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# Demand and Willingness to Pay for Rice Commodities In West Java

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Rice; demand elasticity; WTP; welfare

**Abstract**

Rice is the staple food of Indonesian people. In West Java, the price of rice in 2019 in the turn of the month increases gradually, therefore, more attention is needed regarding rice price stabilization. Price stabilization is an important dimension in contributing to social welfare stabilization. This study aimed to determine the factors that influence rice demand and consumers' willingness to pay for rice (Willingness to Pay) in West Java. The basic methods of this research were descriptive and analytical methods. The method of taking location was purposive and sampling was done by convenience sampling technique. Types of data and data sources were primary data and secondary data. Data collection techniques by interview, observation and recording. Data analysis methods used included: (1) Descriptive Analysis Method; (2) Analysis of factors that influence demand by using Seemingly Unrelated Regression (SUR); (3) Willingness to Pay (WTP). The results showed that the price of rice had a positive effect on rice expenditure, yet had a negative effect on rice demand. While the number of family members has a positive effect on rice demand. Calculation of value (WTP) obtained Gross WTP value of IDR 4,315,638.26. The amount to be paid is IDR 243,635.85, the Net WTP value is IDR 4,072,002.41. When prices increase by 10%. then the welfare level decreased by -67.89%. Meanwhile, when prices fell by 10%, the welfare level increased by 61.10%.

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## INTRODUCTION

The rice economy is a significant supporter of the rapid economic growth in Indonesia since the 1960s (Timmer, 1996). According to the Central Statistics Agency (2018b), Indonesia's rice production is 32.42 million tons annually and the amount of rice consumption reaches 29.57 million tons. This shows that Indonesia experienced a rice supplement of 2.85 million tons. However, that year Indonesia imported 2.2 million tons of rice. This was not relevant to the actual situation and might reduce prices at the national farmer level. According to data from the Central Statistics Agency (2018b), Java is the island with the highest demand for rice. According to Khudori (2008), the need for rice continues to increase along with the increasing population.

**Table 1. Average Rice Consumption per Capita per Year by Province in Java year 2014-2017**

| No | Province | Consumption (Kg/Capita/Year)) | | | |
|---|---|---|---|---|---|
| | | 2014 | 2015 | 2016 | 2017 |
| 1 | West Java | 105.3 | 104.1 | 104.2 | 128.4 |
| 2 | Banten | 109.2 | 111.2 | 116.7 | 111.8 |
| 3 | Special Region of Yogyakarta | 106.9 | 101.8 | 107.9 | 106.9 |
| 4 | Central Java | 95.9 | 77.1 | 79.2 | 76.4 |
| 5 | East Java | 91.4 | 93.3 | 95.3 | 91.3 |
| 6 | Jakarta Capital Special Region | 88.4 | 83.3 | 83.1 | 81.2 |

Source: (Central Beureau of Statistics, 2018a)

Table 1 presents data on average annual rice consumption per capita by province in Java in 2014-2017. The data shows that West Java is the province with the highest level of rice consumption in Java. Based on these data, it can be seen that rice is still choosen as daily staple food by people in West Java. According to the Central Statistics Agency (2019b), a rice deficit had occurred in West Java in the first three months of 2019. The deficit caused the rice price which was initially stable to fluctuate or above the Highest Retail Price (HRP) set by the government. Rising rice prices were causing problems for the community.

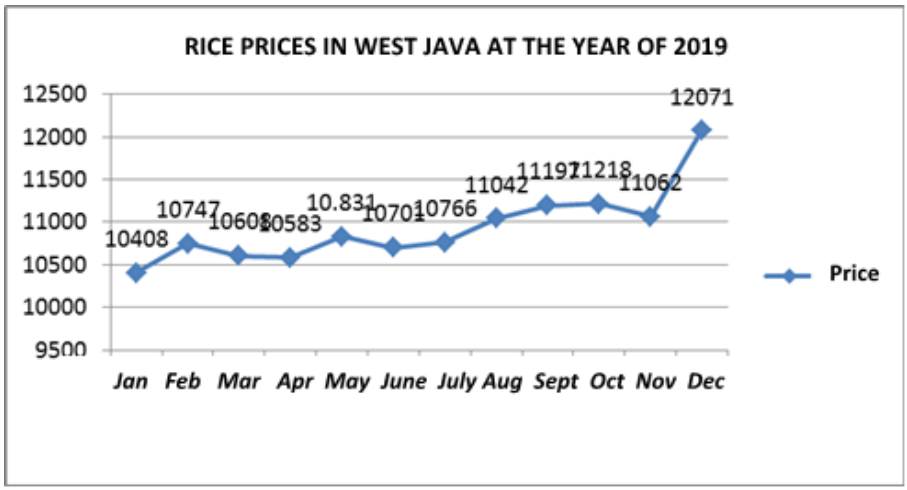


**Figure 1. Rice Price Changes in West Java, 2019**
Source: Food Price Information Portal, 2019

Figure 1 shows the change in rice prices in West Java year 2019, which had increased every month. In January the price of rice was IDR10,408 and increased every month, until the price of rice reached the highest price of IDR 12,071 in December. The graph illustrates that the price of rice in West Java in the turn of the month increased gradually. According to Sanny (2010), price is an important factor in consumer purchasing decisions. Sriwaranun et al. (2014), stated that price is an important dimension in demand. Therefore, stabilizing the price of rice or food is considered very important. According to Amang (1999), based on literature from several economists, it is considered that food price stabilization schemes are difficult to implement because of some imbalance in costs and can be influenced by special interests. Price stabilization is an important dimension in contributing to social welfare stabilization (Timmer, 1992).

This study aimed to determine the factors that affect rice demand and the value of willingness to pay (WTP) in West Java. This research is important to do because rice is a staple food for Indonesian people. Therefore, more attention needs to be paid to the stabilization of rice prices, because they can have an impact on political stability and economic growth. Basically, social welfare is expected to be at the Pareto optimum condition, a condition that occurs when all economic actors are in an optimum welfare condition. The value of Willingnes to Pay (WTP) is used as a measure of welfare (Ratih et al., 2013). According to Foster (1997), the greater value of the benefits obtained by individuals is in line with the meaning of social welfare. It is intended to create prosperity between rice consumers and farmers (producers) of rice that can be implemented through policies made by the government. Based on this, the demand for rice when the price of rice has increased or decreased towards the welfare of the community was raised to be the main topic of this research discussion.

## RESEARCH METHODS

This research used descriptive method. Descriptive method was used to determine the level of relationship between two or more variables, without making changes, additions, or manipulation of existing data to make conclusions. The location of the study was determined purposively in two regions in West Java, namely in the city of Bandung with a consumption center area and Indramayu Regency with a production center area.

The population in this study was the final rice consumers in West Java. The determination of the sample in this study was carried out using a non-probability sampling technique which was done using a convenience sampling technique. According to Sekaran (2006), Convenience Sampling is a collection of information from population members that is obtained easily and is able to provide the information needed. This study required as many as 100 samples found in a number of public places that were final rice consumers who routinely buy rice, of which 50 were in Bandung and 50 were in Indramayu Regency. The data used were primary data and secondary data. Primary data were obtained from direct interviews with rice consumer respondents. Secondary data were obtained from literature, literature, previous researches, the internet, the Central Statistics Agency, libraries, and government agencies in West Java that are relevant to this research. Data collection was done by observation, interview, and recording.

Data analysis methods were used to answer the objectives of the study. The analytical method used in this study to determine the effect of factors in this study was the Seemingly Unrelated Regression (SUR) model introduced by Arnold Zellner in 1962. The SUR model is a multivariate regression model and part of multiple linear regression. The SUR model is a model that consists of several equations and the variables are not bidirectional. This model consists of several unrelated systems of equations (Zellner (1962). The regression equation system is stated as follows:

$$Y_1 = \alpha_0 + \alpha_1 X_1 + \alpha_2 \text{Ln}X_1 + e \quad (1)$$

$$\text{Ln}Y_2 = \beta_0 + \beta_1 \text{Ln}X_1 + \beta_2 \text{Ln}X_2 + \beta_3 \text{Ln}X_3 + \beta_4 \text{Ln}X_4 + e \quad (2)$$

Explanation:

| | |
|---|---|
| Y1 | = Expenditures for Rice (Rp) |
| Y2 | = Rice Request (Kg / Month) |
| α0, β0¬ | = Constant |
| α1, α2 | = Regression Coefficient of Equation 1 |
| β1, β2, β3, β4 | = Regression Coefficient of Equation 2 |
| X1 | = Rice Price (IDR / kg) |
| X2 | = Revenue (IDR / Month) |
| X3 | = Number of Family Members (People) |
| X4 | = Low Quality Rice Price (IDR / kg) |
| e | = Error |

The analytical method used to determine the value of willingness to pay was calculated by using multiple linear regression analysis and looking at the demand curve. In this study, researchers looked for Gross WTP value, the amount to be paid and Net WTP. The steps to calculate the value of Willingness to Pay are as follows:

1. Using the Multiple Linear Regression equation
   $\text{Ln}Y = \alpha + \beta_1 \text{Ln}X_1 + \beta_2 \text{Ln}X_2 + \beta_3 \text{Ln}X_3 + e$
2. Change to the exponent regression function equation
   Anti Ln:
   $Y = \alpha \cdot X_1^{\beta 1} \cdot X_2^{\beta 2} \cdot X_3^{\beta 3}$
   $Y = (\alpha \cdot X_2^{\beta 2} \cdot X_3^{\beta 3}) \cdot X_1^{\beta 1}$
   $Y = \alpha' \cdot X_1^{\beta 1}$
3. Change the dependent variable as an independent variable and vice versa
   $Y = \alpha' \cdot X_1^{\beta 1}$
   $Q = \alpha' \cdot P_1^{\beta 1}$

$$P_1^{B1} = \frac{Q}{\alpha'}$$

$$P_1 = \frac{Q^{\frac{1}{\beta 1}}}{\alpha'^{\frac{1}{\beta 1}}}$$

4. Determining the value of Willingness to Pay with the consumer surplus formula

$$P(x) = \int_0^Q Q(x)dx$$

Explanation:
P (x): Gross Willingnes to Pay (WTP)
0: Lower Limit
Q: Upper Limit
Q (x): Equation Function Request

The following illustration is the demand curve in determining the value of Willingnes to Pay (WTP) or consumers' willingness to pay:

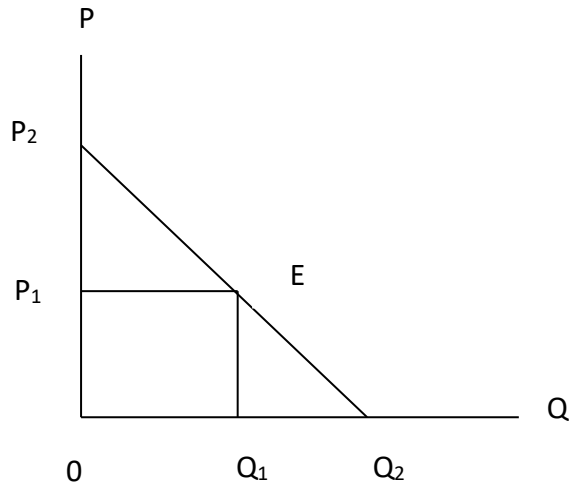


**Figure 2. Demand Curve**

Information:
0Q1EP2 = Total willingness of consumers to pay (Gross WTP)
0Q1EP1 = Price paid by consumers
P1EP2 = Consumer surplus (Net WTP) (Pearce & Turner, 1990)..

## RESULT AND DISCUSSION

### West Java General Condition

West Java is one of the provinces in the western part of Java Island. West Java is astronomically located at longitude 104 ° 48 'BT to 108 ° 48' BT and Latitude 5 ° 50 'LS to 7 ° 50' LS. West Java Province is administratively divided into 27 Regencies / Cities. The study was conducted in the City of Bandung and Indramayu Regency. The total population in West Java Province in 2016 was 47,379,389, an increase of 669,820 people (Central Beureau of Statistics, 2019a). The dependency ratio of West Java Province in 2018 was 46.8% which means that every 100 productive age population must bear 47 non-productive age population. The GRDP growth rate of West Java Province according to business field based on constant prices in 2015-2018 showed the growth of 17 sectors in West Java. The average GRDP of West Java Province from 2015-2018 was experienced fluctuations. The largest GRDP in 2016 amounted to 5.67%. In 2018 West Java Province GRDP of 5.64% increased compared to the previous year of 5.35% (Central Beureau of Statistics, 2019a). The demand for rice in West Java in 2018 exceeded the production produced in the West Java region.

The existence of this rice deficit resulted in price instability that year, so that the willingness of the people to buy rice was also changed. In 2018 the amount of rice production in West Java was 5.48 million tons with a level of rice consumption of 6.25 million tons, so that in that year West Java experienced a rice deficit of 0.77 million tons.

**Characteristics of Respondents**

**Table 2. Age of Rice Consumer Respondents in Bandung City and Indramayu Regency, West Java year 2019**

| No | Age (Year) | Number of Respondents (Person) | Percentage (%) |
|---|---|---|---|
| 1. | 20 - 30 | 24 | 24 |
| 2. | 31 - 40 | 16 | 16 |
| 3. | 41 - 50 | 31 | 31 |
| 4. | ≥51 | 29 | 29 |
| | Total | 100 | 100 |

Source: ( Central Beureau of Statistics, 2019a)

The data of rice consumer respondents in Bandung City and Indramayu Regency, West Java in Table 2 shows that the largest age group of rice consumers is in the age range of 41-50 years. The 41-50 age groups had 31 respondents with a percentage of 31% of the total 100 respondents. The 41-50 age groups dominated the purchase of rice because it belongs to the productive age group. According to Sumarwan (2002), age can cause differences in consumption of a particular item.

**Table 3. Education Level of Rice Consumer Respondents in Bandung City and Indramayu Regency, West Java**

| No. | Education level | Number of Respondents (Person) | Percentage (%) |
|---|---|---|---|
| 1. | No Formal Education | 2 | 2 |
| 2. | Elementary School | 21 | 21 |
| 3. | Middle School | 14 | 14 |
| 4. | High School | 39 | 39 |
| 5. | University | 24 | 24 |
| | Jumlah | 100 | 100 |

Source: Primer Data Analysis, 2019

Table 3 presents data on the level of education of rice consumer respondents in Bandung City and Indramayu District, West Java. The data shows that the majority of the education level of rice consumer respondents was in high school, as many as 39 people with a percentage of 39%. This shows that rice consumers in Bandung City and Indramayu District had a fairly good level of education. According to Wadi & Gede (2013), demographic factors, one of which is education, have a positive or significant effect on consumers' responses in buying goods.

**Table 4. Occupations of Rice Consumer Respondents in Bandung City and Indramayu Regency, West Java**

| No. | Occupations | Number of Respondent (Person) | Percentage (%) |
|---|---|---|---|
| 1. | Housewife | 54 | 54 |
| 2. | Private Employee | 7 | 7 |
| 3. | Enterpreneur | 13 | 13 |
| 4. | Labor | 2 | 2 |
| 5. | Civil Servant | 24 | 24 |
| | Jumlah | 100 | 100 |

Source: Primer Data Analysis, 2019

The occupations of rice consumers in Bandung City and Indramayu Regency, West Java, which were shown in table 4 indicated that the most types of respondent occupations were as housewives, amounting to 54 people with a percentage of 54%. Housewives become the majority of consumers because they are tasked with purchasing food needs, especially rice.

**Analysis of Factors that Affecting Rice Demand in West Java**

**Table 5. Results of Seemingly Unrelated Regression (SUR) Analysis**

| Variable | Regression Coeficient | Sig. |
|---|---|---|
| Rice expenditure | | |
| Medium Quality Rice Price ($X_1$) | 3.372751 | 0.002*** |
| Contant | 200237.4 | 0.000*** |
| $R^2$ | 0.7202 | |
| $Chi^2$ | 61.30 | |
| Rice Demand | | |
| Medium Quality Rice Price ($X_1$) | -1.125539 | 0.001*** |
| Consumer Revenue ($X_2$) | -0.0265575 | $0.517^{ns}$ |
| Number of family members ($X_3$) | 0.4147122 | 0.000*** |
| Poor Quality Rice Price ($X_4$) | 0.5757381 | $0.115^{ns}$ |
| Constant | 7.962579 | 0.000*** |
| $R^2$ | 0.3139 | |
| $Chi^2$ | 44.71 | |

Source: Primer Data Analysis, 2019

Explanations:

*** : significant at α = 1%
** : significant at α = 5%
* : significant at α = 10%
Ns : not significant

In Table 5, it is explained that the coefficient of determination (R2) is 0.72, meaning that 72% of the variation of the independent variable namely rice price (X1) can explain the dependent variable, namely rice expenditure (Y1). Meanwhile, the other 28% is explained by other variables outside the model such as the amount of rice and types of rice varieties. Rice expenditure is influenced by rice prices positively at α = 1%. An increase in rice prices will increase rice expenditure. This is in

accordance with research conducted by Ramadanus, et al. (2013), which stated that an increase in rice prices would increase rice spending on households.

The coefficient of determination (R2) in the second model of the demand function equation is 0.31, meaning that 31% of the variation of independent variables are rice price (X1), consumer income (X2), number of family members (X3), and low quality rice price (X4 ) can explain the dependent variable, namely rice demand (Y2). The independent variable price of rice (X1) individually significantly affected the dependent variable, namely the demand for rice (Y2), with a significance value of 0.001 <α = 0.01 in line with research according to Putri (2019), that price is a determining factor in making purchasing decisions. The independent variable number of family members (X3) individually significantly affected the dependent variable, namely the demand for rice (Y2), with a significance value of 0.000 <α = 0.01. This is in line with research from Deviana (2014), that the number of family members influences evident in the demand for rice production in Kubu Raya Regency. Meanwhile, the variable of consumer income (X2) and the price of low quality rice (as a proxy for substitute goods) did not significantly affect the demand for rice (Y2). This shows that consumers would not reduce the quantity of rice demand when there is a change in income. In addition, consumers also did not replace their rice varieties with cheaper rice when their income falls, according to research conducted by Sugiyanto (2006), which stated that rice consumption was relatively insensitive to changes in income. A decrease in income would not increase or decrease the quantity of rice consumed. However, if income decreased, it would change the quality of rice with lower quality rice.

**Value of Willingness to Pay for Rice in West Java**

Willingness to Pay (WTP) is the amount that consumers are willing to pay to obtain an item. In this study, Willingness to Pay (WTP) is measured by looking at the demand curve. The demand curve reflects the willingness of consumers to pay lies in the consumer surplus. According to Marpaung (2013), consumer surpluses were measured as the maximum amount of prices to be paid for an item and reduced by the amount of goods paid. In this study, the consumer surplus is the Net WTP, while Gross WTP is the value of WTP before deducting the amount of goods paid.

**Table 6. Analysis of the Value of Willingness to Pay for Rice in West Java**

| Value | Result | Price increased 10% | | Price Decreased 10% | |
|---|---|---|---|---|---|
| | | Result | Changing Percentage | Result | Changing Percentage |
| Gross WTP | IDR 4.315.638,26 | IDR 1.378.958,19 | -68.04% | IDR 6.940.119,39 | 60.81% |
| Amount of Payment | IDR 243.635,85 | IDR 71.555,91 | -70.62% | IDR 379.998,78 | 55.96% |
| Net WTP | IDR 4.072.002,41 | IDR 1.307.402,08 | -67.89% | IDR 6.560.120,60 | 61.10% |

Source: Processed Primary Data, 2019

Information:
The results in the table were obtained from the demand function integral $P(x) = \int_0^Q Q(x)dx$

The results of calculations in Table 6 show that Gross WTP or willingness to pay consumers amounted to Rp 4,315,638.26. The amount to be paid by consumers is the multiplication of the price with the amount of rice purchased, which is Rp 243,635.85. Meanwhile, the NET WTP calculation results in this study produced a value of Rp 4,072,002.41.

A demand analysis was made in this study, which examined the impact on consumers' willingness to pay rice if the price of goods rises by 10% and falls by 10%. When the price rised by 10% the value of Gross WTP of Rp 1,378,958.19 with the influence of the welfare percentage of -68.04%, the value of the amount to be paid is Rp 71,555.91 with the effect of the welfare percentage of -70.62% and Net WTP of Rp 1,307, 402.08 with the influence of the welfare percentage of -67.89%.

When the price decreased by 10%, the Gross WTP generated was IDR 6,940,119.39 with the influence of the welfare percentage of 60.81%, the amount to be paid was IDR 379,998.78 with the effect of the welfare percentage of 55.96% and Net WTP of IDR 6,560,120.60 with the effect of a welfare percentage of 61.10%. it was in accordance with the law of demand for an increase in price will reduce demand and vice versa.

From the explanation above it can be seen that rising and falling prices can affect the level of welfare. Therefore, price stability must be maintained because consumers can allocate their budget optimized their needs. This price stabilization can be done by the government. Forming rice price policies should be carried out by the government. According to Siswanto, et al. (2018), policies made by the government are directed towards the welfare of producers and consumers. Rice price policy can have an impact on the equitable distribution of rice, which is to provide high rice prices in deficit areas so that rice flows from surplus areas to deficit areas. Making rice price policies can improve economic efficiency, improve income distribution and improve community welfare (Amang & Sawit, 1999).

## CONCLUSION

Based on the formulation of the problem, research objectives, hypotheses, and research results, it can be concluded: (1) Factors affecting rice expenditure are the price of rice. The greater the amount of rice demand, the greater the rice expenditure. Furthermore, the factors affecting rice demand are the price of rice and the number of family members. (2) The value of Willingness to Pay (WTP) or the willingness of consumers to pay for rice commodities in West Java obtained a value of IDR 243,635.85 at a price per kilogram of IDR 11,610 with an amount of rice of 20,958 kg. The value of Willingness to Pay (WTP) for rice commodities in West Java with price changes, if the price of rice has increased by 10%, then the level of welfare has decreased by -67.89%. Meanwhile, a decrease of 10%, then the level of welfare increased by 61.10%.

## RECOMMENDATION

Significant factors that affecting rice demand are price and number of family members. Therefore, the role of the government is needed in making policies to stabilize prices in order to create public welfare, as well as increase rice supply by increasing farmers' production through the use of appropriate technology, subsidizing crop production facilities and reducing land conversion. Suggestions for

further research are to examine other variables that are likely to influence rice and have not been examined in this study so that the results are more accurate, as well as provide examples of policies that can be actually applied by the government to the wider community

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