

## Evaluation of Irrigation System Performance In Ujungjaya Irrigation Area Sumedang Regency

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**Abstract.** Water is a human life that must be managed and maintained for sustainability. Water for agricultural businesses can be fulfilled through rainwater or an irrigation system, starting from the dam flowing through the network or irrigation canal from the main canal to the tertiary plots of rice fields. For this reason, it is necessary to evaluate the performance of the existing irrigation system. According to the Regulation of the Minister of PUPR RI No.12/PRT/M/2015, it can be stated that the Performance Condition of the Ujungjaya Irrigation System in Sumedang Regency currently has a performance with a value of 43.41% with Poor Performance Criteria (< Value of 55%), while the Real Needs for Operation and Maintenance (AKNOP) of the Ujungjaya Irrigation Area per year is Rp.3,073,990,000,- or Rp. 1,917,648,- rounded up to Rp.1,900,000,- per hectare (Ha). With the division for Operational Administration activities, OP activities are Rp. 709,300,- or around 23.07%, the rest, which is Rp. 2,364,690, or around 76.93% must be used for physical maintenance activities

**Keywords:** Irrigation, system, performance, Ujungjaya, Regency

### INTRODUCTION

Water is a human life that must be managed and maintained for sustainability. In its implementation, humans are often neglected in carrying out their duties to support the sustainability of existing water sources. Water for agricultural businesses can be fulfilled directly, namely through rainwater that falls into rice paddies. This applies to areas that are not reached by water sources. As for areas that have water sources, the provision of plant water needs is carried out through an irrigation system, starting from a dam or dam, which is then channeled through the Irrigation Network or Canal from the Main Channel to the tertiary plots of rice fields.

Referring to the Regulation of the Minister of Public Works of the Republic of Indonesia Number 14 of 2015 concerning Criteria and Determination of the Status of Irrigation Areas, it has regulated the authority in the management of Irrigation as follows:

- a. The Central Government has the authority and responsibility to develop and manage primary and secondary irrigation systems in irrigation areas covering an area of more than 3000 ha,

cross-provincial irrigation areas, cross-country irrigation areas, and national strategic irrigation areas.(PUPR, 2015d)

- b. The Provincial Government has the authority to manage primary and secondary irrigation systems in irrigation areas with an area of 1000 ha-3000 ha, and irrigation areas across districts/cities.(PUPR, 2015d)
- c. The Regency/City Government has the authority to manage primary and secondary irrigation systems in irrigation areas with an area of less than 1000 ha in 1 (one) regency/city area.(PUPR, 2015d)

The Ujungjaya Irrigation Area serves an area of 1,603 hectares of Cipelang water sources. The Cipelang Watershed (DAS) is a Sub-Watershed of Cimanuk, where the upstream part of the river at an altitude of +590 meters above sea level is the foot of Mount Tampomas. It is included in the administrative area of Conggeang District, Sumedang Regency. With a watershed area of 97.00 Km<sup>2</sup>, with a river length of 18.94 Km.(YudhaPrigadi, 2017).

Based on the Decree of the Governor of West Java Number: 761/Kep.574 Rek/2022 concerning the Global Planting Plan and the Annual Irrigation Water Allocation Plan for the 2023 Planting Season, the Ujung Jaya irrigation area serves an agricultural area of 1,603 hectares with details in the Planting Period I for rice in Group I covering an area of 700 hectares and rice in Group II covering an area of 903 hectares, Furthermore, during the Planting Period II of Group I Rice covering an area of 450 Ha, and Palawija covering an area of 1153 Ha. As for the Planting Period III, no services can be provided in connection with Water Discharge, which is not technically available in the field.(Government & Java, 2022)

The existence and condition of the Ujung Jaya Irrigation Network is currently not ideal, considering that from monitoring in the field, the condition of buildings and irrigation support facilities, especially channels, is still found to be damaged / leaks, grass/bushes and the condition of the dam that has been damaged. For this reason, it is necessary to conduct a thorough evaluation of the performance of the Ujung Jaya Irrigation Area, so that farmers in the Sumedang Regency area can receive the maximum benefits from the existing irrigation infrastructure. One of the methods of Irrigation System Performance Evaluation To determine the condition of the performance of the irrigation system in an irrigation area according to the Ministry of PUPR RI through the Regulation of the Minister of PUPR Number: 12/PRT/M/2015, consisting of 6 (six) indicators, namely: (1) Physical infrastructure (2) Plant productivity, (3) Supporting facilities, (4) Personnel organization, (5) Documentation, (6) P3A institutional conditions.(PUPR, 2015a)

In this study, the author limits the discussion of existing problems according to the issues that the author uses as the topic of this research, namely:

- a. What is the Amount of Water needed and Availability for Irrigation Services?
- b. What is the current condition of the Irrigation Network and its supporting facilities?
- c. Plant Productivity and Planting Patterns per year?
- d. Personnel organization in the field along with Documentation?
- e. How much does irrigation operations cost per year?

The purpose of this study is that the author wants to assess the Performance of the Irrigation System in the Ujungjaya Irrigation Area in Sumedang Regency from the existing IKSI Components, as well as how the Operation Management Efforts on the Irrigation Network have been carried out by Technical Agencies in the West Java Provincial Government by their Duties and Obligations. Meanwhile, the goal that the author wants to get is to obtain an overview and condition of the performance of the irrigation system in the Ujung Jaya Irrigation Area in supporting the productivity of rice planting/palawija in the area irrigated by the Ujung Jaya Irrigation Area. As well as how much is needed to carry out operations in the Irrigation network in the Ujungjaya Irrigation Area, which is effective and efficient every year.



## LITERATURE REVIEW

The Ujung Jaya irrigation area is one of the Irrigation Areas under the Authority of the West Java Provincial Government as regulated in the Regulation of the Minister of PUPR No.14 of 2015 which is located in the Sumedang Regency area; this irrigation area irrigates rice fields covering an area of 1,603 hectares which includes Ujung Jaya District which consists of 6 villages, namely: Ujungjaya Village, Palasari Village, Suka Mulya Village, Kudangwangi Village, Kebon Cau Village and Palabuan Village in Sumedang Regency.(BPS Sumedang Regency, 2021)

### **Picture 1. Map of UjungJaya Irrigation Area, Sumedang Regency**

According to the Regulation of the Minister of Public Works of the Republic of Indonesia Number 12 of 2015, The definition of Irrigation is the effort to provide, regulate, and dispose of irrigation water to support agriculture, which includes surface irrigation, swamp irrigation, groundwater irrigation, pump irrigation, and pond irrigation.(PUPR, 2015c). Furthermore, the definition of irrigation, as stated in Law No. 17 of 2019 concerning water resources, is that the irrigation system includes irrigation infrastructure, irrigation water, irrigation management, irrigation management institutions, and human resources.(Law of the Republic of Indonesia No. 17 of 2019, 2019)

An assessment and evaluation are needed in accordance with technical rules and applicable laws and regulations to ensure the effective and efficient implementation of irrigation services in the UjungJaya Irrigation Area in Sumedang Regency in accordance with the expectations of farmers in the field.

For this reason, a technical study is needed on the components that can affect the good and bad of an existing irrigation system, namely:

1. Analysis of Water Demand and Availability of Irrigation Water.
2. Observation of the Condition of the Irrigation Network and its supporting facilities.
3. Analysis of the Productivity of the Crops produced and their Planting Patterns per year.
4. Observation of Personnel Organization and Documentation.
5. Calculate the need for Irrigation Network Operation Costs per year.

### **METHODS**

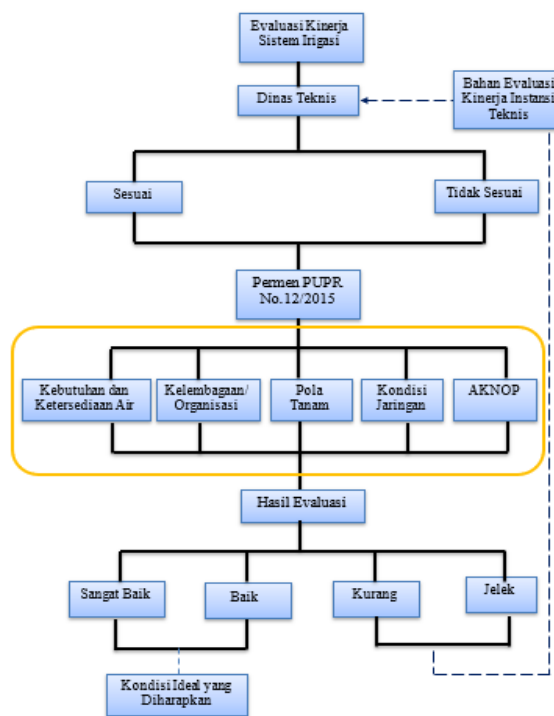
In this study, the method used is qualitative descriptive. In the application of this research, the author uses the data obtained by the author from the results of research (observation) in the field, which is then analyzed to describe the existing conditions drawn at the time of the research to get the ideal conditions expected in the future. In this case, the author refers to the following frame of mind: Figure 2.

The Ujung Jaya Irrigation Area has a large service area. The main source of water from the Ujung Jaya Irrigation Area is the Cipelang River, which is included in the Cimanuk watershed.

**Tools and Materials**

Before carrying out performance assessment activities of the Irrigation System in an Irrigation Area, it is necessary to provide, namely:

- a. Map of Irrigation Areas
- b. Documents (As Build Drawings, Blanks O and P, Report Book, Network and Building Schematics)
- c. Measuring Instruments (meter, GPS)



**Figure 2. Research Mindset**

**Water Balance Calculation**

The Water Balance is the most critical part of implementing an irrigation service process in an Irrigation Area anywhere because it calculates the availability of water and whether it can meet the irrigation water needs in the Irrigation Area served. According to the Directorate General of Water Resources (2019), the calculation of the water balance is based on the weekly or mid-monthly period, which is distinguished by three main elements, namely as follows:

**a) Water Availability**

Mainstay Water Discharge (*Dependable Flow*) is the minimum discharge of the river for a predetermined possibility of being met that can be used for irrigation. The probability of being fulfilled is set at 80% (the probability that the river discharge is lower than the mainstay

discharge is 20%). (Directorate General of Water Resources, 2010) Irrigation water users in downstream areas must also take into account their need for irrigation water, which may be used for purposes other than irrigation

**b) Water Requirements**

In calculating water needs, water needs for domestic and industrial purposes must also be taken into account so that there is no shortage in the distribution of water in irrigation canals given to farmers. The water needs provided are not only for plant growth but also take into account water needs for land preparation, including water for seedbeds, at the stage of land preparation.

Water needs for rice fields are expressed in mm/day or lt/s/ha. Water needs do not include efficiency in the tertiary and main networks; efficiency is calculated based on the need for irrigation water intake.

**c) Water Balance**

In calculating the water balance, the demand for the harvest produced for the planting pattern used will be compared to the mainstay discharge for each half month and the area that can be irrigated. If the river discharge is abundant, it can meet all the areas served, but if the river discharge is inadequate, then the area of irrigation services can be reduced or modified by modifying the planting pattern.

**Network Health Values (Connectors)**

The evaluation of the irrigation network condition index follows the provisions in the Minister of PUPR Regulation No. 12/PRT/M2015 To evaluate the irrigation network condition index, there are 6 indicators, namely:

- 1. Main building = 13 %
- 2. Carrier channel = 10 %
- 3. Building on the carrier channel = 9 %
- 4. Sewers and their buildings = 4 %
- 5. Entrance/Inspection = 4 %
- 6. Housing Office and Warehouse = 5 %

**Irrigation System Performance Index (IKSI) Value**

The irrigation network condition index evaluation follows the provisions in the Minister of PUPR Regulation No. 12/PRT/M2015. To evaluate the irrigation network condition index, there are 6 indicators with the following weighting values:

- 1. Physical infrastructure = 45 %
- 2. Crop productivity = 15 %

3. Supporting facilities	=	10 %
4. Personnel organization	=	15 %
5. Documentation	=	5 %
6. P3A/GP3A/IP3A	=	10 %
Total	=	100 % (PUPR, 2015d)

The assessment criteria for the Irrigation System Performance Index (IKSI) are as follows:

a. Excellent Performance	=	80 - 100
b. Good Performance	=	70 - 79
c. Poor Performance	=	55 - 69
d. Poor Performance	=	< 55 (PUPR, 2015d)

### **Calculation of the Number of Real Needs for Operation and Maintenance (AKNOP)**

The implementation of Operation and Maintenance work in the Water Resources (Irrigation) sector is under the provisions issued in the Regulation of the Minister of Public Works Number 12/PRT/M/2015 concerning the Exploitation and Maintenance of Irrigation Networks consisting of:

#### **a. Operation Activities :**

The scope of Irrigation Network Operations activities includes: Planning, Implementation and Monitoring and Evaluation. The implementation of Irrigation Operations in the field is carried out by filling in the Blank "O" in accordance with the provisions of the Directorate General of Water Resources by the Service Unit Officers in the field coordinated by the Irrigation Mantri.

#### **b. Maintenance Activities,**

In an effort to maintain and secure the irrigation network so that it can always function properly, facilitating the implementation of operations and maintaining its sustainability through continuous maintenance, repair, prevention, and security activities, the field officers report the Maintenance work's results in Blank "P"

The calculation of the Irrigation Operation and Maintenance Needs (AKNOP) is carried out by referring to the Regulation of the Minister of Public Works and Public Housing of the Republic of Indonesia Number 8 of 2023 concerning Guidelines for the Preparation of Construction Work Cost Estimates in the Public Works and Public Housing Sector.(PUPR, 2023)

This calculation is intended to assess the effectiveness and magnitude of the Budget/Costs needed in Operation and Maintenance Activities by the relevant Technical agencies.

## **DISCUSSION**

### **Rice Population and Productivity**

UjungJaya District is located in Sumedang Regency, West Java Province. It consists of 9 Villages with a Total Population of 30,987 people. The population of the UjungJaya Village area itself is 6,469, with a ratio of 3,209 males and 3,260 females (BPS census 2020). The district has an area of 80.56 hectares.

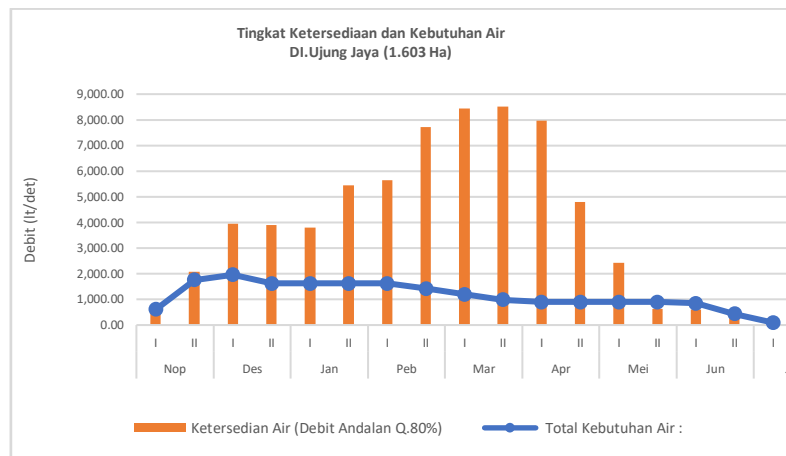
Sumedang Regency is one of the largest contributors to rice production in West Java, apart from Indramayu Regency, Karawang Regency, Cirebon Regency, and Subang Regency. The harvest area of rice crops in West Java Province is 1,662,403.96 hectares with a total rice production of 9,433,723.09 tons (BPS, 2022). As for the Sumedang Regency area, the rice harvest area is 56,662.01 hectares, with a total rice production of 298,163 tons in the same year

### **Management of Ujungjaya Irrigation Area.**

The Ujungjaya Irrigation Area is the authority of the West Java Provincial Government by the Regulation of the Minister of Public Works and Public Housing No. 14/PRT/M/2015 concerning Criteria and Determination of Irrigation Area Status, with an area of irrigation services of less than 3,000 Ha. The UjungJaya Irrigation Area in Sumedang Regency has a service area of 1,603 hectares. (PUPR, 2015b) The Cimanuk Watershed Sub-Basin is the source of water coming from the Cipelang River, which is included in the Cipelang Watershed (DAS).

The Cariang Dam (UjungJaya Dam) in 2022 has been damaged/destroyed by the Flash Flood in the Cipelang River. This incident also caused local residents to be submerged in floods with water levels reaching 4-6 meters above the surface of the Cipelang River Bridge in UjungJaya Village, UjungJaya District, Sumedang Regency

### Analysis of Irrigation Water Demand and Availability



**Picture 0. Water Availability and Demand DI/Ujungjaya (2024).**

The analysis of water availability was carried out using 2 weekly Discharge Data collected by Ujung Jaya Irrigation Officers/Mantri through Blank O-04 and Discharge channel using Blank O-06. As well as Planting Realization Data collected in Blank O-10. By taking into account the K factor in the Weir. So that from the Analysis Results it can be seen by using the Mainstay Discharge Calculation Analysis ( $Q-80\%$ ), namely in Planting Season I (MT-I) The maximum available water volume is 8,448.60 liters/sec, while the minimum water volume is 566.16 liters/second to supply a rice field area of 903 hectares which is divided into 2 (two) groups. Meanwhile, in the II Planting Season (MT-II) the maximum water volume reached 8,520.48 liters/sec and the minimum water volume was 261.60 liters/sec to irrigate rice fields with an area of 450 hectares and Palawija with an area of 597 hectares.

Water needs in the Ujung Jaya irrigation area to irrigate rice fields covering an area of 1,603 hectares, which in its implementation is divided into 2 Planting Seasons and two groups consisting of 2 plant commodities (Rice and Palawija). The results of the calculation of water needs by taking into account the level of water efficiency in the canal of 20%, the results were obtained for the largest water demand in the first planting season (MT-I) with one planting commodity (rice) covering an area of 1,603 hectares requiring water of 1,958.90 liters/second, and the minimum water requirement of 612.50 liters/sec. Furthermore, in the second planting season (MT-II) with two commodities, namely Rice Plants covering an area of 450 Ha and Palawija Plants covering an area of 597 Ha, your maximum water requirement is 1,201.78 liters/second and the minimum water requirement is 94.50 liters/second.

Based on data analysis, it is known that the Ujungjaya Irrigation Area in the planting season I (MT-I), where the amount of water in the dam is available to the maximum, can meet the service needs of 1,603 hectares with 2 groups for the full type of rice crop commodities. Considering that MT. I the volume of water in the weir is available to the maximum. However, in the second planting season (MT.II) it was only able to serve 65.31% of the total service area or an area of 1,047 hectares with details for rice crop commodities reduced by 700 hectares in MT. I to 450 Ha in MT.II, the rest is pursued by Palawija Plant Commodities. 250 Ha in Group I and 347 Ha in Group II.

**Table 0. Recapitulation of the Results of the Lecture at Ujung Jaya (2024)**

No.	Building Indicators	Maximum Value (%)	Assessment Result (%)
1.	Main building	13	6,21
2.	Carrier channel	10	5,49
3.	Building on the carrier channel	9	2,85
4.	Sewers and their buildings	4	1,35
5.	Entrance/Inspection	4	0,96
6.	Housing Office, and Warehouse	5	1,71
	<b>Sum</b>	<b>45</b>	<b>18,57</b>

**Network** **Condition Analysis**

**(KONJAR)**

The results of the above study convey that the condition of the irrigation network in the Ujungjaya Irrigation Area has a weight of 18.57%. This condition is caused by the damage to the dam, which is the main source of irrigation in the Ujungjaya Irrigation Area and cannot operate / function optimally due to the flash flood disaster that occurred on the Cipelang River in Sumedang Regency.

**Irrigation System Performance Index (IKSI) Analysis**

**Table 0. Recapitulation of IKSI DI.Ujungjaya (2024)**

No.	Components of IKSI	Weight ( % )	Assessment Results ( % )
1.	Physical Facilities	45	18,57
2.	Planting Productivity	15	4,00
3.	Supporting Facilities	10	5,33

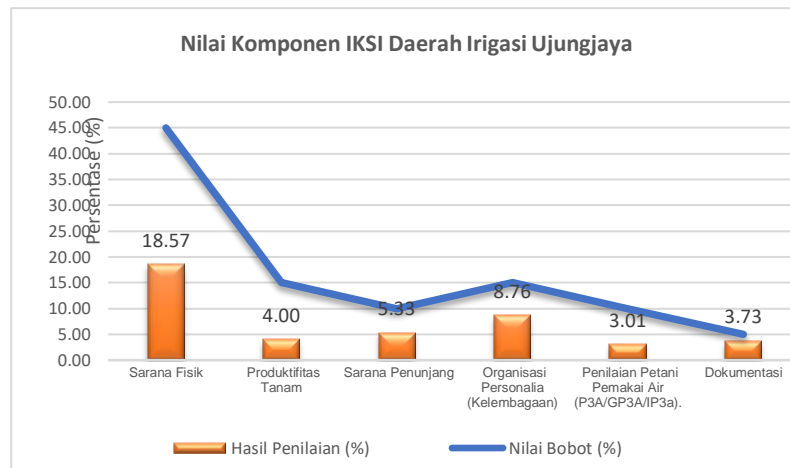
4.	Personnel Organization (Institutional)	15	8,76
5.	Water User Farmers Group (P3A/GP3A)	10	3,01
6.	Documentation	5	3,73
	<b>Total</b>	100	43,41

From the table above, it can be explained that based on the Regulation of the Minister of PUPR No.12/2015, which is 43.41% with the criteria of Poor Performance (<55%). This is also influenced by the low condition of the leading irrigation network in the dam and its support network, which makes it unable to meet the criteria for irrigation services in the field and uneven water availability throughout the growing season.

### Crop Productivity Analysis

For the level of Planting Productivity in the Ujungjaya Irrigation Area with a Planting Standard Area of 1,603 Ha, the planting realization in the Planting Period I (MT-I) is 1,603 Ha (100%). In comparison, in the Planting Period II (MT.II) it is 1,047 Ha (65.32%). Meanwhile, there is none in the III (M.T-III) planting season. From this data, it can be calculated that the existing Crop Index (IP) is 165.32%, with a percentage of realization of planting area of 55.11%. The rice productivity that can be produced from the target is 5.00 tons/ha while the realization in the field is 4.50 tons/ha. So the percentage of rice productivity realization in the Ujungjaya Irrigation Area is 90.00%.

The condition of the network in the Ujungjaya irrigation area also affects the planting productivity which only reaches 165.32 (IP <300) or only 2 Planting Seasons a year. In addition, several canal sections have been damaged/leaked and covered with sediment, thus affecting the condition of water flow distribution from the dam to the rice fields. Graphically it can be described as follows:



**Picture 0. IKSI Value of Ujungjaya Irrigation Area (2024)**

### Analysis of the Real Needs of Operations and Maintenance (AKNOP)

The results of the analysis/calculation of the Real Needs for Operation and Maintenance (AKNOP) of the Irrigation network in the Ujungjaya Irrigation Area in Sumedang Regency are as follows: For the total cost of Operation and Maintenance per Year of the Ujungjaya Irrigation Area, amounting to Rp.3,073,990,000,- or Rp. 1,917,648,- rounded up to Rp.1,900,000,- per hectare (Ha). With the division for Operational Administration activities, OP activities are Rp. 709,300,- or around 23.07%, while the rest, which is Rp. 2,364,690, or around 76.93%, must be used for physical maintenance activities.

## CONCLUSIONS AND SUGGESTIONS

### Conclusion

Evaluation of Irrigation System Performance in the Ujungjaya Irrigation Area Based on the results of the discussion above, it can be concluded as follows:

- a. The Performance Condition of the Ujungjaya Irrigation System in Sumedang Regency currently has a performance with a score of 43.41% with a Poor Performance Criterion (< Value of 55%). This is influenced by the low level of existing Fission Infrastructure (Network/Conjar conditions), as well as insufficient water availability factors for the Planting Period II and Planting Period III, as well as the non-achievement of the Planting Productivity Level every year.
- b. The Real Operation and Maintenance Needs (AKNOP) of the Irrigation network in the Ujungjaya Irrigation Area can be conveyed that for the total cost of Operation and Maintenance per year of the Ujungjaya Irrigation Area, which is Rp.3,073,990,000,- or Rp. 1,917,648,-

rounded up to Rp.1,900,000,- per hectare (Ha). With the division for Operational Administration activities, OP activities are Rp. 709,300,- or around 23.07%, the rest, which is Rp. 2,364,690, or around 76.93% must be used for physical maintenance activities

### **Suggestions**

To improve the Performance of the Irrigation Network in the Ujungjaya Irrigation Area in Sumedang Regency in the future, the author suggests the following:

- a. Immediate handling, especially those in critical conditions such as the Main Building (Weir) and Secondary Canals in the Ujungjaya Irrigation Area by the Relevant Technical Agencies, either the Central Government, the Provincial Government or the Sumedang Regency Government jointly
- b. In preparation for Planting Periods II and III, it is necessary to build and prepare Embung- Embung or Water Pockets that can accommodate a sufficient amount of water in the Downstream Region.
- c. c. To uniformize planting patterns, increased socialization from the Global Planting Plan (RTTG) is necessary.
- d. The Regional Government must be able to meet the needs of Costs for Operation and Maintenance activities in the Ujungjaya Irrigation Area.

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