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IMPROVING FARM INCOME AND SUSTAINABILITY (An Analysis of Characteristics and Economic Performance of Semi-Organic Rice Farming in Central Lampung)

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ABSTRACT

Semi-organic rice farming is an environmentally friendly approach that aims to replace chemical pesticides with organic alternatives and gradually reduce chemical fertilizers in favor of organic farming. This study aims to analyze the characteristics and performance of semi-organic rice farming in Seputih Raman District, Central Lampung Regency. The farm performance indicators used are farm income, R/C ratio, production BEP, and price BEP. The research was carried out from September to October 2024. A total of 40 farmers participated as respondents in this study, selected using the census method. Data analysis methods include quantitative descriptive analysis, income, R/C ratio, production BEP, and price BEP. The results showed that the majority of farmers were of productive age, had primary and secondary education, 5-10 years of experience, and managed an average of 0.34 hectares of land. Farming practices involve reducing urea fertilizer by 18% and NPK Phonska by 40% of the recommended dose, while applying 20 liters/ha of organic pesticide. This condition is reinforced by the price of semi-organic harvested dry grain (GKP), which is IDR 500/kg higher than conventional GKP, thus increasing the bargaining position and income of farmers. Semi-organic rice farming generates income on cash costs of IDR 27,190,788/ha with a return on capital (R/C) value of 3.97, and income on total costs of IDR 17,980,936/ha with an R/C value of 1.98. The production BEP value was 2,887 kg/ha, and the price BEP was IDR 3,238/kg. This study concludes that semi-organic rice farming possesses supportive characteristics and demonstrates positive farming performance. The implication is that institutional strengthening and policy support are needed to promote wider adoption of this system.

Keywords: characteristics; farm income; performance; semi-organic rice.

INTRODUCTION

Indonesia, a country rich in agriculture and natural resources, has an agricultural sector that serves as a central pillar in supporting the national economy and ensuring food security. The agricultural potential of Indonesia is extraordinarily vast, with extensive and diverse land resources that support the production of various crops and agricultural commodities. Optimal management of natural resources presents significant opportunities for agricultural production (Rai & Faisal, 2022). Rice, as the primary staple food, plays a vital role in ensuring Indonesia's food security. Adequate and optimal management is key to maintaining national food availability.

Lampung Province plays a significant role in national rice production, with a harvested area of 530,108.09 hectares and a total production of 2,757,898.19 tons, ranking fifth in harvested area and sixth in national rice production (Badan Pusat Statistik, 2024). Central Lampung Regency is the most significant contributor to the province, with a harvested area of 108,130 hectares and a production of 608,009 tons, achieving a productivity level of 5.62 tons per hectare, which surpasses the provincial average of 5.20 tons per hectare (Badan Pusat Statistik Provinsi Lampung, 2024). Seputih Raman District, which has the largest harvested area in Central Lampung (12,895.15 hectares) and a

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production volume of 71,287.60 tons, holds a strategic role in supporting both regional and national food security (Dinas KPTPH, 2024).

The success of rice production in Seputih Raman District depends not only on quantity but also on quality, with semi-organic rice becoming a central focus for the sustainability of farming practices. The development of this farming method aims to reduce farmers' dependence on chemical pesticides, which, although effective in controlling pests, have adverse effects on human health. Chemical pesticides can pose serious health risks through dermal, respiratory, and dietary exposure, potentially leading to cancer, respiratory disorders, diabetes, and neurological diseases (Theresia et al., 2023). Excessive use also harms the environment, leading to pest resistance, the elimination of natural enemies, pest resurgence, and the accumulation of harmful residues on crops and in ecosystems (Nurpadilah, 2021).

Semi-organic farming represents a transitional phase toward fully organic agriculture, commonly referred to as the conversion or transition period (Domiah & Januar, 2018). The reduction in the use of chemical fertilizers (Agnesti et al., 2023) and the shift from chemical to organic pesticides are crucial steps in implementing semi-organic rice farming in Seputih Raman District, particularly among farmers of the Farmers' Group Association (PP) Gapsera Sejahtera Mandiri. This group was established in response to the growing awareness of the importance of environmentally friendly rice farming practices.

PP Gapsera Sejahtera Mandiri faces several challenges in developing semi-organic rice farming, one of which is the low interest among farmers to shift from conventional farming systems. This condition has led to a decline in the cultivated area, from 25 hectares in the first planting season of 2019 to 13.50 hectares in the first planting season of 2023. The decrease is attributed to the generally lower productivity of semi-organic rice compared to conventional systems (Pratama et al., 2018), as well as the perception that the farming process is more complex, particularly in the preparation and application of organic pesticides, which involve multiple steps and require more time (Wulandari et al., 2022). In contrast, synthetic chemical pesticides are considered more practical due to their easy availability and immediate usability, requiring no additional processing.

Farmers generally conduct simple economic calculations without systematic record-keeping, which means many are unable to identify the income level of their farming activities accurately. Information on the feasibility of farming operations is also essential to assess whether a farming enterprise can be run sustainably. Farming activities that are proven to be feasible have the potential to be further developed, thereby providing economic benefits to farmers (Wulandari et al., 2022). An information system that presents objective data on farm feasibility is crucial to ensure effective management and sustainability, particularly in semi-organic rice farming.

Research on semi-organic rice farming has been conducted by Agnesti et al. (2023) and Istiyanti et al. (2021), primarily focusing on the analysis of production costs, farm income, and farm feasibility, with some studies also including assessments of farmers' characteristics. However, these studies have not specifically examined the distinct characteristics of semi-organic rice farming itself. Moreover, the study by Anggara et al. (2023) did not complement the analysis of farm performance with Break Even Point (BEP) calculations, which are essential for determining the minimum production and price levels required to avoid financial losses. Additionally, there is a lack of research conducted explicitly in Seputih Raman District, Central Lampung Regency, an area with a unique agro-ecosystem and socio-economic conditions that differ from those of other regions.

Thus, the novelty of this study lies in its integrated approach, which comprehensively analyzes both farmer characteristics and the specific features of semi-organic rice farming using a more comprehensive set of performance indicators. The significance of this study also stems from its contribution in providing contextual empirical data in a region that has not been widely studied, offering a valuable foundation for policy formulation and the sustainability of semi-organic rice farming at the local level. Based on the aforementioned background and issues, this study aims to analyze the characteristics and performance of semi-organic rice farming in Seputih Raman District, Central Lampung Regency. The performance indicators used include farm income, the R/C ratio, production break-even point (BEP), and price break-even point.

MATERIALS AND METHODS

This research was conducted at the Farmers' Group Association (PP) Gapsera Sejahtera Mandiri, located in Seputih Raman District, Central Lampung Regency, Lampung Province. The location was purposively selected, considering that PP Gapsera Sejahtera Mandiri is a farming group committed to developing semi-organic rice farming without the use of chemical pesticides. The study involved 40 respondents, consisting of 27 member farmers and 13 partner farmers from PP Gapsera

Sejahtera Mandiri, who were selected using a census method. The research was carried out from September to October 2024. This study utilized both secondary and primary data to support the achievement of the research objectives. Secondary data was obtained from various government agencies and relevant journals related to the research topic. Primary data was collected through interviews using a structured questionnaire with the respondents.

A quantitative descriptive analysis method was used in this study to analyze the characteristics of farmers and semi-organic rice farming activities, as applied in the research by Fianda (2023). This approach was employed to systematically and objectively describe various variables (Sahir, 2021), including age, education level, experience, farm size, and inputs used in farming, thereby providing a comprehensive representation of the characteristics of the farmers and the farming practices they implement. The following data analysis methods were used to evaluate the performance of semi-organic rice farming.

Cost analysis involves calculating all expenses incurred during the production process, including both fixed and variable costs. According to Soekartawi (2002), the formula for cost analysis is as follows:

$$TC = FC + VC \quad (1)$$

Description: TC = Total Cost (IDR/ha); FC = Fixed Cost (IDR/ha); VC = Variable Cost (IDR/ha)

Revenue analysis is obtained from the sales of semi-organic rice production. Revenue is calculated by multiplying the quantity of production by the unit selling price. Mathematically, the formula for total revenue (TR) according to Soekartawi (2002) is as follows:

$$TR = P \times Q \quad (2)$$

Description: TR = Total Revenue (IDR/ha); P = Price of the product (IDR/kg); Q = Semi organic rice production (kg/ha)

Income analysis is the difference between revenue and total production costs, reflecting the farmer's profit. According to Soekartawi (2002), the formula for income analysis is as follows:

$$\pi = TR - TC \quad (3)$$

Description: π = Farm income (IDR/ha); TR = Total Revenue (IDR/ha); TC = Total Cost (IDR/ha)

The parameters for income assessment are: a. If TR > TC, the farm achieves a profit; b. If TR = TC, the farm is at the break-even point. If TR < TC, the farm incurs a loss

The feasibility of a farming business can be analyzed using the R/C ratio, which measures the efficiency of the business by comparing revenue and production costs. The R/C ratio indicates the amount of revenue earned for every rupiah spent, allowing it to be used to assess the level of profitability of the farming business. The R/C ratio calculation can be done using the following formula (Soekartawi, 2002):

$$R/C\ ratio = TR/TC \quad (4)$$

With the following R/C ratio criteria: a. R/C > 1, the farming business is economically profitable/efficient; b. R/C = 1, the farming business is at the break-even point (BEP); c. R/C < 1, the farming business is economically unprofitable/inefficient.

The break-even point (BEP) is a condition where the results of the farming business equal the capital invested, meaning that under this condition, the farming business neither provides a profit nor incurs a loss for the person running it. BEP consists of two types: BEP production and BEP price. BEP production refers to the minimum production volume that must be achieved in the farming business to avoid losses. The BEP calculation helps determine the potential profit of the farming business and has been used in studies by Agnesti et al. (2023) and Subastian & Yuliawati (2024) as follows:

$$BEP\ Production = Total\ Production\ Cost\ (IDR)/Production\ Price\ (IDR/kg) \quad (5)$$

BEP price refers to the minimum price at which a product is produced in a farming business to avoid losses. The BEP price is the cost price or base price; thus, products should be sold above the cost price for the farming business to be profitable. The calculation formula is as follows:

BEP Price = Total Production Cost (IDR)/Total Production (Kg) (6)

RESULTS AND DISCUSSION

Farmer Characteristics

Identifying the characteristics of semi-organic rice farmers is crucial to understanding how they manage their farming businesses, as well as to observe the impact of social and economic conditions on their farming decisions and the challenges they face. Based on the research findings, the majority of farmers fall within the productive age range (15–64 years), comprising 82.50%, indicating a strong potential for the development of semi-organic rice farming. Most farmers have completed elementary and senior high school, with each accounting for 32.50%. The number of family dependents typically ranges from 2 to 3 people, accounting for approximately 65.00% of the total.

The farming experience of most semi-organic rice farmers ranges between 5 and 10 years, accounting for 65.00%, which categorizes them as fairly experienced. The land area of semi-organic rice farming in Seputih Raman District varies, with an average of 0.34 hectares, and the majority of farmers manage land of 0.25 hectares (77.50%). Most of the land managed is owned by themselves (77.50%), consistent with the findings of Yoga et al. (2024) in Ponorogo. These characteristics, including age, education level, number of dependents, farming experience, land area, and land ownership status, are illustrated in Figure 1.

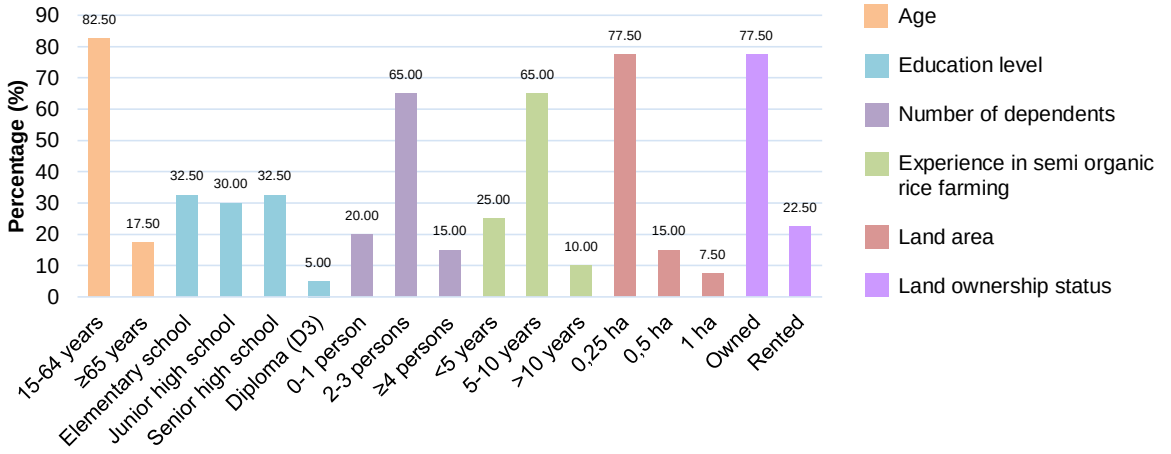

Figure 1. Characteristics of semi-organic rice farmers

Characteristics of Semi-Organic Rice Farming

Rice seeds are a crucial component in farming, as seed quality directly affects productivity and harvest outcomes. Semi-organic rice farmers in Seputih Raman District use four rice seed varieties, with Sintanur being the most dominant at 67.5%, followed by Mentik Wangi (15%), Rojolele (10%), and Pandan Wangi (7.5%). These varieties are chosen because they meet the criteria set by PP Gapsera Sejahtera Mandiri, specifically for producing rice with a soft texture and aromatic qualities.

The use of fertilizers in semi-organic rice farming plays a crucial role in increasing production (Afa et al., 2022) and supporting sustainable agriculture. According to the research findings, the average use of manure reached 1,625.82 kg/ha, reflecting efforts to enhance soil fertility through organic means. This strategy of maximizing organic fertilizer use is implemented by PP Gapsera Sejahtera Mandiri as part of the transition towards an organic farming system, encouraging a gradual reduction in chemical fertilizer use. The management of PP Gapsera Sejahtera Mandiri recommends that farmers gradually reduce their dependence on chemical fertilizers, with the long-term goal of fully transitioning to organic farming. As a result, the average use of urea fertilizer was recorded at only 184.00 kg/ha, representing an 18% decrease from the recommended dose of 225 kg/ha (Badan Penelitian dan Pengembangan Pertanian, 2021), while NPK Phonska fertilizer was used at an average of 150.91 kg/ha, a 40% reduction from the recommended dose of 250 kg/ha. This reduction

indicates a progressive step towards implementing more environmentally friendly and sustainable farming practices.

These findings highlight the novelty of this study by addressing gaps not explored in previous research, as Agnesti et al. (2023) and Istiyanti et al. (2021) focused on income and feasibility without examining the technical aspects of farming practices. This study fills that gap by analyzing input use patterns, actual fertilizer application rates, and institutional strategies supporting the transition to organic farming in Seputih Raman District.

Semi-organic rice farmers in Seputih Raman District apply liquid organic fertilizer in three stages, during soil preparation, the vegetative phase, and the generative phase, with an average use of 20 liters per hectare. Additionally, organic pesticides are used as an alternative to chemical pesticides, aligning with the principles of sustainable agriculture. The average use of organic pesticides also reaches 20 liters per hectare. The availability of organic pesticides, facilitated by PP Gapsera Sejahtera Mandiri, makes it easier for farmers to obtain these inputs while supporting the implementation of sustainable semi-organic rice farming practices.

Labor plays a crucial role in managing semi-organic rice farming, both within the family and outside the family. According to the research findings, the activities that absorb the most labor outside the family are harvesting (28.94 HOK/ha) and land preparation (22.57 HOK/ha), while weeding (11.42 HOK/ha) and pest and disease control (9.53 HOK/ha) are the main activities carried out by family labor. These data indicate that farmers tend to involve labor outside the family in farming stages that require significant effort in a short time, such as planting and harvesting, while tasks that can be done gradually are handled mainly by family labor.

Cost of Semi-Organic Rice Farming

The total cost of semi-organic rice farming consists of two main components: cash costs and imputed costs. Cash costs refer to the actual expenditures incurred by farmers in running their farming operations, while imputed costs reflect costs that are not directly paid out but are still considered as part of the total production cost. This cost structure has been applied in studies conducted by Hidayah et al. (2024) and As-Sadili et al. (2023), aiming to provide a comprehensive overview of total production costs.

Table 1. Cost structure of semi-organic rice farming in the first planting season of 2024

Cost Type	Amount (IDR/ha)	Ratio (%)
Cash Costs		
Variable Costs		
Seeds	180.364	0,98
Fertilizers	1.783.564	9,71
Organic Pesticides	200.000	1,09
Labor outside the family	5.299.273	28,85
Fixed Costs		
Land Rent	1.290.909	7,03
Land Tax	27.321	0,15
Irrigation	374.255	2,04
Total Cash Costs	9.155.685	49,85
Imputed Costs		
Variable Costs		
Seeds	153.600	0,84
Manure	1.276.727	6,95
Family Labor	2.896.727	15,77
Fixed Costs		
Equipment Depreciation	191.888	1,04
Land Rent	4.690.909	25,54
Total Imputed Costs	9.209.852	50,15
Total Costs	18.365.537	100,00

Source: Primary data processed, 2024

Based on Table 1, the most considerable cash cost incurred by farmers is attributed to the use of outside family labor (28.85%), particularly among those employing agricultural mechanization to improve farming efficiency, which is consistent with the findings of Putri et al. (2024) in Tuban Regency. The semi-organic rice farming activities that most use outside of family labor are harvesting, land preparation, and planting. Farmers use tractors for land preparation, manual labor from local

community members for planting, and combine harvesters for harvesting. The cash cost incurred in semi-organic rice farming is recorded at IDR 9,155,685/ha (49.85%). Meanwhile, the most considerable imputed cost comes from land rental (25.54%), as most farmers (77.5%) use their land. The imputed cost amounts to IDR 9,209,852/ha (50.15%), resulting in a total cost of IDR 18,365,537/ha for this farming operation.

The total cost of semi-organic rice farming in Seputih Raman District is lower than the study by Istiyanti et al. (2021), which reported IDR 21,599,005/ha for semi-organic rice farming in Bantul. However, it is higher than the study by Agnesti et al. (2023), which reported IDR 12,026,030/ha for semi-organic rice farming in Karawang.

Revenue from Semi-Organic Rice Farming

Revenue is obtained by multiplying the average productivity of semi-organic rice (kg/ha) and the average selling price (IDR/kg) received by farmers in Seputih Raman District, as shown in Table 2.

Table 2. Revenue of semi-organic rice farming in the first planting season of 2024

Description	Value
Average productivity (kg/ha)	5.673
Average selling price (IDR/kg)	6.361
Revenue (IDR/ha)	36.346.473

Source: Primary data processed, 2024

Based on Table 2, the revenue from semi-organic rice farming reached IDR 36,346,473/ha. This figure is higher compared to the studies by Anggara et al. (2023) in Mesuji, which reported IDR 35,178,333/ha; Istiyanti et al. (2021) in Bantul, with IDR 32,783,090/ha; and Agnesti et al. (2023) in Karawang, at IDR 31,916,000/ha. The difference in revenue is attributed to the higher selling price of semi-organic rice in Seputih Raman District, which reaches IDR 6,361/kg, compared to Bantul (IDR 6,073/kg) and Karawang (IDR 4,924/kg).

Although semi-organic rice production in Karawang is higher, at 6,480 kg/ha, compared to Seputih Raman District, which only reaches 5,673 kg/ha, the higher selling price in Seputih Raman contributes to greater farming revenue. This situation is influenced by the policy of PP Gapsera Sejahtera Mandiri, which owns a rice milling factory and sets the purchase price of semi-organic harvested dry grain (GKP) higher, at IDR 500/kg above the price of conventional GKP, thereby increasing farmers' bargaining power over their harvests.

Income from Semi-Organic Rice Farming

Income from semi-organic rice farming is obtained from the difference between revenue and total production costs. This income analysis is classified into two categories: income based on cash costs and income based on total costs. Income based on cash costs reflects the profit obtained after deducting all the direct costs incurred by the farmers, while income based on total costs takes into account all expenses, including both cash and imputed costs. The details of the income from semi-organic rice farming are presented in Table 3.

Table 3. Income of semi organic rice farming in the first planting season of 2024

Description	Value (IDR)
Revenue	36.346.473
Cash costs	9.155.685
Total costs	18.365.537
Income over cash costs	27.190.788
Income over total costs	17.980.936

Source: Primary data processed, 2024

Based on Table 3, the income from semi-organic rice farming in Seputih Raman District, based on cash costs, reaches IDR 27,190,788/ha, while the income based on total costs is IDR 17,980,936/ha. These figures indicate that semi-organic rice farming in this region is profitable, with total revenue exceeding total production costs (TR > TC). Compared to the study by Istiyanti et al. (2021), the income based on cash costs in Seputih Raman is higher than in Bantul, which was recorded at IDR 23,000,000/ha. Furthermore, the study by Wulandari et al. (2022) shows that the income based on total costs from semi-organic rice farming in East Lombok is lower, at IDR 16,840,732/ha.

Analysis of the Feasibility of Semi-Organic Rice Farming

The feasibility of farming can be analyzed using several methods, including the revenue-cost ratio (R/C ratio) and break-even point (BEP), which encompasses both BEP production and BEP price.

Table 4. R/C ratio analysis of semi-organic rice farming in the first planting season of 2024

Description	Value (IDR)
Revenue	36.346.473
Cash costs	9.155.685
Total costs	18.365.537
R/C ratio over cash costs	3,97
R/C ratio over total costs	1,98

Source: Primary data processed, 2024

Based on Table 4, the R/C ratio for cash costs in semi-organic rice farming in Seputih Raman District is 3.97, while the R/C ratio for total costs is 1.98. These values indicate that semi-organic rice farming in this area is feasible (R/C > 1), as it is economically profitable and efficient. Compared to previous studies on semi-organic rice farming, the cash cost-to-revenue (R/C) ratio in Seputih Raman is higher than the 3.32 recorded by Istiyanti et al. (2021). Additionally, the total cost R/C ratio in Seputih Raman is also higher than the 1.75 reported by Oktariani & Wanna (2021) in Palembang and the 1.55 found by Domiah & Januar (2018) in Banyuwangi.

Based on Table 5, the average productivity of semi-organic rice farming in Seputih Raman District reaches 5.67 tons/ha, which is higher compared to the average rice productivity in Central Lampung Regency, which is recorded at 5.62 tons/ha (Badan Pusat Statistik Provinsi Lampung, 2024). However, the analysis shows that 57.50% of semi-organic rice farmers in Seputih Raman still have productivity levels below the regency's average, indicating variability in productivity achievements at the farmer level and generally lower than that of conventional rice. In terms of price, the average selling price of semi-organic rice in Seputih Raman is IDR 6,361/kg, higher than the prices reported by Istiyanti et al. (2021) in Bantul at IDR 6,073/kg, Wulandari et al. (2022) in East Lombok at IDR 5,000/kg, and Agnesti et al. (2023) in Karawang at IDR 4,924/kg.

Table 5. Break Even Point (BEP) analysis of semi-organic rice farming in the first planting season of 2024

Description	Value
Total cost (IDR/ha)	18.365.537
Average productivity (kg/ha)	5.673
Average selling price (IDR/kg)	6.361
BEP production (kg/ha)	2.887
BEP price (IDR/kg)	3.238

Source: Primary data processed, 2024

The break-even point (BEP) production value for semi-organic rice farming in Seputih Raman District is recorded at 2,887 kg/ha, while the average production reaches 5,673 kg/ha, meaning that the production obtained by farmers has exceeded the break-even point. This condition indicates that semi-organic rice farming in Seputih Raman is feasible, as the average production exceeds the BEP production. Compared to previous studies, the BEP production value in Seputih Raman is higher than the one found by Pratama et al. (2018) in Kudus, which was 2,522 kg/ha; however, it is lower than the study by Domiah & Januar (2018) in Banyuwangi, which reached 3,743 kg/ha. This difference suggests that the production efficiency of semi-organic rice farming in Seputih Raman is more efficient than in Banyuwangi, but less efficient compared to Kudus.

The break-even point (BEP) price for semi-organic rice farming in Seputih Raman District is IDR 3,238/kg, while the average price received by farmers is IDR 6,361/kg (IDR 6,361/kg > IDR 3,238/kg). This condition indicates that semi-organic rice farming in the area is feasible because the selling price exceeds the BEP price, allowing farmers to earn a profit. Compared to previous studies on semi-organic rice farming, the BEP price in Seputih Raman is higher than the research by Oktariani & Wanna (2021) in Palembang, which was IDR 2,590/kg, but lower than the study by Istiyanti et al. (2021) in Bantul, which reached IDR 3,996/kg. This difference suggests that the price efficiency of semi-organic rice farming in Seputih Raman is more efficient than in Bantul but less efficient compared to Palembang. These findings demonstrate the study's novelty by addressing gaps

in previous research, particularly the absence of BEP analysis in Anggara et al. (2023). By incorporating BEP production and price calculations, this study provides a more comprehensive assessment of farm performance and contributes to a deeper understanding of the economic feasibility of semi-organic rice farming at the local level.

CONCLUSIONS AND SUGGESTIONS

Semi-organic rice farming in Seputih Raman District is characterized by farmers who are primarily of productive age, have basic and secondary education, 5-10 years of experience, and manage an average of 0.34 hectares of land. The practice involves a reduced use of chemical fertilizers and the application of organic pesticides, supported by PP Gapsera Sejahtera Mandiri through better pricing of dry grain (GKP). The farming yields income over cash costs of IDR 27,190,788/ha and income over total costs of IDR 17,980,936/ha. The R/C ratios are 3.97 (cash costs) and 1.98 (total costs), indicating economic viability. BEP values 2,887 kg/ha (production) and IDR 3,238/kg (price) further confirm its feasibility. Overall, the semi-organic rice farming in Seputih Raman District has supportive characteristics and a positive performance, making it suitable for further development. To support the sustainable development of semi-organic rice farming, it is essential to strengthen farmer institutions, such as improving farmer group management and facilitating access to environmentally friendly production inputs. Local governments are expected to provide support through the promotion and development of semi-organic rice farming. Additionally, partnerships between farmers and agribusiness actors should be strengthened to create a more efficient and beneficial value chain. Policy interventions that promote sustainable agriculture by integrating semi-organic programs into local agricultural policies are also essential to encourage the broader adoption of this system.

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