

DETERMINANTS OF RICE AVAILABILITY IN THE BALI PROVINCE

Regina Jessinta Qurayuni Islamey¹, Ratna Setyawati Gunawan^{2*}, Agus Arifin³, Suparjito Suparjito⁴

¹Universitas Jenderal Soedirman, regina.islamey@mhs.unsoed.ac.id, Indonesia

^{2*}Universitas Jenderal Soedirman, ratna.gunawan@unsoed.ac.id, Indonesia

³Universitas Jenderal Soedirman, agus.arifin@unsoed.ac.id, Indonesia

⁴Direktorat Jenderal Perbendaharaan Jawa Tengah, jito.pdie.uns@gmail.com, Indonesia

*corresponding author

ABSTRACT

This research is a quantitative research with secondary data regarding the factors that influence the availability of rice in Bali Province. The purpose of this study was to determine the effect of farmer labor, rice harvest area, population, and corn production on rice availability. Based on the research results and data analysis, it shows that farmer labor, paddy harvested land area, and population in Bali Province have a positive effect on rice availability. Corn production has a negative effect on the availability of rice. The implication of the conclusions above is that the government and society must pay attention to the regeneration of farmers and the development of farmer workforce so that rice production can be more efficient and effective, maintain the preservation and protection of harvested land to avoid scarcity, and continue to increase and maintain rice productivity so that rice availability can be kept up with the increase of population.

Keywords: Food Security; Rice Availability; Paddy; Farmer; Population; Corn Production

1. Introduction

Indonesia is a fertile agricultural country, in which local wisdom is stored in abundant agricultural products. One of Indonesia's leading agricultural products is food crops. Agriculture is an important sector in a country because basic needs can be fulfilled by utilizing raw products from the agricultural sector such as paddy which will later be processed into rice for consumption as a staple food (Mulyo et al., 2015).

Food is something that is consumed consistently in a certain amount and turns into a common part of the routine of overeating as it is the main source of energy and nutrition that the body needs (Food and Agriculture Organization/FAO, 2011).

According to Pujiati et al., (2020), rice is the product of the agricultural sector which is the highest food commodity in Indonesia among other food commodities such as corn, eggs, sweet potatoes and vegetables. In 2021, national per capita rice consumption reached 114.6 kg per person per year. Pujiati et al., (2020) also stated that one of the factors that can affect food security is the availability of rice stocks that can be provided nationally.

Based on the 2021 Food Security Index, Bali Province was ranked first with a score of 83.82. The province of Bali is famous for its natural beauty, especially its beaches. The capital city of Bali is located in Denpasar City. Bali is also known for its interesting and unique art and culture.

The number of agricultural workers is a sensitive attribute that influences the economic dimension of a sustainable rice supply system (Nurmalina, 2008). The higher the number of farmer workers, the more rice availability.

Land is a provider of food sources, especially agricultural and plantation food sources. According to Suryana (2014), competition for land use including waterways and water will be increasingly sharp due to high economic growth targets and a large percentage and number of population increases. The wider the rice harvest area, the more rice availability.

A large population will increase the demand for food (Suryana, 2014). Hence, the greater the population number, the greater need for rice consumption. Corn can be used as a diversifying food ingredients for rice, in order to support food diversification program so that food security can be realized.

2. Literature Review

2.1 Production Function

The availability of rice can be viewed from the production side. According to Boediono (2016), production is an activity of adding value to an object or creating new objects so that they are more useful in meeting needs.

Mankiw (2013) explains that the production function is the relationship between the amount of input used in making one item and the amount of output of that item. Based on the production theory, the production function can be stated as follows:

$$Q = F (C, L, R, T)$$

Which Q = Output ; C = Capital ; L = Labor ; R = Resources ; T = Technology. This production function basically shows that the amount of production depends on the production factor itself.

The more the number of factors of production, the higher the production results will be.

Factors of production according to (Walton & Wyckof, 2000) consist of:

- a. Natural resources, all the wealth that exists in the universe can be used in the production process. Natural production factors consist of land, water, air, sunlight, and minerals.
- b. Labor, is a production factor that plays a major role. Labor is needed in the management of available natural resources.
- c. Capital, as a supporting factor in accelerating and increasing capabilities in the process of producing services or goods.

- d. Entrepreneurship, one's ability to manage and regulate other factors of production, including natural factors of production, labor and capital.

2.2 Food Security

2.2.1 Food

According to the FAO (Food and Agriculture Organization) (2011) food is something that is consumed consistently in certain amounts and turns into a common part of the routine of overeating as it becomes the main source of energy and nutrition that the body needs.

Food classification known as the Desirable Dietary Pattern according to FAO (1997), is grouped into 9 groups namely grains, tubers, animal foods, oils and fats, oily seeds, nuts, sugar, vegetables and fruit, and others (drinks and condiments). In PP 17 of 2015, food can come from biological sources of agricultural, plantation, forestry, fishery, animal husbandry, water and water products which are designated as food or drink for human consumption.

It can be concluded that food is the right of every human being that must be fulfilled for survival. As the main source of energy and nutrition needed by the body. What must be fulfilled is their need for food in order to live a healthy, active and productive life.

2.2.2 Food Security Concept

The World Food Summit (1996) suggested that food security can be achieved if all individuals continuously, both physically, socially and economically, have access to adequate or sufficient, nutritious and safe food, meet their needs, and choose to live actively. and healthy. Meanwhile, the World Health Organization (WHO) and the Food and Agriculture Organization (FAO) explain that food security is access for every household and individual to be able to obtain food at any time for the needs of a healthy life.

Based on the definition of food security from FAO, there are 4 factors that affect food security, namely the adequacy of food availability, stability of food availability, accessibility to food, and quality or food safety.

2.2.3 Rice Availability

Supply is food that is available and accessible to the community in sufficient quantity and quality at any time (Gaol et al., (2014). The availability of rice in an area is intended entirely to meet rice consumption in that area. Adequacy can be seen from production and imports compared to consumption.

2.3 Relationship Between Independent Variables and Dependent Variable

2.3.1 Farmer to Rice Availability

Man power is the population who are of working age (15-64 years) or the total population in a country who can produce goods and services (Subri, 2003). Mosher (1987), states that farmers are humans who work to raise plants and or animals to be taken advantage of to generate income.

Farmer labor is someone who works to maintain food crops related to the control or use of land to produce goods both for self-sufficiency and for the community.

2.3.2 Rice Harvest Area to Rice Availability

Land is one of the most important factors of production in agriculture because land is a place where farming can be carried out and where production is produced. Land area is the area of rice fields planted with certain commodities in certain seasons. According to Gayatri (2017), the area of the rice harvest area is the area of land that is actively used for rice production activities.

2.3.3 Population to Rice Availability

Residents are all people who occupy an area or country. The large number of people who occupy an area or country will have an impact on population density. In Deliarnov's book (2005), Malthus explains that the general tendency of a country's population will continue to grow, while at the same time the factors of land production will decrease, so that food supplies cannot keep up with the rapid and high population growth.

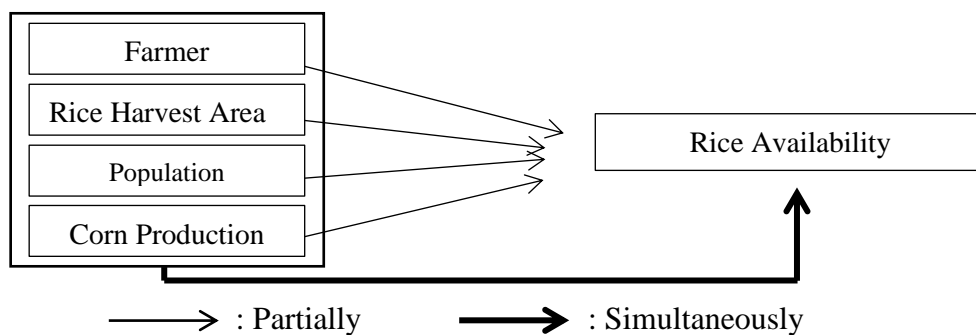
2.3.4 Corn Production to Rice Availability

Corn is a plant that belongs to the grain plant. Corn is the second national food crop after rice. In order to support the food diversification program by diversifying staple foods, corn can be one of the ingredients for staple food diversification.

2.4 Previous Research

In empirical studies in several regions that have been carried out by several previous researchers, different trends have been produced regarding the determining variables of rice availability. There are differences in results, as well as several other variables used for rice availability. The results of the analysis that has been carried out indicate that the variable area of rice harvest land, rice labor, and population have a significant effect on rice availability.

2.5 Framework



2.5 Hypothesis

- a. H₁: The variable of farmer labor has a positive and significant effect on the availability of rice.
- b. H₂: The variable area of paddy harvested land has a positive and significant effect on the availability of rice.
- c. H₃: The population variable has a negative and significant effect on the availability of rice.
- d. H₄: The corn production variable has a negative and significant effect on the availability of rice.

3. Research Methodology

3.1 Types of research

In this study, the data used were secondary data obtained from literature books, journals, and published data by institutions such as the National and Bali Central Bureau Statistics (BPS). The method were multiple linear regression methods, with a time series data. The research time limit is the 2006-2022.

3.2 Research Location

The location of this research is in the Province of Bali. This is because Bali is the province with the highest Food Security Index score in Indonesia in 2021. Bali is also the province with the highest rice productivity.

3.3 Research Object

The objects in this study belong to two variables, namely the dependent variable and the independent variable. The dependent variable used is the availability of rice, the independent variables are the farmer's workforce, rice harvest area, population, and corn production.

3.4 Model Determination

In this study, the regression analysis equation model was transformed to natural logarithms to reduce excess data fluctuations in the model. The equation model in this study:

$$\ln Y = a + \ln b_1 TK + \ln b_2 LP + \ln b_3 JP + \ln b_4 PJ$$

Which: Y = Rice Availability; TK= Farmers; LP= Rice Harvest Area ; JP= Population; PJ= Corn Production; b_1 = Coefficient of the number of farmers; b_2 = Coefficient of rice harvest area; b_3 = Coefficient of population; b_4 = Coefficient of corn production; a = Intercept.

3.5 Operational Definitions and Data Sources

All variable data used were obtained from BPS, Bali Province. The following is a description of these variables:

- a. Farmer
Farmer Labor is the entire number of people who work in agriculture. In units of people.
- b. Rice Harvest Area
The area of rice harvested land is the area of rice plants that can be harvested after the plants are old enough. In units of ha.
- c. Population
The total population is all members of the community who are domiciled or have settled in the Province of Bali for a period of approximately one year. In units of people.
- d. Corn Production
Corn production is the entire production of corn in the province of Bali. In units of tons.

3.6 Data analysis method

Based on Gujarati (2004), regression analysis is an analysis related to the dependence of one variable, namely the dependent variable on the independent variable. This study uses regression analysis of time series data, namely the observation of an object over a certain period of time.

The multiple regression analysis tool in this study uses the Eviews 12 application. Starting with the normality test, the classic assumption test is the multicollinearity test, the heteroscedasticity test, and the autocorrelation test.

- a. Normality test, using the Jarque Bera test (JB) with the histogram-normality test., with a significance level of 5% as a decision indicator. If the probability value is > 0.05 , then the data is normally distributed, and if the probability value is < 0.05 , then the data is not normally distributed.
- b. Multicollinearity test, using the VIF Variance Inflation Factor test and the tolerance of each independent variable. If the VIF value is < 10 and the tolerance value is > 0.1 , it can be said that the data does not contain multicollinearity. If the VIF value is > 10 and the tolerance value is < 0.1 , then the data can be said to contain multicollinearity.
- c. Heteroscedasticity test, using the Glejser test. If from the Glejser test results it is found that the significance value of the independent variable on the residual absolute value is > 0.05 , then the data used in the study can be said to not contain heteroscedasticity and if the residual absolute value is < 0.5 , then the data can be said to contain heteroscedasticity.

3.7 Hypothesis Testing

Hypothesis testing is carried out to find out whether or not the variables or models used partially or completely are meaningful. The hypothesis test used is:

- a. t test, to test the significance of the constants of each independent variable, whether the variable number of farmer labor (TK), harvested land area (LP), population (JP), and corn production (PJ) really have a partial effect on the dependent variable, namely the availability of rice (Y). Test criteria with a significant level (α) = 0.05 are determined as follows:
t stat \leq t table, then H_0 is accepted.
t stat $>$ t table, then H_0 is rejected.

- b. F test, which is a test to determine the effect of independent variables, namely the number of farmer workers (TK), harvested land area (LP), population (JP), and corn production (PJ) really have a partial (separate) effect on the variable the dependent is the availability of rice (Y). With a % level or a significance level of 5%:
 $F_{count} \leq F_{table}$, H_0 is accepted, meaning that each independent variable together does not have a significant effect on the dependent variable.
 $F_{count} > F_{table}$, then H_0 is rejected, meaning that each independent variable jointly has a significant influence on the dependent variable.
- c. The coefficient of determination R^2
 The coefficient of determination measures how far the model's ability to explain the variation in the dependent variable. The greater the value of R^2 (closer to 1) indicates the better for the regression model. And the closer it is to 0, the more imprecise the regression line is for measuring observational data.

4. Results

4.1 Normality Test Result

Table 1. Normality Test Result

<i>Jarque Bera</i>	0.202140
<i>Prob.</i>	0.903870

The probability value obtained for the Jarque-Bera test is 0.903870 which is greater than the significance level of 0.05, so it can be said that the data is normally distributed.

4.1 Classical Assumption Test Results

4.1.1 Multicollinearity Test

Table 2. Multicollinearity Test Results

<i>Variable</i>	<i>Coefficient</i>	<i>Uncentered</i>	<i>Centered</i>
	<i>Variance</i>	<i>VIF</i>	<i>VIF</i>
lnTK	0,000315	2333,885	1,161410
lnLP	0,001294	11079,31	2,302797
lnJP	0,010173	43257,69	2,592304
lnPJ	0,000305	2266,061	1,468878

Based on the results of the multicollinearity test from the table above, the independent variables (farmer workforce, rice harvest area, population, and corn production) have a VIF value of not more than 10, which means that the data does not have a multicollinearity problem.

4.1.2 Heteroscedasticity Test

Table 3. Heteroscedasticity Test Results

<i>Prob. Chi-Square (4)</i>	0.3339
<i>Sig.</i>	0.05

The results of the heteroscedasticity test, based on table 4.6, the probability value of Chi-Square (4) is 0.3339, which is greater than the significance level of 0.05, which means that the data used in this study did not experience symptoms of heteroscedasticity.

4.2 Multiple Regression Analysis

Table 5. Results of Multiple Regression Analysis

Variabel	Coefficient	Prob.
C	-2.312892	0.1033
lnTK	0.057514	0.0071
lnLP	1.060525	0.0000
lnJP	0.351039	0.0045
lnPJ	-0.015921	0.3800

Based on table above, an equation of the coefficients can be formed as follows:

$$\widehat{\ln Y} = -2.312 + 0.057 \ln TK + 1.060 \ln LP + 0.351 \ln JP - 0.015 \ln PJ$$

From these equations can be used as a reference to be interpreted as follows:

- a. If TK, LP, JP, and PJ are constant at a value of 0, it will cause the Y value (rice production) to be - 2.31%
- b. If TK increases by 1% then the value of Y (availability of rice) will increase by 5.75%
- c. If LP increases by 1% then the value of Y (availability of rice) will increase by 106.05%
- d. If JP increases by 1% then the value of Y (availability of rice) will increase by 35.10%
- e. If PJ increases by 1%, the value of Y (availability of rice) will decrease by 1.59%

5.2 Hypothesis Test Results

Table 6. Hypothesis Test Results

Variable	R ²	Adj R ²	F-test		t-Stat	Sig.	Description
			F-Stat	Sig.			
Farmer	0.992420	0.989893			3.239796	0.0071	Significant
Rice Harvest Area					29.47960	0.0000	Significant
Population			392.7758	0.000000	3.480387	0.0045	Significant
Corn Production					-0.911477	0.3800	Not significant

5.2.1 Farmers to Rice Availability

Based on the results of the t test, the farmer's workforce produces a t-count of 3.239796 which is greater than the t-table of 1.728 and has a significance value of 0.0071 less than an alpha of 0.05, so it can be said that the farmer's workforce partially has a significant influence on the availability rice.

5.2.2 Rice Harvest Area to Rice Availability

Based on the results of the t test, the area of paddy harvested land produces a t-count of 29.47960 which is greater than the t-table of 1.728 and has a significance value of 0.0000 less than alpha 0.05, so it can be said that the area of rice harvested area partially has a significant influence on rice availability.

5.2.3 Population to Rice Availability

Based on the results of the t test, the population produces a t-count of 0.351039 which is greater than the t-table of 1.728 and has a significance value of 0.0045 which is smaller than the alpha of 0.05, so it can be said that the total population partially has a significant influence on the availability of rice.

5.2.4 Corn Production to Rice Availability

Based on the results of the t test, corn production produces a t-count of -0.911477 which is smaller than the t-table of 1.728 and has a significance value of 0.3800 greater than alpha 0.05, so it can be said that corn production partially has no effect on rice availability.

5.2.5 Determination R^2

The results show that the R^2 number is 0.992420 ranging from 0 to 1. Meanwhile, the Adjusted R^2 value is 0.989893, meaning that the independent variable is able to explain the dependent variable of 98.9893% and the remaining 1.0107%, the others are influenced by other factors outside the model.

5.2.6 Simultaneous Influence

Based on the results of the F test, it can be seen that the F-calculated probability value is 0.000000 which is smaller than the alpha of 0.05, so that the model together can be used to predict the relationship between the independent variables and the dependent variable. With a degree of freedom of 0.05, the F-table is 3.26. It can be concluded that the F-count of 392.7758 is greater than the F-table of 3.26, so that together the independent variables (farmer labor, rice harvest area, population, and corn production) affect the dependent variable (availability of rice).

6. Conclusion

Based on the results of research conducted by researchers regarding the factors that influence the availability of rice in the Province of Bali in 2006-2022. Resulted in the following conclusions:

- a. Simultaneously, the variables of farmer labor, rice harvest area, population, and corn production affect the availability of rice in the Province of Bali in 2006-2022.
- b. The variable influence of farmer labor partially has a positive and significant effect on the availability of rice in the Province of Bali in 2006-2022. The area of paddy harvested land

partially has a positive and significant influence on the availability of rice in the Province of Bali in 2006-2022. The total population partially has a positive and significant influence on the availability of rice in the Province of Bali in 2006-2022. While the variable corn production was partially found to have a negative and insignificant effect on the availability of rice in the Province of Bali in 2006-2022.

References

- Boediono. (2016). *Introduction to Economics Microeconomics*. Yogyakarta: BPFE Yogyakarta.
- Deliarnov. (2005). *Development of Economic Thought*. Jakarta: PT. Raja Grafindo Persada.
- Gaol, W. M., Supriana, T., & L., S. N. (2014). Factors Affecting the Availability of Rice and Corn in North Sumatra Province. *Journal on Social Economics of Agriculture and Agribusiness*.
- Gayatri, N. F. (2017). Analysis of Factors Influencing Rice Availability in Malang City. *Student Scientific Journal of FEB Universitas Brawijaya Vol. 5 No. 2*.
- Gujarati, D. N. (2004). *Basic Econometrics 4th Edition*. McGraw Hill Comp.
- Mankiw, N. G. (2013). *Introduction to Macroeconomics 4th Edition*. Jakarta: Salemba Empat.
- Mosher. (1987). *Mobilizing and Building Farms*. Jakarta: Yasaguna.
- Mulyo, J., Sugiyarto, & Widada, A. W. (2015). Food Security and Self-sufficiency in Farming Households in Marginal Areas in Bojonegoro Regency. *Agro Economics Journal 26 (2)*.
- Nurmalina, R. (2008). Sustainability of the National Rice Availability System; Rap-Rice Ordination Technique Approach With Multidimensional Scaling (MDS) Method. *Journal of Agribusiness and Agricultural Economics Vol. 2 No. 2*.
- Pujiati, S., Pertiwi, A., S., C. C., I., D. M., & F., S. H. (2020). Analysis of Food Availability, Affordability, and Utilization in Supporting the Achievement of Community Food Security in Central Java Province. *Journal of Agricultural Social Economics Vol. 16, No. 2*.
- Ramadhani, D. A., & Sumanjaya, R. (2015). Analysis of Factors Influencing Soybean Availability in Indonesia. *Journal of Economics and Finance Vol. 2 No. 3*.
- Subri, M. (2003). *Human Resource Economics in a Development Perspective*. Jakarta: PT. Raja Grafindo Persada.
- Suryana, A. (2014). Towards Sustainable Indonesian Food Security 2025: Challenges and Handling. *Forum Penelitian Agro Ekonomi*.
- Walton, G. M., & Wykoff, F. C. (2000). *Understanding Economics Today ; 7th Edition*. McGraw Hill College.