DETERMINATION OF RICE AVAILABILITY IN BANYUMAS REGENCY IN 2003-2022

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ABSTRACT

Food security is one of the central issues in national development. One aspect of realizing food security is the availability of rice which is one of the products of the agricultural sector staple food for some Indonesian citizens. Banyumas Regency is one of the rice producers in Central Java Province, but the development of the harvested area and rice production in Banyumas Regency fluctuates every year. The aims of this study are: 1) To analyze the availability of rice in Banyumas Regency in 2003-2022. 2) Analyze the effect of rice prices, rice productivity, cassava production, and the amount of rice seeds on the availability of rice in Banyumas Regency in 2003-2022. This research method uses secondary data, namely quantitative data based on time series in 2003-2022.The analytical tool used is multiple linear regression analysis. The result that the availability of rice in Banyumas Regency was classified as a low surplus 0.75-0.95. The variables of rice price, productivity, cassava production and the number of rice seeds simultaneously have a significant influence on the availability of rice in Banyumas Regency. The implication of this research is that the government and related agencies are able to maximize the absorption of rice availability, price stabilization programs, increase harvest areas and production so that productivity increases, the need for food diversification to reduce dependence on one main type of food such as rice.

Keywords: Food Security, Rice Availability, Rice Prices, Rice Productivity, Cassava Production, Number of Rice Seeds.

1.   Introduction

Indonesia is a country that has abundant natural resources and is referred to as an agricultural country where the majority of the population earn a living in the agricultural sector. One of the goals of sustainable development is to create sustainable food security and welfare of farmers with a view to ending hunger and global food security. Efforts to develop Indonesian agriculture so that it is of high quality and reduces the poverty rate requires the role of the government in terms of policies to achieve even distribution of food self-sufficiency (Bappenas, 2019)**.**

Food security is one of the central issues in national development. Food security issues include availability, equity and affordability of food. Food security can be realized through one of the main requirements, namely the availability subsystem, where food production comes from this subsystem Suryana et al. (2014).

One of the food crop commodities that has important potential in agricultural development is paddy which is then processed into rice. Rice is the staple food of most Indonesian citizens, to meet the consumption needs of all Indonesian people. Rapid population growth causes the need for food to increase. Habits of people's behavior in Indonesia consume rice due to the eating culture of the Indonesian people who feel that when they consume rice they can be said to be eating, although the need for carbohydrates can be met from other foods which also greatly affect the demand for rice (Yusuf et al. 2018).

Banyumas Regency is one of the rice-producing regencies/cities in Central Java Province. Banyumas Regency has an area of around 1,335.30 km² and is located in the western part of Central Java Province. However, the harvested area and rice production in Banyumas Regency fluctuate every year. The largest rice production occurred in 2018 amounting to 323,966 Tons from a harvested area of 59,062 Ha. In 2014 it decreased by 8.9 percent. The decrease in production and harvested area in Banyumas Regency was caused by relatively high rainfall so that several areas were always flooded every year, so that paddy fields that could produce rice failed to harvest or farmers were unable to plant rice.

Table 1. Harvested Area, Production, Rice Productivity in Banyumas Regency in 2013-2021

Year	Harvested Area (Ha)	Production (Tons)	Productivity (Tons/Ha)
2013	67,151	348,196	5,19
2014	63,831	316,917	4.96
2015	67,667	384,943	5.69
2016	69,991	388,194	5.55
2017	66,761	370,947	5.56
2018	70,809	409,054	5.78
2019	67,240	379,456	5,64
2020	64,170	371,827	5.79
2021	64,457	376,083	5.83
2022	64,034	371,676	5.80

Source: Central Bureau of Statistics for Banyumas Regency, 2023

One of the government policies in maintaining the availability of rice is the policy of setting grain and rice prices. But policy the purchase price of grain and rice set by the government where the lower purchase price is lower than the cost of production can cause business incentives received by farmers to potentially be even more depressed and suppress the welfare of farmers (Judith, 2023). The problem with domestic rice prices is that if the world's supply of rice is abundant, rice prices will become cheaper. On the other hand, if the world's supply of rice is depleted, the price of rice will be higher. For farmers, the basic price of grain is intended to protect farmers' income so that it can increase the availability of rice. According to research Gayathri (2017) the price of rice has a positive effect on the availability of rice in Malang City. This research shows that the higher the rice price, the higher the rice production in Malang City.

Another factor affecting the availability of rice is productivity. High productivity will have an impact on a country's food security. Increased productivity of rice, the amount of rice produced

can increase. Based on research Pusvita et al. (2022) states that the productivity factor can affect the availability of rice food.

Another variable that is thought to affect the availability of rice is cassava production. Cassava production does not directly impact rice availability, but seen from the land use used if there is a shift in land area from rice farming to cassava farming it can affect rice availability. Wijoyo et al. (2020) stated that the price of sugar had a negative effect on the availability of rice in East Java Province, in this condition due to the relationship between the substitution of land used. So that when sugarcane production increases, the use of land used to produce rice decreases.

The use of rice seeds will affect the production of rice produced. The more rice seeds that are planted, the more rice production will be so that the availability of rice will be fulfilled. Based on research results Khakim et al. (2013), it was found that seeds had a positive and significant effect on rice production in Central Java.

Based on the description above, this research is important to do because rice is a staple food source for most of the population and also in Banyumas Regency the agricultural harvest area has decreased so it is necessary to identify the determinants affecting the availability of rice in Banyumas Regency to maintain food security for the community, increase productivity and avoid crises Food. The update in this research is the use of cassava production variables as agricultural substitution crops other than rice and corn.

2. Literature Review

2.1 Food Security Concept

Based on Law No. 18 of 2012 concerning Food, it is explained that security is a state of fulfilling a country's sufficient food, both in quantity and quality, safe, diverse, nutritious, equitable and affordable that meets nutritional and health needs that can be accessed, obtained and maintained by all levels of society and protects sustainable food consumption.

According to *Food and Agriculture Organization (FAO)*, (2016) Food security is a condition in which which individuals, households and communities have safe, sufficient and continuous physical, social and economic access to safe, sufficient and continuous access to food that is nutritious, safe and halal to fulfill need food and preference food they to live a healthy and active life.

According to the index of food security in BKP (2020) There are three pillars of food security, namely food availability, food affordability (access) and utilization food.

2.2 Production Theory

According to Sukirno (2000) factors of production are objects provided by nature by humans that can be used to produce goods and services. Factors of production are divided into four types, namely land and natural resources, labor, capital, entrepreneurial skills.

The Cobb-Douglas production function is an equation that shows the influence between the input used and the output produced. The Cobb-Douglas production function can be written mathematically by the equation:

$$Q = AK^\alpha L^\beta$$

Where :
Q = Output / Quantity
K = capital inputs
L = labor input
A = efficiency parameter
α = elasticity of capital input
β = labor input elasticity

2.3 Supply Theory

According to Mankiw (2000) supply is the amount of goods or services available and can be offered by producers to consumers positively related to the price of goods. Offers can be influenced by several factors, including the price of the item itself, the price of substitutes, production costs, technological advances, taxes, and forecasted future prices.

3. Research Methodology

3.1 Research Design

The data used in this study are secondary data from the Central Bureau of Statistics (BPS) of Banyumas Regency, the Agriculture and Food Security Office of Banyumas Regency, and the Industry and Trade Office of Banyumas Regency for the period 2003-2022. This type of research is quantitative descriptive research using multiple linear regression analysis. This research uses time series data which is a set of observational data ordered in time (Hanke & Wichers, 2005). In this study, the data used is 2003-2022 for 20 years. The variables in this study include rice price, rice productivity, cassava production, and the number of rice seeds as independent variables while rice availability is the dependent variable. Data processing and analysis were carried out with EViews 10 software and Ms. Excel.

3.2 Analysis of Rice Availability

Data analysis of the calculation of rice availability through the formula below:

$$KB = PP - (B + P + T)\text{x C}$$

Where :
KB = availability of rice (tonnes/year)
PP = rice production (tonnes/year)
B = seed (0.9%)
P = feed (0.44%)
T = scattered (4.92%)
C = conversion of rice (63.84%)

3.3 Multiple Linear Regression Analysis

According to Sugiyono (2017) multiple linear regression analysis aims to predict the ups and downs of the dependent variable which is influenced by the independent variable. The model equation can be written mathematically as follows:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 - \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

or

$$Y = \alpha + \beta_1 HB + \beta_2 PP - \beta_3 PKP + \beta_4 JBP + \varepsilon$$

Where :
Y = Availability of Rice
HB = Price of Rice
PP = Rice Productivity
PKP = Cassava Production
JBP = Number of Rice Seeds
α = Constant (intercept)
β_1= Rice Price Coefficient
β_2 =Rice Productivity Coefficients
β_3 =Cassava Production Coefficient
β_4 =Coefficient Number of seeds
ε = error term

3.4 Operational Definition of Variables

- *3.4.1* The availability of rice is calculated from the net production of rice every year, but this study has limitations in export and import data. The unit for the amount of rice availability is tons per year (tons/year).
- *3.4.2* The price of rice used is the average price of medium IR 64 rice that applies each year in units of rupiah per kilogram (Rp/kg).
- *3.4.3* Rice productivity is the ratio between rice production (lowland rice and upland rice) divided by the area of land in Banyumas Regency. The unit used is tons per hectare (tons/ha).
- *3.4.4* Cassava production is cassava production produced by Banyumas Regency every year expressed in units of tons per year (tonnes/year).
- *3.4.5* Rice seed in this study refers to the amount of seed used in agriculture. The unit used is tons.

4. Results

4.1 Rice Availability Analysis

The method for identifying rice availability classified as food insecure uses the 2020 Food Security and Vulnerability Atlas (FSVA) approach using the Microsoft Excel 2010 application. The following is the range of indicators for the ratio of food availability.

Table 2. Food Availability Ratio Indicator

Indikator	Range	Condition
	>1.5	High Deficit
	> 1.25 - 1.50	Moderate Deficit
Ratio of per capita normative consumption to food availability (rice)	> 1.00 - 1.25	Low Deficit
	> 0.75 - 1.00	Low Surplus
	> 0.50 - 0.75	Moderate Surplus
	< 0.50	High Surplus

Source: Ministry of Agriculture's Food Security Agency, 2020

The following is data on the development of rice availability in Banyumas Regency in 2003-2022.

Table 3. Rice Production, Rice Availability, Total Population, Rice Availability Ratio, Food Conditions in Banyumas Regency in 2003-2022

Year	Rice Production (Tons)	Availability of Rice (Tons)	Total population	Rice Availability Ratio	Food Conditions
2003	349,750	210,232.00	1,524,901	0.80	Low Surplus
2004	358,095	215,241.00	1,538,285	0.78	Low Surplus
2005	341,200	205,032.00	1,545,364	0.83	Low Surplus
2006	316,153	189,902.00	1,552,252	0.90	Low Surplus
2007	331,563	199,245.00	1,571,614	0.87	Low Surplus
2008	348,055	209,208.73	1,582,619	0.83	Low Surplus
2009	366,114	220,118.63	1,595,945	0.80	Low Surplus
2010	401,261	241,251.08	1,557,667	0.71	Moderate Surplus
2011	345,761	207,843.68	1,574,001	0.83	Low Surplus
2012	381,092	229,186.47	1,590,011	0.76	Low Surplus
2013	348,196	209,264.86	1,605,579	0.84	Low Surplus
2014	316,917	190,421.48	1,620,918	0.93	Low Surplus
2015	384,943	231,458.21	1,635,909	0.78	Low Surplus
2016	388,194	233,384.03	1,650,625	0.78	Low Surplus
2017	370,947	223,017.00	1,665,025	0.82	Low Surplus
2018	409,054	245,973.74	1,679,124	0.75	Low Surplus
2019	379,456	228,150.11	1,685,078	0.83	Low Surplus
2020	371,827	223,591.56	1,776,918	0.87	Low Surplus
2021	376,083	226158.16	1,789,630	0.87	Low Surplus
2022	371,676	223,502.53	1,806,013	0.89	Low Surplus

Source: Processed Data Excel, 2023

Based on the 2020 Food Security and Vulnerability Atlas (FSVA) approach, the results of the indicator ratio for rice availability in Banyumas Regency for 2003-2022 were obtained. The condition of the rice availability ratio in Banyumas Regency is surplus but relatively low. However, in 2010 the condition of the ratio of rice availability increased to a moderate surplus, this was influenced by the increase in harvested area and production.

4.2 Hypothesis test

Testing the hypothesis in this study uses multiple linear regression analysis and aims to determine the effect of the independent variables on the dependent variable. The data used is time series data for the period 2003-2022. The data analysis technique uses the Eviews 10 program. Following are the results of the estimation model for rice availability in Banyumas Regency.

Table 4. Regression Output Results

Variables	coefficient	std. Error	t-Statistics	Prob.
C	10.28415	0.013845	742,7831	0.0000
HB	-1.16E-06	3.34E-07	-3.4724	0.0034
pp	0.188641	0.001548	121.8672	0.0000
PKP	-2.84E-08	9.63E-09	-2.9477	0.0100
JBP	0.000575	6.84E-06	83.9871	0.0000
Adjusted R-squared			0.999405	
F-statistics			7,977,436	
Prob(F-statistic)			0.000000	

Source: Eviews processed data 10, 2023

The table above informs the estimation results of the rice availability model in Banyumas Regency obtained from constants and regression coefficients. Mathematically the model equation is obtained as follows:

$$LogsKB = 10{,}28415 - 0{,}00000116\,HB + 39806{,}89\,PP - 0{,}0000000284PKP + 0{,}000575\,JBP + e$$

Information :
KB = Availability of Rice
HB = Price of Rice
PP = Rice Productivity
PKP = cassava production
JBP = Number of Rice Seeds

4.2.1 Coefficient of Determination (R^2)

The coefficient of determination (R2) refers to the ability of the independent variable (X) to explain the dependent variable (Y). The output results above show that the adjusted R-squared value is 0.999405, which means that the independent variables of rice price, rice productivity, cassava production and the number of rice seeds are able to explain 99.94% of the variation in the variable availability of rice. The remaining 0.06% is explained by other variables not examined.

4.2.2 F Test (Simultaneous)

Simultaneous Testing (F Test), basically aims to find out whether all the independent or independent variables contained in the model have an effect simultaneously on the dependent or dependent variable (Ghozali, 2005). The output results show a statistical F value of 7,977.436 with a probability of 0.000000 which is less than the alpha value (0.05), so it can be concluded that the four variables of rice price, rice productivity, cassava production and the number of paddy seeds simultaneously affect the availability of rice.

4.2.3 T Test Results (Partial)

This hypothesis testing is carried out partially with the aim of knowing the effect and significance of each independent variable on the dependent variable (Ghozali, 2013). Following are the results of the partial test in this study seen from table 3.

4.2.3.1 Testing of Rice Prices

Based on the results of data processing in the table above, it shows that the probability value of 0.0034 is smaller than the alpha value (0.05) with a coefficient value of -0.00000116, so the rice price variable partially has a negative and significant effect on rice availability. This means the hypothesis is rejected. This means that if the price of rice increases by IDR 1, the availability of rice will decrease by 0.00000116 tons.

4.2.3.2 Tests on Rice Productivity

The results of the analysis show that the probability value of 0.0000 is smaller than the alpha value (0.05) with a coefficient value of 0.188641, so the rice productivity variable partially has a positive and significant effect on rice availability. This means the hypothesis is accepted. It means that for every increase in rice productivity by 1 unit, the availability of rice will increase by 39,806.89 tons and vice versa if rice productivity decreases by 1 unit, the availability of rice will decrease by 39,806.89 tons.

4.2.3.3 Testing of Cassava Production

Based on the results of the analysis above, it shows that the probability value of 0.01000 is smaller than the alpha value (0.05) with a coefficient value of -0.0000000284, so the cassava production variable partially has a negative and significant effect on rice availability. This means the hypothesis is accepted. This means that if cassava production is 1 unit, the

availability of rice will decrease by 0.0000000284 tons. Conversely, if cassava production decreases by 1 unit, the availability of rice will increase by 0.0000000284 tons.

4.2.3.4 Testing the Number of Rice Seeds

The results of the analysis show that the probability value of 0.0000 is smaller than the alpha value (0.05) with a coefficient value of 0.000575, the variable number of paddy seeds partially has a positive and significant effect on rice availability. This means the hypothesis is accepted. It means that every increase in the number of rice seeds by 1 unit, the availability of rice will increase by 0.000575 tons.

5. Discussion

Based on the calculation of rice availability using the 2020 Food Security and Vulnerability Atlas (FSVA) approach, it was found that the condition of rice availability in Banyumas Regency was classified as a low surplus. This is because the availability of agricultural land in Banyumas Regency from 2003-2022 has experienced a decreasing trend, but the amount of rice production produced tends to experience an increasing trend, but this affects the availability of rice produced, which is still classified as a low surplus. The condition of low surplus rice availability refers to a situation where farmers' rice yields come from their own region, this is because local rice production can meet the needs of the community (Pratama et al. 2021).

The results of the analysis show that the price of rice has a negative effect on the availability of rice, this hypothesis is not in accordance with the research hypothesis. However, the availability of rice in Banyumas Regency is classified as a low surplus but fluctuating rice production, in 2022 rice production reached 371,676 tons, which has decreased from 2021. Based on research Karya, (2012) states that the price of rice has no effect on the food security ratio because rice is a primary good and is inelastic, which implies that price fluctuations do not result in major changes in demand. Gapari (2021) stated that the increase in rice prices would have a negative impact on agricultural needs including fertilizers, pesticides and pesticides.

The results of the analysis show that rice productivity has a positive effect on rice availability, this hypothesis is in accordance with the research hypothesis. This is because the productivity of rice in Banyumas Regency during 2003-2022 was 5.5 tons/ha and the amount of rice production in Banyumas Regency experienced an upward trend so that the availability of rice also increased. The results of this study are in line with Pusvita et al. (2022) states that the productivity factor can affect the availability of rice food. This means that any increase in productivity will affect the adequacy of food availability.

Based on the estimation results of regression testing stated that cassava production had a negative and significant effect on rice availability. Cassava can be used as an alternative crop besides rice and corn. This can have an effect on the use of the harvested land used. Wijoyo et al. (2020) stated that the price of sugar had a negative effect on the availability of rice in East Java Province, in this condition due to the relationship between the substitution of land used. So that when sugarcane production increases, the use of land used to produce rice decreases.

The results of this study are in accordance with the hypothesis which states that the number of rice seeds has a positive effect on the availability of rice in Banyumas Regency. Based on research results Khakim et al. (2013) it was found that seeds had a positive and significant effect on rice production in Central Java because increased production through the use of quality seeds had a 20 percent chance of agricultural land area.

6. Conclusion

Based on the results of the data analysis and discussion, the condition of the availability of rice in Banyumas Regency is classified as a surplus but is still low with a range of more than 0.75-0.95. The variables of rice price, productivity, cassava production and the number of rice seeds simultaneously have a significant influence on the availability of rice in Banyumas Regency. Partially the productivity variables and the number of seeds have a positive and significant effect on the availability of rice in Banyumas Regency. Meanwhile, the variables of rice price and cassava production have a negative and significant effect on the availability of rice in Banyumas Regency.

Based on the conclusions discussed earlier, the implications of this research are that the government and agencies such as the Agriculture and Food Security Office, the Industry and Trade Office and Bulog of Banyumas Regency can maximize the absorption of rice availability, price stabilization programs, increase harvest areas and production so that productivity increases, the need for food diversification to reduce dependence on one main type of food such as rice. The role of farmers in agricultural activities to produce rice availability so that food security is maintained.

References

Badan Ketahanan Pangan. (2021). Indeks Ketahanan Pangan 2021. In *Badan Ketahanan Pangan*.

Badan Pusat Statistik. (2020). Statistik Indonesia Tahun 2023. *Statistik Indonesia 2020*, *1101001*, 790. https://www.bps.go.id/publication/2020/04/29/e9011b3155d45d70823c141f/statistik-indonesia-2020.html

Badan Pusat Statistik. (2022). Luas Panen dan Produksi Padi di Indonesia 2021 (Angka Tetap). *Bps*, *2021*(21), 1–20.

Badan Pusat Statistik (BPS). (2022). *Rata-rata Pengeluaran Konsumsi Masyarakat Tiap Bulan*. Katadata.Co.Id. https://databoks.katadata.co.id/datapublish/2022/06/21/berapa-rata-rata-pengeluaran-konsumsi-masyarakat-tiap-bulan

Badan Pusat Statistik Kabupaten Banyumas. (2023). *Kabupaten Banyumas Dalam Angka 2023*.

Bappenas. (n.d.). Retrieved June 12, 2023, from https://sdgs.bappenas.go.id/tujuan-2/

Food and Agriculture Organization. (2016). *Indonesia and FAO Partnering for Food Security and Sustainable Agricultural Development*.

Gapari, M. Z. (2021). Pengaruh Kenaikan Harga Beras Terhadap Kesejahteraan Petani Di Desa Sukaraja. *PENSA : Jurnal Pendidikan Dan Ilmu Sosial*, *3*(1), 14–26. https://ejournal.stitpn.ac.id/index.php/pensa

Gayatri, N. F. (2017). Analisis Faktor-Faktor yang Mempengaruhi Ketersediaan Beras di Kota Malang. *Jurnal Ilmiah Mahasiswa Fakultas Ekonomi Dan Bisnis Universitas Brawijaya*, *5*(2).

Ghozali, I. (2005). *Aplikasi Analisis Multivariate Dengan Program SPSS*. Universitas Diponegoro.

Ghozali, I. (2013). *Aplikasi Analisis Multivariate dengan Program IBM SPSS. 21 Update PLS Regresi*. Universitas Diponegoro.

Karya, J. W. (2012). *Pengaruh Persediaan Beras, Produksi Beras, dan Harga Beras Terhadap Ketahanan Pangan Kabupaten/Kota di Jawa Tengah Tahun 2008-2010. 1*(1), 42–47.

Khakim, L., Hastuti, D., & Widiyani, A. (2013). Pengaruh luas lahan, tenaga kerja, penggunaan benih, dan penggunaan pupuk terhadap produksi padi di Jawa Tengah. *Jurnal Ilmu-Ilmu Pertanian Mediagro*, *9*(1), 71–79.

M Paschalia Judith J. (2023). *Ketentuan tentang Harga Pembelian Dinilai Rugikan Petani - Kompas.id*. Kompas.Id. https://www.kompas.id/baca/ekonomi/2023/02/21/ketentuan-tentang-harga-pembelian-dinilai-rugikan-petani

Mankiw, N. G. (2000). *Teori Ekonomi Makro Jilid 2*. Erlangga.

Pratama, A. R., Sudrajat, S., Harini, R., & Hindayani, P. (2021). Strategi Ketahanan Pangan Beras berdasarkan Pendekatan Food Miles. *Media Komunikasi Geografi*, *22*(2), 219. https://doi.org/10.23887/mkg.v22i2.37518

Pusvita, E., Ogari, P. A., & Iskandar, A. (2022). *Mapping the Potential of Food Crops Through Food Diversification in Ogan Komering Ulu District. 3*(1).

Sugiyono. (2017). *Metode Penelitian Kuantitatif, Kualitatif, dan R&D*. Alfabeta.CV.

Sukirno, S. (2000). *Pengantar Teori Mikroekonomi*. RajaGrafindo.

Suryana, A., Rachman, B., & Hartono, D. (2014). Dinamika kebijakan harga gabah dan beras dalam mendukung ketahanan pangan nasional. *Pengembangan Inovasi Pertanian*, *7*(4), 155–168.

Wijoyo, B. H., Hidayat, S. I., & Abidin, Z. (2020). Analisis Ketersediaan Beras Di Jawa Timur. *Berkala Ilmiah AGRIDEVINA*, *8*(2), 83–98. https://doi.org/10.33005/adv.v8i2.1799

Yusuf, Y., Amrullah, A., & Tenriawaru, A. N. (2018). Perilaku Konsumen Pada Pembelian Beras Di Kota Makassar (Cunsomer Behavior on Purchasing Rice in Makassar City). *Jurnal Sosial Ekonomi Pertanian*, *14*(2), 105. https://doi.org/10.20956/jsep.v14i2.3695