



RESEARCH ARTICLE

Implementation of an agribusiness system to support rice farming performance in Grobogan, Indonesia

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Abstract

Examining the implementation of an agribusiness system and its effect on rice farming performance in Grobogan is crucial for identifying challenges and opportunities to improve farmers' productivity, efficiency and profitability. The findings of this analysis can serve as a foundation for developing suitable policies and programmes to support advancement of rice-farming in Grobogan. This study analysed agribusiness implementation, production, efficiency, profitability of rice farming. The research employs a survey method, selecting two districts, Wirosari and Godong and two villages from each district. Farmer samples were obtained through simple random sampling, with 20 samples from each village, resulting in a total of 80 samples. Data were analysed using agribusiness approach, multiple linear regression and the economic efficiency. The results indicated that agribusiness system had been implemented effectively with rice productivity reaching 75 quintals/ha, with an average land area of 0.77 ha. All the independent variables, land, seeds, urea fertiliser, triple superphosphate (TSP) fertiliser, pesticide, labour and agribusiness implementation significantly affected rice production. With an adjusted value of 0.968, the use of input factors was not yet efficient. The average income of rice farmers was Indonesian rupiah (IDR) 15172142/planting season with a profitability of 67.97 %, demonstrating that rice farming in Grobogan is continuing.

Keywords: allocative efficiency; agribusiness; income; productivity; rice

Introduction

Agricultural enterprises based on agribusiness systems involve activities related to the management and utilisation of production inputs to generate agricultural products, thereby requiring the implementation of an agribusiness system. In practice, farmers and livestock producers have not fully implemented agribusiness principles in managing their enterprises (1), meaning that the implementation of agribusiness is still carried out with moderate criteria. Research on the application of agribusiness systems to support rice farming performance is important. The performance of rice farming can be measured through productivity, efficiency and income. Rice is a staple food source for the majority of the Indonesian population, so the availability and stable price of rice are very important to maintain national food security. The availability of rice and food security are supported by productivity.

Increasing rice productivity can help meet the growing demand for rice and population growth. This can help identify factors that hinder production increases, such as the use of superior varieties, appropriate cultivation techniques, efficient use of fertilisers and pesticides and good water management practices. Various factors can influence low productivity, such as the allocation of production inputs used by farmers, which often does not align with best practices or the input usage recommendations suggested by extension workers (2). In addition to the influence of production factors, low productivity levels are also suspected to occur due to

inefficiency, or the inability of farmers to achieve efficiency (3). Productivity is closely related to efficiency (4), therefore, the implementation the six-rights of agribusiness is crucial (5).

Efficient farming will certainly produce maximum production and productivity, while inefficiency results in decreased productivity (6). Efficiency is defined as the effort to use the smallest possible input to achieve the greatest possible production (7). The inputs used in rice production include land, seeds, labour, organic and inorganic fertilisers and pesticides. By increasing production efficiency, farmers can produce more rice at a lower cost, thereby increasing their income. Increased income for rice farmers can improve their well-being and that of their families. Therefore, increased productivity and income for rice farmers contribute to national food security and farmer welfare in Indonesia. This study aims to examine the agribusiness implementation of production factors in rice farming, analyse factors influencing rice production, analyse the price efficiency of input factor use and analyse the profitability of rice farming.

Previous studies mainly focused on technical efficiency and productivity of farming rice farming, while limited attention has been given to integrating agribusiness implementation, allocative efficiency and profitability within a single analytical framework. Therefore, this study contributes by examining how agribusiness implementation affects production performance of rice farming in Grobogan Regency.

Materials and Methods

The research was conducted in Rajek and Kemloko villages in Godong District and Tambakselo and Dapurno villages in Wirosari District, Grobogan Regency, Central Java. The locations were selected purposively because of the challenges associated with implementing agribusiness systems and the efficient use of production inputs. The purposive selection was based on the challenges of implementing an agribusiness system, which is generally still in the moderate category and the use of production facilities, which are not yet efficient.

The research employed a survey method (8), with samples drawn from the population of rice farmers. The research locations were selected purposively because the majority of the local population were farmers and the use of production inputs was not yet efficient. Following the recommendation that the minimum sample size should be ten times the number of variables analysed (9), a total of 80 farmers were selected as respondents, with 20 farmers sampled from each village. The sampling method used in this study was probability sampling, specifically simple random sampling (10).

A variable is the object of research or the focus of the study. The variables used in this study were divided into two categories: independent and dependent variables. Dependent variable is influenced by one or more independent variables (10). The independent variables include factors influencing rice production, namely, land area, seeds, urea fertiliser, triple superphosphate (TSP) fertiliser, pesticides, labour and agribusiness practices, with production variables as the dependent variable.

The data analysis used in this study was descriptive and quantitative, as follows: The 6-right approach to agribusiness involves descriptive analysis of the use of production facilities, timeliness, quantity, type, quality, products and price (11). The assessment criteria for each element use a Likert scale: P (poor) if the farmer does not apply the correct concept, L (less) if the farmer applies one correct concept, M (moderate) if the farmer applies two correct concepts, G (good) if the farmer applies three to four correct concepts and VG (very good) if the farmer applies five to six correct concepts (12). Furthermore, to determine the predicate for the application of agribusiness in each subsystem, it was determined based on the number of scores. A score of > 80 % of the total score indicates that the agribusiness system is in very good condition. A score of > 60–80 % of the total score indicates that the agribusiness system is in good condition. A score of > 40–60 % of the total score indicates that the agribusiness system is in fair condition. A score of > 20–40 % of the total score indicates that the agribusiness system is in a less condition. A score of 0–20 % of the total score indicates that the agribusiness system is in poor condition. Furthermore, to analyse the implementation of the beef cattle agribusiness, an index approach is used, following the method described in previous research (13):

Agribusiness implementation index =

$$\frac{\text{Score obtained}}{\text{Maximum score}} \times 100 \%$$

Factors influencing rice production were analysed using multiple linear regressions with SPSS programme

The equation model is:

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7$$

Where:

Y : Rice production (kg)

a : Constant

$b_1...b_7$: Regression coefficients

X_1 : Land area (ha)

X_2 : Seed use (kg)

X_3 : Urea fertiliser use (kg)

X_4 : TSP fertiliser use (kg).

X_5 : Pesticide use (L)

X_6 : Labour use (work day)

X_7 : Agribusiness implementation (score).

The allocative efficiency of production factor use in rice farming is analysed using a comparison of the marginal product value of each input (MVP_{xi}) with the input price equal to 1 (14).

$$\text{Allocative efficiency} = \frac{MVP_{xi}}{MC_{xi}} = \frac{B_{xi} \cdot Y / X_{i-1} \cdot P_y}{P_{xi}} \text{ or } \frac{MPP \cdot P_y}{P_{xi}} = 1$$

where:

MPV_{xi} : Marginal value product used xi (Indonesian rupiah (IDR))

MC_{xi} : Marginal cost used xi (IDR)

P_{xi} : Price of production factor used (IDR)

$\frac{MPP \cdot P_y}{P_{xi}} < 1$, This means that the use of production factors is inefficient; therefore, the use of input needs to be reduced.

$\frac{MPP \cdot P_y}{P_{xi}} = 1$, meaning that the use of production factors is allocatively efficient.

$\frac{MPP \cdot P_y}{P_{xi}} > 1$, This means that the use of production factors is not yet efficient; therefore, the use of input needs to be increased.

Farming income analysis refers to the process of assessing and evaluating the income generated from farming activities (15). Rice farmers' income can be determined by calculating the difference between revenue and expenditure (7). This can be written systematically as:

$$I = TR - TC$$

Where:

I : Farmer's income (IDR)

TR : Total revenue (IDR)

TC : Total cost (IDR)

Profitability analysis in lowland rice farming demonstrates variable returns depending on production systems, environmental conditions, input management and production techniques (16). Profitability analysis in lowland rice farming can be determined using the following formula (17):

$$\text{Profitability} = \frac{\text{Farmers income (IDR)}}{\text{Total cost (IDR)}} \times 100 \%$$

Results and Discussion

Grobogan Regency is a rice production centre in Central Java. In 2024, the harvested area was 129651.83 ha, with production reaching 679393.06 tonnes and productivity reaching 5.24 tonnes/ha. Grobogan Regency also has a significant number of farmers. In 2025, Grobogan Regency had 203234 farmers in total. Of these, 80 farmers were selected as research samples from the two selected districts.

Farmer identity

The identity of the sample farmers provides a snapshot of their situation as crucial factors in farming. Farmers in a farming business act as managers who plan, organise, implement and evaluate the production processes. The farmer identity data in this study included age, education level, years of farming experience and land area owned. The respondents (Table 1) in this study were 80 farmers from the Wirosari and Godong Districts. Most respondents (96.25 %) were within productive age range, with an average age of 49.5 years. Age can influence a farmer's physical ability to carry out farming activities. Farmer age is a factor related to their ability to work in farming activities (1). Farmers who work during their productive years perform better and more effectively than those who work during non-productive ages.

Table 1. Number and percentage of identity of rice farmer respondents in Grobogan Regency

Sl.No.	Identity	Number	Percentage
1.	Year old (year)	---(person)---	---(%)---
	30–40	15	18.75
	41–50	40	50.0
	51–60	22	27.50
	> 60	3	3.75
2.	Education		
	Elementary school	7	8.75
	Junior high school	28	35
	High school	37	46.25
	College	8	10.00
3.	Farming time (Year)		
	10–20	18	22,50
	21–30	35	43,75
	31–40	27	33,75
4.	Farm land scale (ha)		
	< 0.5	22	27,50
	0.5–1	37	46,25
	> 1	21	26,25

Source: Primary data analysis

The majority (46.25 %) of respondents had a high school education and 10 % had a college education, which is considered a good level of education for farmers. A farmer's education attainment can influence their farming behavior, particularly regarding technology adoption. Farmers with a higher level of education are better able to absorb technology applications because they understand what is being taught more easily (18).

Table 2. The precise of on-farm agribusiness subsystem implementation of rice farm

Production factors	Implementation of agribusiness subsystem					
	Time	Number	Type	Grade	Product	Price
Seed	Good (54.4)	Moderate (50.2)	Good (56.4)	Good (52.2)	Moderate (42.2)	Moderate (42.4)
Urea fertiliser	Good (50.2)	Moderate (44.2)	Good (42.4)	Good (42.2)	Moderate (44.2)	Good (42.4)
TSP fertiliser	Good (44.6)	Moderate (52.4)	Moderate (44.2)	Good (50.4)	Moderate (40.4)	Good (42.2)
Pesticide	Good (46.2)	Moderate (44.6)	Good (48.2)	Moderate (46.4)	Moderate (44.2)	Good (46.2)
Labour	Good (52.4)	Moderate (44.2)	Good (50.4)	Good (48.4)	Moderate (40.4)	Moderate (42.4)

Source: Primary data analysis; TSP: triple superphosphate.

Description: The percentage (%) is the frequency distribution percentage for each criterion.

Production facilities are measured using the six right concepts: right on time, quantity, type, quality, product and price.

The average length of time farmers has been farming is 22.4 years. This length of farming experience reflects their farming experience and can influence their knowledge and experience in carrying out farming activities. Farmers' experience can be used as an opportunity to direct the efficient use of production inputs because farmers carry out farming activities based on their experience (19).

Agriculture is a land-based biological industry. Land is a necessary factor for farmers in their farming activities. Based on the distribution of farm sizes among rice farmers, the average is 0.77 ha, with ownership status being owned by the owner and the farmer as a tenant. A farmer with 0.77 ha of land can be described as a small-scale farmer operating below the average land ownership in Indonesia, who often faces economic and structural challenges such as land fragmentation and limited off-farm employment opportunities. These farmers likely rely on income from their agricultural activities to meet their living needs, with harvest yields significantly determining their level of well-being and income (20). Due to limited land area, these farmers' incomes are heavily influenced by the productivity and yield of their land and commodity prices in the market (21).

Implementation of production factors in rice farming

Agribusiness-based farming systems are inseparable from agricultural development goals, which include achieving agribusiness development and improving farmers' welfare. Agribusiness development aims to increase production and added value efficiently, thereby achieving competitiveness in the market. This overall goal must be based on improving farmer/rancher welfare (22). The core of this goal is to achieve food security based on the principles of independence and continuity (23). The principle of independence in strong and continuing agribusiness development is demonstrated by the level of farmer income and the increase in business scale, as measured by the productivity (24).

This research was conducted on rice farming operated by the farmers. The approach used in this study was an agribusiness system approach, specifically the application of production facilities based on the six rights, namely right time, quantity, type, quality, product and price. The application of production facility subsystems is listed in Table 2.

The implementation of each on-farm agribusiness subsystem using the 'six precise' approach to the input factor usage was in the moderate to good category (25). This requires an approach to improve farmers' skills and knowledge of agribusiness concepts (26). This approach can be implemented through farmer empowerment activities, including agricultural extensions. Based on the results of the input factor implementation, 53.33 % of farmers effectively implemented it. This indicates that, despite their

22.4 years of farming experience, not all have gained experience in the proper use of the production inputs.

Farmers often face obstacles in providing production facilities. Seed prices are often unfavourable to farmers, meaning they are high (27). Similarly, issues related to seed quantity and quality have also been encountered. Fertiliser availability is generally sufficient to meet the needs of farmers. Fertiliser and pesticide prices remain high for livestock farmers and distribution is often delayed. The pricing of production inputs is still dependent on input traders, ultimately resulting in high farm production costs (28, 29).

Factors influencing rice production

The results of the Durbin-Watson test indicated a p -value greater than 0.05, suggesting that all variables were normally distributed. The multicollinearity assessment revealed a Variance Inflation Factor (VIF) value of less than 10, indicating that all variables were free from multicollinearity. The research data were distributed without forming discernible patterns, suggesting the absence of heteroscedasticity. Regression analysis was determined to be the best linear unbiased estimator (BLUE) based on normality and classical assumption tests.

The results of the regression analysis were as follows:

$$Y = 1742.79 + 4773.363X_1 + 2144.111X_2 + 79.426X_3 + 109.528X_4 + 1979.347X_5 + 89.388X_6 + 961.408X_7$$

As illustrated in Table 3, factors such as land ($p:0.005$), seed ($p:0.000$), urea ($p:0.000$), TSP ($p:0.000$), pesticide ($p:0.033$), labour (0.022) and agribusiness implementation (0.009) showed the coefficients positive, indicating that increases in these variables were associated with higher rice production. All variables significantly affected production ($p < 0.05$). The availability and quality of land are fundamental to agricultural productivity in the region. The fertility of the land, its water retention capacity and the overall soil health are critical. Cultivation practices that improve soil quality, such as integrated soil fertility management, can enhance crop yields (30).

The choice of seed affects the overall yield potential of crops. Improved wheat varieties, for example “ciherang”, have been shown to significantly impact production outcomes when selected appropriately (31). Fertilisers, such as urea and TSP, are vital in providing essential nutrients, such as nitrogen and phosphorus, to crops, which support plant growth. The adoption of climate-smart agricultural technologies often includes the strategic use of fertilisers to enhance productivity while mitigating environmental impacts (31). Pesticides play a role in protecting crops from pests and diseases, which can drastically reduce yields if left unmanageable. Their use, however, must be balanced with sustainability practices to avoid negative environmental

consequences (32). Labour availability and efficiency are crucial, especially in regions that rely on smallholder farming. The knowledge and skills of the labour force can significantly impact the adoption of climate-smart practices and technologies, thereby enhancing productivity (33).

The implementation of agribusiness has significantly impacted rice production. This is understandable because the application of these production factors forms the technical foundation of farming. Therefore, based on these factors, it is necessary to improve farmers' ability to allocate production factors by referring to the six methods. This aligns with the farmers' performance in rice production. The results show that farmers are capable of farming with a rice productivity of 7.5 tonnes/ha/harvest season. This yield is higher than the standard productivity of 6 tonnes/ha/season.

The regression analysis of the factors influencing production shows that the regression model is a fit model. The results are presented in Table 4.

Table 4. Determination coefficient of regression model

Model	R	R square	Adjusted R Square	Standard error of the estimate	Durbin-Watson
1	.985 ^a	.970	.968	5924.11199	2.259

a. Predictors: (Constant), labour, land, IP, pesticide, TSP, seed, urea

b. Dependent variable: production.

The regression model demonstrated an excellent fit, with an adjusted R^2 value 0.968. This indicates that the variables land, seeds, urea, TSP, pesticides, labour and agribusiness implementation were able to explain the production variable. The remaining 3.2 % of variation in rice production was explained by factors not included in the model.

Price efficiency of production factors

The goal of this efficiency analysis was to minimise production costs and maximise yields, thereby increasing farmer income. Farmers can improve efficiency by selecting superior rice varieties, using fertiliser appropriately, managing water effectively and utilising labour optimally (34). By achieving efficiency in input use, farmers can increase rice productivity, reduce production costs and increase their overall income (35). In microeconomics, the cost efficiency of rice inputs is defined as the condition in which farmers allocate inputs (such as seeds, fertilisers, pesticides and labour) in such a way that the ratio of their marginal product to the price of those inputs is at least close to unity (36, 37). This means that farmers maximise their profits by avoiding using too many expensive inputs for a small output or too few inputs that could yield higher yields.

Table 3. Regression results of factors affecting rice production

Model	Unstandardised coefficients		Coefficients ^a standardised coefficients		Sign	Collinearity statistics	
	B	Standard error	Beta			Tolerance	VIF
Constant	1742.797	1816.984			.341		
Land (X ₁)	4773.363	1649.935	.061		.005	.925	1.081
Seed (X ₂)	2144.111	118.471	.709		.000	.268	3.738
Urea fertiliser (X ₃)	79.426	16.502	.267		.000	.134	7.471
TSP fertiliser (X ₄)	109.528	12.904	.467		.000	.136	7.368
Pesticide (X ₅)	1979.347	907.856	.054		.033	.666	1.501
Labour (X ₆)	89.388	33.162	.101		.022	.293	3.415
Agribusiness Implementation (X ₇)	961.408	409.244	.057		.009	.709	1.410

Source: primary data analysis.

VIF: variance inflation factor; TSP: triple superphosphate.

The results of the price or allocative efficiency analysis in Table 5 indicate that the use of production factors was inefficient. This is indicated by a value greater than 1, meaning that the use of production facilities must be increased. Insufficient use of production factors can be caused by high prices of production factors while farmers face capital constraints. The emphasis on price or allocative efficiency is related to the price components of inputs and outputs used. Therefore, it is very appropriate for farmers' circumstances. Farmers are still inefficient in the use of production factors, indicating that there are capital constraints in allocating the amount of production factors used. However, the amount of input used for urea and TSP was already within the standard limit, namely 250–300 kg/ha. This is likely due to land conditions that are starting to decline in fertility because of intensive fertiliser use. If efficiency > 1, it means the additional value generated from the input is greater than its cost. In this case, farmers need to increase the use of that input to achieve higher efficiency and profits. Price efficiency means that farmers use production inputs in the most cost-effective way and generate the greatest income for each input cost incurred.

Rice farming income and profitability analysis

The analysis of rice farming income and profitability is a performance measure for a farm. This can serve as a benchmark for enterprises continuity, which is supported by the land area, production volume, grain selling price and production costs (16, 38, 39). Variable costs (94.73 %) exceed fixed costs (5.27 %), which is understandable given that, in business, the cost components directly related to production are variable costs. Among the variable costs, labour costs are the highest. The agricultural labour shortage is caused by an aging workforce, a lack of interest among young people due to stigma and unattractive work and changing career aspirations among farmers' children.

The agricultural labour (Table 6) shortage primarily arises from the aging workforce in farming, which limits the availability of workers as fewer younger individuals enter this sector (40). The shortage is exacerbated by young people's lack of interest in agricultural jobs, often due to the stigma and unattractive nature of the work, as well as changing career aspirations among the children of farmers, who increasingly pursue non-farming occupations (41). This problem has resulted in decreased food production and higher production costs due to higher wages and mechanisation costs and has forced farmers to switch to modern agricultural technologies or increase operational costs. This is understandable, as the tendency for labour shortages in rural areas results in higher wages. The average wage for eight hours of rural labour was IDR 95000.

Table 5. Price efficiency of rice farming

Production factors	B	X	P _x	MPP	Efficiency
Land	4773.36	0.77	2658000	35800200	87178.87
Seed	2144.11	22.8	18000	543080.74	195286.71
Urea fertiliser	79.42	258.5	3450	1774.41	3329.02
TSP fertiliser	109.52	300.5	2800	2104.86	4865.72
Pesticide	1979.34	3.52	165645	3247366.17	126891.84
Labour	89.38	33.9	100000	15227.60	985.63

Source: Primary data analysis

Description

B: unstandardised coefficients; X: input factor usage; P_x: price of input factor; MPP: marginal physical product; TSP: triple superphosphate.

Price efficiency is obtained from the MPP multiplied by the product price and divided by the input price. While the MPP is obtained from the number of products divided by the input used multiplied by the unstandardised coefficients.

Table 6. Cost production of rice farming in planting season 1, 2025

Cost	Amount	Percentage
	--- IDR ---	---%---
Fixed cost		
- Land rent	963333	4.32
- Land tax	73211	0.33
- Depreciation	139586	0.63
Total fixed cost	1176130	5.27
Variable cost		
- Seed	589320	2.64
- Fertiliser	2287661	10.25
- Herbicide	2218162	9.94
- Pesticide	2690851	12.06
- Labour	13303251	59.60
- Irrigation	55571	0.25
Total variable cost	21144817	94.73
Total production cost	22320948	100.00

Source: Primary data analysis

IDR: Indonesian rupiah

Income and profitability analyses are important performance indicators for continuing of rice farming, as these results indicate the farmer's ability to manage and run their farm. The results of this analysis are presented in Table 7. The productivity of 7500 kg/ha represents an excellent result, exceeding the rice productivity in Grobogan Regency in 2025 (6174 kg/ha). These results are fundamentally attributable to the implementation of agribusiness, particularly the use of excellent production factors in the industry. Furthermore, farm results, as demonstrated by income and profitability, indicate that rice farming in the study area is profitable for farmers. Profitability in lowland rice farming depends on production system effectiveness, improved agronomic practices including nutrient and water management, risk reduction strategies and access to resources like credit and cooperative groups (16)

Table 7. Revenue, income and profitability of rice farming in Grobogan

Indicator	Amount	Amount
	--- (0,77 ha) ---	--- (1 ha) ---
Production (kg)		
Paddy price (IDR/kg)	5775.00	7500.00
Revenue (IDR)	6472.63	6472.63
Production cost (IDR)	37493090.00	48692325.00
Income (IDR/harvesting)	22320,948.00	28988244.16
Income (IDR/month)	15172142.00	19704080.84
	3793035.50	4926020.21
Profitability (%)	67.97	67.97

Source: Primary data analysis

IDR: Indonesian rupiah.

Rice farming profitability of 67.97 % means that 67.97 % of the total income generated from rice farming activities is net profit after deducting all operational and capital costs. This profitability value indicates that rice farming is profitable because the profitability value is positive and relatively moderate, indicating efficiency in rice farming management. Therefore, a profitability of 67.97 % indicates that rice farming is efficient in generating profits and meeting the agricultural objectives of profitability.

Although pricing efficiency is still not efficient, it can be improved through the improved implementation of the 6-right agribusiness and the importance of aligning input and output prices with farmers, this can increase income and profits. From the performance of agribusiness implementation, the efficiency of input factor use and profitability indicate that the rice farming carried out by farmers shows a good, profitable and ongoing effort (42, 43). Adoption of advanced management packages, improved varieties and efficient water management practices can significantly increase yield and profitability (44, 45). Addressing technical inefficiency and production risk through appropriate input use and genetic improvement further supports profitability (35)

Conclusion

This study concludes that rice farming in Grobogan Regency is characterised by productive-age farmers with relatively good education, long farming experience and limited landholdings, which collectively influence farming performance and decision-making. The implementation of agribusiness practices based on the six-right principles is generally in the moderate to good category, contributing to rice productivity that exceeds the regional average. Regression results confirm that land, seed, fertilisers (urea and triple superphosphate (TSP)), pesticides, labour and agribusiness implementation significantly and positively affect rice production, with the model explaining 96.8 % of production variation. Despite these favourable production outcomes, the allocative efficiency of most production factors remains suboptimal, primarily due to high input prices and capital constraints faced by farmers. Nevertheless, income and profitability analyses demonstrate that rice farming in the study area is profitable and economically viable, with a high profitability rate of 67.97 %, supported by strong yields and effective agribusiness implementation. Therefore, strengthening farmers' capacity in input allocation, improving access to affordable agriculture inputs and expanding agribusiness-oriented extension services are essential to further enhance efficiency, profitability and the long-term continuing of rice farming in Grobogan Regency.

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Authors' contributions

TE conceived and designed the study, coordinated the research process, conducted data analysis, drafted the manuscript. M contributed to data collection, data processing and assisted in the

interpretation of the results. MA participated in data collection, literature review, supported manuscript revision and contributed to the study design, performed statistical analysis and critically reviewed the manuscript. All authors read and approved the final manuscript.

Compliance with ethical standards

Conflict of interest: Authors do not have any conflict of interests to declare.

Ethical issues: None

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