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The influence of land area, planting area, and harvested area on rice production in Majalengka regency in 2014-2023

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ABSTRACT

This research aims to determine the effect of land area, planting area and harvest area on production results in Majalengka Regency in 2014-2023. The method used in this research is quantitative using decondary data in the form of a time series from 2014-2023. The data obtained in this research is data obtained from BPS and the Food Security, Agriculture and Fisheries Service. The method used in this research is a multiple linear regression analysis method. The results of this research show that: 1) Land area has a negative and significant effect on rice production results in Majalengka Regency, this means that increasing land area does not always increase rice production, possibly due to other factors sysh as soil fertility, use of technology or suboptimal agricultural management 2) Planting area has a positive and significant effect on rice production results in Majalengka Regency, this means that the wider the planted land, the higher the rice production 3) Harvested area has a positive and significant effect on rice production results in Majalengka Regency, this means that the wider the harvested area, the higher the rice production. These findings can be a reference for the development of agricultural policies in Majalengka Regency, Such as agricultural intensification and efficient input subsidies

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1. INTRODUCTION

Development economics is a branch of economics that studies the economic aspects of the development process in developing countries which can be seen from how much income the country earns or from national income(Amalia, 2022). Economic development must also involve various sectors that play a role in development, one of which is the agricultural sector which has a role in equalizing development through poverty alleviation efforts and improving people's income. In addition, the agricultural sector has also become one of the shapers of national culture and an ecosystem balancer. With the existence of economic development through the agricultural sector which is also one of the sectors that is the center of attention in national development(Dwiarta, et al., 2020).

The agricultural sector plays an important role in increasing Indonesia's economic development, because the agricultural sector is the main source of livelihood for most Indonesian people. The agricultural sector has great potential to increase the income of Indonesian farmers through the agricultural products obtained. Moreover, in Indonesia there are so many agricultural lands that make people able to plant various crops and food ingredients needed by the community (Kasruddin, 2022).

Majalengka Regency is an area located in the eastern part of West Java Province. Majalengka Regency has diverse potential, both in terms of Natural Resources (SDA) and Human Resources (SDM). In Natural Resources (SDA), Majalengka Regency has a number of potentials in the agricultural and tourism sectors which are supported to build the economy of Majalengka Regency. Majalengka Regency was chosen as a research location because it has a high influence related to agriculture and has rice fields in 2021 of 50,169 Ha, Majalengka Regency with the majority of the population working in agriculture so that it is able to encourage income From the agricultural sector in Majalengka Regency.

One of the important factors that affect rice production include land area, planting area, and harvested area. Land area is the area available for planting, while planting area refers to the area actually planted, and harvested area is the area that is successfully harvested. These three components are interrelated and contribute significantly to the final results of rice production. The majority of the people of Majalengka Regency are rice farmers, the agricultural sector is the most important sector in meeting food needs and the main driver of the regional economy. Rice production indicators include various factors that determine the success of the harvest. Planted area and harvested area are two main indicators, where the wider the area planted and harvested, the greater the potential for rice production.

The economy in Majalengka Regency is also dominated by the agricultural sector which can be said to be one of the strengths to develop the rate of economic growth in Majalengka Regency. As we know that some areas in Majalengka Regency, especially in the highlands, still have many rice fields owned by residents, supported by these geographical factors, the agricultural sector in Majalengka Regency is believed to be able to continue to contribute to improving the economy while increasing agricultural output. The agricultural sector in Majalengka Regency has productive land of approximately 50,000 hectares of rice fields and 23,694 hectares of dry fields which are utilized by farmers to produce food products. Food crops are agricultural crops that are utilized for human food.

Majalengka Regency, located in the eastern part of West Java Province, holds considerable potential in the agricultural sector, which plays a crucial role in the regional economy. One of its key commodities is rice, with the majority of the population working as rice farmers. In 2021, the total rice field area reached approximately 50,169 hectares however, rice production in Majalengka has fluctuated from year due to several factors sush as changes in lard area, planted and harvested area, weather conditions, and the suboptimal use of production, while in other years, despite similar land availability, yields declined due to inefficient farming practices. In general, the land area has shown a decreasing trend over time-from 50,962 hectares in 2014 to 49,465 hectares in 2023 primarily due to land conversion for housing and industrial development. These conditions have contributed to unstable rice production and emphasize the need for optimizing land use and improving agricultural practices to enhance rice productivity in the region.

Majalengka regency plays a significant role in the agricultural sector, particularly as a rice production center. However, over the past decade, the dynamics of regional development have triggered the conversion of agricultural land to non-agricultural uses, primarily for organization, industry, and supporting infrastrial areas. This land conversion not only changes the spatial structure of the region but also directly impacts

the availability of productive land for agriculture. Land conversion in Majalengka can be measured by the decline in rice paddy area recorded in data from the Central Statistics Agency (BPS) from 2014 to 2023. During this period, there was a significant decline in the standard area of rice paddies, which then slowed down with a decrease in rice production volume. This phenomenon indicates that the increasingly limited agricultural land due to land conversion tends to contribute to the instability of annual rice production.

Food security is a strategic issue that is a primary concern in nation development particularly in addressing the challenges of population growth, climate chang, and agricultural land conversion. In this context, increasing food production, particularly rice as a primary commodity, is a crucial pillar in achieving national food independence and sovereignty. External factors in farming that can affect the level of agricultural production include land area, planting area and harvest area. Therefore, increasing land area will result in higher production, but if the land area is limited, production results will also be low.

Research conducted by (wulan, T.D., & Ardiansyah, 2022) aimed to analyze the influence of various production factors, such as land area, seed type, labor and fertilizer use, on vegetable farming productivity. The results showed that all production factors had a significant influence, with land area being the dominant factor. The larger the managed land area, the higher production yield. Therefore, optimal land management is key to increasing farming productivity. Based on the background above, the author wants to conduct a study entitled "The Effect of Land Area, Planting Area and Harvest Area on Rice Production Results in Majalegka Regency in 2014-2023".

2. RESEARCH METHOD

This research was conducted in Majalengka Regency, the research time is planned from October 2024 until completion. The population in this study is the entire research object to be studied. The population used in this study is all data on land area, planting area, harvested area and rice production in Majalengka Regency during the 2014-2023 period using Time series data (Based on the time period or time series). The sampling method used in this study is saturated sampling, namely a sampling technique where all members of the population are sampled, the number of samples (n) obtained from time series data is 40 data. The data collection technique used in the study is to use documentation and literature studies. In this study there are 3 independent variables, namely: Land Area (X1), Planted Area (X2), Harvested Area (X3). The dependent variable is a variable that is explained or influenced by the independent variable or dependent variable. The data collection technique in this study uses documentation and literature studies. To test the influence of independent and dependent variables, namely land area, planted area, and harvested area on rice production, partially and simultaneously, multiple linear regression analysis and classical assumption tests such as normality, homoscedasticity, and linearity were used. Hypothesis testing was conducted using the Eviws 13 application.

To ensure the validity of the regression model used in this study, classical assumption tests were conducted, including tests for normality, multicollinearity, heteroscedasticity, and autocorrelation, which indicated that the model met all basic statistical requirements. Furthermore, to verify that the relationship between variables was linear, a model specification test using the Ramsey RESET Test was used, which yielded a probability value of 0.8947 (>0.05). This result indicates that the regression model does not experience specification errors, so the linearity assumption remains statistically acceptable. Although the regression results indicate a negative land area coefficient, which contradicts theoretical expectations, this can be contextually explained by the phenomenon of agricultural land conversion to non-agricultural sectors and

suboptimal agricultural management, as discussed in the results and sections. Thus, the linear relationship between variables is maintained within the theoretical framework, although the direction of the empirical relationship shows different dynamics.

Furthermore, although the data used in this study only covers 10 years (2014–2023), the saturated sampling technique on time series data yielded 40 observations, which was deemed sufficient to construct a valid multiple regression model. To avoid the risk of overfitting or biased conclusions due to the relatively limited amount of data, the model's validity is supported by the Adjusted R^2 coefficient of determination of 0.9811, indicating that 98.11% of the variation in the dependent variable can be explained by the three independent variables. Furthermore, the F-statistic value of 157.3551 and a very small significance level (<0.05) indicate that the regression model is simultaneously feasible and significant. Therefore, despite the limited number of years of data, the model's statistical power can be justified.

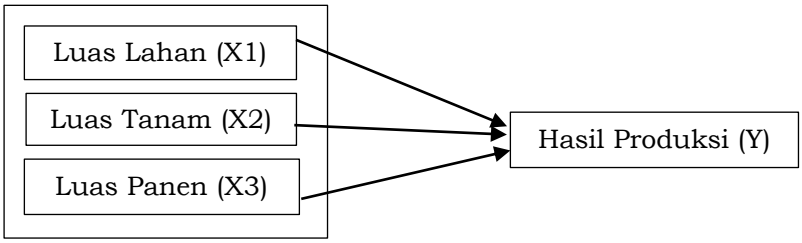

Figure 2. Final Equation Modeling Structure

3. RESULT AND DISCUSSIONS

3.1 lassical Assumption Test

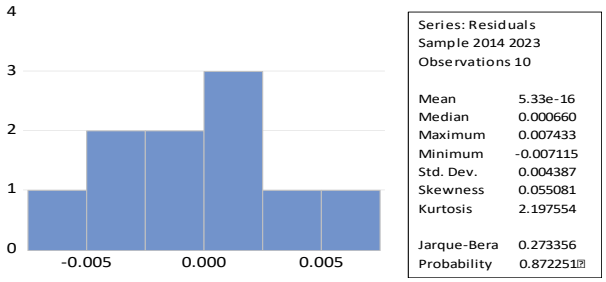

Figure 2. Normality Test Results

Based on the results of the normality test, the probability value is 0.872. The probability value > 0.05 means that the residual value is normally distributed.

Table 1 Multicollinearity Test Results

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	5.995589	2077017.	NA
X1	0.265634	2032769.	1.840441
X2	0.002917	25563.90	3.485762
X3	0.006296	55211.30	2.506223

Source: Data processed 2024

Based on table 4.2 above, it can be seen that the Centered Variance Inflation Factors (VIP) value on the independent variable or free variable of land area is 1.840441, planted area is 3.485762, and harvested area is 2.506223. This value is less than 0.10 or 10, so it can be stated that there is no multicollinearity problem in the research data.

Table 2 Heteroscedasticity Test Results

Heteroskedasticity Test: Breusch-Pagan-Godfrey Null hypothesis: Homoskedasticity			
F-statistic	0.437714	Prob. F(3,6)	0.7342
Obs*R-squared	1.795591	Prob. Chi-Square(3)	0.6159
Scaled explained SS	0.387057	Prob. Chi-Square(3)	0.9429

Source : Data processed 2024

As can be seen from table 4.3 above, it can be seen that the chi-square probability value is 0.615 > 0.05. So it can be concluded that there is no heteroscedasticity problem.

Table 3 Autocorrelation Test Results

Breusch-Godfrey Serial Correlation LM Test: Null hypothesis: No serial correlation at up to 2 lags			
F-statistic	1.587131	Prob. F(2,4)	0.3109
Obs*R-squared	4.424513	Prob. Chi-Square(2)	0.1095

Source : Data processed 2024

Itcan be seen from table 4.4 above, it can be seen that the probability value of Obs*R-Square is 0.109 > 0.05. So it can be concluded that there is no autocorrelation problem.

Tabel 4 Linearity Test Result

Ramsey RESET Test
Equation: UNTITLED
Omitted Variables: Squares of fitted values
Specification: Y C X1 X2 X3

	Value	Df	Probability
t-statistic	0.139173	5	0.8947
F-statistic	0.019369	(1, 5)	0.8947
Likelihood ratio	0.038663	1	0.8441

Source : Data processed 2024

Judging from table 4.5, the probability value of the F-statistic is 0.894 > 0.05, so it can be concluded that there is a linear relationship between the independent variable and the dependent variable.

3.2 Multiple Linear Regression

Tabel 5 Multiple Linear Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.465391	2.448589	2.232057	0.0671
X1	-1.050586	0.515397	-2.038401	0.0087
X2	0.157169	0.054013	2.909836	0.0270
X3	0.900807	0.079350	11.35236	0.0000

Source : Data processed 2024

Based on table 4.6 above, a formula can be made for a simple linear regression equation, namely as follows:

$$Y = a + \beta 1X1 + \beta 2X2 + \beta 3X3 + e$$

$$\text{Produksi} = 5.465391 - 1.050586\ X_1 + 0.157169\ X_2 + 0.900807\ X_3 + e$$

Berikut adalah interpretasi dari persamaan regresi linier sederhan diatas: (a) The constant value shows a positive number of 5.465391, the positive sign indicates a unidirectional influence between the independent and dependent variables. This shows that if all independent variables including land area (X1), planting area (X2), harvested area (X3) are 0, then the value of the dependent variable, namely production results (Y) is 5.465391. (b) Land area variable (X1), the coefficient of the land area variable has a negative regression coefficient of -1.050586. Which explains that if the land area variable increases by 1 point, the rice production in Majalengka Regency in 2014-2023 will decrease by 1.050586 assuming other variables remain constant and vice versa. (c) Variable Planted area (X2), the coefficient of the planted area variable has a positive regression coefficient of 0.157169 which explains that if the planted area increases by 1 point, the rice production in Majalengka Regency in 2014-2023 will increase by 0.157169 assuming other variables remain constant and vice versa. (d) Harvested Area Variable (X3), the coefficient of the harvested area variable has a positive regression coefficient of 0.900807, which explains that if the harvested area increases by 1 point, the rice production in Majalengka Regency in 2014-2023 will increase by 0.900807, assuming other variables remain constant and vice versa.

The interpretation of the regression coefficient results in this study can be linked to the microeconomic aspects of farmers by analyzing the influence of input costs per hectare on rice production. The results show that increased rice production can be achieved through optimizing the use of inputs, sush as fertilizers and seeds, despite land reduction. Therefore, this study can provide more effective policy recommendations to increase rice production and food security in Majalengka Regency. Thus, the government can develop policies that support farmers in optimizing input use, increasing production efficiency, and reducing production costs. Furthermore, this study can also provide valuable information for farmers and policymakers to increase rice production and food security, thereby improving community welfare and reducing dependence on food imports.

3.3 Hypothesis Testing

Table 6. T Test Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.465391	2.448589	2.232057	0.0671
X1	-1.050586	0.515397	-2.038401	0.0087
X2	0.157169	0.054013	2.909836	0.0270
X3	0.900807	0.079350	11.35236	0.0000

Source : Data processed 2024

3.4 The Influence of Land Area on Production

The first hypothesis in this study is the land area (X1) on production results (Y). It can be seen in table 4. 7 above, that the land area has a coefficient value of -1.050586 with a negative value and a probability value of 0.0087 <0.05 and can be seen from the t table and t count, namely t count of -2.038401 while t table is 1.68830 so 1.68830 <2.038401. So the results of this test indicate that the land area has a negative and significant effect on rice production in Majalengka Regency, so H1 is rejected.

3.5 The Influence of Planted Area on Production

The second hypothesis in this study is the planting area (X2) on production results (Y). Based on table 4.7, the planting area has a coefficient value of 0.157169 with

a positive value and a probability value of 0.0270 <0.05 is obtained, and it can be seen from the t table and t count, namely t count of 2.909836 while t table is 1.68830 so 1.68830 <2.909836. So the results of this test indicate a positive and significant influence between planting area and rice production in Majalengka Regency, so H2 is accepted.

3.6 The Effect of Harvest Area on Production

The third hypothesis in this study is the harvested area (X3) on production results (Y). Based on the model in table 4.7, the harvested area has a coefficient value of 0.900807 which is positive and a probability value of 0.0000 <0.05 is obtained, and it can be seen from the t table and t count, namely t count is 11.35236 while t table is 1.68830 so 1.68830 <11.35236. So the results of this test indicate a positive and significant influence between the harvested area and rice production in Majalengka Regency, so H3 is accepted.

Table 7 Coefficient Test Results

R-squared	0.987449	Mean dependent var	5.850000
Adjusted R-squared	0.981174	S.D. dependent var	0.039158
S.E. of regression	0.005373	Akaike info criterion	-7.325783
Sum squared resid	0.000173	Schwarz criterion	-7.204748
Log likelihood	40.62891	Hannan-Quinn criter.	-7.458557
F-statistic	157.3551	Durbin-Watson stat	2.388419
Prob(F-statistic)	0.000004		

Source : Data processed 2024

Based on table 4.8 above, the coefficient of determination seen from Adjusted R2 (R Squared) is 0.9811 or 98.11%, which means that all independent variables are able to explain the variation in the dependent variable by 98.11%, while the remaining 1.89% (100%–98.11%) is explained by other variables that are not in this research model.

Table 8 F Test Results

R-squared	0.987449	Mean dependent var	5.850000
Adjusted R-squared	0.981174	S.D. dependent var	0.039158
S.E. of regression	0.005373	Akaike info criterion	-7.325783
Sum squared resid	0.000173	Schwarz criterion	-7.204748
Log likelihood	40.62891	Hannan-Quinn criter.	-7.458557
F-statistic	157.3551	Durbin-Watson stat	2.388419
Prob(F-statistic)	0.000004		

Source : Data processed 2024

Based on table 4.9, it can be seen that the calculated f value is 157.3551> 2.87 with a probability value of 0.000004. This value means that the probability is <0.05, so it can be concluded that all independent variables (land area, planting area, and harvest area) have a simultaneous/joint influence on the dependent variable (production), so that H4 is accepted.

3.7 The Influence of Land Area on Rice Production in Majalengka Regency

Based on the results of this hypothesis test, it shows that the land area variable (X1) has a coefficient value of -1.050586 with a negative value and a probability value of 0.0087 <0.05 and can be seen from the t table and t count, namely t count of -2.038401 while t table is 1.68830 so 1.68830 <2.038401. So the results of this test show that land area has a negative and significant effect on rice production in Majalengka Regency. So H1 is rejected.

Majalengka Regency is one of the areas in West Java that has great potential in the agricultural sector, especially in producing rice crops and is the main source of income for many of its residents. From the geographical location of Majalengka Regency,

there are still many rice fields owned by residents who have productive land of ± 50,000 hectares. However, with the conversion of agricultural land for infrastructure development and industrial areas such as the West Java International Airport (BIJB), hotels, factories, commercial areas and housing, the area of agricultural land has decreased by 1,497 hectares from the period 2014-2023.

The results of the study found that land area has a negative and significant effect on rice production. This indicates the findings of the study, where the wider the land, the rice production will decrease, conversely the lower the land area, the higher the rice production. This is what happened in Majalengka Regency for the period 2014-2023. Majalengka Regency in 2014 had a land area of 50,962 hectares with a rice production of 664,220 tons. Then in 2016, the land area decreased to 50,459 hectares with increasing rice production.

The researcher's findings that the land area increased and production decreased due to ineffective management such as lack of labor, lack of use of technology, lack of selection of superior seeds, pest attacks, rice collapsed due to wind and other unexpected things that caused a decrease in production. While the decrease in land area and production increased due to agricultural intensification such as fertilization, selection of superior seeds, climate, good land management caused an increase in rice production. Although there was a reduction in land area due to land conversion into infrastructure development and industrial areas such as BIJB, hotels, factories, housing and commercial areas.

According to Suharto in Kharismawati's research, in 2021, to overcome this problem, the government is intensifying the green revolution and agricultural intensification where the green revolution or agrarian revolution is a change in the way of farming from traditional methods to modern methods to increase agricultural productivity. The green revolution is also a revolution in this activity, there is a revolution in rice production from scientific discoveries in the form of new superior seeds that have an impact on high yields. The goal of the green revolution is to increase agricultural productivity while intensification is carried out using agricultural land management techniques, irrigation management, fertilization, pest control and the use of superior seeds (Muharram, 2020). The success of agricultural intensification efforts carried out can show the ability to manage agricultural land as well as possible starting from the use of various intensification methods and the green revolution. The results of this study are in line with David Ricardo's grand theory whichhh states that the addition of input of production factors will decrease the level of production or production results. In this study it was found that the wider the land, the lower the rice production because if there is an increase in input (land) but the management is less than optimal, it will cause a decrease.

The study is in line with the study(Kharismawati, et al., 2021) which concluded that land area has a partial negative and significant effect on production. This indicates that the wider the land, the lower the rice production due to flooding, rain, and pest attacks. Conversely, the lower the land area, the higher the production due to good land management and agricultural intensification. In addition, this study is also in line with(Nurzannah, et al., 2020) Regarding the analysis of factors affecting lowland rice production in Binalawan Village, namely if the land area increases by 1 unit, the rice production in Binalawan Village will decrease. This study is also in line with(Putri, R. K., & Fahira, 2021) which concluded that land area has a partial negative and significant effect on production. This indicates that the wider the land, the lower the production because the existing land area is not managed optimally, such as lack of seed selection, pests, lack of labor, causing a decrease in production results, conversely, the lower the land area, the higher the production, according to this study, there was a decrease in land and production increased due to maximum land management such as choosing good seeds, choosing superior fertilizers and others

However, this result is not in line with the findings (Andrias, et al., 2021) which show that in the variable of land area, a partial increase will have a positive and significant effect on increasing rice production, the wider the land (cultivated/planted), the greater the amount of production produced by the land.

3.8 The Influence of Planted Area on Rice Production Results in Majalengka Regency

Planted area is one of the significant factors in influencing rice production. Based on the results of this hypothesis test, it shows that the variable of planted area (X2) has a t count of 2.909836> t table 1.68830 with a prob value (Signification) of 0.0270, this value is smaller than 0.05, so H2 is accepted, which means that partially the planted area has a positive and significant effect on production results.

Based on the research results, it is known that the planting area on production results in Majalengka Regency fluctuated in several periods but not significantly. This is supported by good land management and supporting environmental factors. From the secondary data study, it can be seen that the area of land planted in Majalengka Regency is able to produce rice production, where the planting area plays an important role in determining the amount of production results. In theory, the wider the planted land, the greater the production potential that can be achieved, because the planting area directly affects the number of plants that can grow and produce rice. The addition of planting area will provide a positive contribution to increasing production, as long as it is supported by good management, such as the use of superior seeds, proper fertilization, and adequate irrigation.

This is in line with the grand theory put forward by Adam Smith regarding output growth, total output describes the level of production of goods and services influenced by the availability of natural resources, labor and inventory of goods, to maximize output growth, all existing natural resources must be managed effectively and efficiently by labor with capital goods. According to (Nurhidayat, 2023) the factors that influence production are land, fertilizers, pesticides, labor, capital, seeds and technology. The addition of planting area will provide a positive contribution to increasing production, as long as it is supported by good management.

The area of planted land is the most important factor in production because it directly determines the production capacity of an agricultural area. The larger the area of planted land, the greater the potential production results that can be obtained, provided that other factors such as soil quality, irrigation management, use of technology, and agronomic practices support. Large areas of planted land allow farmers to plant more commodities in one planting cycle, thereby increasing total production. In addition, the optimal area of planted land is also related to the efficiency of resources such as labor, agricultural tools, and fertilizers, all of which can be utilized more optimally on a larger scale. However, the area of planted land alone is not enough to ensure high production results. Other supporting factors, such as soil fertility, availability of irrigation water, use of superior seeds, and modern cultivation techniques, must be considered to optimize production results. This is also supported by several previous studies.

In addition, the results of this study are also in line with research conducted by (Wenni, 2019), which states that the planting area has a positive and significant effect on rice production in Sumatra, the results of this test confirm that increasing the planting area contributes significantly to increasing rice production in Majalengka Regency. However, it should be remembered that increasing production from planting area is also influenced by several factors such as the availability of water, seeds, fertilizers and pesticides must be adjusted to the planting area to support maximum results. Soil quality also plays an important role, where fertile soil will provide better results than less fertile soil.

3.9 The Influence of Harvest Area on Rice Production Results in Majalengka Regency

Based on the results of this hypothesis test, it shows that the harvested area variable (X3) has a t count of 11.35236> t table 1.68830 with a prob value (Signification) of 0.0000, this value is smaller than 0.05, so H3 is accepted, which means that partially the harvested area has a positive and significant effect on production. This means that if the rice harvest area is increased by 1 unit, it will increase production.

Harvested area is one of the factors that greatly determines production results, harvested area shows the total area of plants that are successfully harvested in one planting season. This factor is very important because it shows the success of agricultural land utilization and is a determining factor in production results. Harvested area is influenced by various factors, such as climate conditions, land quality, irrigation systems and others. In theory, the wider the harvest, the more production will be produced. This is also supported by several previous studies. Judging from the results of the study, it is known that the harvested area fluctuates, although in Majalengka Regency, food needs (rice) are still met, where according to the Acting Regent of Majalengka, Mr. Dedi Supandi (2023) the need for rice in Majalengka Regency is 560,135 tons, while the annual rice production still meets the need for rice in Majalengka Regency.

In the theory of agricultural production, the wider the harvest, the more production is produced. The harvest area is one of the factors that greatly determines production results, the harvest area shows the total area of plants that are successfully harvested in one planting season. This factor is very important because it shows the success of agricultural land utilization and is a determining factor in production results. The results of this study are in line with Adam Smith's grand theory which emphasizes that optimal management of natural resources and efficient use of production factors will increase total output. In line with previous research which states that factors that affect the harvest area such as climate conditions, land quality, fertilizer, urea and irrigation systems that must be managed effectively in order to increase production results.

The results of this study are in line with research (Asriadi, A. A., & Firmansyah, 2023), that one of the independent variables, namely the harvested area, has a positive and significant effect on rice production in Makassar City. This is also in accordance with the theory put forward by Mubyarto, Harvested area is one of the factors that affects production, because the wider the harvest, the more production is produced. And this study is also in line with research (Safitri, F., et al., 2024), that the factors that have a significant effect on rice production are harvested area because increasing harvested area can increase rice production.

In addition, the results of this study are also in line with research conducted by (Nurzannah, et al., 2020) which states that the harvest area affects rice production. With a large harvest area, the amount of production will also increase, for that it is necessary to follow it up with good maintenance, such as irrigation that is able to regulate and provide soil irrigation that can maintain soil fertility so that it can expand the harvest area and can also create sophisticated technology to repel pests which are the main obstacles for farmers so far because they can reduce the harvest area so that the amount of production is not optimal. This is very necessary to do for food security, because Majalengka Regency has a very large population, considering that the population in Majalengka Regency is increasing from year to year and the staple food is rice.

From the secondary data study, it can be seen that the harvest area in Majalengka Regency is able to produce rice production, but the government must carry out strict control so that rice fields in the area do not shift from agricultural land to non-agricultural land, so that the area of rice harvest remains unchanged. It would be nice if the government could carry out large-scale land expansion to increase the rice harvest sector.

3.10 The Influence of Land Area, Planted Area and Harvested Area on Rice Production Results in Majalengka Regency

Based on table 4.9, it can be seen that the calculated f value is 157.3551> 2.87 with a probability value of 0.000004. This value means that the probability is <0.05, so it can be concluded that all independent variables (land area, planting area, and harvest area) have a simultaneous/joint influence on the dependent variable (production). So H4 is accepted.

Based on the results of the test of the influence between independent variables (land area, planting area, and harvest area) on the dependent variable (Production), the R square value was obtained at 0.9811 or 98.11%, meaning that the independent variables can explain or contribute to rice production by 98.11%, while the remaining 1.89% is influenced by other variables not examined in this study. This is in accordance with the statement of Sugiyono and Susanto, namely that if the R2 test is getting closer to the number 1, then the influence of the independent variables and the dependent variables is very strong.

According to the research results above, it means that in order to increase rice production, optimal management of all independent variables is needed, namely land area, planting area, and harvest area. This management includes efforts to maintain or increase the area of land available for agriculture, ensure maximum use of planting land with good cultivation techniques, and minimize harvest results due to external factors such as pest attacks or climate change. In addition, increased production can be achieved by supporting farmers through the provision of modern agricultural technology, access to superior seeds, improving irrigation systems, and providing training related to sustainable agricultural practices. Government policy support in preventing land conversion and improving agricultural infrastructure is also key to ensuring that these three variables can be managed effectively to achieve higher productivity. This is also supported by several previous studies.

The results of this study are in line with research conducted by (Astuti, R. and Kurniawan, 2020) the test results show that in the variables of land area, planting area and harvested area simultaneously have a positive and significant effect on rice production. This study explains that the wider the land used, both for planting and harvesting, the greater the amount of production produced. Increasing land area, planting area, and harvested area not only contributes to increased production, but also shows effectiveness in optimizing agricultural resources. (Astuti, R. and Kurniawan, 2020) also stated that the success of increasing production is influenced by effective management of these three variables. In this context, in addition to sufficient land area, regulating the planting area in balance with land capacity and planting season is very important so that there is no excess or shortage of harvest.

In addition, the results of this study are also in line with research conducted by (Asmalia, 2020) which shows that land area, planting area and harvested area simultaneously have a positive and significant effect on rice production. However, increasing land area, planting area and harvested area must be accompanied (Astuti, R. and Kurniawan, 2020)by resource efficiency, while supporting factors such as labor, fertilizer, water availability and government policies in protecting productive agricultural land greatly affect the success of the agricultural system as a whole.

In addition, increasing land area, planting area, and harvest area must be supported by sustainable management efforts, good land management includes the use of modern technology, proper fertilization, and continuous monitoring of soil conditions. Not only that, collaboration between farmers, government, and related institutions needs to be strengthened to create a supportive environment for increasing rice production.

According to data from the central Statistics Agency (BPS), rice production trends in the province show a similar decline to that in Majalengka, Primarily due to land

conversion, climate change, and the dynamics of production input. However, in terms of land area and planted area, Majalengka is experiencing a more rapid decline than the provincial trend. This can be attributed to the increasingly massive land conversion for industrial and organization purposes in the region, which directly impacts rice production quantitatively. At the west java provincial level, according to BPS data, despite year-to-year fluctuations in rice production, several regencies have been able to maintain or even increase their productivity thank to the implementation of modern agricultural technology and improved irrigation systems. For example, areas like Indramayu and Subang regencies have shown relatively stable production trends,thank to the implementation of agricultural intensification and extensification programs. This suggests that while trend are common, adaptive capacity and regional policy interventions also determine final production outcomes.

4. CONCLUSION

Based on the results of the study above, it can be concluded that land area has a negative and significant effect on rice production in Majalengka Regency, where when land area increases, production decreases due to less than optimal management, conversely, land area decreases, production increases due to land conversion, but with agricultural intensification such as fertilization, selection of superior seeds, good soil management, production results increase. Meanwhile, planting area and harvested area have a positive and significant effect on production results due to optimal management, but there are fluctuations in planting area and harvested area on production results due to other factors such as flooding, pest attacks, lack of irrigation and other unexpected things. Optimizing rice production amidst declining land area can include agricultural intensification through the use of technology, superior seeds and effective farm management and providing subsidies for agricultural inputs such as pesticide fertilizer and efficient farm equipment effective air management, and training on effective farm technology and management.

The result of this study can serve as a basis for replication in other regions in Indonesia with similar agrarian structures and land coversion pressures. The findings regarding the influence of land area, planted area, and harvested area on rice production indicate patterns that can be further tested in other regions with comparable agrarian conditions. Thus, this study not only contributes to the local context of Majalengka Regency but also opens up opportunities for broader generalization of the findings to support research on agrarian policy and food security at the national level.

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