Jurnal Lahan Suboptimal : Journal of Suboptimal Lands
ISSN: 2252-6188 (Print), ISSN: 2302-3015 (Online, www.jlsuboptimal.unsri.ac.id)
Vol. 13, No.2: 186–197 Oktober 2024
DOI: 10.36706/JLSO.13.2.2024.675

Can rice farming through the national strategy food estate increase regional production?

Apakah usahatani padi sawah melalui strategi nasional food estate dapat meningkatkan produksi daerah?

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(Received: 8 January 2024, Revision accepted: 19 September 2024)

Citation: Yusup, S., & Sonia, Y. (2024). Can rice farming through the national strategy food estate regional production?. *Jurnal Lahan Suboptimal : Journal of Suboptimal Lands. 13* (2): 186–197. https://doi.org/10.36706/JLSO.13.2.2024.675.

ABSTRAK

Food estate merupakan program pengembangan pangan dengan skala luas yang dilakukan secara terintegrasi mencakup pertanian, perkebunan dan peternakan dalam suatu kawasan. Penelitian ini bertujuan untuk menganalisis faktor-faktor produksi usahatani padi sawah dalam upaya peningkatan produksi padi pada program strategi nasional *food estate* di Kalimantan Tengah dan menganalisis efisiensi teknis usahatani padi sawah dalam upaya peningkatan produksi padi pada program strategi nasional *food estate* di Kalimantan Tengah. Penelitian ini dilaksanakan di Lahan *food estate* Desa Belanti Siam. Pemilihan lokasi secara *purposive sampling*. Metode pengambilan sampel dilakukan secara acak dengan metode *random sampling* menggunakan rumus Slovin dan total responden 89 orang. Metode analisis menggunakan analisis fungsi produksi Cobb-Douglas dengan alat bantu SPSS 26 dan analisis efisiensi teknis dengan program Stokastik Frontier. Berdasarkan hasil penelitian: (1) lahan (X_1), benih(X_2), kapur(X_3), dan pupuk(X_4) berpengaruh signifikan (p <0,05) terhadap hasil produksi padi sawah di lahan *food estate* desa Belanti Siam, sedangkan pestisida(X_5), tenaga kerja(X_6), alsintan(X_6), dummy sistem tanam(D_1), dan dummy pola tanam(D_2) tidak berpengaruh signifikan terhadap hasil produksi padi sawah di lahan *food estate* di desa Belanti Siam. (2) Petani di Desa Belanti Siam sudah tergolong efisien secara teknis dengan rata-rata efisiensi teknis 96,5% (cut-Off >0,70), sedangkan secara individual terdapat 88 petani yang tergolong efisien secara teknis. Penelitian ini diharapkan dapat menjadi bahan pertimbangan dalam pengambilan kebijakan pertanian baik bagi kesejahteraan petani maupun untuk peningkatan produksi padi dalam menjaga ketahanan pangan.

Kata kunci: Cobb-douglas, efisiensi teknis, food estate, kebijakan pertanian, ketahanan pangan

ABSTRACT

The food estate was a large-scale integrated program for the development of food production, encompassing agriculture, plantations, and livestock within a specific area. This research aimed to analyze the production factors of paddy farming to increase rice production in the national food estate strategy program in Central Kalimantan and analyze the technical efficiency of paddy farming to increase rice production in the national food estate strategy program in Central Kalimantan. This research was conducted at the food estate land of Belanti Siam Village. The selection of the location was done via purposive sampling. The sampling method was conducted randomly using the random sampling method with the Slovin formula, and the total number of respondents was 89 individuals. The analysis method employed was the Cobb-Douglas production function analysis using the SPSS 26

software tool and the analysis of technical efficiency using the Stochastic Frontier program. Based on the research findings, it was observed that the variables of land (X1), seed (X2), lime (X3), and fertilizer (X4) have a significant impact (p <0.05) on the rice production in the paddy fields of the Belanti Siam food estate village. However, the variables of pesticide (X5), labor (X6), agricultural machinery (X6), dummy planting system (D1), and dummy planting pattern (D2) do not have a significant impact on the rice production in the paddy fields of the Belanti Siam food estate village. (2) The farmers in Belanti Siam Village were already considered technically efficient, with an average technical efficiency of 96.5% (cut-off >0.70). However, 88 individual farmers were classified as technically efficient. This research was expected to serve as a basis for agricultural policy-making, benefiting farmers' welfare and increasing rice production to ensure food security.

Keywords: Cobb-Douglas, technical efficiency, food estate, agricultural policy, food security

INTRODUCTION

The agriculture sector plays a major role in the Indonesian economy. According to BPS statistics from 2021, 13.28% of Indonesia's GDP comes from the agricultural, forestry, and fisheries sectors, with the food crop subsector accounting for 2.60% of GDP. Crops abundant in vital nutrients, such as proteins and carbohydrates, which humans require heavily, are included in this subsector. The Food and Agriculture Organization (FAO) (2020), often known as the World Food Agency, predicts that Indonesia will be affected by the COVID-19 pandemic-related worldwide food crisis. The current global food crisis is a national strategic concern. The possibility of a worldwide food catastrophe is strongly associated with Indonesia and other countries with rapidly expanding populations. This is because as the population expands, so does the need for food, particularly rice, sorghum, and shrimp. Furthermore, because of its lengthy wet season, Indonesia, a tropical nation, is vulnerable to climate change. The scenario becomes increasingly complex due to the uncontrollable uncertainty caused by the COVID-19 epidemic (Amri & Muttaqin, 2022).

The Indonesian government responded to the FAO report by accelerating the implementation of the national food estate strategy program to address the food crisis (Pantaugambut.id, 2022). *Food Estate* is an integrated program that covers agriculture, plantations, and farms in a large-scale region to develop food production (Lasminingrat & Efriza, 2020). The program aims to build food production centers by unifying precise farming, farmers' corporations, and ecosystem conservation to create community well-being and increase national food supplies. One of the provinces that implemented the food estate program is Central Kalimantan. Central Kalimantan has an ex-PLG area dominated by gambut, and the location of the implementation of the food estate program is in Kapuas district and Pulang Pisau district (Lasminingrat & Efriza, 2020).

The main commodity for developing food estate programs in Central Kalimantan, particularly in the Kapuas and Pisao Pulang, is Padi. Padi is a grass-and-grass plant that is one of the food-producing materials identical to rice in Indonesia. Food Estate can create a sustainable food supply for the government. Based on data on the yields of the grain production on the land, the food Estate has experienced a significant decline in grain production, one of which is the district of Pulang Nisau. However, the government has supported as much as possible such as granting aid to means of production and expanding land to agricultural equipment and machinery. According to the Central Statistical Agency of Central Kalimantan (2022), the production of peanuts in Central Kalimantan was 381.19 tons/Dry Giling Pest (GKG) in 2021.

From 2020 to 2021, the production of peas in Central Kalimantan experienced a significant decrease of 76.76 thousand tonnes/GKG by 2021. Padi production and productivity in the Food Estate program in 2020–2021 significantly increased the crop size of each center site. Some sites in the 2021 region that have a harvest area in the Kapuas district have increased by 56.12 Ha or 2%, and yields have improved by 15%. Besides, the Pulang Pisau district has a significant crop area of 24.694 Ha or 12%, but the yield in 2021 is only 66.982 (Department of Food Crops, Horticulture, and Livestock of Central Kalimantan Province, 2022). Based on

data filling the means of production, agricultural tools, and machinery, land expansion has been done in the food estate program, but the grain production yield still needs to be improved. Padi productivity in Kapuas district and Pisau district has a factor of decrease in the percentage of padi production. In addition to the factor of production, other factors are the application of technology. The existence of production factors and the improper application of technology will result in low production and high farming costs. The purpose of this research was to analyze the production factors and technical efficiency of the *Padi Sawah* crop to improve rice production as part of the national food estate strategy program in Central Kalimantan.

MATERIALS AND METHODS

Preparation Phase

Preparation of research by visiting research objects, observations, and finding problems at the research site. The next step was to define the problem formula, purpose, and limitations of research so that research stays consistent. The final stage of research preparation was reviewing literature reference sources to compare with other research and help in the analysis and data collection process.

Implementation

This research was carried out using a quantitative research approach. Research location in Pulang Nisau District, Central Kalimantan. The location was selected with purposive sampling, considering field data concerning the decline in peat production in the Pandih Batu Village Siam district, which became the center of excellence (COE). The Pandi district was the center of the development of the Food Estate program by the Central Kalimantan government in the agricultural sector.

Methods

The methods used for sampling were probability samplings, which means that each element has the same probability of being selected. The research population of as many as 911 farmers in Siam, the district of Return Knife, will be used in determining the sampling size. The Slovin formula will be used as followed.

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

Description :

n	=	Total Sampel
N	=	Total Population
e	=	Error Rate (10%).
1	=	Constant Number

Based on the calculation of the Slovin formula, the number of samples obtained in this study was 90 farmers with an error rate of 10%. The method of sampling members of the population in the study was done using the random sampling technique.

The data collection method in this study was primary and secondary data collection. The collection of this primary data itself was done by observation and conducting interviews as well as submitting questionnaires to the respondents or samples that have been selected.

Data Analysis

Double Linear Regression Analysis

This study's data analysis method uses the Cobb-Douglas production function, where this function or equation involves two or more free variables (independent) and non-free variables. Mathematically, the COBB-DUGLAS production function was written as follows.

$$Y = a\, X_1^{b1}\, X_2^{b2} \ldots, X_i^{bi} \ldots, X_n^{\beta n} e^u$$

In addition, the stage of the hypothesis in the Cobb-Douglass production function could be transformed into a natural double logarithm with the following linear double regression form.

Data processing was done electronically using Statistical Package for the Social Sciences (SPSS) and Software Frontier 4.1. Further, the data in test F to see the influence of the production factor on grain production. In addition, the impact of each factor of production of the farming enterprise with test T and to review the contribution of the dependent variable to the independent variable performed the determination coefficient test (R2).

Technical Efficiency of Production Factors

The level of technical efficiency achieved by farmers was measured by comparing actual production to potential production. Parameters were estimated using the MLE estimate method. (Maximum Likelihood Estimate). The technical efficiency level (TE) in this study was measured using calculations with provisions. Default requirement $0 \leq$ efficiency level ≤ 1 with a precondition among others:

a. The farm was technically efficient if the efficiency level was closer to 1.
b. The farm was not technically efficient if the efficiency level was getting closer to zero.

The level of efficiency of the farming activity could be categorized as highly efficient when the value of the efficiency index was ≥ 0.90, quite efficient if 0.70 > the level of effectiveness, and said to be inefficient if the level was < 0.70 (Coelli & Battese, 1998). In addition, using productive factors was technically efficient if the productive factor used produces maximum production. The decision to accept or reject the hypothesis will be considered using the Likelihood ratio test (LR). Identifying the source factor of technical inefficiency on a farm enterprise, then using a dual linear regression model that was estimated simultaneously.

RESULTS

As to the production factors that were supposed to influence the production of wild grain in food estate land, the results of the double linear regression analysis obtained using SPSS could be seen in Table 1.

Table 1. Results of analysis of factors of production of usahatani paddy fields in the food estate village Belanti Siam

Model	Koefisien	T	Sig.
(Constant)	5.511	5.622	.000
Land area	.118	2.227**	.029
Total of seeds	.206	2.241**	.028
Calf	.158	2.635**	.010
Fertilizer	.155	2.349**	.021
Pesticides	-.080	-.836	.406
Workforce	.069	.877	.383
Agriculturaltools and machinery	.100	.201	.841
Plantation system	.051	.739	.462

Source: Primary data analyzed using SPSS, 2023

Based on Table 1 showed the result of double linear regression analysis in the Cobb-Douglas production function equation. Estimates the factors that affect the production of wild grain in the food estate land of the village Belanti Siam.

Linear Regression Model Hypothesis Testing
Determination Coefficient Test (R^2)

The results of the determination coefficient (R^2) test could be seen in Table 2. Based on Table 2. shows the influence of free variables on the output of grain production in the food estate of the village of Belanti. As for the R-value obtained at 0.655, it shows the relationship between all free variables to the bound variable, i.e., the outcome of the grain output in the land of food estate (Y) Belanti was strong enough to be 0.655 or 65,5%. The greater the correlation coefficient value or closer to 1, the stronger the independent variable correlations to the dependent variable were.

Table 2. Results of the determination coefficient test

Model	R	R Square	Adjusted R Squere	Std. Error Of the estimate
1	$.655_a$	.429	.363	653.93836

Source: Primary data analyzed using SPSS, 2023

The value of the R Square or determination coefficient (R2) in the model was 0.429 or 42.9%, then the conclusion that the free variable on the soil (X1), seed (X2), limestone (X3), fertilizer (X4), pesticides (X5), labor (X6) and agricultural tools and machinery (X7), as well as dummy variables such as the crop system (D1), and crop pattern (D2) could explain the influence of independent variables on the dependent variable.

Significant Test Simultaneously (Test F)

The F test was performed to determine whether all independent variables simultaneously influence the dependent variable, namely the production of wild grain in the food estate (Y) land of the village of Belanti Siam. The hypothesis to be tested was as follows.

a. H_0: There was no influence of the productive factors of land, seeds, limestone, labor, fertilizers, pesticides, agricultural tools and machinery, cultivation patterns, and

cultivation systems on the yield of wild grain production in the food estate land of the village of Belanti Siam.

b. H_1: There was an influence of the factors of production of land, seeds, limestone, labor, fertilizers, pesticides, agricultural tools and machinery, planting patterns, and planting systems on the output of grain production in the food estate land of the village of Belanti Siam

The results of the F-test analysis through the ANOVA table could be seen in Table 3. Based on Table 3 showed the existence of simultaneous influence between free variables and bound variables. Based on the F value of 6.373 and the value of the Ftable of 1.966 with a significance of 0,000<0,05, H0 was rejected, and H1 was accepted. Then, it could be concluded that the guidelines of free variable testing simultaneously influence the output of cereal production in the food estate (Y) village Belanti Siam.

Table 3. Simultaneous F test results

Model	Anova	
	F-count	Sig
Production Factors	6.373	.000[b]

Source: Primary data analyzed using SPSS, 2023

Significant or Partial Test (Uji T)

Based on the results of the test, t showed that the free variable has a partial influence on the output of the grain production in the food estate of the village of Belanti Siam (α = 5%). Based on the significance test individually or partially, of the 9 (nine) free variables that were tested against the bound variable, i.e., the production of grain in the land of food estate (Y), there were 4 (four) freed variables which have a significant or partial effect on the other soil (X1), seeds (X2), limestone (X3), and fertilizer (X4), with a significant value of < 0,05. In contrast, the other 5 (five) Free variables did not significantly influence the dependent variable.

Technical Efficiency Analysis of Production Factors of Padi Sawah Farm Enterprises in Lahan Food Estate Belanti Siam Village

Technical efficiency relates to how a farmer manages his business; technical efficiency usually relates to his managerial abilities. The result of the assumption of this production function parameter was obtained through the Maximum Likelihood Estimation (MLE). The results of the parameter prediction and the t-test could be seen in Table 4 as followed.

Table 4. Estimated production functions of frontier stochastic enterprises paddy fields farm in lahan food estate Belanti Siam Village

Variable	Coefisien	Standar Error	Test-count
1 (Constant)	-1.684	1.252	-1.344
Land area	0.140	5.681	2.479**
Total of seeds	0.217	0.102	2.115**
Calf	0.165	0.058	2.812***
Fertilizer	0.175	0.081	2.162**
Pesticides	-0.017	0.093	-0.958[ns]
Workforce	0.040	0.076	0.530[nss]
Agriculturaltools and machinery	0.252	0.554	0.454[ns]
Plantation system	0.068	0.071	0.964[ns]
Plant pattern	-0.028	0.076	-0.366[ns]
Sigma -Squared	0.030	0.021	1.403[ns]
Gamma	0.124	0.662	0.187[ns]

Based on Table 5. shows the analysis results using the Stochastic Frontier approach to estimate MLE with the Frontiers 4.1 program. Furthermore, based on the analysis, four production factors influence the output of wild beans in the food estate land: soil(X1), seeds(X2), limestone(X3), and fertilizer(X4), shown with higher values than the table at significant rates of 5% and 1%.

Based on the results of the MLE analysis obtained, Calf (X3) was the most responsive or highly influential variable to the output of peanut butter in the food estate of the village of Balanti Siam because it has a t-count value of 2,812> t table was 2,645 with a rate of error of 99%. This was because the land that becomes the place of cultivation of peat butter was the land with coconut soil.

The soil's fertility affects plants' growth, so the supply of calcium in a balanced and periodic manner will reduce the soil's acidity level. Calcium was also an important supplier for plants for growth and development, so calcium has a major influence on the production of paddy in the land of food in the village of Balanti Siam. In addition, there were quite responsive variables to the yield of grain production, namely soil(X1), seeds(X2), and fertilizer(X4), which have a significant effect of 0.05. Other free variables do

not affect the output of wild grain in the food estate of the village of Belanti Siam. This was due to the need for maximum use of productive factors during the cultivation of peas. Farm effort could be considered efficient if value > 0.70 (Coelli, 1998). The distribution of the technical efficiency level of padi sawah in the food estate land of the village Belanti Siam could be seen in Table 5.

Table 5. Distribution of technical efficiency of paddy fields at food estate village Belanti Siam

Interval	Farmer	%)
0.61–0.70	0	0
0.71–0.80	1	1.1
0.81–0.90	9	10.1
0.91–1.00	79	88.8
Total	89	
Average	0.965	
Minimum	0.802	
Maximum	0.992	

Source: Results of analysis using Stochastic Frontier, 2023.

Based on Table 5, it was indicated that the rate of technical efficiency level of the farming enterprise in the food estate land of the village of Balanti was 0.965, with the lowest value of 0.802 and the highest of 0.992, which means that it could be concluded that farmers in the Siamese Belanti were technically efficient in the use of production factors with cut-off value >0.70. The productivity rate achieved by farmers in the village of Belanti was about 96.5% of the frontier, the maximum productivity that could be attained with the best management system.

The farmers who could be said to have technical efficiency individually were as many as 88 people, ranging from 81% to 99%. The efficiency level belongs to the category of technically quite efficient because of the approach of the border (TE-1). Based on the calculation of technical efficiencies, it was known that 88 farmers responding to the field in the food estate village of Belanti have a relatively high level of technical effectiveness in the range of 0.91–1.00, as much as 88.8%. This showed that the higher level of efficiency technically could reflect the managerial skills of farmers. The high level of efficiency also showed that the farmers' chances of increasing productivity were reduced by the increase in productiveness achieved.

Farmers of *Padi* at food estate sites could still increase productivity by 4.35% by optimizing agricultural inputs and cultivation techniques used by the most efficient farmers. It also reviewed the LR value (Log-likelihood Ratio tets) on the estimated function of the frontier production table with the MLE approach of 4,171.

The LR test was then compared to the X21 critical value (Kodde & Palm, 1986) with a 0.25 percent error rate of 6,031. It indicates that H0 was accepted and H1 was rejected. It means that the farmers' efforts in the food estate of the village of Belanti have yet to reach technical efficiency. Technical efficiency differences could be caused by age, professional experience, education, or land ownership status. Factors affecting technical efficiency were analyzed by looking at the effects of technical inefficiency.

This inefficiency effect was considered a term error of the productive function modeled. Values and γ indicate technical inefficiencies in the frontier stochastic model. The effect of ineffectiveness was attributed to the term error of the productive function modeled. Then, it was necessary to analyze the source of inefficiency aimed at identifying the sources of technical ineffectiveness of the peat in the food estate of the village of Belanti Siam using the production model Stochastic Frontier, where the results of the analysis could be seen in Table 6.

Tabel 6. Sources of technical inefficiency in rice farming in Belanti Siam Village

Variable	Coefisien	Standar Error	t- Count
Long Education	-0.018	0.1492	-0.764
Age of the farmer	-0.019	0.292	-1.447
Experience	0.015	0.739	0.913
Sigma-Squared	0.030	0.	1.403385
Gamma		0.124	0.187

Source: Results of analysis using Stochastic Frontier, 2023

Table 7 provides information on the source that caused technical inefficiency in the farming business at the food land of Eetate village in Belanti. The analysis of Sigma-Squared values shows that the distribution of the infection term error (ui) was 0.030, indicating that the term error was normally distributed. With a gamma value of 5% error rate, it was found that 0.187 t-count was

less than the t-table of 1.67, meaning that 12.45% of the term error was due to technical inefficiency and 88.55% was due to risk factors. When gamma values were close to zero, the entire term error was caused by noise, such as climate, weather, pests, etc.

DISCUSSION

Farmland refers to the area that is used to grow and produce crops. The size of the land is a crucial factor in agricultural production, as a larger land area can result in higher production. Analysis has shown that in the land food estate of the village of Belanti Siam, the size of the land area (X1) has a significant and positive impact on grain production output (Karmini, 2018). The regression coefficient for the land area is 0.118, which means that a 1% increase in land area can result in a 0.118% increase in production output. Previous studies have also demonstrated that larger land size leads to higher agricultural productivity. Farmers who own larger land areas tend to produce higher yields, as stated by (Zarliani, 2020).

According to Zarliani (2020), farmers with larger farmland areas have higher productivity in their business, indicating that a larger farmland area can result in greater yields. Paulus et al. (2017) also noted that land size had a significant and positive impact on peach production during a recession. In the village of Belanti Siam, survey results indicate that respondents obtained a potential land ratio of 2 hectares per person. The land analyzed ranges from 2 to 10 hectares, including land ownership status, both owned and rented. Farmers who own larger land areas have been found to produce higher yields than those with smaller land areas but the same production capacity. Therefore, the size of the land has a significant and positive impact on the yield of grain production in the village food estate land.

Seeds are harvested seeds intended to be used as input in business. Seeds are one of the most important production recommendations in increasing the productivity of a plant. Therefore, the quantity of seeds used has a strong influence on the growth of plants.

The regression analysis results show that the seed variable has a significant influence of 0.028< 0.05 and positively influences the output of peat production, where the coefficient is 0.206. The magnitude of the positive seed coefficient of 0.206 shows that with the addition of 1% of seed use, production will increase by 0.206%. It is also consistent with the previous research by Al Zarliani (2020) that seed influences the outcome of the research area. The amount of seed used in farming is adjusted to the size of the harvested land; the larger the land the farmer harvests, the more seed is used, which affects the yield. Paulus et al. (2017) showed that seed production factors significantly and positively influence grain production yield in the research area.

Based on the results of the research, the use of seeds of padi by respondent farmers who have farmers in the food estate of the village of Belanti Siam is as much as 25-50 kg/ha for the seed of new superior varieties, namely varieties Inbrida, inpari 32, inpari 37,inpari 42, sartani. Meanwhile, the usage of hybrid seed varieties averages 5-17 kg/ha with varieties types HIPA 18, HIPA 21, Supadi, and Mapan. Many seeds are also adapted to the area of land and the system of crops used. Farmers say using different varieties in each growing season is also usually done so plants avoid easily attacking pests and diseases. According to farmers, using the same varieties at every growing season makes them more vulnerable to pests and diseases; also, using varieties is based on the climate at each planting season. The new superior varieties farmers use can adapt to their environment. Planting this new superior variety (VUB) alternately will break the life cycle of pests and diseases.

Food Estate Melting is a soil amendment technique that aims to raise the soil's pH by incorporating limestone (Cybext Agriculture, 2021). After analyzing the data, it was found that the calcium variable had a significant and positive impact (p-value < 0.05) on the output of Sawah peat production in the food estate. The coefficient for this variable was determined to be 0.158. The calcium regression coefficient (X3) is 0.230, meaning that a 1% increase in calcium will result in a yield increase of 0.218 kg.

Consistent with prior research conducted by Krisnawati & Bowo (2019), it has been found that calcium can elevate the soil's pH level and enhance the growth and yield of grain crops.

Calcium impacts the crop's height, the quantity of seedlings, and the mass of the grass. According to Kusnadi et al. (2022), dolomite limestone has been found to enhance pepper productivity by approximately 10% in dew fields. Applying 500 kg/ha of a substance can raise the soil's pH to ensure the availability of hares, hence promoting optimal growth of pepper crops.

The investigation conducted by the farmers revealed that the primary determinant of the quality of cabbage is the soil in which it is grown. The soil exhibits a rather elevated acidity level, specifically with a pH range of 3–4. The soil's low phosphorus and mineral content results in reduced fertility. The process of neutralizing soil pH can be achieved by incorporating lime. Applying a predetermined quantity of lime to the soil significantly impacts the first yield of plants. Consequently, the presence of limestone significantly impacts the pea output in the Siamese village of Balanti Siam.

The limestone farmers use in the Siamese village of Belanti Siam consists of KAPTAN limestones and dolomites. Farmers often administer calcium once annually or during each planting season. The irregularity of calcium distribution in each growing year is attributed to the high cost of calcium, which is a financial burden for farmers. *Fertilizers* provide essential nutrients for plants, which are added to the soil to enhance the growing process and promote maximum growth. The variable analysis of fertilizer influence yielded a statistically significant result (0.021 < 0.05), indicating a positive relationship with a regression coefficient value of 0.155. Consequently, fertilizers exert a tangible and substantial impact on production yield. This suggests that the level of fertilizer applied to the soil on agricultural land significantly impacts crop yield.

This aligns with the research conducted by Sufriadi & Hamid (2021) on the impact of fertilizer on bean crop output. Administering fertilizers by the prescribed guidelines will yield ideal outcomes. According to the research conducted by Susanti, Meli et al. (2019), fertilizer has a substantial and beneficial impact on the yield of wild beans in the study region. Alternative viewpoints The study conducted by Sholeh et al. (2017) demonstrates that fertilization significantly impacts the production of peanut crops grown on marginal land. Furthermore, the research findings demonstrated that organic fertilizer significantly improves plant output. The highest crop productivity is achieved by using urea fertilizer at a rate of 250 kg/ha, NPK at a rate of 200 kg/ha, and organic matter at a rate of 6,000 kg/ha. This results in a wheat yield of 5.72 tons/ha.

According to the findings of interviews with farmers, respondents indicated that providing fertilizer significantly impacted plant growth, including stimulating the growth of peas and raising the weight of the peas. The study's findings indicated that the farmers surveyed provided well-balanced fertilizers to the wild pea crops. The farmers surveyed primarily utilize chemical fertilizers, specifically NPK, and urea, in a 1:2 ratio for application.

Pesticides are chemicals used to control pests and diseases that attack plants. Based on the variable analysis, pesticides are not affected (0,406> 0,05) and are negatively influenced by the pesticide regression coefficient (-0,080) on the production of wild beans in the food estate. According to Walis, Nunu et al. (2021), pesticides have no effect. This is because farmers use pesticides that are adapted to pests and diseases. These positive effects indicate an increase in the number of pesticides used at the right dosage to increase production.

Based on the results of interviews with respondent farmers, pesticides were administered to peat crops at the time of pest and disease attacks. Pesticide administration with a 16-18 liter thickness in a single spray by spending a row of 10 tanks/ hectares in one spray. The spraying time technique also affects pesticide administration for pest and disease control. Therefore, pesticides are not influenced by farmers, who only give pesticides when pests attack. It is also predicted to be resistant to pests, causing the pesticides used by farmers in the Belanti Siam balance ineffective against grain production.

Agriculture Deputy (2003) stated that pests and plant diseases are dynamic in their development and are influenced by biotics (growth phases, populations of other organisms) and antibiotics such as antibiotics. Pests of

diseases that frequently attack plants pests, pests of rats, gray worms, and others. The pest control still hard to control by the farmers in the village of Belanti Siam is the rat pest.

The labor force is a determining element of the season-dependent farming enterprise. Employment usually comes from farmers' families and others. The analysis results showed that the labor force is not significantly influenced by (0,383 > 0,05) but has a positive influence of 0.069 on the output of grain production in the food estate of the village Belanti Siam.

The value of the labor coefficient indicates a positive influence, and if there is an increase of 1% in labor, then it is reversed to the production of 0.069%. It aligns with the Zarliani study (2020) that labor does not influence production output. This is due to the underoptimal use of labor and working hours, which impacts unintended productivity. According to Walis, Nunu et al. (2021), labor did not influence the increase in peanut production but correlated positively. Positive labor coefficient against peanut production due to the increase in the labor force, which means encouraging more intensive processing of peanut farms.

According to the research, the workforce used in the village of Belanti Siam needs to be used more for each growing season. This is because the labor force still needs to be increased to meet the need for working time in the villages of Belenti Siam. The lack of labor force is also due to the entire labor force, which has the enterprise of the farm of paddy fields, so a division of time of less than the maximum will be used. This labor shortage affects the late growing season and the maintenance of crops, resulting in more vulnerable pests and diseases, thus interfering with the growth of plants.

Agricultural tools and machinery are tools used in agriculture to make it easier for farmers to cultivate the land and agricultural produce in the endeavor of the farm, so with the presence of tools, mechanical technology is expected to be effective in helping farmers in managing the farm enterprise. Based on the variable analysis of Agricultural Equipment and Machinery, it showed no significant (0.84 > 0.05) but a positive impact. This is due to a coefficient of 0.100 against the output of peanuts in the Food Estate village of Belanti Siam.

If there is an optimization of the use of agricultural tools and machinery are tools used in agriculture to make it easier for farmers to cultivate the land and agricultural produce in the endeavor farm, so with the presence of tools, mechanical technology is expected to be effective in helping farmers manage the farm enterprise. Based on the variable analysis of Agricultural Equipment and Machinery, it showed no significant (0.84 > 0.05) but a positive impact. This is due to a coefficient of 0.100 against the output of peanuts in the Food Estate village of Belanti Siam. According to Emalia et al. (2021), using agricultural tools and machinery has no real impact on producing wild beans and farmers' income in the Siamese Belanti village. If there is an optimization of the use of Alsintan, then the performance of the peat farmer will be better, and the production can be increased. Based on the results of research, the introduction of technology that goes into the food estate of the village Belanti Siam belongs to modern technology, such as hand tractor, combine harvester, joinder or tractor wheel 4, and rice transplanter. The results of the analysis showed that the agricultural tools and machinery used did not have a real impact on the output of production and based on the results of interviews, there are still some tools and agricultural machines that are less than the maximum used by the farmer in the food estate of the village of Belanti Siam, for example the jonder machine. This is because it is unsuitable for farmland, which is low plains and already deep land, so the use is less than maximum.

The harvest process is assisted by a Hansvester combined harvest machine that can help farmers make time more efficient, but the harvesting machine still needs to be more than the maximum. This is because the Hansvester Combain machine is not suitable for land conditions, and the machine's use time becomes inefficient, resulting in farmers switching to the conventional way of harvesting grain. Lack of optimum use of agricultural tools and machinery affects labor needs., then the performance of the peat farmer will be better, and the production can be increased.

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The Padi planting system is the setting of the planting distance used by farmers in planting padi on the land. The adjustment of the cultivation distance used significantly impacts the growth of plants in grain production. The analysis shows that the variable dummy of the growing system is insignificant, with a significant rate of 0.462 > 0.05. However, it has a positive effect (coefficient of 0.051) on the output of wild grain production in the food estate. Based on the positive coefficient value, using a fixed crop system would impact the output of 0.051%. This is in line with the research carried out by Lita et al. (2013), which stated that crop systems influence the growth and weight of plants.

Based on the research results of the three crop systems studied, they obtained an influential crop system: the SRI plant system and the organic crop tape table. Planting systems using regular or conventional tables have a lower influence on the growth and weight of plants per malai. This is because the conventional or normal tables are more suitable for the monsoon season; when done in the rainy season, the seeds will be submerged in water for a long time, which will cause their seeds to rot and inhibit growth. According to Megrifoh, Nur et al. (2017) revealed in their research that the planting distance used affects the height of plants, the number of malai per pile, and the number of dew. Based on the research results, the Legowo planting distance of 3:1 has a high yield.

Based on an interview with a farmer in Belanti Siam, the system used is a direct seed planting system using a "*Gledek*," or a seedplant with a distance of 20 x 20 cm and direct seeds in manual sowing. This planting with a direct seed system uses a traditional tool called "Gledek," made of long paralogs. The method of planting tables carried out by the respondent farmers belong to planting is still conventional, so this leaves the planting system unrealistically affected. The planting distance will affect growth. As far as the plant is planted, there is little competition between the plants in taking water and sunlight in photosynthesis. Adjusting the planting distance also facilitates the process ofining the plants themselves.

Typically, there are two distinct cultivation patterns: monoculture, which involves growing a single crop, and polyculture, which involves growing multiple types of crops. The analytical results indicate that the dummy pattern of cultivation had no statistically significant effect (p-value = 0.646 > 0.05) and a negative influence of -0.037 on the output of cereal cultivation in the food estate of the hamlet of Balanti Siam.

Using improper crop patterns will reduce production by -0.037%, as indicated by the coefficient value. Ohorella et al. (2019) conducted research showing that employing a double crop model with a grain swing can significantly boost the productivity of dry land padi gogo base crops. The study found that this approach can result in a 135% to 180% increase in land productivity compared to a monoculture plant design.

Monoculture cultivation patterns are employed due to farmers' familiarity with planting a single grain on their property or because it has been a longstanding tradition and cultural practice among farmers in the Siamese village of Belanti.

The pattern of cultivation has little impact on grain production. Monoculture farming techniques can optimize land utilization by facilitating rapid treatment and harvesting. However, monocultures also possess a significant vulnerability, specifically the uniformity of growers that might expedite the dissemination of plant breeding organisms. Efficient utilization of production factors enables the achievement of maximum output. The research findings indicate that production elements, including soil, seeds, limestone, and fertilizer, significantly impact the yield of wild grain production. Both farmers and the government should be concerned about these influential aspects in production to boost grain production. The *padi* production in Pulang Nisau district in 2022 amounted to 61,307 tonnes per GKG. The output in the Padi district in 2022 experienced a 15% decrease compared to the output in 2021, which was 72,440.

Production gaps arise due to limiting constraints, such as the scarcity and rising costs of subsidized fertilizer and the availability of farmers with access to purchasing power. Furthermore, the agricultural tools and machinery utilized are suboptimal due to the inadequate suitability of the land characteristics and socio-cultural limitations. As a result, farmers perceive some tools and agricultural machines to be more efficient. Anticipated growth in production is projected rather than a reduction. The decrease in production indicates that the food estate program needs to be more successful in adequately ensuring the availability or safety of high-quality food, particularly in Central Kalimantan.

The technical effectiveness of farming operations in Siamese Belanti Village is influenced by various long-term elements, such as farmers' educational background, age, and experience, among others. As an illustration, the field of education (Z1) exhibits a technical inefficiency coefficient of -0.018 and a t-count value of -0.764. The coefficient indicates that there is a positive correlation between a farmer's level of education and their level of efficiency. Education might be seen as a substitute for farmers' managerial skills. According to Sutawati and Fathmah's (2014) research, there is a direct correlation between farmers' education level and the effectiveness of their farming efforts. Higher education leads to greater efficiency in farming.

According to a survey conducted among farmers in the hamlet of Belanti Siam, the respondents' educational attainment needs to be higher. The amount of education directly impacts the mindset of farmers in their acceptance of technological innovation and information. The variable Z2, which represents the farmer's age, has a technical inefficiency coefficient of -0.019, with a t-count value of -1.447. This is because the age distribution of farmers falls within the productive age bracket. The older a farmer becomes, the less efficient he becomes in farming. The aging process generally diminishes a farmer's capacity to embrace and utilize new ideas and technologies, resulting in a decrease in technical efficiency. According to the research findings, the farmers involved in *paddy field* cultivation in Balanti Siam village were predominantly between 40 and 60.

The technical inefficiency coefficient value (Z3) is 0.015, with a t-count value of 0.913. Consequently, as farmers gain more experience in managing farms, their level of inefficiency increases, indicating a decrease in technical efficiency. Consequently, the greater the duration of farmers' experience, the higher the probability that they will persist in practicing conventional farming methods and be less receptive to embracing innovations and technologies. Rachima et al. (2008) found that experience has a significant and tangible impact on technical licensing. Experience has positive coefficient values, indicating that it does not necessarily guarantee farmers can reduce technological inefficiency.

The interview results from the farmers' research in Siamese Belanti village indicate that the participants have over 20 years of farming expertise. According to farmers' experience, they may tend to persist in using traditional farming methods. Farmers in research areas who have received a long education and are relatively young tend to have higher efficiency than farmers with lower education and older. However, the experience of the farmer's enterprise only sometimes guarantees a decrease in technical inefficiency in the farming enterprise.

CONCLUSION

The study analyzes factors influencing paddy output in the Belanti Siam village food estate, revealing that factors such as land, seed, limestone, fertilizer, pesticides, labor, and Agricultural machinery influence the output. Dummy variables like crop system and pattern also play a role. Four independent factors significantly impact wild fruit production, while five other variables do not significantly affect paddy field production. Only 88 farmers show technical efficiency, with factors like education and age influencing outcomes. The study suggests that implementing a national food estate strategy program can improve regional food output.

ACKNOWLEDGEMENTS

We want to extend our appreciation to the community of Belanti Siam village in Pulang Pisau District, Kalimantan Tengah, Indonesia particularly the local farmers and Ikramina Yusti Amina, a doctoral student in Biology Education at the State University of Malang, for their invaluable assistance in enhancing and refining the content of this article.

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