COST ANALYSIS OF WATER RESOURCES MANAGEMENT SERVICES BELANTI II IRRIGATION AREA CENTRAL KALIMANTAN PROVINCE

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Abstract

The Belanti II Swamp Irrigation Area in Pulang Pisau Regency, Central Kalimantan, spans 3,275 Ha. Water management activities, necessitated for sustained irrigation, incur the Water Resources Management Service Fee (BJPSDA), calculated on cost recovery principles. This study aims to (1) Determine the BJPSDA value by considering the economic benefit factor, (2) Assess farmers' Ability To Pay (ATP) and Willingness To Pay (WTP) for BJPSDA, and (3) Evaluate the Belanti II swamp irrigation network and optimization efforts. The BJPSDA in Belanti II is Rp5,625,504,000, with agricultural benefits contributing Rp51,468,721,052.40 (51.86% of NME). The cost is Rp570,151.69/Ha or Rp101/m3. Farmer ATP and WTP for BJPSDA are Rp54/m3. The irrigation system lacks proper water flow regulation structures, but optimization efforts include channel normalization and water control structures. To enhance leaching ability, 500 m3/ha/day of fresh water is needed. Structures like weirs and flap gates regulate water supply during high and low tides, respectively. These initiatives aim to ensure consistent irrigation and sustainable water resource management in Belanti II.

Keywords: *BJPSDA Irrigation, Ability to Pay, Willingness to Pay*

1. INTRODUCTION

Water management in swampland is not only intended to avoid excessive flooding in the rainy season but must also be intended to avoid drought in the dry season. Water management that merely controls inundation in the rainy season by creating drainage channels will cause drought in the dry season. According to their location and function, channels are divided into four: 1. Primary channels are channels that carry water from the main building to the final building. 2. Secondary channels are channels that carry water from the divider channel in the primary channel to the final building. 3. Tertiary channels are channels that function to irrigate one tertiary plot, which takes water from secondary channels or primary channels. Quaternary channels are channels in paddy fields and take water directly from tertiary channels.

Irrigation Area (DI) Belanti II Unit Pandih Batu Subdistrict, Pulang Pisau Regency, Central Kalimantan Province has an area of 4,500 ha, functional area of 3,275 ha, primary channel 8.7 km (1 section), secondary channel 221.03 km (100 sections), collector channel 6,000 meters, covering 2 villages, namely Belanti Siam Village with a total of 836 tenant farmers, planting area of 2,096 ha and Gadabung Village with a total of 476 tenant farmers, planting area of 1,179 ha. The assisted farmers in Belanti Siam Village consist of 22 farmer groups (4 PPPA) and in Gadabung Village consist of 12 farmer groups (4 PPPA).

The form of farmers' participation in irrigation management is in the form of fees managed by the Water User Farmers Association (HIPPA) or Water User Farmers Association (P3A). If farmers' participation is taken into account as part of the Water Resources Management Service Fee (BJPSDA), it will be a deduction for government subsidies in the agricultural sector. The role of farmers' BJPSDA in irrigation management in Rawa Belanti II in Pulang Pisau District is currently realized in the form of Irrigation Services Fee (IPAIR) paid by farmers in HIPPA. The amount of IPAIR paid by farmers in DI Rawa Belanti II is currently only an agreement between farmers and HIPPA of Rp 24,000/ha or Rp 56/m3.

According to Sangkawati (2009), to carry out water resources management according to the principles of needs management and increase BJPSDA revenue, it is necessary to conduct research analyzing the correlation between management service fees and beneficiaries in accordance with applicable regulations, joint commitments, and cost contributions to be determined, there must be an understanding of interested parties with criteria that must be met. Anwar & Utomo (2013) in their research explained that the calculation of BJPSDA is influenced by the quality of water services and the value of economic benefits of water users. Meanwhile, the Regulation of the Minister of Public Works No. 18/PRT/M/2015 also explains that the calculation of BJPSDA must take into account the weight of the economic interest value of water users.

Through IPAIR, farmers through the Water User Farmers Association (P3A) were trained to bear the operation and maintenance (O&M) costs independently. IPAIR continued to increase ranging from Rp 8,000-Rp 12,000 (1987-1992) and Rp 18,000-24,000 (1994-1995) (Sumaryanto, 2006). Although IPAIR continues to increase, it is not proportional to the total costs required for irrigation operations and maintenance. This is what then gave rise to the discourse of BJPSDA.

This study aims to (1) Determine the value of the Cost of Water Resources Management Services (BJPSDA) irrigation by considering the value factor of economic benefits, (2) Determine the value of Ability to Pay (ATP) and Willingness to Pay (WTP) farmers in making payments Cost of Water Resources Management Services (BJPSDA) irrigation. The results of this study are expected to produce BJPSDA irrigation in accordance with the costs required for the operation and maintenance of irrigation networks and the benefits of irrigation water received by farmers to ensure the quality of irrigation services, while still considering the ability and willingness of farmers as water users to pay BJPSDA, (3) Knowing the condition of the Belanti II swamp irrigation network and the efforts that have been made to optimize water management.

2. LITERATURE REVIEW

2.1. Irrigation

Irrigation Anonymous (2002a) is a collection of human efforts in terms of (1) distributing water from water sources, (2) distributing water to channels, (3) then dividing water to the land, (4) flowing it to agricultural/non-agricultural crops, and (5) excess water is released through drains. As for other definitions of irrigation, some say that irrigation

Anonymous (2006) is an effort to procure, regulate and dispose of irrigation water to support various agriculture ranging from surface irrigation, swamp irrigation, underground water irrigation, pump irrigation, and pond irrigation.

In order to increase the area of rice fields that have irrigation, irrigation extensification and irrigation intensification activities can be carried out. Extensification and intensification of irrigation include (Iswandari, 2003):

a. Maintaining the quality of irrigation so that it is expected that the quality function of irrigation can be improved, at least not decreased.
b. Tertiary network construction projects and paddy field printing can be completed immediately so that they can fully support the work of the main irrigation network.
c. Immediate rehabilitation of damaged irrigation networks
d. Immediate completion of pending irrigation projects 5. Development of new irrigation covering rain-fed rice fields that are considered to have good potential both technically and economically.

2.2. Irrigation System

The social physical elements of irrigation systems include Anonymous (2002b) human elements, natural and environmental elements, physical elements, plant elements, and irrigation operation and maintenance techniques. The irrigation system Small & Svendsen (1990) is a unity of social physical elements that are used to distribute water from natural water sources to irrigated land. This irrigated land can be for agricultural crops and nonagricultural crops.

Irrigation system management is needed to help distribute water more effectively and efficiently. The scope of the irrigation system Anonymous (2006) is irrigation infrastructure, irrigation water, irrigation management, irrigation management institutions and human resources. So it can be concluded that the irrigation system can work optimally if there is a strong integration between human resource asset management and non-human resource asset management such as nature, crops, physical irrigation networks.

2.3. Water Resources Management Service Fee

The degradation of irrigation infrastructure functions is caused by excessive shifts in groundwater levels, the number of nuisance plants in drainage channels, and sedimentation along irrigation networks. While the causes of degradation of irrigation operation and maintenance include (Sumaryanto, 2006):

a. No good progress on farmers' ability to finance irrigation operation and maintenance
b. Inefficient institutional system due to free rider and rent seeking practices
c. Irrigation institutional design is not in line with user aspirations

Reform of the management system in the irrigation system that has been going on for a long time must be immediately implemented and intensively socialized to farmers. Some experts are more inclined to increase the efficiency of irrigation through a supply management approach. But there are also those who think it would be more effective and relevant if the increase in irrigation efficiency through demand management approach.

Indonesian farmers have been using a supply management approach (Sumaryanto, 2006). If Indonesian farmers still use this method in the short-medium term it can still be tolerated although improvements in operational aspects in the field still have to be improved.

In the long term, this supply management approach is no longer feasible because it tends to be ineffective and is exacerbated by the decreasing supply of irrigation water with the increasing economic value of irrigation water. Examples of supply management approaches include:

1. Implementation of low flow management system
2. Low flow management
3. Intermittent flow pattern

This phenomenon of decreasing water quantity inversely proportional to the increasing economic value of irrigation water has led to the creation of a new approach. This approach is the demand management approach. There are two paths in the demand management approach (Sumaryanto, 2006), among others:

a. Output maximization strategy by obtaining maximum output or income through available irrigation water. This strategy is most effectively used in conditions where people do not understand the high economic value of irrigation water.
b. The strategy of reducing inputs by reducing the quantity of irrigation water used in producing a certain amount of output. This strategy can be applied when the community's understanding of the economic value of irrigation water is based on economic considerations. Where irrigation water in this case already has a high economic value. Coupled with irrigation system facilities and infrastructure that greatly support the work of farmers.

The condition of the Indonesian people who do not understand and cannot accept the high economic value of irrigation water is more suitable to use a demand management approach through an output maximization strategy. However, there are still weaknesses in the output maximization strategy (Sumaryanto, 2006), namely:

a. Implementation is difficult to cover very large irrigation areas, especially when the land involves diverse farming community cultures.
b. The accuracy of cropping pattern design and physical infrastructure support is very influential on efficiency.
c. This pattern is still considered less aspirational and less popular in the era of democracy

2.4. Method of Calculation of Irrigation Water Resources Management Service Fee

The method of calculating the service fee for irrigation water resources management is:

1. Irrigation Water Resources Management Service Fee based on PUPERA Ministerial Regulation No. 18/PRT/M/2015 2015 Factors contained in BJPSDA are the cost of managing water resources, the value of economic benefits and the area of agricultural businesses.
2. The cost of Irrigation Water Resources Management Services uses basic service cost modeling by considering service quality factors and the value of economic benefits (Anwar & Utomo, 2013).

2.5. Irrigation Water Resources Management Service Fee According to Minister of Public Works and Public Housing Regulation No. 18/PRT/M/2015

The preservation of the benefits of water resources and water resources facilities and infrastructure should be fully guarded by the government and the people of Indonesia. One of the government's safeguards is through the Minister of Public Works and Public Housing

Regulation No. 18/PRT/M/2015 regulating the Water Resources Management Services Fee. The calculation of BJPSDA irrigation with the formula is as follows:

$$\text{BJPSDA} = \frac{\text{Natural Resource Management Cost x \% Economic Benefit}}{\text{Value Agricultural Business Area}}$$

where:

BJPSDA	: Water Resources Management Service Fee (Rp/Ha)
Value of Economic Benefits	: The benefits gained for doing agricultural business (IDR)
Farm size	: Farm area used by farmers (Ha)

2.6. Ability To Pay (ATP) and Willingness to Pay (WTP)

The Government of Indonesia as the regulator has issued a regulation on BJPSDA irrigation through Minister of Public Works and Housing Regulation No. 18/PRT/M/2015. Even so, farmers as tax subjects still need to be consulted about the impact of these regulations on their purchasing power in their daily lives. This is done in order to create equitable justice for the use of water economic resources. The purchasing power of farmers can be analyzed using several methods, two of which are Ability To Pay and Willingness To Pay.

According to Tamin et al (1999) Ability To Pay (ATP) is the purchasing power of a person or group to pay for services obtained on the basis of ideal considerations. So in this case the ATP analysis approach is based on the allocation of 6 n cost of irrigation water resources management services and income earned by farmers. So to summarize, ATP in this case is the ability of farmers in terms of making payments for the cost of irrigation water used.

$$\text{ATP} = \frac{\text{I x \%C}}{\text{D}}$$

where:

ATP	= Ability to Pay (IDR)
I	= Income (Rp)
%C	= Percentage of revenue for BJPSDA irrigation (%)
D	= Quantity of irrigation water utilized by farmers $(m)^3$

Willingness To Pay (WTP) according to Tamin et al (1999)is the willingness of users to incur some costs for the use of services used. The approach to the WTP method in terms of the cost of irrigation water resources management services is done on the basis of perceptions of irrigation water users (farmers) on the cost of irrigation water resources management services. Then the factors that affect WTP (Tamin et al., 1999).

Farmers' WTP for IPAIR tariffs in this study was analyzed through a survey by distributing questionnaires with a question format developed from the contingent valuation (CV) method. This CV technique pays more attention to environmental factors. Through CV can help estimate the value of the unity (contingent) of several alternative scenarios surveyed to respondents (Setiawan, 2005). This CV method includes:

a. Open ended CV Method This method has been used less frequently because it takes too much attention to the environment. In general, respondents may be confused because they are unfamiliar with it. If this method is used, the results can be inaccurate (the survey results can show that the respondent's WTP is not the maximum).
b. Referendum CV Method Through this method, respondents are asked questions with two alternatives. One option can be selected from the two alternatives. Usually, respondents are only given "yes" or "no" answer options.

The WTP value of each respondent is the maximum rupiah that farmers are willing to pay. To get the average value of WTP, the following equation can be used:

$$MWTP = \frac{1}{n}\sum_{i=1}^{n} WTPi$$

where:

MWTP	= average WTP, in rupiah per cubic meter (Rp/m3)
n	= number of samples
WTPi	= maximum WTP value of respondent i

The basis that can be used in setting tariffs (Tamin et al, 1999) are:
1. In setting the tariff, it is recommended not to exceed the ATP value
2. If the proposed tariff is between the ATP and WTP values, it can be accompanied by improvements in the level of service.
3. If the proposed tariff is below the tariff calculation and above the ATP then the difference can be used as a subsidy burden that must be borne by the regulator (government).
4. If the tariff of a vehicle type is below ATP and WTP, there is flexibility in setting a new tariff value. This difference can be used to cross-subsidize other vehicles whose tariff calculation exceeds the ATP value.

3. RESEARCH METHOD

3.1. Location and Time of Research

The research location is the Irrigation Area (DI) Belanti II Unit Pandih Batu Subdistrict, Pulang Pisau Regency, Central Kalimantan Province, which has an area of 4,500 ha Raw Area, 3,275 ha Functional Area, 8.7 km Primary Channel (1 Section), 221.03 km Secondary Channel (100 Sections), 6,000 meters Collector Channel covering 2 villages, namely Belanti Siam Village with a total of 836 families of tenant farmers, 2,096 ha planting area and Gadabung Village with a total of 476 families of tenant farmers, 1,179 ha planting area. The research time was 4 months.

Figure 1. Flowchart of Research Design

3.2. Population

The population of this study are all farmers who are members of HIPPA (Association of Water Using Farmers) ranging from land owners and land tenants in the Belanti II Swamp Irrigation Area, Pandih Batu District, Pulang Pisau Regency, Central Kalimantan Province.

3.3. Sample

The farmers sampled for the study were farmers who were members of HIPPA. The total population of farmers in the Belanti II Swamp Irrigation Area in Pandih Batu Subdistrict, Pulang Pisau Regency is 1,312 farmers, covering 2 villages, namely Belanti Siam Village with 836 families (64%) and Gadabung Village with 476 families (36%).

The Slovin formula Prasetyo & Jannah (2005) can be used in determining the sample size with the following formula:

$$n = \frac{N}{1 + N(e)^2}$$

where:
n = sample size
N = population size
e = 5% sample selection error percentage

The simple random sampling method was used in the sample selection with the following details:

a. Belanti II irrigation area only has 1 irrigation network in the Belanti II Swamp Irrigation Area of Pulang Pisau Regency.

b. The sample of farmers who became the research sample were farmers who were members of HIPPA in the Belanti II Swamp Irrigation Area of Pulang Pisau District, totaling 1,312 farmers. With the Slovin formula, the number of farmer samples obtained was 307 farmer samples. The calculation of the farmer sample is as follows:

$$n = \frac{1.312}{1+(1.312*(0.05)^2)} = 306{,}542 \sim 307$$

Based on the number of samples, obtained:

a. Number of farmer respondents Belanti Siam Village = 307 x 64% = 195 respondents
b. Number of farmer respondents Gadabung Village = 307 x 36% = 112 respondents

3.4. Research Instruments

The research instrument is a questionnaire, used as a means of communication with respondents to obtain data. The data obtained and collected comes from filling out a questionnaire in the form of an opinion on a statement directly by the respondent, which relates to the variables of project activities. The list of statements used is only intended for objective types of statements with predetermined opinion choices. The ability and purchasing power of farmers to pay for IPAIR can be calculated through the ATP method and the WTP method.

Table 1. ATP and WTP Variables

Methods	Variables	Literature Reference
ATP	1. Total farmer income	Permata (2012), Irawan (2009), Tamin et al (1999)
	2. Farmer's net income	Guntoro (2003)
	3. Agricultural land	Guntoro (2003)
	4. Percentage of income for production costs and irrigation service fees	Tamin et al (1999)
	5. Farmer categorization	Irawan (2009)
	6. Formal education of farmers	Irawan (2009)
	7. Number of family members	Permata (2012), Irawan (2009)
WTP	1. Quality and quantity of services	Permata (2012)
	2. Cost of irrigation services that have been set	Irawan (2009)
	3. Quantity of irrigation water used	Irawan (2009)
	4. Farmer categorization	Irawan (2009)
	5. Ownership status of rice field plot	Irawan (2009)
	6. Size of paddy field plot	Guntoro (2003)
	7. There are alternative water sources	Guntoro (2003)

Source: Fitri (2017)

3.5. Data Collection Procedure

Data sources required in the research are primary data and secondary data. In order to obtain data and parameters that will be measured for each observation are as follows:

1. Primary Data

Primary data is data obtained from original sources and collected specifically to answer research problems. Survey and interview methods are used in primary data collection techniques. Primary data in this study is used to obtain data about:

a. Facilities, infrastructure, and physical condition of the area at Rawa Belanti II in Pulang Pisau District by direct observation.
b. Water use by farmers in the DI Rawa Belanti II area of Pulang Pisau District by direct observation.
c. The Ability to Pay and Willingness to Pay questionnaires were distributed to farmers in the Rawa Belanti II area of Pulang Pisau District through interviews and surveys.

2. Secondary Data

Secondary data is data collection sourced second-hand from an agency, written/printed materials such as journals/newsletters and others. This BJPSDA research is focused on DI Rawa Belanti II. Thus, related parties include the Central Kalimantan Provincial Irrigation Public Works Office, Pulang Pisau District Irrigation Public Works Office, Water User Farmers (P3A) in the Belanti II Swamp DI area and the Central Kalimantan Provincial Statistics Agency. Secondary data required:

a. General information about DI Rawa Belanti II
b. Technical data of DI Rawa Belanti II
c. Scheme of irrigation network DI Rawa Belanti II
d. Budget Implementation List (DIPA)
e. Operation and Maintenance Real Costs (AKNOP)
f. Activity data includes the cost of operation and maintenance of irrigation networks and other activities that are closely related to irrigation network service activities.
g. Cropping data include harvested land area, c r o p p i n g pattern, type and age of plants, cropping intensity
h. Service Index (IP)
i. Water discharge collection
j. Employee data
k. Farmer data includes data on the number of existing farmers, land ownership size, membership of HIPPA (Association of Water Using Farmers)/ GHIPPA (Association of Water User Farmers).

3.6. Data Analysis Technique

1. Economic Benefit Value

Agricultural NME can be calculated from the revenue from the sale of agricultural products minus the total production costs incurred. The scope of this research is DI Rawa Belanti II which utilizes irrigation water.

2. Irrigation Water Resources Management Service Fee

The calculation of BJPSDA irrigation with the formula is as follows:

$$\text{BJPSDA} = \frac{\text{Natural Resource Management Cost x \% Economic Benefit Value}}{\text{Agricultural Business Area}}$$

BJPSDA	: Water Resources Management Service Fee (Rp/Ha)
Value of Economic Benefits	: The benefits gained for doing agricultural business (IDR)
Farm size	: Farm area used by farmers (Ha)

3. Validity and Reliability Test of Questionnaire

After the questionnaire was filled in by the respondents, the questionnaire was tested, namely the validity test and reliability test (Azwar, 2007)

1) Validity Test

The validity test of the questionnaire used is the corrected correlation test. The test is to see the correlation of the score of each independent variable, in this case the scores P1 t o P7 on the total score (P_{total}) of the independent variables. Furthermore, the corrected correlation test (rc) is carried out. The validity test steps are as follows:

a) Creating a statement score tabulation table

Table 2. Statement Score Tabulation Table

Respondent	atement				Total
	P1	P2	....	P7	Ptotal
1					
2					
3					
...					
N					

Source: Azwar (2007)

b) Determining the hypothesis test

Ho: rc < 0.3: invalid variable H1: rc ≥ 0.3: valid variable

c) Test statistics

$$r = \frac{n(\sum P.P_{total}) - (\sum P)(\sum P_{total})}{\sqrt{(n\sum P^2 - (\sum P)^2}\sqrt{(n\sum P_{total}^2 - (\sum P_{total})^2}}$$

$$r_c = \frac{r.S_t - S_b}{\sqrt{[S_t^2 + S_b^2 - 2r.S_b.S_t]}}$$

where:

P	: question item score
P_{total}	: total question item score
r	: correlation coefficient between WTP validity score and WTP_{total} validity score
rc	: corrected correlation coefficient
Sb	: standard deviation of validity score P

St : standard deviation of P_{total} validity score
n : number of respondents

d) If rc < 0.3, then Ho is accepted, meaning that PAPs are not selected for further analysis. If rc ≥ 0.3, then Ho is rejected, meaning that PAPs are selected for further analysis.

2) Reliability Test

The questionnaire reliability test used is the Cronbach's Alpha test. The Cronbach's Alpha test steps are as follows:

a) Determine the reliability test hypothesis
Ho: $\alpha \leq 0.6$: the questionnaire is not reliable
H1: $\alpha > 0.6$: the questionnaire is reliable.

b) Test statistics

$$\alpha = \left(\frac{k}{k-1}\right)\left(1 - \frac{\sum_{i=1}^{k} S_i^2}{S_t^2}\right)$$

Where:
α : Cronbach's Alpha value
k : number of statement variables
S2 : the variance value of each variable statement
S2 : variance value of the total variable statement

c) If $\alpha \leq 0.6$, the questionnaire is not reliable
If $\alpha > 0.6$, the questionnaire is reliable

3.7. Respondent Characteristics

After testing the validity and reliability of the questionnaire, the questionnaire was distributed. The questionnaires were distributed to 2 villages in Belanti II District, Pulang Pisau Regency, with a total sample size of 307 respondents. Respondent characteristics were divided into ten criteria.

1. Characteristics of respondents based on age
2. Characteristics of respondents based on gender
3. Characteristics of respondents based on region
4. Characteristics of respondents based on marital status
5. Characteristics of respondents based on the number of family members
6. Characteristics of respondents based on education
7. Characteristics of respondents based on length of farming
8. Characteristics of respondents based on land area
9. Characteristics of respondents based on land status

3.8. Ability To Pay

ATP is the ability of farmers in terms of making payments for the cost of irrigation water used. This research is based on the household budget method (Permata, 2012)

$$ATP = \frac{I \times \%C}{D}$$

where:
ATP = Ability to Pay (IDR) I= Income (Rp)
%C = Percentage of revenue for BJPSDA irrigation (%)
D = Quantity of irrigation water utilized by farmers (m)3

The components of the ATP equation can be described as follows:
1. Income (I)
2. Expenditure on irrigation costs (C)
3. Total irrigation water discharge used (D)

3.9. Willingness To Pay

According to Tamin et al (1999), Willingness To Pay (WTP) is the user's willingness to pay a certain amount for the use of services used. The approach to the WTP method in terms of the cost of irrigation water resources management services is carried out on the basis of the perceptions of irrigation water users (farmers) of the tariff cost of irrigation water resources management services. Farmers' WTP for IPAIR tariffs in this study was analyzed through a survey by distributing questionnaires with a question format prepared from the contingent valuation (CV) method. Comparative Analysis of ATP and WTP Values Three conclusions can be drawn, namely:
1. ATP value is greater than WTP value Describes the ability of users (farmers in Rawa Belanti II) to pay more than the desire to pay for the service in question.
2. ATP value is smaller than WTP value Describes a user's willingness to pay irrigation rates greater than his or her ability to pay. Usually occurs when the utility of the service is relatively very high compared to the low income of the service user.
3. ATP value is equal to WTP value Describing between the ability and desire of farmers to pay irrigation tariffs is the same, because there is a balance of user utility with the costs incurred to pay for irrigation services. There are four basic guidelines that can be used in setting tariffs (Tamin et al, 1999), namely:
   1) In setting the tariff, it is recommended not to exceed the ATP value
   2) If the proposed tariff is between the ATP and WTP values, it can be accompanied by improvements in the level of service.
   3) If the proposed tariff is below the tariff calculation and above the ATP then the difference can be used as a subsidy burden that must be borne by the regulator (government).
   4) If the tariff is below ATP and WTP, there is flexibility in setting the new tariff value. This difference can be used to cross-subsidize other vehicles whose tariff calculations exceed the ATP value.

4. RESULT AND DISCUSSION

4.1. Value of Economic Benefits (NME)

The profit earned from agricultural activities is the value of agricultural economic benefits (NME). The NME of agriculture can be calculated from the revenue from the sale of agricultural products minus the total production costs incurred. The scope of this research is the Belanti II Unit of Pandih Batu Sub-district, Pulang Pisau Regency, Central Kalimantan Province, which includes 2 villages, namely Belanti Siam Village with a total of 836 tenant farmers, a planting area of 1,500 hectares. 2,096 ha and Gadabung Village with 476 tenant farmers, planted area 1,179 ha. The assisted farmers in Belanti Siam Village consist of 22 farmer groups (4 PPPAs) and in Gadabung Village consist of 12 farmer groups (4 PPPAs).

Table 3. Rice Planting Data in Belanti II Irrigation Area

No.	Regional	Land Area (Ha)	Planting Index (%)	Productivity (Ton/Ha)
1	Belanti Siam	2.096	162%	3,27
2	Gadabung	1.179	146%	3,19
	Total	3.275		

Source: Central Kalimantan Provincial Agriculture Office, 2020

The results of Table 3 can be seen that the total area of rice fields in the Belanti II Irrigation Area is 3,275 Ha, with the lowest cropping index in Gadabung which is 146% and the highest in Belanti Siam at 162%. While the highest planting productivity for rice is in Belanti Siam at 3.27 tons / ha and the lowest planting productivity for rice is in Gadabung at 3.19 tons / ha. To determine the value of revenue from agricultural products, it is calculated by multiplying the number of harvests by the selling price of grain. The number of harvests is calculated by multiplying the land area of each region by the planting index and planting productivity as follows:

Table 4. Rice Harvest Data in Belanti II

No.	Regional	Agricultural land area (Ha)	Planting Index (%)	Harvested Area (Ha)	Productivity (Ton/Ha)	Harvest Quantity (Tons)
		a	b	c = a*b	d	e = c*d
1	Belanti Siam	2.096	162%	3.395,52	3,27	11.103,35
2	Gadabung	1.179	146%	1.721,34	3,19	5.491,07
	Total	3.275		5.116,86		16.594,43

The results of Table 4 explain that for the lowest number of rice harvests in Gadabung at 5,491.07 tons, the highest is in Belanti Siam at 11,103.35 tons. After finding the total number of harvests per region, the next step is to calculate the rice revenue obtained from the number of harvests multiplied by the price of grain, as follows:

Table 5. Rice Farming Revenue in Belanti II

No.	Regional	Harvest Quantity (Tons)	Grain price (Rp/Ton)	Agricultural receipts (Rp)
		a	b	c = a*b
1	Belanti Siam	11.103,35	4.208.000	46.722.898.483,20
2	Gadabung	5.491,07	4.202.000	23.073.495.469,20
	Total	16.594,43		69.796.393.952,40

Source: Central Kalimantan Provincial Agriculture Office, 2020

The results of Table 5 explain that rice farming revenue in the Belanti II Irrigation Area is the lowest in Gadabung at Rp 23,073,495,469.20. The highest agricultural revenue is in Belanti Siam amounting to Rp 46,722,898,483.20. Value of Economic Benefits in Belanti II, as follows:

Table 6. Economic Benefit Value of Rice in Belanti II DI

No.	Regional	Harvested Area (Ha)	Unit Cost Production (IDR/Ha)	Total Cost Producti on (Rp)	Reception Agriculture Paddy (Rp)	NME Padi
		a	b	c = a*b	d	e = d - c
1	Belanti Siam	3.395,52	3.273.000	11.113.536.960,00	46.722.898.483,20	35.609.361.523,20
2	Gadabung	1.721,34	4.191.000	7.214.135.940,00	23.073.495.469,20	15.859.359.529,20
	Total	5.116,86		18.327.672.900,00	69.796.393.952,40	51.468.721.052,40

Source: Central Kalimantan Provincial Agriculture Office, 2020

The results of Table 6 can be analyzed that the total economic benefit value of rice is Rp51,468,721,052.40. The lowest economic benefit value of rice is in Gadabung amounted to Rp15,859,359,529.20. The highest economic benefit value of rice paddy is in Belanti Siam at Rp35,609,361,523.20.

4.2. Irrigation Water Resources Management Service Fee

The institution that manages activities in DI Belanti II is the Public Works Office of Central Kalimantan Province. In this study, secondary data on the cost of water resources management services in the form of data on the Real Needs of Operation and Maintenance Costs (AKNOP) obtained from the Public Works Office of Central Kalimantan Province. Recapitulation of the Real Needs of Operation and Maintenance (AKNOP) of Irrigation Areas as follows:

Table 7. Real Need for Operation and Maintenance Costs (AKNOP)

No.	Activity Description	Total Cost (Rp)
A.	Operation	
	Total Operating Cost	1.364.774.500
	Total Operational Procurement Cost	803.700.000
B.	Maintenance	
	Total Cost of Routine Maintenance	525.543.316
	Total Periodic Maintenance Cost	2.350.697.120
C.	OP Management (Training/Facilities Etc.)	
	Total Management Fee	69.380.000

No.	Activity Description	Total Cost (Rp)
	Total Aknop OP Cost	5.114.094.936
	Value Added Tax (10% O+PR+PB+M)	511.409.494
	Total Cost AKNOP OP ((O+PR+PB + M) + Taxes Value Added)	5.625.504.430
	Rounding of Total Cost of Aknop OP Irrigation Area 5,117 Ha	5.625.504.000

The recapitulation of the real need for water resources management costs in DI Belanti II based on Table 7 was found to be Rp 5,625,504,000.

4.3. BJPSDA Irrigation Value

The units of economic benefit value and the volume or production produced are as follows:

Table 8. Total benefit value of Belanti II

No.	Description	Unit	Value
1	Unit price benefit value		
	a. Agriculture	Rp/Ha	6.929.150,34
	b. Flood Control	Rp/Ha	6.929.150,34
2	Volume or production		
	a. Agriculture	Ha Harvested	5.116,86
	b. Flood Control	Ha	6.895,22
3	Value of Economic Benefits		
	a. Agriculture	Rp	51.468.721.052,40
	b. Flood Control	Rp	47.778.015.980,55
	Total	Rp	99.246.737.032,95
4	Percentage of benefit value		
	a. Agriculture	%	51,86%
	b. Flood Control	%	48,14%
			100,00%

Source: Central Kalimantan Provincial Agriculture Office, 2020

Table 8 shows the total NME of IDR 99,246,737,032.95. The largest NME is Agriculture NME with a value of Rp 51,468,721,052.40 or 51.86% of the total NME. Then the Flood Control NME amounted to Rp 47,778,015,980.55 or 48.14%.

The value of BJPSDA is done by multiplying the percentage weight of the economic benefit value by the total cost of water resources management, then divided by the volume or production produced, as follows:

$$\text{BJPSDA} = \frac{\text{Natural Resource Management Cost x \% Economic Benefit Value}}{\text{Agricultural Business Area}}$$

BPJSDA Agriculture:

The recapitulation of the real need for water resources management costs in DI Belanti II based on Table 7 was found to be Rp 5,625,504,000. The management cost for irrigation according to the NME weight is 51.86% multiplied by the total management cost of

Rp5,625,504,000. The area of agricultural production in DI Belanti II is 5,116.86 Ha, so the BJPSDA value of irrigation can be calculated as follows:

$$\text{BJPSDA} = \frac{5.625.504.000 \ \text{x} \ 51,86\%}{5.116,86} = \text{Rp} \ 570.151,69/\text{Ha}$$

BPJSDA Flood Control:

The recapitulation of the real need for water resources management costs in DI Belanti II based on Table 7 was found to be Rp 5,625,504,000. The management cost for irrigation according to the NME weight is 48.14% multiplied by the total management cost of Rp5,625,504,000. The area of agricultural production in DI Belanti II is 6,895.22 Ha, so the BJPSDA value of irrigation can be calculated as follows:

$$\text{BJPSDA} = \frac{5.625.504.000 \ \text{x} \ 48,14\%}{6.895,22} = \text{Rp} \ 392.752,90/\text{Ha}$$

Table 9. Calculation Result of BJPSDA Value

No	Description	% NME	Management Fee	Volume/Production		BJPSDA Value	
				Unit	Value	Unit	Value
1	Agriculture	51,86%	5.625.504.000	Ha	5.116,86	Rp/Ha	570.151,69
2	Flood Control	48,14%		Ha	6.895,22	Rp/Ha	392.752,90

The BJPSDA values in Table 9 are calculated based on the total volume or production produced. To obtain the BJPSDA value per m3 of water usage, a conversion is made according to the water usage of each user.

Secondary data from the Central Kalimantan Provincial Agriculture Office states that the amount of water used for agricultural irrigation in DI Belanti II for 1 (one) year is 28,848,053 m3 with a harvested area of 5,116.86 Ha (from table 6).

The amount of water used for agricultural activities per hectare of paddy field is:

$$\text{Amount of water used} = \frac{\text{Total water usage}}{\text{Harvest area}}$$

$$\text{Amount of water used} = \frac{28.848.053 \ m^3}{5,116.86 \ \text{Ha}} = 5,637.84 \ m/\text{Ha}^3$$

The amount of water used for flood control activities is:

Amount of water used = amount of water used x control area
= 5,637.84 m3 /Ha x 6,895.22 Ha
= 38.874.167,36 m3

The value of BJPSDA in DI Belanti II based on Table 9 was found to be Rp5,625,504,000. BJPSDA irrigation:

Management cost for irrigation = IDR 5,625,504,000 x 51.86%
= IDR 2,917,386,374.40.

The water used for agriculture in DI Belanti II is 28,848,053 m3 , so the BJPSDA value of irrigation after being converted to water usage is:

$$\text{BJPSDA irrigation} = \frac{\text{Management fee for irrigation}}{\text{Total water usage}}$$

$$= \frac{\text{IDR } 2{,}917{,}386.\ 374.40}{28.848.053 \text{ m}^3} = \text{IDR}101.13/\text{m}^3$$

BJPSDA flood control:
Management cost for flood control = IDR 5,625,504,000 x 48.14%
= IDR 2,708,117,625.60.

The water used for agriculture in DI Belanti II is 28,848,053 m3, so the BJPSDA value of flood control after being converted to water usage is:

$$\text{BJPSDA flood control} = \frac{\text{Management fee for flood control}}{\text{Total water usage}}$$

$$= \frac{\text{Rp } 2.708.117.625{,}60}{38.874.167{,}36 \text{ m}^3} = \text{Rp } 69{,}66/\text{m}^3$$

Table 10. Calculation Results of BJPSDA Value Based on Water Use

No	Description	% NME	Management Fee	Volume/Production		BJPSDA Value	
				Unit	Value	Unit	Value
1	Agriculture	51,86%	5.625.504.000	m3	28.848.053,00	Rp/m3	101,13
2	Flood Control	48,14%		m3	38.874.167,36	Rp/m3	69,66

Source: Data processing results, 2022

Table 10 shows that the percentage of Agriculture NME is 51.86% with a BJPSDA Value based on water usage of Rp 101.13/m3. Flood Control NME percentage of 48.14% with BJPSDA Value based on water usage of Rp 69.66/m3.

4.4. Validity and Reliability Test of Questionnaire

Before the questionnaire was distributed to all respondents, validity and reliability tests were conducted on the questions contained in the questionnaire. Validity and reliability tests were conducted on 30 farmers as respondents taken randomly from a predetermined sample.

a. Validity Test

Hypothesis Test:
Ho: rc < 0.3: invalid variable H1: rc ≥ 0.3: valid variable

Using the help of the SPSS program, the corrected correlation coefficient is obtained from the Corrected Item-Total Correlation as follows:

Table 11. Validity Test Results of Each Question

Question	Variable	src	Description
Do you know irrigation water fee obligations?	P1	0,718	Valid
Do you always pay irrigation water fees?	P2	0,847	Valid
Whether irrigation water needs are obtained purely from the irrigation system alone (without using a pump system)?	P3	0,549	Valid
What is the water demand on the land Are you always fulfilled?	P4	0,621	Valid
If the water needs of the land have not been met, then is there any form of action? follow-up from the irrigation manager?	P5	0,613	Valid
Are there alternative water sources when land water needs are not met?	P6	0,652	Valid
Has the irrigation fee rate paid so far been commensurate with the service?	P7	0,686	Valid

Source: Data processing results, 2022

b. Reliability Test

The questionnaire reliability test used is the Cronbach's Alpha test. Hypothesis testing:
Ho: $\alpha \leq 0.6$: the questionnaire is not reliable
H1: $\alpha > 0.6$: reliable questionnaire

By using the help of the SPSS program, the Cronbach's Apha value is obtained as follows:

Table 12. Cronbach's Alpha Reliability Test Results

Question	Variables	Cronbach's Alpha
Do you know irrigation water fee obligations?	P1	0,856
Do you always pay irrigation water fees?	P2	0,840
Whether irrigation water needs are obtained purely	P3	0,878
from the irrigation system alone (without		
using a pump system)?		

What is the water demand on the land Are you always fulfilled?	P4	0,869
If the water needs of the land have not been	P5	0,870
met, then is there any form of action? follow-up from the irrigation manager?		
Are there alternative water sources when land water needs are not met?	P6	0,866
What is the rate of irrigation fees paid	P7	0,860
has been commensurate with the service?		

Source: Data processing results, 2022

From table 12, it is obtained that all α values> 0.6, then Ho is rejected, meaning that all questionnaire variables are quite reliable or consistent in performing their measuring functions.

c. Respondent Characteristics

The questionnaire was distributed to farmers who are members of HIPPA as a research sample of 307 farmers in the Belanti II Swamp Irrigation Area in Pandih Batu Sub-district, Pulang Pisau District, covering 2 villages, namely Belanti Siam Village with 195 tenant farmers 64% and Gadabung Village with 112 tenant farmers 36%.

The characteristics of respondents include nine criteria, namely age, gender, region, marital status, number of family members, latest education, length of farming, land size, and land status. Respondent characteristics are presented in descriptive form as follows:

1) Characteristics of respondents based on age

Table 13. Characteristics of Respondents Based on Age

Age	Frequency	Percentage
20 - 30 years	4	2%
31 - 40 years	59	19%
41 - 50 years	125	41%
51 - 60 years	69	22%
61 - 70 years	38	12%
71 years <	12	4%
Total	307	100%

Source: Data processing results, 2022

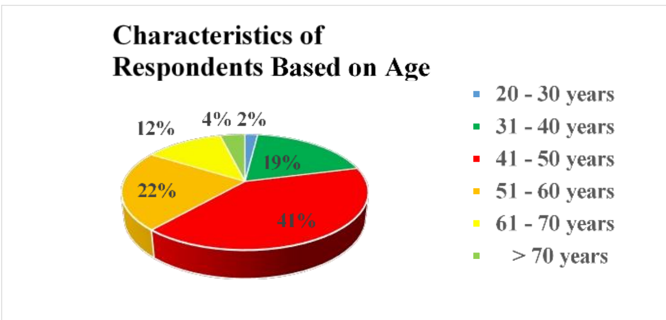

Figure 2 Composition of Respondent Characteristics Based on Age

Source: Data processing results, 2022

Table 13 and Figure 2 show the frequency of the highest to lowest age ranges are respondents 41 - 50 years 125 people (41%), 51 - 60 years 69 people (22%), 31 – 40 years 59 people (19%), 61 - 70 years 38 people (12%), more than 70 years 12 people (4%), 20 - 30 years 4 people (2%), the age of the youngest respondent was 28 years and the oldest was 76 years.

2) Characteristics of respondents based on gender

Table 14. Characteristics of Respondents Based on Gender

Gender	Frequency	Percentage
Male	293	95%
Female	14	5%
Total	307	100%

Source: Data processing results, 2022

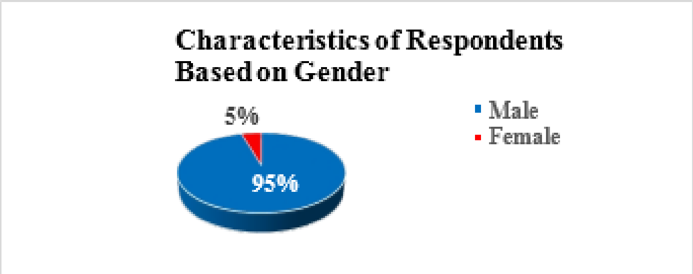

Figure 3. Composition of Respondent Characteristics Based on Gender
Source: Data processing results, 2022

Table 14 and figure 3 show 14 female respondents (5%), and 293 respondents male (95%).

3) Characteristics of respondents based on region

Table 15. Characteristics of Respondents Based on Region

Region	Frequency	Percentage
Belanti Siam Village	195	64%
Gadabung Village	112	36%
Total	307	100%

Source: Data processing results, 2022

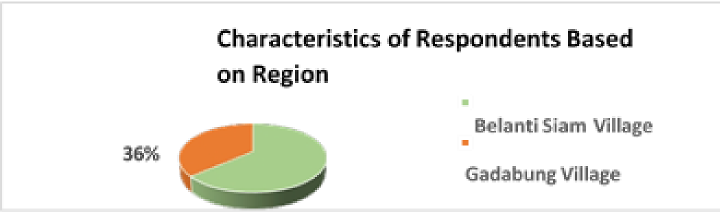

Figure 4. Composition of Respondent Characteristics by Region
Source: Data processing results, 2022

Table 15 and Figure 4 show the number of respondents in the Belanti Siam village area 195 respondents (64%) and in the Gadabung village area 112 respondents (36%).

4) Characteristics of respondents based on marital status

Table 16. Characteristics of Respondents Based on Marital Status

Marriage Status	Frequency	Percentage
Marry	272	88%
Not Married	17	6%
Widow	6	2%
Widower	12	4%
Total	307	100%

Source: Data processing results, 2022

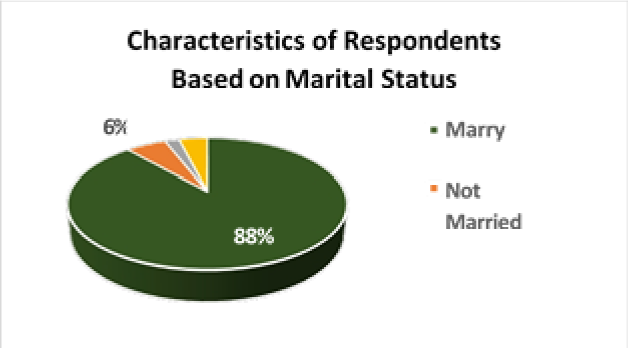

Figure 5. Composition of Respondent Characteristics Based on Marital Status
Source: Data processing results, 2022

Table 16 and Figure 5 show that 272 respondents (88%) were married, 17 were not married (6%), 12 were widowers (4%) and 6 were widows (2%).

5) Characteristics of respondents based on the number of family members

Table 17. Characteristics of Respondents Based on Number of Family Members

Number of Family Members	Frequency	Percentage
0 - 2 people	88	29%
3 - 5 people	211	69%
6 people <	8	2%
Total	307	100%

Source: Data processing results, 2022

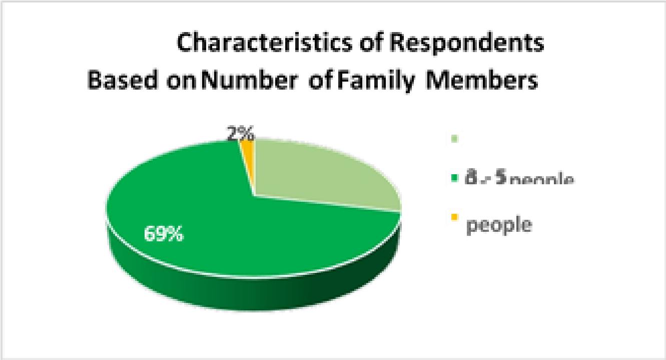

Figure 6. Composition of Respondent Characteristics Based on Number of Family Members
Source: Data processing results, 2022

Table 17 and Figure 6 show that respondents with 3 - 5 family members 211 respondents (69%), 0 - 2 people 88 respondents (29%) and more than 5 people 8 respondents (2%).

6) Characteristics of respondents based on education

Table 18. Characteristics of Respondents Based on Education

Education	Frequency	Percentage
Not graduated from elementary school	36	12%
SD	155	50%
SMP	70	23%
HIGH SCHOOL	43	14%
Higher Education	3	1%
Total	307	100%

Source: Data processing results, 2022

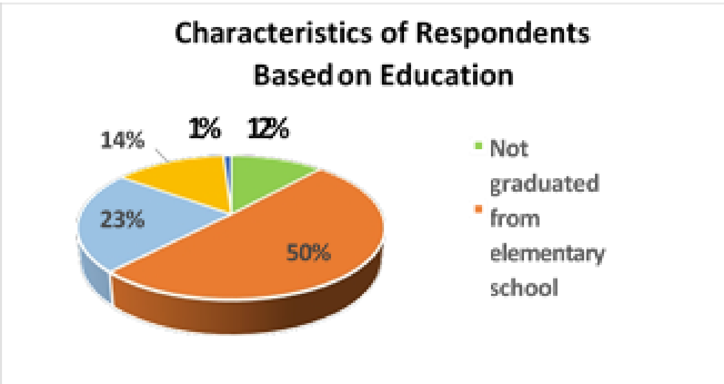

Figure 7. Composition of Respondent Characteristics Based on Education
Source: Data processing results, 2022

Table 18 and Figure 7 show that the highest to lowest frequency of education is elementary school 155 people (50%), junior high school 70 people (23%), high school 43 people (23%), did not finish elementary school. 36 people (12%), university 3 people (1%).

7) Characteristics of respondents based on length of farming

Table 19. Characteristics of Respondents Based on Length of Farming

Length of time farming	Frequency	Percentage
0 - 10 years	107	34%
11 - 20 years	123	40%
21 - 30 years	54	18%
31 - 40 years	21	7%
41 years <	2	1%
Total	307	100%

Source: Data processing results, 2022

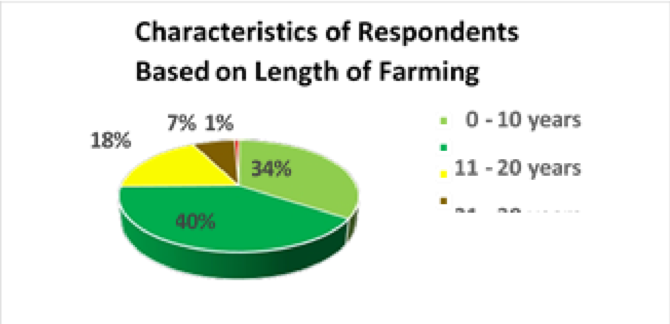

Figure 8. Composition of Respondent Characteristics Based on Length of Farming
Source: Data processing results, 2022

Table 19 and Figure 8 show the highest to lowest frequency of education is 11-20 years 123 people (40%), 0-10 years 107 people (34%), 21-30 years 54 people 18%), 31-40 years 21 people (7%), more than 40 years 2 people (1%). the latest respondent's farming duration is 3 years and the oldest is 50 years.

8) Characteristics of respondents based on land area

Table 20. Characteristics of Respondents Based on Land Area

Land Area	Frequency	Percentage
0 - 5.000 m^2	73	23%
5.001 - 10.000 m^2	159	52%
10.001 - 15.000 m2	30	10%
15.001 - 20.000 m2	19	6%
20.001 - 25.000 m2	12	4%
25.001 m2 <	14	5%
Total	307	100%

Source: Data processing results, 2022

Table 20 shows the frequency of the largest to smallest land area is 5,001 - 10,000 m2 159 people, 0 - 5,000 m2 73 people, 10,001 - 15,000 m2 30 people, 15,001 - 20,000 m2 19 14 people, more than 25,000 m2 and 20,001 - 25,000 m2 12 people. The smallest respondent's land area was 200 m2 and the largest was 58,780 m2.

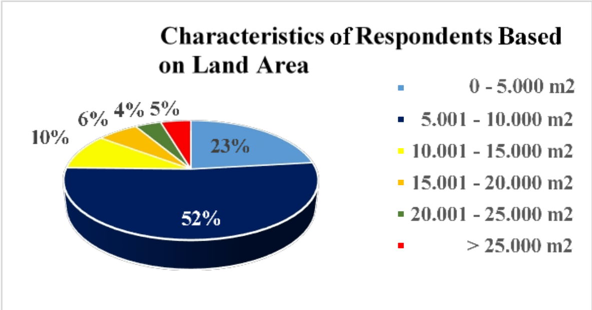

Figure 9. Composition of Respondent Characteristics Based on Land Area
Source: Data processing results, 2022

Figure 9 shows the composition of the land area range 5,001 - 10,000 m2 52%, 0 - 5,000 m2 23%, 10,001 - 15,000 m2 10%, 15,001 - 20,000 m2 6%, over 25,000 m2 5% and 20,001 - 25,000 m2 4%.

9) Characteristics of respondents based on land status

Table 21. Characteristics of Respondents Based on Land Status

Land Status	Frequency	Percentage
Owned	235	77%
Rent	72	23%
Total	307	100%

Source: Data processing results, 2022

Table 21 shows the number of respondents with land status owned by 235 people, and 72 people rented.

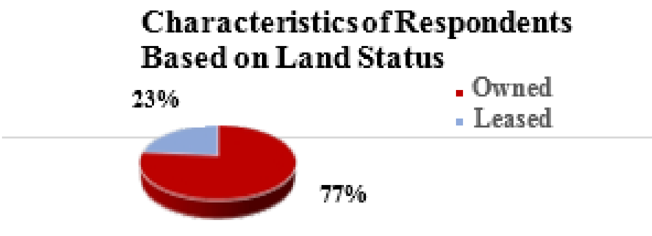

Figure 10. Composition of Respondent Characteristics Based on Land Status
Source: Data processing results, 2022

Figure 10 shows the composition of respondents with land status of 77% owned and 23% rented.

IPAIR Base Rate in Belanti II The form of farmers' participation in irrigation management is in the form of fees managed by the Water User Farmers Association (HIPPA) or Water User Farmers Association (P3A). If farmers' participation is accounted for as part of the Water Resources Management Service Fee (BJPSDA), it will be a deduction from government subsidies in the agricultural sector. The role of BJPSDA farmers in irrigation management in DI Rawa Belanti II Pulang Pisau Regency is currently realized in the form of Irrigation Services Fee (IPAIR) paid by farmers in HIPPA. The amount of IPAIR paid by farmers in DI Rawa Belanti II is currently only an agreement between farmers and HIPPA of Rp 24,000/ha or Rp 56/m3.

4.5. Ability To Pay

Ability To Pay (ATP) is the ability of farmers to pay the cost of irrigation water used in the form of IPAIR (Irrigation Water Service Fee) rates as follows:

$$ATP = \frac{I \text{ x } \%C}{D}$$

where:
ATP = Ability to Pay (IDR) I= Income (Rp)
%C = Percentage of revenue for BJPSDA irrigation (%)
D = Quantity of irrigation water utilized by farmers (m)3

The components of the ATP equation can be described as follows:

1) Income (I)

The questionnaire results showed that the lowest income per harvest was Rp1,500,000. While the highest income per harvest is Rp66,000,000. The average income of farmers per harvest is Rp14,162,150. The range of farmers' income per harvest along with the frequency and percentage is as follows:

Table 22. Income per harvest

Revenue (Rp)	Frequency	Percentage
1.000.000 - 10.000.000	109	35%
10.000.001 - 20.000.000	158	51%
20.000.001 - 30.000.000	17	6%
30.000.001 - 40.000.000	13	4%
40.000.001 - 50.000.000	2	1%
50.000.001 <	8	3%
Total	307	100%

Source: Data processing results, 2022

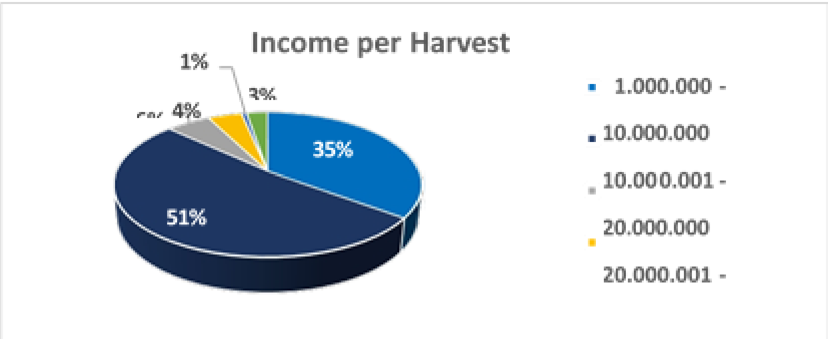

Figure 11. Income Composition of Each Harvest
Source: Data processing results, 2022

Table 22 and Figure 11 show the frequency of the highest to lowest income range is Rp10,000,001-Rp20,000,000 158 people (51%), Rp1,000,000- Rp10,000,000 109 people (35%), Rp20,000,001-Rp30,000,000 17 people (6%), Rp30,000,001-Rp40,000,000 13 people (4%), more than Rp50,000,000 8 people (3%), Rp40,000,001-Rp50,000,000 2 people (1%).

2) Expenditure on irrigation costs (C)

The questionnaire results obtained the lowest Irrigation Water Service Fee (IPAIR) tariff value per planting period is Rp1,500. The highest IPAIR tariff value per planting period is Rp66,000. Meanwhile, the average IPAIR tariff value per planting period is Rp14,162. The frequency and percentage are as follows:

Table 23. Irrigation Water Service Fee Tariff (IPAIR)

IPAIR Tariff (IDR)	Frequency	Percentage
0.000 - 10.000	109	36%
10.001 - 20.000	158	51%
20.001 - 30.000	17	6%
30.001 - 40.000	13	4%
40.001 <	10	3%
Total	307	100%

Source: Data processing results, 2022

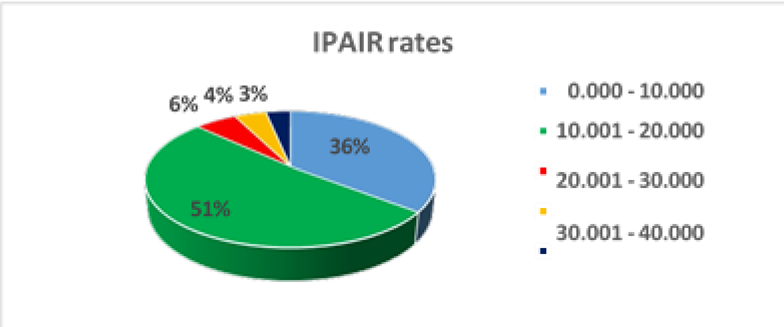

Figure 12. IPAIR Tariff Composition

Source: Data processing results, 2022

Table 23 and Figure 12 show that the highest to lowest frequency range of irrigation water service fee (IPAIR) is Rp10,001 - Rp20,000 158 people (51%), Rp0,000 - Rp10,000 109 people (36%), Rp20,001 - Rp30,000 17 people (6%), Rp30,001 - Rp40,000. 13 people (4%), more than Rp40,000 10 people (3%).

3) Total irrigation water discharge used (D)

Questionnaire results from 307 samples obtained the smallest irrigation water use per planting period of 275 m3. The largest irrigation water use per planting period was 610 m3. Then the average irrigation water use per planting period was 363 m3. The frequency and composition of the percentage of respondents using water for each planting period is as follows.

Table 24. Irrigation water use for each cropping period

Irrigation Water Use Each Planting Period (m)^3	Frequency	Percentage
0- 300	65	21%
301 - 600	240	78%
601 <	2	1%
Total	307	100%

Source: Data processing results, 2022

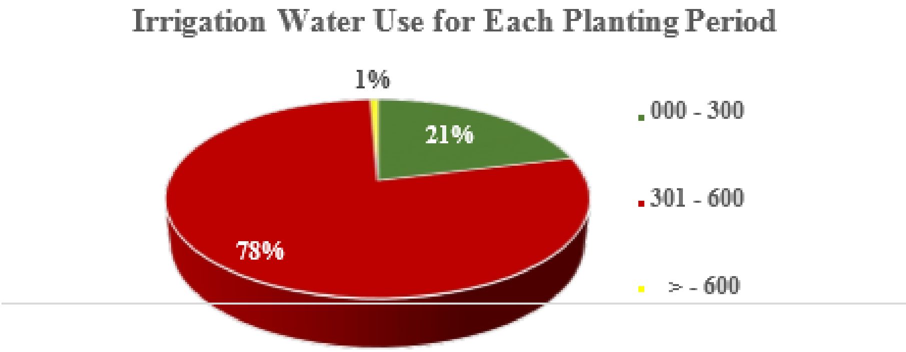

Figure 13. Irrigation Water Use for Each Planting Period
Source: Data processing results, 2022

Table 24 and Figure 13 show that the highest to lowest frequency of irrigation water use range for each cropping period is 301 - 600 m3 240 people (78%), 0 - 300 m3 65 people (21%), more than 600 m3 2 people (1%).

The calculation of individual ATP can be calculated using the equation: $ATP = \frac{I \times \%C}{D}$

An example of individual ATP calculation for the 1st respondent is:

$$ATP = \frac{I \times \%C}{D} = \frac{IDR\ 5{,}600{,}000 \times 0.1\%}{350\ m^3} = IDR\ 16/m^3$$

The calculation of the second respondent up to 307 can be done in the same way using the equation. Furthermore, the frequency distribution of ATP is as follows:

Table 25. Frequency Distribution of ATP

ATP (Rp/m)^3	Frequency	Percentage
1 - 20	90	29%
21 - 40	103	34%
41 - 60	83	27%
61 - 80	22	7%
81 <	9	3%
Total	307	100%

Source: Data processing results, 2022

Table 25 shows that respondents who were able to pay Irrigation Water Service Fees (IPAIR) of Rp1/m3 to Rp20/m3 were 90 people (29%), who were able to pay IPAIR Rp21/m3 to Rp40/m3 were 103 people (34%), 3383 people (27%), those able to pay IPAIR of Rp41/m3 to Rp60/m3 as many as 22 people (7%), and those able to pay IPAIR of more than Rp80/m3 as many as 9 people (3%).

Table 26. Frequency distribution of ATP percentage

Percentage	Average ATP	Frequency
10	110	1
20	100	1
30	86	7
40	73	13
50	62	14
60	50	54
70	39	77
80	30	47
90	17	74
100	10	19
	Total	307

Source: Data processing results, 2022

The results of table 26 can be described that 10% of respondents were able to pay Rp110.00/m3, 20% of respondents were able to pay Rp100.00/m3 , 30% of respondents were able to pay Rp86.24/m3 , 40% of respondents were able to pay Rp73.11/m3 , 50% of respondents were able to pay Rp62,14/m3 , 60% respondents were able to pay Rp49.77/m3 , 70% respondents were able to pay Rp39.04/m3 , 80% respondents were able to pay Rp29.68/m3 , 90% respondents were able to pay Rp17.27/m3 , 100% respondents were able to pay Rp10.36/m3.

4.6. Willingness To Pay (WTP)

Willingness To Pay (WTP) is the user's willingness to pay a certain amount for the use of services used. The WTP approach to the cost of irrigation water resources management services was carried out on the basis of irrigation water users' perceptions of the cost of irrigation water resources management services through a questionnaire distribution survey as follows:

Table 27. Recapitulation of Respondents' WTP Questionnaire Answers

No.	Question Item	Answer		Total (Respondents)
		Yes (Respondent)	No (Respondents)	
1	Do you know the obligation of irrigation water fees?	98	209	307
2	Do you always pay irrigation water fees?	73	234	307
3	Are irrigation water needs obtained purely from the irrigation system alone (without using a pump system)?	96	211	307
4	Is the need for water on your land always met?	187	120	307

5	If the water needs of the land have not been met, then is there any form of follow-up from the irrigation manager?	231	76	307
6	Are you willing to pay the increased irrigation fees?	75	232	307
7	Has the irrigation fee paid so far been commensurate with the service?	161	146	307

Source: Data processing results, 2022

Table 27 shows that:

a. There are 98 farmer respondents who are aware of irrigation fees
b. There are 73 respondents who have paid irrigation fees, meaning that there is still an information gap to farmers about the importance of discipline in paying irrigation fees to HIPPA.
c. There were 211 farmer respondents who used the pump system in meeting irrigation water needs so far. So more than 50% of farmer respondents have to spend more money and energy to irrigate their fields.

The WTP calculation for the first respondent is:

WTP = existing tariff + maximum increase willing to pay
= IDR 5,600 + (0% x IDR 5,600)
= IDR 5600

WTP per water use = WTP/number of waters uses
= IDR 5,600/350 m3
= Rp 16/m3

The WTP value obtained for the first respondent is IDR 16/m3. Similar steps were taken to calculate the WTP value for the second respondent up to 307.

Table 28. Frequency distribution of WTP

WTP (Rp/m^3)	Frequency	Percentage
1 - 20	76	25%
21 - 40	102	33%
41 - 60	96	31%
61 - 80	23	7%
81 <	10	3%
Total	307	100%

Source: Data processing results, 2022

Table 28 shows that respondents who are willing to pay Irrigation Water Service Fee (IPAIR) of Rp 1/m3 to Rp20/m3 are 76 people (25%), who are willing to pay IPAIR Rp21/m3 to Rp40/m3 are 102 people (33%), who are willing to pay IPAIR Rp41/m3 to Rp60/m3 as many as 96 people (31%), who are willing to pay IPAIR Rp61/m3 to Rp80/m3 as many as 23 people (7%), and who are willing to pay IPAIR more than Rp80/m3 as many as 10 people (3%).

Table 29. Frequency distribution of WTP percentage

Percentage	Average WTP	Frequency
10	110	1
20	100	1
30	85	9
40	73	13
50	61	17
60	51	55
70	40	79
80	30	40
90	18	75
100	10	17
	Total	307

Source: Data processing results, 2022

The results of table 29 can be described that 10% of respondents are willing to pay Rp110.00/m3 , 20% of respondents are able to pay Rp100.00/m3 , 30% of respondents are willing to pay Rp86.24/m3 , 40% of respondents are willing to pay Rp84.91/m3 , 50% of respondents are willing to pay Rp60.95/m3 , 60% of respondents willing to pay Rp50.52/m3 , 70% of respondents willing to pay Rp39.52/m3 , 80% of respondents willing to pay Rp29.77/m3 , 90% of respondents willing to pay Rp17.55/m3 , 100% of respondents willing to pay Rp10.44/m3.

4.7. Comparative Analysis of ATP and WTP Values

A comparison of ATP and WTP values can be seen in the following:

Table 30. ATP and WTP values at Rawa Belanti II

Percentage of Respondents Who Having ATP and WTP (%)	ATP (Rp/m)^3	WTP (Rp/m)^3
10	110	110
20	100	100
30	86	85
40	73	73
50	62	61
60	50	51
70	39	40
80	30	30
90	17	18
100	10	10

Source: Data processing results, 2022

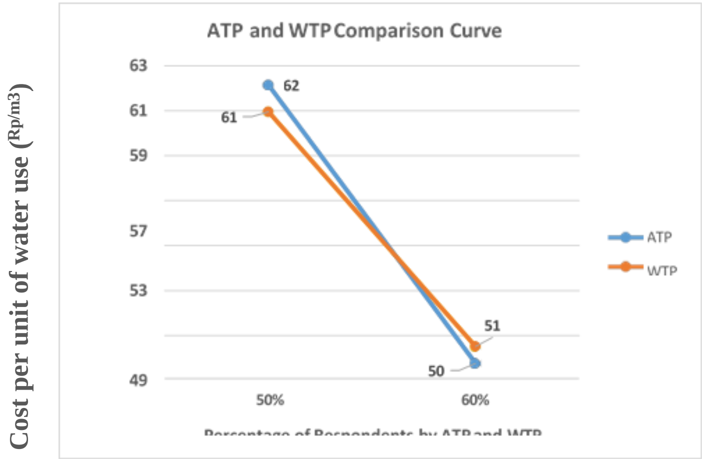

Figure 14. ATP and WTP Value Curves of Belanti Swamp II
Source: Data processing results, 2022

Table 30 and Figure 14 can be analyzed as follows:

1. The ATP value is greater than the WTP value when the ATP value is Rp62/m3 and WTP is Rp61/m3. This means that the ability of users (farmers in Rawa Belanti II) t o pay is greater than the desire to pay for the services concerned.
2. The ATP value is smaller than the WTP value when the ATP value is Rp 50/m3 and WTP is Rp 51/m3. The condition of the ATP value that is smaller than the WTP value illustrates the user's desire to pay irrigation tariffs is greater than his ability to pay. Usually occurs when the utility of the service is relatively very high than the income of service users tends to be low.
3. ATP value is equal to WTP value
   The ATP value is equal to the WTP value when Rp 54/m3 . This condition illustrates the ability and desire of farmers to pay irrigation tariffs are the same because there is a balance of user utility with the costs sacrificed to pay for irrigation services There are four basic guidelines that can be used in setting tariffs (Tamin et al, 1999), namely:
   1) In setting the tariff, it is recommended not to exceed the ATP value
   2) If the proposed tariff is between the ATP and WTP values, it can be accompanied by improvements in the level of service.
   3) If the proposed tariff is below the tariff calculation and above the ATP then the difference can be used as a subsidy burden that must be borne by the regulator (government).
   4) If the tariff is below ATP and WTP, there is flexibility in setting the new tariff value. This difference can be used to cross-subsidize other vehicles whose tariff calculations exceed the ATP value.

Based on the guidelines of Tamin et al (1999) then in setting the tariff is recommended not to exceed the value of ATP. So that the basic IPAIR tariff that can be set at DI Rawa Belanti II is Rp 54/m3.

5. CONCLUSION

5.1. Conclusion

Based on the research objectives and the results of the analysis and discussion, it can be concluded as follows:

1. The cost of water resources management services (BJPSDA) for irrigation in Belanti II in Pulang Pisau Regency is Rp 5,625,504,000. The value of agricultural economic benefits in Belanti II is Rp 51,468,721,052.40 or 51.86% of the total value of economic benefits (NME). The cost of irrigation water resources management services in Belanti II amounted to Rp 570,151.69/Ha or Rp 101/m3.
2. Ability To Pay (ATP) and Willingness to Pay (WTP) of farmers in making payments for irrigation Water Resources Management Service Fees (BJPSDA) are:
   a. The ability of farmers in Rawa Belanti II to pay irrigation tariffs is greater than the desire to pay for services, when the ATP value is Rp 62/m3 and WTP is Rp 61/m3.
   b. Farmers' willingness to pay irrigation tariffs is greater than their ability to pay, when the utility of the service is relatively very high compared to the income of service users, which tends to be low when the ATP value is IDR 50/m3 and WTP is IDR 51/m.3
   c. The ability and willingness of farmers to pay irrigation tariffs are equal, because there is a balance of user utility with the costs sacrificed to pay for irrigation services, when the ATP and WTP values are Rp 54/m3.
3. DI Belanti II has one primary channel and several secondary channels with an open irrigation system, there is no water structure that regulates the flow direction. Efforts have been made to optimize water management, including channel normalization, additional collector channels and water control buildings. Channel normalization is done to increase leaching ability. The leaching process in the Belanti II irrigation area of 3,976 ha requires 500 m3 /ha/day of fresh water, equivalent to 1,988,000 m3 /day. A weir structure on the secondary canal regulates supply at high tide and a flap gate at the end of the secondary canal regulates water flow to the collector canal at low tide.

5.2. Suggestion

Suggestions that can be given are:

1. Guidelines for calculating the value of agricultural economic benefits (NME) in this study are only the main agricultural commodities of Central Kalimantan province, namely rice, if there is further research to calculate BJPSDA irrigation can be analyzed in other agricultural commodity sectors.
2. The calculation and analysis of the comparison of ATP and WTP and BJPSDA irrigation can be used as a consideration by the manager of DIR Belanti II Pulang Pisau Regency in issuing policies on the issue of determining BJPSDA irrigation

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