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Assessment of the Tertiary Irrigation System in Bulutimorang Irrigation Area, Sidrap Regency

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ABSTRACT

Irrigation plays a crucial role in agriculture, particularly in Indonesia, by ensuring a stable water supply for rice fields, thereby enhancing crop productivity and optimizing water use. The efficiency of an irrigation network directly impacts water distribution, making it essential to assess system performance regularly. This study evaluates the performance of the tertiary irrigation system in the Bulutimorang Irrigation Area, Sidrap Regency, and maps the condition of its existing physical infrastructure. The research was conducted from May to July 2023 and involved field surveys, network tracing, and interviews with farmers, sluice gate officers, and irrigation personnel (juru/mantri). Data were analyzed to validate key performance indicators based on the Regulation of the Minister of PUPR No. 12/PRT/M/2015. The results indicate that the tertiary irrigation network in the Bulutimorang Irrigation Area is functioning well, with an overall performance score of 72.06%. These findings highlight the need for continued maintenance and improvement strategies to sustain efficient irrigation management in the region.

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1. INTRODUCTION

Water is an essential resource in agriculture, playing a crucial role in plant growth and ensuring optimal productivity. To support sustainable agricultural development, the government has constructed numerous irrigation canals across various regions to meet farmers' water needs. However, the effectiveness of these irrigation systems depends not only on their availability but also on their proper maintenance.

Despite extensive efforts to develop irrigation infrastructure, inadequate maintenance has led to deterioration, particularly in tertiary irrigation canals, which are the final channels delivering water to rice fields. Poorly maintained irrigation systems can reduce water efficiency and negatively impact crop yields. Therefore, regular assessment and maintenance are necessary to ensure the long-term functionality and sustainability of irrigation networks [1].

Sidrap Regency serves as a key agricultural hub in Indonesia, with 48,710 hectares of rice fields supported by an extensive irrigation network spanning 445,137.88 km. This network comprises 37.49 km of main canals, 210.39 km of secondary canals, and 444,890 km of tertiary canals. Among these, the Bulutimorang Irrigation Area covers 3,754 hectares and requires systematic maintenance to maximize its functionality [2].

To facilitate effective irrigation management, the Indonesian Ministry of Public Works and Public Housing (PUPR) has established performance assessment guidelines, outlined in Ministerial Decree No. 12/PRT/M/2015. These guidelines provide standardized criteria for evaluating irrigation system performance and optimizing maintenance efforts.

This study aims to assess the performance of the tertiary irrigation system in the Bulutimorang Irrigation Area, Sidrap Regency, and to map the existing physical infrastructure conditions. The findings will help identify areas requiring maintenance and contribute to improved water management strategies in the region.

2. MATERIALS AND METHODS

2.1 Time and Place
Research entitled "Performance Assessment of the Tertiary Irrigation System in the Bulutimorang Irrigation Area, Sidrap Regency" was conducted in Sidrap Regency, South Sulawesi in May-July 2023.

2.2 Tools
The tools used in this research are GPS, stationery, camera, laptop, smartphone, ArcGIS software, Microsoft Excel software, Google Earth.

2.3 Material
The materials used in this research are satellite image maps, e-PAKSI applications, DI maps, irrigation network schemes, irrigation building schemes, overview maps, meters, building list forms, canal area list forms.

2.4 Research Procedure
The research procedure for evaluating the ability of tertiary irrigation systems consists of seven stages which are described as follows:

2.4.1 Preparation
At this stage, research tools and materials are prepared, research permits and data collection at the relevant agencies as well as complete building list forms and channel area list forms.

2.4.2 Data Collection
Data collection was carried out using two methods, namely primary data collection and secondary data.

a) Primary data produces data tracking the capabilities of tertiary irrigation networks in irrigation areas (DI) obtained from interviews, observations and direct measurements in the field. Meanwhile, the assessment was carried out together with several interpreters.
b) Secondary data was generated from data obtained at the UPT PSDA Bulutimorang office including:
    1) Map of irrigation areas
    2) Data (tabular) on standard, potential and functional areas
    3) RBI Map/Google Earth Map
    4) Tertiary plot data
    5) Irrigation network scheme and building condition data
    6) Data on O&M supporting facilities
    7) Personnel Organization Data
    8) Overview map
    9) Data documentation of P3A performance assessment data
    10) Data on planting area and productivity of rice plants
    11) Available debit data and demand debit
    12) Organizational structure for implementing the OP Irrigation Network
    13) P3A/GP3A data (legal entity status, P3A/GP3A institutional development status, frequency of P3A/GP3A meetings, P3A participation).

2.4.3 Survey and Inventory of Tertiary Network Infrastructure
The survey and inventory aims to determine the condition of the buildings in the tertiary irrigation network of DI Bulutimorang in 2022, especially the physical condition, and the inventory becomes a reference for determining the non-physical condition of the tertiary irrigation network. Inventory carried out on tertiary networks includes the following:

a) Inventory of tertiary plot data per irrigation area
b) Data inventory (tabular) of standard, potential and functional areas.
c) Inventory of IP3A/GP3A/P3A data in irrigation areas
d) DI inventory data. operations and maintenance employees
e) Data on planting index and rice productivity in irrigation areas
f) Data inventory of OP facilities and infrastructure

2.4.4 Tertiary Irrigation System Performance Assessment Analysis
A performance analysis of tertiary irrigation networks based on irrigation network performance evaluation guidelines (surface) with the Central Authority, Ministry of Public Works and General Affairs[3]. Housing area. The following weights are used to assess the performance of irrigation networks:

a) Weighted assessment of the physical components of tertiary networks, including the state of carrier channels, carrier channel structures, and drain structures.

b) The importance of crop productivity components is evaluated in relation to irrigation water requirements (Factor K), the state of the planted area realized, and the state of rice productivity.
c) The weight of the OP condition components of the tertiary network, such as damage, water distribution, channel cleaning, and OP support equipment, is assessed. Analysis of the weight assessment of the OP/Org officer components. personnel regarding P3A technical officers often communicate with farmers and interpreters.
d) Examining the weight of documentation components, which include tertiary plot data books, maps and photos.
e) P3A is already a legal entity, institutional conditions of P3A, ulu-ulu/P3A meetings with interpreters, P3A actively carries out surveys and handling natural disasters, compliance of P3A members in improving networks and handling natural disasters, compliance of P3A members, functional capabilities and coordination of P3A, participation P3A in monitoring and evaluation.

2.4.5 Determination of Condition and Performance Indicators

Physical components in tertiary networks are used in determining condition indicators. Meanwhile, non-physical components in tertiary networks are used to determine performance indicators. According to the Minister of Public Works regulation Number 12/PRT/M/2015) determining indicators in percent units is divided based on the weight value (NB) as follows:

a) Physical infrastructure has 4 indicators consisting of:
   1) Good condition: 90≤NB≤100%
   2) Slightly damaged condition: 80≤NB≤90%
   3) Moderately damaged condition: 60≤NB≤80%
   4) Severely damaged condition: <60%
b) For non-physical, there are 4 performance indicators consisting of:
   1) Excellent performance: 90≤NB≤100%
   2) Good performance: 80≤NB≤90%
   3) Adequate performance: 60≤NB≤80%
   4) Underperformance: <60%
   c) Confirm the results of the tertiary irrigation system performance assessment in the Bulutimorang irrigation area together with observers, interpreters and P3A.

2.4.6 Data Processing and Presentation of Irrigation Area Conditions

Data processing is carried out from the results of the tertiary irrigation system performance assessment to produce a performance index with values (Regulation of the Minister of Public Works Number 12/PRT/M/2015):

a) 80≤NB≤100% : excellent performance
b) 70-≤NB≤80% : good performance
c) 55≤NB≤70% : underperformance
d) <55 : poor performance

and loading irrigation area maps using image data processing software in the form of ArcGIS.

2.4.7 Output

The output of this research is a map of the condition and performance values of the tertiary irrigation network in the Bulutimorang irrigation area.

3. RESULTS AND DISCUSSION

3.1 General Conditions of the Bulutimorang Irrigation Area

The Bulutimorang Irrigation Area (D.I.) is an important irrigation network located in Sidenreng Rappang Regency, South Sulawesi, specifically in Bulo Village, Panca Rijang District. It is situated approximately 193 km from Makassar, the provincial capital of South Sulawesi. The irrigation system is supplied by water from the Bulutimorang Dam, which is fed by the Bulutimorang River, a tributary of the Walanae Watershed (DAS) in Sidrap Regency.

Originally constructed in 1923 during the Dutch colonial period, the Bulutimorang Dam features a flat irrigation field type. Geographically, this irrigation area shares its borders with Kulo District to the north, Wattang Sidenreng District to the east, Maritengngae District to the south, and Panca Rijang District to the west. The Bulutimorang Irrigation Area spans 5,442 hectares, covering four sub-districts and providing irrigation to 15 villages.

The network consists of a main canal with a length of 1,909 meters, secondary canals stretching 43,037 meters, and tertiary canals covering 123,667 meters. Within this system, there are 61 tertiary plot units, which are divided into six sub-sections: Bendung Sub with 9 units, Kadidi Sub with 12 units, Bombong Sub with 14 units, Tanete Sub with 12 units, Simae Sub with 10 units, and Aka-akae Sub with 10 units.

A detailed visual representation of the Bulutimorang Irrigation Area, including its primary, secondary, and tertiary irrigation channels, can be seen in Figure 1. The map highlights the network structure, tracing the water flow from the weir (water intake point) to the agricultural fields.

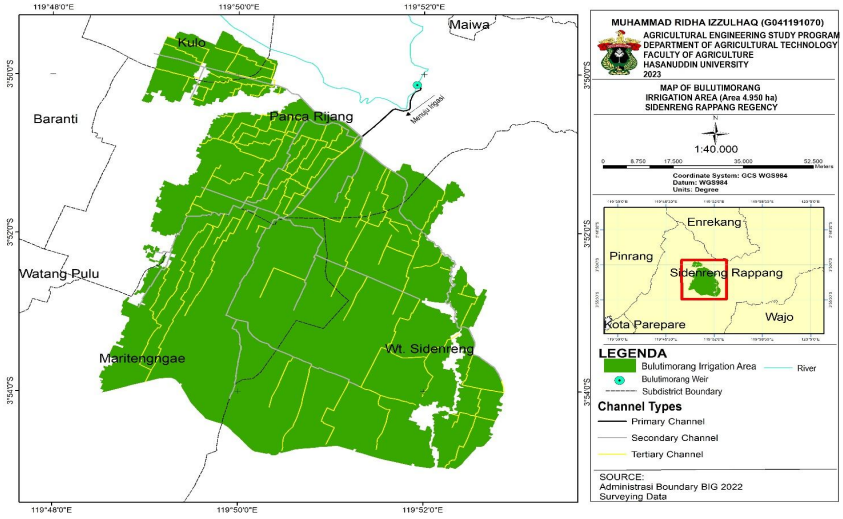

Figure 1. Map of Bulutimorang Irrigation Area.

3.2 Performance Analysis of the Irrigation System in the Bulutimorang Irrigation Area

3.2.1 Condition of Physical Infrastructure

The physical infrastructure in the tertiary irrigation canals in the Bulutimorang irrigation area was assessed by conducting direct searches and collecting data directly in the field and accompanied by irrigation observers and several interpreters/orderlies. The collected data is then processed into the existing condition index to produce the final weight.

The final weight produced in the physical infrastructure of the tertiary irrigation network is 11.81% of the existing maximum weight value of 25%. This value is influenced by several components as can be seen in Table 1 with the carrier channel component having a significant impact because it is the component with the highest contribution. Meanwhile, the building components in the carrier channel are the components that provide the lowest contribution value. So, referring to PUPR Ministerial Regulation No.12/PRT/M/2015, the condition of physical infrastructure is in a state of deficiency (55≤NB≤70%).

A further description of the components of the physical infrastructure assessment in the Bulutimorang irrigation area can be seen in Table 1 below. The table shows the existing condition of the physical infrastructure and also the maximum weight of each existing component.

Table 1. Performance assessment of the physical infrastructure of the DI Bulutimorang tertiary irrigation system.

No	Description	Existing Condition (%)	Max Weight (%)
(1)	**(2)**	**(3)**	**(4)**
1	Carrier channel	10.78	14
2	Buildings on the carrier channel	0.39	8
3	Sewers and Buildings	0.64	3
	Total Bobot	**11.81**	**25**

3.2.2 Carrier Channel Condition

The state of the carrier channel is known through an assessment in accordance with aspects that can be seen in Table 2 during the tracing of tertiary irrigation networks. Referring to the Regulation of the Minister of PUPR No. 12/PRT/M/2015 the maximum weight condition value set on the carrier channel is 77% so that the condition of the carrier channel is in good condition (70≤NB≤80%).

Table 2. Carrier channel condition assessment on physical infrastructure

Description	Final Weight (%)	Part Value (%)	Condition Index	
			Existing (%)	**Max (%)**
(1)	**(2)**	**(3)**	**(4)**	**(5)**
1. Carrier Channel	**10.78**	**100**		**14.00**

1	Each channel shape, dimension, elevation, and capacity is adequate to carry the maximum required/planned discharge.	5.60	50	80	7.00
2	The height of the embankment is sufficient to prevent overflow at any time during operation.	2.24	20	80	2.80
3	Carrier channel condition	1.96	20	70	1.40
4	Channel density level	0.98	10	70	1.40

Looking at the results that have been obtained, it is known that the shape, elevation, and channel capacity of the carrier channel has the highest contribution value of 5.60%. This is in accordance with the situation in the field which shows that the existing channels are in accordance with the channel capacity, it's just that some channels have a lot of sedimentation. The value given refers to the indicators contained in the Directorate General of Water Resources (2017). While the channel density level section has the lowest contribution value of 0.98%. The situation in the field also shows that the existing channels are still natural so that they have a density value of 15 m ≤ 20 m/ha.

3.2.3 Building Condition on the Carrier Channel

To find out the condition of the building on the carrier channel refers to the Regulation of the Minister of PUPR No.12 / PRT / 2015 which has several parts, namely a complete and functioning regulatory building, discharge measurements can be carried out according to the DI operation plan, functional and complete complementary buildings, and the condition of the building itself. So that to find out more clearly the description of the condition of the building on the carrier channel can be seen in Table 3 below.

Table 3. Assessment of the condition of buildings on the carrier channel.

Description		Final Weight (%)	Part Value (%)	Condition Index	
				Existing (%)	**Max (%)**
(1)		**(2)**	**(3)**	**(4)**	**(5)**
2.	Buildings on the Carrier Channel	**0.39**	**100**		**8.00**
1	Regulatory building (tertiary / cistern) complete and functioning	-	100	-	2.00
2	Discharge measurement can be carried out according to the DI operation plan	-	100	-	2.00
3	Complementary buildings are functional and complete	-	100	-	2.00
4	Building condition	0.39	100	19.50	2.00

The final weight obtained is 0.39% with a maximum weight value of 8.00%. Referring to the regulation of the Minister of PUPR No.12/PRT/2015, the condition of the building on the carrier channel is poor and needs attention (<55%). This is because there are three parts that are not given an assessment, namely that the regulating building (tertiary / quarter box) is complete and functioning, the discharge measurement can be carried out according to the DI operation plan, and the complementary building is functioning and complete. The section was not given an assessment because the tertiary irrigation network in the Bulutimorang irrigation area does not have tertiary boxes and complementary buildings. While in the building condition section, only two of the five sub-sections have a value, namely the sub-section of the measuring rod, liter scale, and water level mark and the operation board sub-section. According to Masita et al. (2019), complementary buildings and discharge measurements are urgent because to find out the volume of water flowing, accurate data records are needed in order to facilitate the water distribution process[4]. The results of interviews from several interpreters and observers need to add complementary buildings to the Bulutimorang irrigation area so that water distribution and monitoring can be even better.

3.2.4 Sewer and Building Condition

In the assessment of the condition of the sewers and their buildings, an assessment is carried out by looking at the condition of the sewers and their buildings that have been built and have been included in the maintenance list and are related to existing flood problems. Further described in Table 4 regarding the results of the assessment of the condition of the sewers and buildings.

Table 4. Assessment of sewers and their structures

Description		Final Weight (%)	Part Value (%)	Condition Index	
				Existing (%)	**Max (%)**
(1)		**(2)**	**(3)**	**(4)**	**(5)**
3.	Sewers and Buildings	**0.64**	**100**		**3.00**
1	All sewers and their structures have been constructed and are on the maintenance list and have been repaired and are functional.	-	75	-	2.25
2	There is no problem with flooding	0.64	25	90	0.75

Based on the assessment that has been carried out, it is known that the final total weight value is 21.25%. Referring to the Regulation of the Minister of PUPR No.12/PRT/M/2015 the condition of the waster channel and its buildings are in poor condition and need attention (<55%). The condition value of the waster channel and its building was obtained through the P3A group in the Bulutimorang irrigation area. Where in the sub-section all the drains and buildings have been built and listed in the maintenance list and have been repaired to function has a value of 0.00% this is due to the absence of drains in the tertiary irrigation network. However, the sub-section of no flooding problems that can affect the performance of irrigation channels has a value of 0.68% of the maximum weight of 0.75% or equivalent to 90%. This is because according to the farmers, there has never been flooding or excess water.

3.3 Plant Productivity Analysis

The weighted value of crop productivity uses data from the UPT Wil. VI Bulutimorang, namely the realization of the planting area and rice productivity. According to the Directorate General of Water Resources (2017), there are three subsections in the assessment of crop productivity, namely (1) fulfillment of water needs at the tapping gate, (2) realization of the planting area, and (3) rice productivity. In the crop productivity section, there are components with the highest contribution value to the assessment, namely the rice productivity component, while the component with the lowest component value is the component of fulfilling water needs at the tapping gate. So that the total value of the weight on crop productivity is 85.33%. This is as shown in Table 5 below.

Table 5. Assessment of crop productivity

Description		Final Weight (%)	Part Value (%)	Condition Index	
				Existing (%)	**Max (%)**
(1)		**(2)**	**(3)**	**(4)**	**(5)**
II. Plant Productivity		**1.80**	**100**		**15.00**
1	Water demand fulfillment at the tapping gate (K factor)	7.20	60	80	9.00
2	Realization of planting area	3.60	27	90	4.00
3	Rice Productivity	2.00	13	100	2.00

In the sub-section of the fulfillment of water needs obtained through the calculation of water requirements in each planting season where in the Bulutimorang irrigation area there are only two planting periods, namely in planting period (MT) I and II. Then for the realization of the planting area, the value is obtained through raw area data and planting area data obtained from the UPT Wil. VI Bulutimorang. While the value of the rice productivity sub-section is obtained by calculating the planned planting area and the realization of the planting area during the planting period.

3.4 Operation and Maintenance Condition Analysis

The assessment of operation and maintenance conditions has a value of 77.50%. The assessment of operation and maintenance conditions refers to the PUPR Ministerial Regulation No.12/PRT/M/2015 in good condition (70≤NB≤80%). This score is obtained from four sub-sections (1) bobolan (illegal collection) from main, secondary, and tertiary channels, (2) water distribution turn at the time of small discharge, (3) tertiary channel cleaning, and (4) OP support equipment. For a more complete assessment of operation and maintenance conditions, see Table 6.

Table 6. Assessment of operation and maintenance conditions.

Description	Final Weight (%)	Part Value (%)	Condition Index	
			Existing (%)	**Max (%)**
(1)	**(2)**	**(3)**	**(4)**	**(5)**

III. OP Condition		**15.50**	**100**		**20.00**
1	Bobolan (illegal collection) from main, secondary and tertiary channels	4.50	30	75	6.00
2	Shift water distribution at times of small flow	2.80	20	70	4.00
3	Cleaning tertiary channels	5.40	30	90	6.00
4	OP support equipment	2.80	20	70	4.00

In the assessment of operation and maintenance conditions, there are components that have the highest contribution to the assessment, namely the component of cleaning the tertiary channel components. Where OP officers at UPT Wil. VI Bulutimorang actively conducts channel cleaning together with P3A in the Bulutimorang irrigation area. While the component that has the lowest contribution is the OP component equipment due to the lack of equipment and materials available and needed to carry out operational and maintenance activities on the channel.

3.5 Water Divider Analysis/Personnel Organization

The assessment of water divider officers/personnel organization has three sub-sections, namely (1) P3A technical officers are available, (2) P3A technical officers have been trained, and (3) P3A officers often communicate with farmers and officials. So that with these subsections, a value of 12% is obtained with a maximum weight value of 15% or equivalent to 78.50%. Referring to the Regulation of the Minister of PUPR No.12/PRT/M/2015, it is in good condition (70≤NB≤80%). Details of the assessment of water divider officers/personnel organization can be seen in Table 7.

Table 7. Condition assessment of water dividers/personnel organization

Description		Final Weight (%)	Part Value (%)	Condition Index	
				Existing (%)	**Max (%)**
(1)		**(2)**	**(3)**	**(4)**	**(5)**
IV. Water Divider/Org. Personnel		**11.78**	**100**		**15.00**
1	Ulu-ulu / P3A technical personnel available	4.80	40	80	6.00
2	Ulu-ulu / P3A officers have been trained	3.38	30	75	4.50
3	Ulu-ulu / P3A officials often communicate with farmers and juru	3.60	30	80	4.50

The value of the water divider officer / personnel organization section is 78.50%. This value was obtained from an interview with the juru in the Bulutimorang irrigation area. The contribution value of each component that is assessed has the same contribution to the assessment. So that what is said is detailed in the sub-section of P3A technical officers available has a value of 4.80% with a maximum weight value of 6% because the technical officers of the water divider are available traditionally and do not concurrently become village officials, the sub-section of P3A technical officers have been trained has a value of 3.38% with a maximum weight value of 4, 50% because water divider officers are able to carry out and obtain water in the main network, and sub-section ulu-ulu / P3A officers often communicate with farmers and juru has a value of 3.60% with a maximum weight value of 4.50% because technical officers often coordinate with juru, farmers regarding water arrangements.

3.6 Documentation Analysis

The analysis in the documentation section is divided into two sub-sections, namely the tertiary plot data book which consists of an organization administration book, tertiary OP manual, and planting schedules and patterns. Second, there are maps and drawings consisting of work area maps, tertiary plot maps, tertiary irrigation network schemes and purnalaksana drawings as can be seen in Table 8. Based on the assessment carried out in the documentation section, a value of 3.14% of the maximum weight value of 5% or equal to 62.75% was obtained. So that referring to the Regulation of the Minister of PUPR No.12 PRT / M / 2015 the documentation section is in a state of deficiency (55≤NB≤69%).

Table 8. Documentation condition assessment

Description		Final Weight (%)	Part Value (%)	Condition Index	
				Existing (%)	**Max (%)**
(1)		**(2)**	**(3)**	**(4)**	**(5)**
V. Documentation		**3.14**	**100**		**5.00**
1	Data Book Tertiary plots	1.56	40	78.13	2.00

1.1	Organization Administration Book	0.40	10	80	0.50
1.2	Tertiary OP Manual	0.56	15	75	0.75
1.3	Planting Schedule and Pattern	0.60	15	80	0.75
2	Maps and pictures	1.58	60	52.50	3.00
2.1	Working Area Map	0.53	15	70	0.75
2.2	Tertiary Plots Map (Socio Hydro)	0.53	15	70	0.75
2.3	Tertiary Irrigation Network Scheme	0.53	15	70	0.75
2.4	Purnalaksana Image	0.00	15	-	0.75

The maps and drawings sub-section has a low value because assessment components such as work area maps, tertiary plot maps, tertiary irrigation network schemes in the Bulutimorang irrigation area require updating, while the value of the drawing component has no value because there are no drawings. Meanwhile, the tertiary plot data book section already has an organizational administration book, tertiary OP manual, and planting pattern schedule. This is taken from the results of interviews and assessment of existing data.

3.7 Analysis of Water User Farmers Association (P3A)

The existing Water User Farmer Association (P3A) in the Bulutimorang irrigation area is 50 P3As incorporated into 6 Water User Farmer Association Associations (GP3A). This existing P3A has been incorporated and developed. This is known from the results of interviews with existing officers. So that referring to the Regulation of the Minister of PUPR No.12 PRT / M / 2015, the assessment carried out in the P3A section has eight sub-sections with an overall value of 14.85% of the maximum weight value of 20% or equivalent to 74.25% so that it is in good condition (70≤NB≤80%). For further assessment can be seen in Table 9 below.

Table 9. Assessment of the condition of water user farmers (P3A)

Description		Final Weight (%)	Part Value (%)	Condition Index	
				Existing (%)	**Max (%)**
(1)		**(2)**	**(3)**	**(4)**	**(5)**
VI. Water User Farmers Association		**15.92**	**100**		**20.00**
1	P3A is already a legal entity	1.96	10	98	2.00
2	P3A Institutional Condition	2.70	15	90	3.00
3	Village ulu-ulu/P3A meeting with juru/mantri/agricultural extension worker	1.00	10	50	2.00
4	P3A actively conducts network survey/tracing	2.40	15	80	3.00
5	P3A members' participation in network repair and natural disasters	2.40	15	80	3.00
6	P3A members' compliance with dues used for tertiary network management	1.56	10	78	2.00
7	Functional ability and coordination of P3A in planning and cropping and water allocation	2.40	15	80	3.00
8	P3A involvement in monitoring and evaluation	1.50	10	75	2.00

Table 9 shows eight sub-sections of the P3A assessment, namely (1) P3A has a legal entity, (2) the condition of P3A institutions, (3) village ulu-ulu/P3A meetings with juru/mantri/agricultural extension workers, (4) P3A actively conducts network surveys/tracking, (5) participation of P3A members in network repair and handling natural disasters, (6) compliance of P3A members with dues used for tertiary network management, (7) functional ability and coordination of P3A in planning cropping and water allocation, and (8) P3A involvement in monitoring and evaluation.

The highest sub-section value is P3A already has a legal entity with a value of 1.96% with a maximum weight value of 2% or equivalent to 98%. This is because all P3As in the Bulutimorang irrigation area already have a legal entity that has been authorized by the Ministry of Law and Human Rights. Meanwhile, the lowest sub-section value is the meeting of ulu-ulu/P3A village with juru/mantri/agricultural extension workers which has a value of 1% of the maximum weight value of 2% or equivalent to 50%. This is because meetings are only held once a month.

3.8 Recapitulation of Tertiary Irrigation System Performance Assessment

The results of the calculation of the performance assessment of the tertiary irrigation system of Bulutimorang irrigation area show a lack of condition (55≤NB≤70%) in accordance with the Regulation of the Minister of PUPR No. 12/PRT/M/2015. The value obtained from the performance assessment of tertiary irrigation systems is 69.87%. With components that have the highest contribution to the assessment is the component of planting productivity while the lowest contribution value to the assessment is the documentation component. For a detailed recapitulation can be seen in table 10 below.

Table 10. Recapitulation of tertiary irrigation system performance assessment

Description		Existing Condition (%)	Max Weight (%)
(1)		**(2)**	**(3)**
1	Physical infrastructure	11.81	25
2	Crop Productivity	12.80	15
3	OP Condition	15.50	20
4	Personnel Organization	11.78	15
5	Documentation	3.14	5
6	P3A	14.85	20
	Total Weight	**69.87**	**100**

3.9 Condition Map of Tertiary Irrigation System in Bulutimorang

The condition of the tertiary irrigation system in the Bulutimorang irrigation area can be described as in Figure 2. The Bulutimorang irrigation area itself has an area of 5,442 ha and the length of the tertiary channel is 123,667m. In Figure 2, it can be seen that the channels that have damaged conditions are in the middle of the rice fields while the parts that have moderate and good conditions are in residential areas and around the road. The length of the tertiary channel that is in a damaged condition is 61,833 m. The length of tertiary channels that are in moderate condition is 46,375 m. While the length of tertiary channels that are in good condition is 15,458 m. While the irrigated area covers 4 sub-districts, namely Panca Rijang, Maritengngae, Watang Sidenreng, and Kulo sub-districts and there are 15 villages that are supplied with water.

The condition of the tertiary irrigation canals can be seen in Figure 2 where there are three conditions given to the tertiary irrigation canals, namely blue color for good condition, red color for damaged condition, and yellow color for moderate condition.

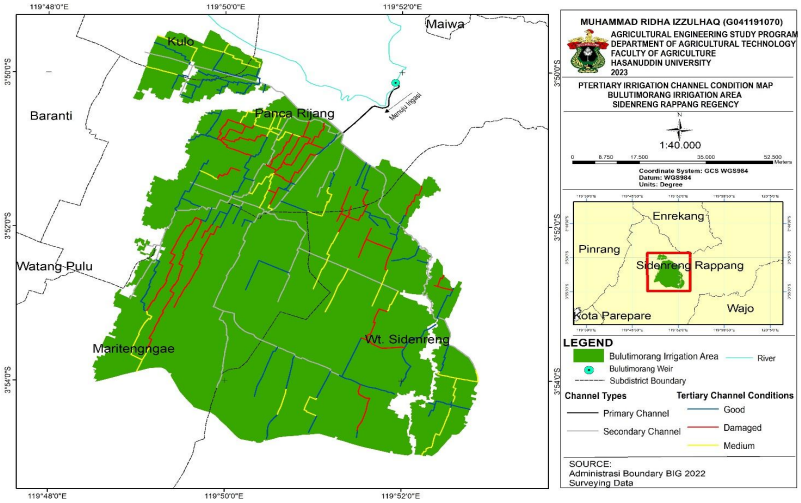

Figure 2. Tertiary Channel Condition Map of D.I. Bulutimorang.

4. CONCLUSION

Based on research that has been carried out, namely assessing the performance of the irrigation system in the Bulutimorang irrigation area, it was concluded that.

1) The performance of the tertiary irrigation system in the Bulutimorang irrigation area is in the poor category (69.87%) based on PUPR Ministerial Regulation No.12/PRT/M/2015.

2) In the six assessment indicators, the part that makes the highest contribution to the assessment is the plant productivity component, while the part that makes the lowest contribution to the assessment is the documentation component.
3) So, based on the assessment that has been carried out, the condition of the tertiary irrigation channels needs to be maintained and the assessment indicators that are lacking need to be improved.

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