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Comparative Analysis of Rice Farming Income of Cibatu 06 and Cibatu 05 in Gampong Meucat Pangwa, Trienggadeng Sub-District, Pidie Jaya Regency

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A B S T R A C T

Rice is Indonesia's staple food, consumed by 90.3% of households (Kementan, 2022). However, land conversion and climate change pose threats to productivity. High-yielding varieties, such as Cibatu 06 and Cibatu 05 (yielding 6-8 tons/ha and resistant to pests), were developed to increase output (BBPadi, 2021). This study compares their financial feasibility in Gampong Meucat Pangwa, Pidie Jaya, using the R/C Ratio. Results show Cibatu 06 had higher productivity (8,900 kg/ha), net income (IDR 28,329,250/ha), and R/C ratio (1.82) than Cibatu 05 (7,800 kg/ha, IDR 20,619,500/ha, R/C 1.60). Cibatu 06 offers a 37.4% higher profit, proving its economic advantage.

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INTRODUCTION

The agricultural sector plays a crucial role as the backbone of Indonesia's food security, where rice is a strategic commodity that accounts for 95% of national carbohydrate consumption (BPS, 2023). Data from the Ministry of Agriculture (2022) shows that 90.3% of Indonesian households depend on rice as a staple food, making rice production stability a priority issue. However, complex challenges such as declining productivity due to internal (e.g., land conversion and lack of technology adoption) and external (climate change) factors continue to threaten. Studies from the IPCC (2021) project that a 1°C temperature increase could reduce rice yields by up to 10%, especially in tropical regions such as Indonesia. Rice (*Oryza sativa* L.), as an annual crop that is sensitive to environmental conditions (Pitojo, 2003), requires superior varietal innovations to adapt to these challenges. Superior varieties such as Cibatu 06 and Cibatu 05 were developed to answer this need. According to the Rice Plant Research Institute (BBPadi, 2021), these two varieties have a productivity of 6-8 tons/ha, higher than local varieties, which only reach 4-5 tons/ha. Other advantages include resistance to the brown planthopper and a shorter harvest period (110-115 days), reducing the risk of crop failure (Suryana et al., 2020).

In Pidie Jaya district, which is one of Aceh's food barns, the adoption of superior varieties such as Cibatu 06 and Cibatu 05 in Gampong Meucat Pangwa is a practical solution for farmers. However, preliminary studies show a gap between productivity and income. For example, a report by the Pidie Jaya Agriculture Office (2023) noted that the average rice production in Trienggadeng sub-district reached 5.2 tons/ha, but farmers' income was still low (IDR 12-15 million/season). This is thought to be due to differences in production costs (e.g., prices of seeds, fertilizer, and labor) or variations in selling prices between varieties. A previous study by Arifin et al. (2022) on the economics of rice farming in Aceh only analyzed local varieties, while research on income comparisons between superior varieties such as Cibatu 06 and Cibatu 05 is still limited. Financial feasibility analysis (e.g., R/C Ratio, BEP, and revenue margin) is very important to determine the most profitable variety choice (Soekartawi, 2002). Based on this background, this study aims to compare the rice farming income of Cibatu 05 vs Cibatu 06 in Gampong Meucat Pangwa. In addition, analyzing the financial feasibility of both varieties using the R/C Ratio indicator.

LITERATURE REVIEW

According to Soekartawi (2002), farming is the activity of combining natural resources, labor, capital, and management to produce agricultural commodities such as rice with the aim of making a profit. Rahim and Hastuti (2010) added that rice farming is a cultivation system that includes the production process from land preparation to harvest by considering technical and economic aspects.

According to the Indonesian Ministry of Agriculture (2021), Cibatu 05 and 06 rice are new superior varieties of breeding results with a productivity advantage of 8-10 tons/ha, where Cibatu 06 is more resistant to the brown stem leafhopper pest than Cibatu 05. BPTP Aceh (2022) explains that the main

difference between the two varieties lies in environmental adaptation, where Cibatu 05 is suitable for fertile land with guaranteed irrigation, while Cibatu 06 is more tolerant of drought.

Gujarati (2003) defines income analysis as an evaluation of the difference between total revenue and total production costs to measure the net profit of a business. Downey and Erickson (1987) added that in farming, income analysis includes not only financial gains but also value added from family labor and efficiency of input use.

Hernanto (2011) stated that the R/C Ratio is an indicator of business feasibility that compares total revenue with total costs, where an R/C value > 1 indicates the business is feasible. Gray et al. (2014) emphasized that the R/C Ratio also reflects the efficiency of resource allocation. Keown et al. (2017) explain that BEP is the point at which total revenue equals total costs, so there is no profit or loss, while Sukirno (2015) adds that in rice farming, BEP is used to assess the risk of market or production failure.

METHODOLOGY

The research was conducted in Gampong Meucat Pangwa, Pidie Jaya, as a purposive location because it is the center of Cibatu 06 and Cibatu 05 rice cultivation (BPS Pidie Jaya, 2023). The object of research was farmers of both varieties, with a focus on comparative analysis of income and farm feasibility (Soekartawi, 2002).

The population in this study includes all farmers who cultivate rice varieties Cibatu 06 and Cibatu 05 in Gampong Meucat Pangwa, Trienggadeng District, Pidie Jaya Regency. The total population of farmers scattered in the village was 30 people, consisting of 15 farmers of Cibatu 06 rice varieties and 15 farmers of Cibatu 05 rice varieties (Dinas Pertanian Pidie Jaya, 2023). The sampling technique used the simple random sampling method or simple random sampling of respondents (Sugiyono, 2019). The selected sample amounted to 30 farmers, divided into 15 Cibatu 06 rice farmers and 15 Cibatu 05 rice farmers. Thus, the entire population of farmers at the research location was used as a sample (total sampling) (Arikunto, 2010).

Farm income is defined as the difference between total revenue (TR) and total costs (TC). Mathematically, farm income is calculated by multiplying the amount of production (Y) by the selling price of the output, as formulated by Soekartawi (1996):

$TR = Y \times PY$

Description:

TR: Total revenue (IDR) Y: Total production (kg)

PY: Selling price per unit (IDR/kg).

Furthermore, farm income (π) is the difference between TR and TC (Soekartawi, 1996; Budiman & Arifin, 2021):

$\Pi = TR - TC$

Description:

Π: Net farm income (IDR)

TC: Total costs (including fixed and variable costs).

Recent research by Saragih et al. (2020) in Agricultural Economics Review emphasized that TR calculation needs to consider external factors such as government subsidies and price fluctuations, while Ellis & Freeman (2020) suggested the use of dynamic approaches (e.g., risk simulation) to address climate uncertainty.

RESULTS AND DISCUSSION

Farm Cost Analysis

Rice cultivation requires various cost components that must be incurred by farmers to obtain optimal yields. Based on the results of research in the study locations, the cost of rice farming of Cibatu 06 and Cibatu 05 varieties includes expenses for seeds, fertilizers, pesticides/biopesticides, labor, land rent, and equipment depreciation. The following are details and a more in-depth analysis of these cost components.

Table 1. Average Cost of Rice Farming Cibatu 06 and Cibatu 05 in 1 Hectare in the Research Area, Year 2025

Type of Cost	Farmer Cibatu 06		Farmer Cibatu 05	
	Needs	Total Cost (IDR)	Needs	Total Cost (IDR)
Seeds	60 Kg	1.200.000	60 Kg	1.200.000
Fertilizer: Urea	250 Kg	750.000	400 Kg	750.000
SP 36	300 Kg	1.650.000	300 Kg	1.650.000
KCL	100 Kg	800.000	100 Kg	800.000
NPK Phonska	400 Kg	1.440.000	400 Kg	1.440.000
Pesticide	10 Liters	1.500.000	10 Liters	1.500.000
Labor Cost				
-Land Processing				
-Building bunds	3 People	6.000.000	3 People	6.000.000
-Nursery	4 People	600.000	4 People	600.000
-Planting	4 People	400.000	4 People	400.000
-Fertilization	20 people	2.000.000	20 People	2.000.000
-Weeding	4 people	400.000	8 people	400.000
-Spraying	10 People	1.200.000	10 People	1.200.000
-Cutting	5 People	1.000.000	8 People	1.000.000
-Transportation	1 Person	2.800.000	1 Person	2.800.000
Total Labor Cost Expenditure		15.400.000		15.400.000
Land Rent		11.200.000		11.200.000
Tool Depreciation		30.750		40.500
Total Cost		**33.970.750**		**33.980.500**

Source: Primary Data (*processed*), 2025

Income Analysis and R/C Ratio Feasibility Analysis

This study aims to analyze the amount of income and profit obtained by respondent farmers from farming activities of Cibatu 06 rice and Cibatu 05 rice. Farm income is calculated based on the difference between total revenue and total costs in one planting cycle. Total costs include all expenses incurred

during the production process until harvest, while total revenue is obtained from multiplying the amount of production by the selling price of the product. The results of the calculation of farm income of the two rice varieties are presented in the following table:

Table 2. Production and Farm Income of Cibatu 06 Rice and Cibatu 05 Rice per Hectare in one Planting in the Research Location, Year 2025.

Description	Unit	Average per	
		Cibatu 06 rice	Cibatu 05 rice
Production	Kg	8.900	7.800
Selling Price	IDR/Kg	7.000	7.000
Revenue	IDR /Ha	62.300.000	54.600.000
Production Cost	IDR /Ha	33.970.750	33.980.500
Revenue	IDR /Ha	28.329.250	20.619.500
R/C		1,82	1,60

Source: Primary Data (*processed*), 2025

Seeds are a major component in rice cultivation as they determine the yield potential and resilience of the crop. In the research location, farmers use rice seeds of Cibatu 06 and Cibatu 05 varieties with a requirement of 60 kg per hectare each, by the recommendation of the Center for Rice Plant Research (BBPadi, 2023), which states that the need for superior rice seeds ranges from 50-60 kg/ha for transplanting systems. The price of seeds per box (5 kg) is IDR 100,000, resulting in a total cost of IDR 1,200,000 per hectare.

Although there is no price difference between the two varieties, the selection of superior seeds is very important because it affects productivity and resistance to pests and diseases (Setyono et al., 2021). Superior varieties such as Cibatu 06 and Cibatu 05 generally have high growth capacity (>90%) and are resistant to blast disease (BBPadi, 2023), thus reducing the risk of crop failure.

Fertilizers play an important role in providing nutrients for rice plants, especially macro elements (N, P, K), which are needed in large quantities. Farmers in the research location use chemical fertilizers such as Urea (250-400 kg/ha), SP-36 (300 kg/ha), KCl (100 kg/ha), and NPK Phonska (400 kg/ha) at a total cost of IDR 4,640,000 per hectare. According to the Ministry of Agriculture (2022), the recommendation for fertilizing paddy rice is 200-300 kg of Urea, 100-150 kg of SP-36, and 50-100 kg of KCl per hectare, depending on soil fertility. Timely and balanced fertilizer application can increase the efficiency of nutrient absorption and crop yield (Dobermann & Fairhurst, 2000). Conversely, if fertilizer is applied inappropriately or in excess, it can lead to decreased productivity and environmental pollution due to nitrogen leaching (FAO, 2019).

Pesticides are used to control plant pest organisms (PPT) such as leafhoppers, stem borers, and blast disease. Farmers in the research location use chemical pesticides for IDR 1,500,000 per hectare. However, excessive use of chemical pesticides can lead to pest resistance, decreased natural enemy populations, and environmental pollution (Pretty & Bharucha, 2015). Therefore, integrated pest management (IPM) by utilizing biopesticides (e.g. Beauveria bassiana for leafhoppers) and biological agents can be a more sustainable alternative (Kementan, 2021).

Labor is the largest cost component in rice farming, reaching IDR 15,400,000 per hectare. Activities such as tillage (IDR 6,000,000), planting (IDR 2,000,000), and harvesting (IDR 2,800,000) require a lot of manual labor. According to BPS (2024), agricultural labor wages in Indonesia range from IDR 50,000 – IDR 100,000 per day, depending on the type of work. Agricultural mechanization (e.g., tractors and combine harvesters) can reduce dependence on human labour and reduce costs (FAO, 2020). However, in areas with narrow land or difficult topography, manual labor is still dominant.

The cost of renting land in the research location is IDR 11,200,000 per hectare for one planting, depending on the agreement between the owner and the cultivator. A study by Ariningsih et al. (2020) shows that the rent for paddy fields in Java ranges from IDR 10-15 million per season, depending on location and soil fertility. Payment can be made before planting or after harvest, but is still considered an imputed cost in the economic analysis of farming (Soekartawi, 2002).

Depreciation of farm implements such as hoes, machetes, and sprayers is calculated based on the lifetime and intensity of use. The depreciation values for Cibatu 06 (IDR 30,750) and Cibatu 05 (IDR 40,500) differ due to variations in tool use. According to Gittinger (1986), depreciation of simple agricultural equipment can be calculated using the straight-line depreciation method assuming an economic life of 3-5 years.

The total production costs for Cibatu 06 (IDR 33,970,750/ha) and Cibatu 05 (IDR 33,980,500/ha) are almost identical. This small difference indicates that both varieties have a similar cost structure, so variety selection should be based on environmental adaptation and yield potential, not cost (BBPadi, 2023).

Analysis of farm income of Cibatu 06 and Cibatu 05 rice varieties shows significant differences in terms of productivity and profit. Based on research data, Cibatu 06 rice produces 8,900 kg/ha of production with a revenue of IDR 62,300,000/ha, while Cibatu 05 produces 7,800 kg/ha with a revenue of IDR 54,600,000/ha (Primary Data, 2025). This difference in production of 1,100 kg/ha resulted in a difference in income of IDR 7,700,000/ha, where Cibatu 06 provided a net income of IDR 28,329,250/ha compared to Cibatu 05 which was only IDR 20,619,500/ha. According to Soekartawi (2002), farm income obtained from the difference between total revenue and total costs is the main indicator in assessing the success of a farming business.

The R/C ratio analysis further strengthens the superiority of the Cibatu 06 variety with a value of 1.82 compared to Cibatu 05 which is only 1.60. R/C ratio values above 1 in both varieties indicate that rice farming is financially feasible (Gittinger, 1986), but Cibatu 06 shows better performance where every IDR 1 cost incurred generates IDR 1.82 revenue. This is in accordance with the technical efficiency theory of Coelli et al. (2005) which states that varieties with higher productivity tend to have better production efficiency. The superiority of Cibatu 06 also reflects the principle of comparative advantage (Ricardian theory) in generating greater economic added value (Pindyck & Rubinfeld, 2018).

The implication of this finding is that farmers should consider using the Cibatu 06 variety more because it provides higher profits. According to FAO (2014) criteria, an R/C ratio value above 1.2 is already considered feasible, so both varieties are worth cultivating. However, with a 37.4% higher profit margin for Cibatu 06, this variety is more resistant to fluctuations in input and output prices (Anderson & Dillon, 1992). For further development, it is necessary to conduct a sensitivity analysis to test the resilience of profits in the event of price changes (Haryanto et al., 2020), as well as an evaluation of non-economic factors such as resistance to pests and diseases that may also affect farmers' preferences in variety selection.

CONCLUSIONS AND RECOMMENDATIONS

Based on the analysis of income and R/C ratio, it can be concluded that the Cibatu 06 rice variety shows superior performance compared to Cibatu 05. In terms of productivity, Cibatu 06 produces 8,900 kg/ha with a net income of IDR 28,329,250/ha, while Cibatu 05 only reaches 7,800 kg/ha with an income of IDR 20,619,500/ha. In terms of efficiency, Cibatu 06's R/C ratio of 1.82 indicates that every rupiah of cost incurred generates IDR 1.82 of revenue, higher than Cibatu 05's 1.60. This finding proves that although both varieties are financially viable (R/C > 1), Cibatu 06 offers a competitive advantage with a 37.4% higher profit margin. Farmers are advised to prioritize the cultivation of Cibatu 06 to maximize income, while further studies on the adaptation of this variety to site-specific environmental conditions and market fluctuations are needed.

FURTHER STUDY

Future research should comprehensively investigate both the yield stability of this cultivar across diverse agroecosystems and its adaptive capacity to climate change, employing multidisciplinary assessment approaches.

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