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PADDY FARMING MT-III, IP 400 PROGRAM IN WERU DISTRICT, SUKOHARJO REGENCY

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Abstract
The increase in national rice production is highly necessary in line with the growing population. One of the programs aimed at increasing national rice production is the IP 400 program. This study aims to determine the amount of cost, revenue, income, and profit of rice farming under the IP 400 program, as well as to assess the feasibility of rice farming during the third planting season (MT-III) of the IP 400 program in Weru District, Sukoharjo Regency. The basic method used in the research is descriptive. The research location was determined purposively. The samples were selected using proportional random sampling. The data analysis methods used include. (1) farming cost analysis (2) farming revenue analysis (3) farming income analysis (4) farming profit analysis, (5) R/C ratio analysis, (6) B/C ratio analysis. This study shows that the average total cost of rice farming in the MT-III season of the IP 400 program is IDR 11,841,180/ha/season, with an average revenue of IDR 30,212,459/ha/season. Thus, the average income obtained is IDR 20,605,461/ha/season, and the average profit is IDR 18,371,279/ha/season. Based on the feasibility analysis, the R/C ratio value is 2.55 and the B/C ratio is 1.55. This indicates that rice farming in the MT-III season of the IP 400 Program in Weru District is profitable and feasible. IP 400 rice farming generates substantial earnings (R/C = 2.55; B/C = 1.55), which significantly increases farmer income. With this rise in income, farming households' economic resilience improves, so directly contributing to poverty reduction in rural areas. As a result, the government should focus on adopting policies that are suited for places with potential for lowland rice growing.

Keywords: Feasibility, Income, No Poverty, Profit, Rice Farming

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INTRODUCTION

One of the most widely cultivated food crop commodities in Indonesia is lowland rice (*Oryza sativa*). National rice production in 2020 was recorded at 54,649,202.24 tons (Badan Pusat Statistik, 2021). According to (Widowati, 2011) rice is one of the four main staple foods in Indonesia, along with cassava, sweet potatoes, and maize. Nearly half of the world's population relies on rice as their primary food source (Lim et al., 2012) This indicates that rice plays a significant role in a country's food security (Kumar et al., 2018) BPS data shows that in 2021, rice consumption in Indonesia reached 81.8 kg per capita per year. This figure does not yet include the increasing population, which continues to grow annually. According to BPS, the population growth rate in 2021 was 1.22%, with a total population reaching 272 million people, indicating that the demand for rice will continue to increase every year.

Population growth presents challenges not only in food supply but also in housing, potentially leading to the conversion of productive land and reducing land availability. According to (Febriaty, 2016)the impact of land-use conversion on food issues is permanent and affects national rice production. Rice as a commodity is consistently associated with various challenges, and therefore requires greater attention to prevent it from becoming a trigger for a food crisis in Indonesia.

One of the efforts made by the government to meet rice demand in Indonesia has been importing rice from other countries. According to BPS (2021), Indonesia imported 407,741.4 tons of rice to increase the domestic rice stock. In addressing the food crisis, the government has also implemented several programs, one of which aims to increase national rice production in pursuit of food self-sufficiency. This rice production enhancement initiative is a program by the Ministry of Agriculture known as the IP 400 program.

The concept of the IP 400 program is to plant rice in irrigated paddy fields that have year- round water supply, allowing for four harvests in one year using highly early-maturing rice varieties (Supriatna, 2012). Sukoharjo Regency is one of the regions in Central Java Province that participated in the IP 400 Program in 2021, with a proposed land area of 1,642 hectares. The largest proposed area was in Weru District, totaling 652 hectares (according to data from the Agriculture and Fisheries Office of Sukoharjo Regency).

The IP 400 Program is a rice cultivation program in which rice is planted and harvested four times a year, and it has been adopted by farmers in Sukoharjo Regency. This indicates that farmers also plant rice during the dry months of the dry season, which are typically left fallow or used to grow secondary crops. The analysis of rice farming was conducted during the dry months, which fall under the third planting season of the IP 400 Program. This program was only launched in 2021 and thus requires further monitoring and evaluation to determine whether it can achieve its goal of increasing national production.

Based on this background, an analysis of rice farming during the third planting season of the IP 400 program in Weru District, Sukoharjo Regency is necessary. Based on the aforementioned background, this study aims to: (1) Determine the amount of cost, revenue, income, and profit from rice farming during the third planting season (MT-III) of the IP 400 program in Weru District, Sukoharjo Regency; (2) Assess the feasibility of rice farming during the third planting season (MT- III) of the IP 400 program in Weru District, Sukoharjo Regency.

RESEARCH METHODS

This research was conducted in Weru District, Sukoharjo Regency, which is one of the areas involved in the 400 Rice Cropping Index (IP Padi 400) Program and has the largest land area among other districts in Sukoharjo Regency. The selected villages are located in three areas: Tegalsari, Karakan, and Karangtengah, which are villages with land included in the IP Padi 400 program. The research was carried out from April to June 2022.

The number of samples used was 44 farmers, based on (Singarimbun & Effendi, 2006)and (Morrisan, 2015) where a sample size equal to or greater than 30 is considered to follow a normal distribution and a sample size of more than 30 tends to yield more consistent results. The number of samples in each village was determined through proportional random sampling (Aletasari Safitri & Mukhidin, 2018) while the samples were selected purposively, namely farmers who participated in the IP 400 program and were land-owning cultivators in Weru District.

The data analysis methods used include cost analysis, revenue, income, profit, and feasibility analysis.

Cost Analysis

The cost analysis concept used is explicit and implicit costs (Hoetoro, 2018) The formula used is :

$$\mathbf{TC = Ce + Ci}$$

TC = Total Cost (IDR)
Ce = Explicit Cost IDR)
Ci = Implicit Cost (IDR)

Revenue Analysis

Revenue is the result of the production of a farming enterprise. The revenue calculated includes the value of the production, whether it is sold or not (Afiza & Pranoto, 2017) The following is the formula for farm revenue:

$$\mathbf{TR = P \times Q}$$

Where:
TR = Total Revenue (IDR/Ha/Planting Season)
P = Selling price of farm production (IDR/Kg)
Q = Quantity of farm production (Kg/Planting Season)

Income Analysis

Income is the difference between the farmer's revenue and the costs actually incurred by the farmer during one planting season (Bakari, 2019). Income can be calculated using the following formula:

$$\mathbf{I = TR - Ce}$$

Where:
I = Income of farm (IDR)
TR = Total Revenue (IDR)
Ce = Explicit Cost (IDR)

Profit Analysis

Profit is the total revenue earned by farmers minus the total costs incurred during one planting season. Farm profit can be calculated using the following formula ('Aini, 2015):

$$\mathbf{\pi = TR - TC}$$
$$\mathbf{\pi = TR - (Ce + Ci)}$$

Where:
π = Farm Profit (IDR)
TR = Total Revenue (IDR)
TC = Total Cost (IDR)
Ce = Explicit Cost (IDR)
Ci = Implisit Cost (IDR)

Feasibility Analysis

Farm feasibility analysis is a method used to determine whether the farming activity carried out by the farmer is profitable and feasible or not (Putra et al., 2017) The R/C ratio compares farm revenue with total farming costs and can be calculated using the following formula:

$$\mathbf{R/C}\ \boldsymbol{ratio} = \frac{TR}{TC}$$

Where:
TR = Total Revenue (IDR)
TC = Total Cost (IDR)

The criteria for the ratio results are as follows:
- R/C > 1, It means the farming is efficient or profitable.
- R/C < 1, It means the farming is inefficient or is unprofitable.
- R/C = 0, It means the farming reaches the Break-Even Point (BEP).

Meanwhile, for the B/C ratio analysis, the formula used is as follows::

$$\mathbf{B/C}\ \boldsymbol{ratio} = \frac{\boldsymbol{\pi}}{\boldsymbol{TC}}$$

Where:

π = Profit of paddy field farming (IDR)
TC = Total cost of paddy field farming (IDR)

The criteria for the ratio results are as follows:
- B/C > 1, it means the farming business is feasible to continue.
- B/C < 1, it means the farming business is unfeasible or is at a loss.

RESULTS AND DISCUSSION

General Overview of The Research Area

Weru Subdistrict is a part of the subdistricts located in Sukoharjo Regency, situated in the southernmost part with an area of 41.98 km² or approximately 8.99% of the total area of Sukoharjo Regency. Administratively, Weru Subdistrict is divided into 13 villages and contains 48 hamlets, which include 137 RW (community units) and 397 RT (neighborhood units). The boundaries of Weru Subdistrict are as follows:

1) North : Tawangsari Subdistrict
2) East : Manyaran Subdistrict, Boyolali Regency
3) West : Cawas Subdistrict, Klaten Regency
4) South : Semin Subdistrict, Daerah Istimewa Yogyakarta

In 2020, Weru Subdistrict experienced 130 rainy days with an average annual rainfall of 17 mm. This climatic condition significantly affects agricultural production, as changes in temperature and humidity can influence the growth and development of plant pests and diseases (Nuraisah et al., 2019)

The area of rice fields in Weru Subdistrict constitutes 47.38% of the total land use in the subdistrict. The area of technically irrigated rice fields is 1,082 hectares, which is more than half of the total rice field area. In 2019, three main commodities were produced in Weru Subdistrict: rice, corn, and soybeans. The commodity with the highest production was rice, amounting to 26,364 tons, followed by soybeans with a production volume of 628 tons, and corn with only 485 tons.

Respondents Characteristics

The characteristics of farmers in this study include age, level of education, number of family members actively involved in farming, experience in rice farming, and the area of land cultivated.

Table 1. Characteristics of IP 400 Respondents in Weru Subdistrict, Sukoharjo Regency, 2022

No.	Description	Explanation
1.	Number of Sample Farmers (people)	40
2.	Average Age of Farmers (years)	58
	a. 15–64 years (people)	29
	b. > 64 years (people)	11
3.	Average Years of Farmer Education	8
	a. No Schooling (people)	0
	b. Elementary School (people)	21

	c. Junior High School (people)	11
	d. Senior High School (people)	6
	e. Higher Education (people)	2
4.	Average Number of Family Members per Farmer	3
5.	Average Number of Family Members Active in Farming (People)	1
6.	Average Years of Rice Farming Experience (Years)	7,5
7.	Average Cultivated Land Area (Hectares)	0,38

Source: Primary Data Analysis, 2022

A total of 40 farmers were selected as research samples. Table 13 shows that the average age of the sample farmers is 58 years. This indicates that farmers in Weru Subdistrict are still within the productive age range. According to (Prasetya & Putro, 2019) a person's age affects labor productivity and can also determine success in performing a job. Good physical condition and mental well-being will influence the success of the IP 400 program in Weru Subdistrict.

The average level of formal education among rice farmers participating in the IP 400 program in Weru Subdistrict is eight years. Most farmers in Weru have completed only elementary or junior high school, with only a few having reached high school or higher education levels. According to (Thamrin et al., 2012) the level of education affects farmers' mindsets and their ability to understand and absorb technological developments or innovations, especially in rice farming. Farmers' thought processes, shaped by their formal education, influence their decision-making when facing problems in their farming activities. The low level of education among farmers in Weru can create difficulties in understanding information and innovations provided by agricultural extension agents. Therefore, appropriate communication methods are necessary to ensure the information is absorbed and accepted by the farmers.

The average number of family members in a rice farming household in Weru is three, but only one family member typically participates in farming activities. Most active participants in farming are the heads of households or husbands, although some respondents involve their wives as well. According to (H.M et al., 2022) the involvement of the farmer's wife is seen as helpful in performing tasks that do not require complex technical skills and are not physically demanding. The limited number of family laborers leads farmers to hire external labor, which increases labor costs and affects their overall income.

Farmers in Weru have an average of 7.5 years of experience in rice farming, which is considered relatively long. This experience is usually passed down from parents or inherited through generations. According to (Oktavia, 2021) experience is essential for farmers in solving problems in the field and indirectly contributes positively to improving production and profits. The role of agricultural extension agents in Weru is also crucial in enhancing farmers' skills, particularly in disseminating technological advancements and new agricultural information, especially related to rice commodities. The intensity of extension support in Weru has been increased, especially since the IP 400 program has only been implemented for one year.

On average, IP 400 rice farming in Weru is carried out on a land area of 0.38 hectares. The land used must meet certain requirements, such as being served by technical irrigation, not being prone to pests and diseases, and having previously achieved IP 300 (three rice harvests per year). The land is generally owned by the farmers themselves, usually inherited from their parents, and has been used for farming for many years. Land, as a production factor, has a significant impact on farming activities.

According to (Daini et al., 2020) the larger the land area, the higher the production yield, which in turn can maximize income.

Analysis of Rice Farming Costs in the Third Planting Season (MT-III) of the IP 400 Program

Farming costs are a crucial aspect of agricultural economics at both the micro and macro levels (Agarwal PK et al., 2018). The rice farming costs for the third planting season (MT-III) under the IP 400 program in Weru Subdistrict include both implicit and explicit costs. Explicit costs are the actual expenses incurred by farmers. These include external labor, production inputs, and miscellaneous costs. Table 2 presents the average cost data for rice farming in the MT-III season of the IP 400 program in Weru Subdistrict

Table 2. Average Rice Farming Costs for the Third Planting Season (MT III) of the IP 400 Program in Weru Subdistrict (Rp), 2022

No	Cost Type	IDR/0,38ha	IDR/ha	%
1	Implicit Costs	690.250	1.810.492	15,3
	a. Family Labor Cost	121.188	317.869	2,7
	b. Internal input cost	40.345	105.823	0,9
	c. Equipment Depreciation	690.250	1.810.492	15,3
	Average Total Implicit Cost	851.783	2.234.184	18,9
2	**Explicit Cost**			
	a. Hired Labor Cost	1.984.250	5.204.590	44,0
	b. External input Cost	1.264.375	3.316.393	28,0
	c. Miscellaneous Costs	414.043	1.086.013	9,1
	a. Hired Labor Cost	1.984.250	5.204.590	44,0
	Average Total Explicit Cost	3.662.668	9.606.997	81,1
	Total Farming Cost	4.514.450	11.841.180	100

Source: Primary Data Analysis, 2022

Based on Table 2 regarding the average rice farming costs of the IP 400 program in the third planting season, it can be seen that the average total cost of rice farming under the IP 400 program in Weru Subdistrict is Rp 11,841,180 per hectare. The proportion of farmers' expenditures in Weru is heavily skewed toward explicit costs, which account for 81.1%, compared to implicit costs, which make up only 18.9%.

This is due to farmers using several production inputs, such as fertilizers and seeds, in quantities exceeding the recommendations provided by extension officers or relevant agencies. Farmers believe that increasing the use of production inputs will lead to higher yields. Additionally, the use of hired labor during several cultivation stages contributes to the rise in explicit costs. The limited availability of agricultural machinery and equipment is also a factor behind the increased need for hired labor.

Although the cost of renting machines for cultivation stages in Weru is cheaper than hiring human labor, due to limited availability, many farmers end up waiting in line or resort to using human labor to stay on schedule for the next cultivation stage. The largest contributor to explicit costs is hired labor, accounting for 44% of the total. According to (Syekh, 2013) the high proportion of hired labor costs is due to the difficulty in finding agricultural labor, which drives up wages in the area.

Analysis of Rice Farming Revenue for the Third Planting Season (MT-III) of the IP 400 Program

Revenue from rice farming under the IP 400 program in Weru Subdistrict during the third planting season is obtained by multiplying rice production (in kg) by its selling price (in Rp). Table 3 contains information on rice farming revenue in the third planting season based on average production and the average price applied.

Table 3. Average Production, Price, and Revenue of Rice Farming in the Third Planting Season (MT III) of the IP 400 Program in Weru Subdistrict, 2022

No.	Description	Per 0,38 ha	Per Hectare
1.	Production (kg) (GKP)	2.707,5	7.101,6
2.	Price (IDR)	4.255	4.255
3.	Revenue (IDR) (1x2)	11.518.500	30.212.459

Source: Primary Data Analysis, 2022

The average harvest yield obtained by rice farmers participating in the IP 400 program in Weru Subdistrict during the third planting season is 7.1 tons per hectare. This figure exceeds the yield data from sample harvesting (ubinan) conducted by the Sukoharjo Regency Department of Agriculture and Fisheries in 2020, which was 6.84 tons per hectare. The higher production compared to the department's sample harvest results is due to the effective use of inputs by the farmers.

The harvested crop sold consists of dry unhusked rice (GKP) with an average price in Weru Subdistrict of Rp 4,255 per kilogram. The revenue received by rice farmers in the third planting season is on average Rp 30,212,459 per hectare. Farmers usually sell their harvest directly to middlemen or to rice mills located within Weru Subdistrict, with prices ranging from Rp 4,000 to Rp 4,300 per kilogram.

Analysis of Income and Profit from Rice Farming in the Third Planting Season (MT- III) of the IP 400 Program

Income is calculated by subtracting actual costs incurred from the total revenue, while profit is obtained by subtracting both explicit and implicit costs from total revenue. The average income and profit from rice farming in the MT-III season of the IP 400 program in Weru Subdistrict can be seen in the following table.

Table 4. Average Income and Profit of Rice Farming in the Third Planting Season (MT III) of the IP 400 Program in Weru Subdistrict, 2022

No	Description	Per 0,38 ha	Per Hectare
1.	Revenue (IDR)	11.518.500	30.212.459
2.	Explicit Cost (IDR)	3.662.668	9.606.997
3.	Implicit Cost (IDR)	851.783	2.234.184
4.	Income (Rp) (1-2)	7.855.833	20.605.462
5.	Profit (Rp) (1-2-3)	7.004.050	18.371.279

Source: Primary Data Analysis, 2022

Based on Table 4, it can be seen that farmers in Weru Subdistrict earn an average income of Rp 20,605,462 per hectare. Meanwhile, the profit obtained by rice farmers participating in the IP 400 program during the third planting season is on average Rp 18,371,279 per hectare. According to research conducted by (Erythrina, 2010) by comparing rice farming that still follows the IP 300 method, the profit from IP 400 rice farming is higher and can increase rice stock. The IP 400 program causes farmers to cumulatively receive more income compared to farming before the program existed. Farmers can generate income more quickly because the farming cycle is accelerated through the IP 400 program.

Feasibility Analysis of Rice Farming in the Third Planting Season (MT-III) of the IP 400 Program

The feasibility analysis used includes the R/C Ratio and B/C Ratio. Table 5 provides information on the values of the R/C Ratio and B/C Ratio for rice farming in the MT III season of the IP 400 program in Weru Subdistrict..

Table 5. R/C Ratio and B/C Ratio Values for Rice Farming in the Third Planting Season (MT III) of the IP 400 Program in Weru Subdistrict, 2022

No.	Description	Per 0,38 ha	Per Hectare
1.	Revenue (IDR)	11.518.500	30.212.459
2.	Total Costs (IDR)	4.514.450	11.841.180
3.	Profit (IDR)	7.004.050	18.371.279
4.	R/C *Ratio* (1:2)		2,55
5.	B/C *Ratio* (3:2)		1,55

Source: Primary Data Analysis, 2022

Based on the feasibility calculations using R/C and B/C ratio analysis, the values obtained were 2.55 for R/C and 1.55 for B/C in the MT III rice farming of the IP 400 program in Weru Subdistrict. The R/C and B/C ratio calculations used the average revenue, profit, and total farming costs. An R/C value greater than 1 means that the MT III rice farming under the IP 400 program in Weru is profitable. Farmers will earn Rp. 2.55 in revenue for every Rp. 1 spent. The B/C ratio value of 1.55, which is also greater than 1, indicates that the rice farming under the IP 400 program in Weru is feasible to continue in the following planting seasons. According to research by (Tresliyana& Erythrina, 2012) both IP 300 and IP 400 rice farming are feasible, although R/C ratio values vary each planting season, the total R/C value for IP 400 farming is higher.

Program Implementation

The IP 400 program in Sukoharjo Regency began in 2021, aiming for planting and harvesting rice four times in one year. The program was initially designed and researched from 2008 to 2014, starting with the adjustment of planting patterns and assembly of ultra-early rice varieties (less than 85 days). Between 2009 and 2010, field trials and socialization were conducted. Three models were tested during trials: the first model used 90-day rice twice per season followed by 75-day rice, estimating 24 tons/ha/year; the second model planted 90-day rice in the first season then 75-day rice with about 22 tons/ha/year; the third model used only 75-day rice estimating 20 tons/ha/year. From 2011 onward, the program focused on development, evaluation, and consolidation.

The first-year implementation of IP 400 in Weru was fairly good. Seedlings were prepared off-field collectively with farmer groups or independently using "dapog" or "culikan" systems, and organic inputs were used to maintain soil stability. However, the program did not achieve the goal of four harvests per year in 2021 due to several technical and non-technical obstacles. Technical constraints included (1) poor-quality seed assistance, (2) limited availability of super early rice seeds in Weru, (3) reduction in subsidized fertilizers, (4) irrigation repairs at Gajah Mungkur Reservoir in Wonogiri causing delayed water supply, and (5) limited agricultural machinery such as tractors and combine harvesters forcing farmers to wait or replace machines with manual labor to keep up with planting schedules. Non-technical problems included rat and leafhopper pest attacks and flooding in Tegalsari Village which submerged seedling fields causing damage and forcing reseeding. These issues disrupted the planned cultivation timeline and prevented achieving four harvests per year.

Super early varieties depended heavily on assistance because seed sellers and rice seed breeders in Weru are still limited for this relatively new variety. The IP 400 program causes continuous rice planting every season throughout the year, naturally providing food sources and habitats for pests since there is no fallow or crop rotation. Water requirements also increase compared to previous seasons. Based on the above, special efforts are needed to address problems that may hinder program progress (Gunawan et al. 2024; Tika et al.)

Ongoing evaluation and improvements are conducted by relevant government agencies such as the Sukoharjo Regency Agriculture and Fisheries Office and Weru Agricultural Extension Center to ensure that IP 400 program goals—achieving a fourth harvest in a year—are met in subsequent years. In the second year, the program's cultivated area in Weru increased from 652 ha to 909 ha. Additional efforts include involving the regent, subdistrict head, and village heads at various levels to support the success of the rice planting index improvement program. Village funds and empowerment of military and police community officers (Babinsa and Bhabinkamtibmas) also contribute to supporting IP 400 (Kurniawati et al. 2025)

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IP 400 rice farming generates substantial earnings (R/C = 2.55; B/C = 1.55), which significantly increases farmer income. With this rise in income, farming households' economic resilience improves, so directly contributing to poverty (SDG's 1) reduction in rural areas. As a result, the government should focus on adopting policies that are suited for places with potential for lowland rice growing.

This indicates that rice farming in the MT-III season of the IP 400 Program in Weru District is profitable and feasible. IP 400 rice farming generates substantial earnings (R/C = 2.55; B/C = 1.55), which significantly increases farmer income. With this rise in income, farming households' economic resilience improves, so directly contributing to poverty reduction in rural areas. As a result, the government should focus on adopting policies that are suited for places with potential for lowland rice growing.

CONCLUSION

Based on the research results, it can be concluded that: (1) The average cost for MT III rice farming under the IP 400 program in Weru is Rp. 11,841,180/ha/season, consisting of implicit and explicit costs. The average revenue is Rp. 30,212,459/ha/season. Farmers earn an average income of Rp. 20,605,462/ha/season, with an average profit of Rp. 18,371,279/ha/season in the third planting season. The profit is relatively high and can cover daily family needs. (2) Feasibility analysis using R/C and B/C ratios shows R/C = 2.55 and B/C = 1.55, both greater than one. This indicates that MT III rice farming under the IP 400 program in Weru is profitable and feasible to continue in subsequent planting seasons

Based on the research, the following recommendations are made: (1) Farmers should keep records or start simple bookkeeping for every transaction, expense, production, and sales in farming, to monitor expenses and help plan future farming seasons (2) Farmers should follow input usage recommendations from local extension agents directly or via manuals to make input use and farming costs more effective and efficient (3) The government should understand and prepare for factors affecting IP 400 implementation such as availability of agricultural inputs, machinery, and disaster mitigation in Weru. Increasing tractors and combine harvesters, providing super early

seeds by collaborating with seed centers and breeders, increasing subsidized fertilizers in the market, and strategies for flood and pest control—such as breeding natural enemies and planting pest-repellent plants around fields—will optimize the IP 400 program in Weru.

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