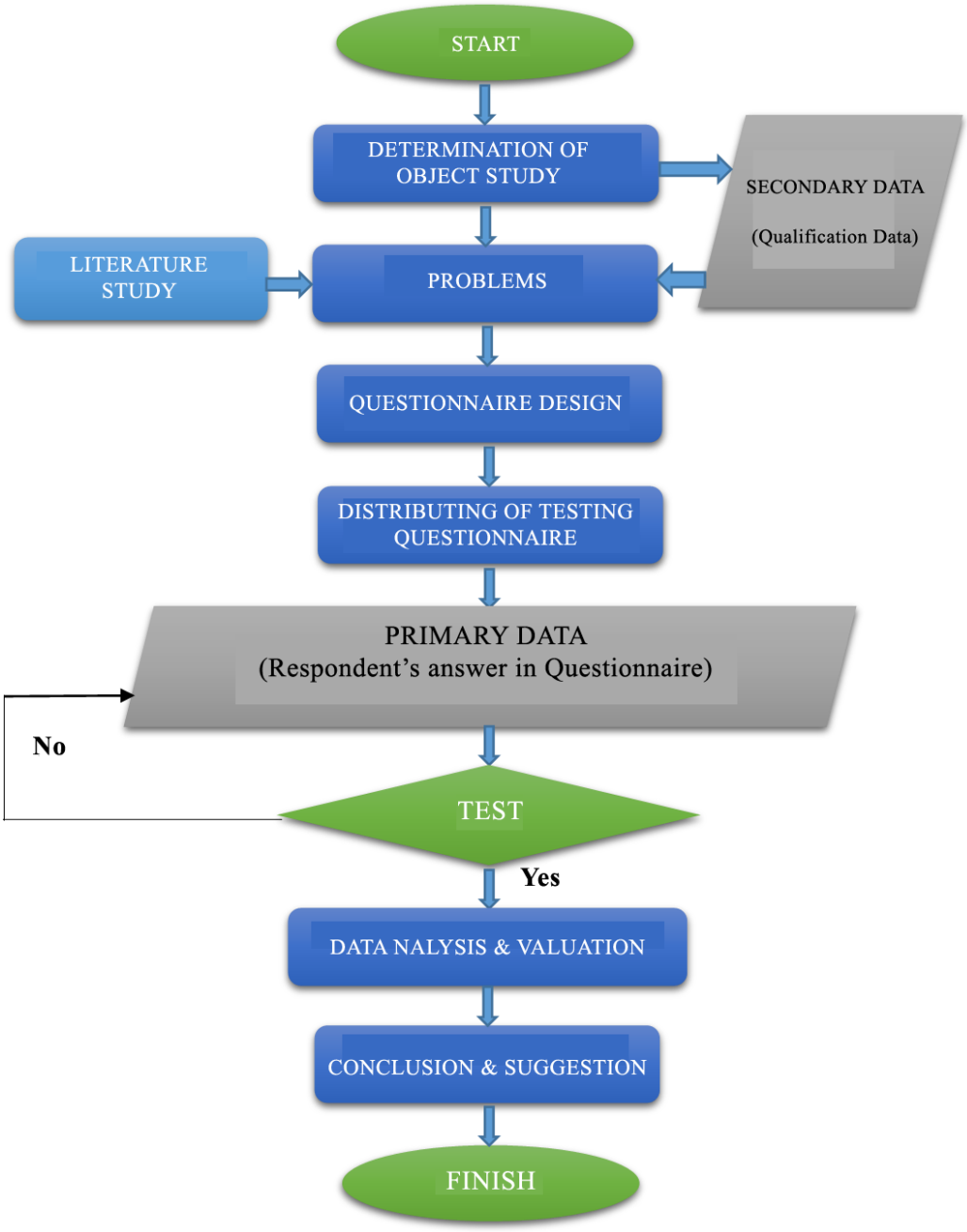

Figure 2: Research Flowchart [10]

IV. RESULT AND DISCUSSION

4.1. Calculation of AKNOP (Angka dan Kebutuhan Nyata operasi dan Pemeliharaan) for Kaubun Irrigation Area

Table 1. Recapitulation of Workperformance Index of Irrigation Network System at Kaubun Area

Description	Index	Max	Min	Optimum
Physical Infrastructure	29.01	45	25	35
Planting Productivity	10.43	15	10	12.5
Supporting Facilities	3.20	10	5	7.5
Personnel Organization	4.2	15	7.5	10
Documentation	0.7	5	2.5	5
P3A	4.3	10	5	7.5
TOTAL	51.84	100	55	77.5

4.2. Calculation of Priority Treatment by Analytical Hierarchy Process (AHP) Method

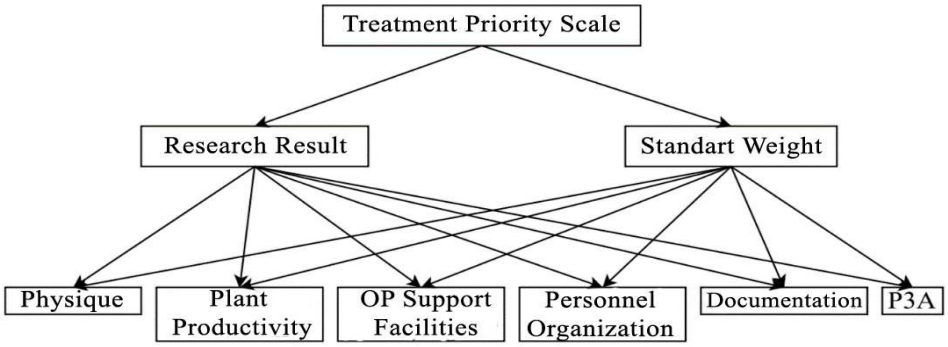

Figure 3: Diagram of AHP Method Network Structures

Based on the calculation of the comparison matrix, a priority vector value is obtained to be used for determining the maximum value, the consistency index (CI), the ratio index (RI) and the consistency ratio (CR). If the CR result is less than 0.1, this value indicates the pairwise comparison matrix is consistent (data is acceptable). Next step is calculating the pairwise comparison matrix for the work performance index values against the alternatives. The following table shows example about how to weight the standard criteria against alternatives.

Table 2. A Pairwise Comparison Matrix of Standard Weight to Alternatives

Criteria	Physical Infra.	Planting Prod.	Supporting Facl.	Personnel Org.	Documen tation	P3A
Physical Infrastructure	1	3	5	7	9	8
Planting Productivity	1/3	1	3	5	7	6
Supporting Facilities	1/5	1/3	1	3	5	4
Personnel Organization	1/7	1/5	1/3	1	3	2
Documentation	1/9	1/7	1/5	1/3	1	½
P3A	1/8	1/6	¼	½	2	1

Table 3. A Normalized Matrix

Criteria	Physical Infra.	Planting Prod.	Supporting Facl.	Personnel Org.	Documen tation	P3A
Physical Infrastructure	0.523	0.619	0.511	0.416	0.333	0.372
Planting Productivity	0.174	0.206	0.307	0.297	0.259	0.279
Supporting Facilities	0.105	0.069	0.102	0.178	0.185	0.186
Personnel Organization	0.075	0.041	0.034	0.059	0.111	0.093

Documentation	0.058	0.029	0.020	0.020	0.037	0.023
P3A	0.065	0.034	0.026	0.030	0.074	0.047

Table 4. The Values of λ max, Consistency Index (CI), and Consistency Ratio (CR)

λ max	Consistency Index (CI)	Consistency Ratio (CR)
6.271	0.054	0.043

After all, pairwise comparison matrix is calculated and the value of CR is found less than 0.1, data then considered as consistent data, indicating the weighting of each criterion against the alternatives has been done correctly. Next step is the determination of final priority in scale order. The priority for handling irrigation problem based on value of total AHP (Limiting) lies in Physical Infrastructure with a value of 0.462 as mentioned in the following table (Table 5).

Table 5. The Priority Order According to AHP Value AHP (Limiting)

Priority Scale	AHP Value (Limiting)
Physical Infrastructure	0.462
Planting Productivity	0.253
Supporting Facilities	0.137
Personnel Organization	0.068
P3A	0.045
Documentation	0.031

4.3. AKNOP (Angka Kebutuhan Nyata Operasi dan Pemeliharaan) Components

The planning for financing operation and maintenance management apart from financing activities in the field, also must be supported by office and administrative activities. Therefore, this aspect is divided into several components of:

1. O & M Management of Operations and Maintenance Management implementation is management activities that must be carried out by the Treasury Official Work Unit.
2. O & M Management of Operations and Maintenance Management is a supporting activity for the implementation of operations and maintenance of surface irrigation network which must be carried out by the field level manager (Technical Implementation Unit/Observer).
3. The operation activity of surface irrigation network is surface irrigation network operation activities carried out in the field.

Financing the AKNOP of Kaubun irrigation area located at Bumi Daya village is a type of work in Surface irrigation that has land area of 600 Ha and owns irrigation network asset according to the result inventory also from data of State Property of BWS Kalimantan IV, as explained below:

1. Primary Building is 1 (one) unit permanent dam (weir)
2. Primary canal with length of 2.232 m
3. 6 (six) unit Diversion Structures.

Furthermore, the following discussion is about lists of costs for Routine Maintenance Activity of Irrigation Network in Kaubun Irrigation area at Bumi Jaya village. There are nine (9) works held at Kaubun irrigation area and presented in the following tables:

1. Work on Waste Disposal at Front of Water Building of Kaubun Irrigation Area of Bumi Jaya Village.

Table 6. DKBPB of Waste Disposal at the Front of Water Building

Location/Vil/Waste Channel	Building Amount	Work Capacity	Frequency/ Year	Wage/Day	Garbage Disposal
Dam	1.00	1.00	12.00	Rp.250.000	Rp.3.000.000
Take Out	6.00	2.00	12.00	Rp.250.000	Rp.9.000.000
Total Amount					Rp.12.000.000

2. Work of Lawn/Weeds Cleaning in Kaubun Irrigation Area of Bumi Jaya Village

Table 7. DKBPB of Lawn or Weeds Cleaning Work

Location/Vil/Waste Channel	Embankment Length	Average Width	Capacity	Frequency/ Year	Wage / Day	Lawn/Weeds Cleaning
Primary Canal	2.23	1.50	100.00	2.00	Rp. 250.000	Rp.16.725.000
Total Amount						Rp.16.725.000

3. Work on Channel (Water/Aquatic Plants) at Kaubun Irrigation Area of Bumi Jaya Village

Table 8. DKBPB of Water/Aquatic Plants Work

Location/Vil/Waste Channel	Channel Length	Average Width	Capacity	Frequency/ Year	Wage / Day	Channel/Line Work
Primary Canal	2.23	1.50	35.00	2.00	Rp. 250.000	Rp.47.785.000
Total Amount						Rp.47.785.000

4. Work on Embankment Maintenance at Kaubun Irrigation Area of Bumi Jaya Village

Table 9. DKBPB of Embankment Maintenance Work

Location/Vil/Waste Channel	Channel Length	Average Width	Capacity	Frequency/ Year	Wage / Day	Channel/Line Work
Primary Canal	2230	1.50	250	1.00	Rp. 250.000	Rp.3.345.000
Total Amount						Rp.3.345.000

5. Work on Minor Repair and Dam Painting at Kaubun Irrigation Area of Bumi Jaya Village

Table 10. DKBPB of Minor Repair and Dam Painting Work

Location/Vil/ Waste Channel	Hb	U	n	F	PK
Dam	2230	1.50	250	1.00	Rp.3.345.000

Description:
PK : (hb+U) x n x f
PK : Office or Official Residence Maintenance
N : number of offices and official residences
Hb : material price
F : frequency/year
U : Worker wage

Table 11. Description of Cost from Minor Repair and Dam Painting Work

No	Name	Volume	Unit	Price	Amount
1	Paint	1	Kg	Rp.105.000	Rp.105.000
2	Thinner	1	Littre	Rp.5.250	Rp.5.250
3	Paint brush	3	Piece	Rp. 40.000	Rp.120.000
4	Cement (Pc)	1	Sack	Rp.96.000	Rp.96.000
5	Sand	0.5	m^3	Rp.373.000	Rp.186.500
6	Gravel	0.25	m^3	Rp.600.000	Rp.150.000
Total Amount					Rp.662.750

6. Work On Minor Repair and Taker Building Painting at Kaubun Irrigation Area of Bumi Jaya Village

Table 12. DKBPB of Minor Repair and Building Painting Work

Location/Vil/Waste Channel	Hb	U	n	F	PK
Taker Building (*Bangunan Pengambil)*	Rp.578.650	Rp.250.000	6	1.00	Rp.4.971.900

Description:
PK : (hb+U) x n x f
PK : Office or Official Residence Maintenance
N : number of offices and official residences
Hb : material price
F : frequency/year
U : Worker wage

Table 13. Description of Cost of Minor Repair and Building Painting Work

No	Name	Volume	Unit	Price	Amount
1	Paint	0.6	Kg	Rp.105.000	Rp.63.000
2	Thinner	0.6	Litre	Rp.5.250	Rp.3.150
3	Paint brush	2	Piece	Rp. 40.000	Rp.80.000
4	Cement (Pc)	1	Sack	Rp.96.000	Rp.96.000
5	Sand	0.5	m^3	Rp.373.000	Rp.186.500
6	Gravel	0.25	m^3	Rp.600.000	Rp.150.000
Total Amount					Rp.578.650

7. Work on Mud Dredging at Kaubun Irrigation Area of Bumi Jaya Village

Table 14. DKBPB Mud Dredging Work

Location/Vil/SP	P	I	T	k	F	U	Pl
Primary Canal	2.23	1.50	0.30	3.00	0.20	Rp.250.000.000	Rp.16.725.000
Total Amount							Rp.16.725.000

Description:
PI : mud dredging
p : length of channel
l : width of channel
t : sediment height
k : capacity
F : Frequency/year
U : work wage/day

8. Work on Building Improvement/Repair at Kaubun Irrigation Area of Bumi Jaya Village

Table 15. DKBPB of Irrigation Network Water Building Improvement/Repair Work

Location/Vil/SP	Material Price	Wage/Day	Number of Buildings	Frequency/Year	Channel/Line Work
Primary Canal	Rp.1.833.500	Rp.250.000	7	1	Rp.14.584.500

Table 16. Cost Description of Water Building Repair Material

No	Name	Volume	Unit	Price	Amount
1	Cement (Pc)	2	Sack	Rp.96.000	Rp.192.000
2	Sand	1.5	m^3	Rp.373.000	Rp.559.500
3	Gravel	1	m^3	Rp.600.000	Rp.600.000
4	River Stones	1	m^3	Rp.482.000	Rp.482/000
Total Amount					Rp.1.833.500

9. Work on irrigation network Maintenance of the Office/Official Residence (including minor repair) at Kaubun Irrigation Area of Bumi Jaya Village

Table 17. DKBPB of Irrigation network of Office/Official Residence Maintenance Work

Location/Vil/ Waste Channel	Material Price	Wage/Day	Number of Buildings	Frequency/Year	Channel/Line Work
Primary Canal	Rp.622.750	Rp.250.000	1	1	Rp.872.750

Table 18. Cost Description of Water Building Repair Material

No	Name	Volume	Unit	Price	Amount
1	Paint	1	Kg	Rp.105.000	Rp.105.000
2	Thinner	1	Litre	Rp.5.250	Rp.5.250
3	Paint brush	2	Piece	Rp. 40.000	Rp.80.000
4	Cement (Pc)	1	Sack	Rp.96.000	Rp.96.000
5	Sand	0.5	m^3	Rp.373.000	Rp.186.500
6	Gravel	0.25	m^3	Rp.600.000	Rp.150.000
Total Amount					Rp.622.750

V. CONCLUTION

From the result of this research, there are several conclution able to be drawn for this study:

1. The result of Recapitulation Index of the Irrigation Network System Work performance revealed the largest optimum value was found in the Physical Infrastructure indicator with index value of 29.01.
2. The result of Main Management Priority by applying the Analytic Hierarchy Process (AHP) method was found in Physical Infrastructure indicator with value of 0.462 (Limiting).
3. The cost for conducting a routine and periodical maintenance for Kaubun irrigation area network is Rp. 3.753.835.675,00.

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