The influences of consumer characteristics on the amount of rice consumption

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Abstract. This study aimed to analyze the characteristics of rice consumers and the influences of consumer characteristics on the amount of rice consumption. The research areas were determined purposively in the sub-districts with the most significant population in Medan City. The analytical methods used were descriptive and multiple linear regression analysis. The results showed that consumers in the study areas have various characteristics, concerning age, income, family size, health, and education. Simultaneously, characteristics of rice consumers have the significant effect on the amount of rice consumed. Partially, age and the number of family members have the significant effect on the amount of rice consumed. The implications of this research are, need different policies toward consumers of rice based on their income strata. Rice policies cannot be generalized.

1. Introduction

Rice is one of the food commodities which plays an important role both from the side of producers, consumers, government, as well as society and the environment in general. From the producer side, 34 percent of Indonesians work in the agricultural sector. While from the consumer side, more than 90 percent of Indonesians consume rice as staple food, even 30 percent of the total expenditure of low-income households is used to buy rice [2].

Rice consumers in North Sumatra can be distinguished as consumers living in rural and urban areas. The need for rice by the population living in rural areas is also higher when compared to the population living in urban areas. It is due to differences in income levels and the lack of variety of rice substitute foods sold in rural areas compared to urban areas [9]. Table 1 shows that the rate of food grains consumption per capita of North Sumatra population is still very high, both in rural and urban areas, where consumption of food grains in rural areas is higher than in urban areas.

The behavior of consumers in the purchase of foodstuffs continues to develop. The increase in public incomes results in demands on quality. Changes in the demographic structures such as educational level, knowledge, lifestyle, technology, transportation, and communication affect consumer preferences and satisfaction.

The average rice consumption in North Sumatra in 2009 was 134.13, while in 2013 it was 131.46. The average per capita rice consumption in Medan City was 134 kg/capita, even higher than the national average rice consumption that was 114 kg/capita [4].
This study divides consumers into groups by income, age, the number of family members, health condition, and educational level. In general, if the income level rises, then the amount and types of food tend to improve as well. At low-income levels, the primary energy sources are obtained from grains, tubers, and vegetables.

Low-income families will more easily meet their food needs if the number of family members who need to be fed a little. The food available for a large family may be sufficient for the family which has the half of the family members, but not enough to prevent malnutrition in the large family.

Concerning age, the age differences will lead to differences in tastes and preferences for the product. Thus, the age differences will also affect the differences in the amount of consumption. So also with health conditions, consumption of rice is closely related to diabetes mellitus and cholesterol, changes in health condition lead to changes in the consumption of rice.

The levels of education affect the amount of consumer consumption. It is because the higher the educational level of a person then will be the better the type of work, and it will affect the level of income. The levels of income itself will also affect the purchasing power, tastes, and the amount of consumption. Besides, the levels of education also affect consumer knowledge about rice products.

This study aimed to analyze the characteristics of rice consumers and the influences of consumer characteristics on the amount of rice consumption in Medan City. It was expected that consumer characteristics by age, income, the number of family members, health condition, and educational level have the significant effect on the amount of rice consumption.

2. Material and Methods
The research areas were determined purposively in the sub-districts with the most significant population in Medan City. Medan City was chosen because it is the capital of North Sumatra Province. The study population was all households of rice consumer in Medan City. The number of households in Medan City in 2015 was 507,205 households [4]. The sample size was determined using the Slovin Method, by the following equation [17].

\[ n = \frac{N}{1 + \epsilon^2 N} \]  

\[ \epsilon \] proportionate sampling error
\[ N \] population size

Table 1. Average Daily Calorie Consumption Per Capita by Types of Food and Urban/Rural Areas (Kcal) Year 2013 – 2014 [3]

| No. | Details                  | Urban 2013 | Urban 2014 | Rural 2013 | Rural 2014 | Urban+Rural 2013 | Urban+Rural 2014 |
|-----|--------------------------|------------|------------|------------|------------|------------------|------------------|
| 1   | Grains                   | 798.03     | 805.55     | 1,080.53   | 1,080.25   | 941.53           | 944.95           |
| 2   | Tubers                   | 13.43      | 15.79      | 24.67      | 26.23      | 19.14            | 21.09            |
| 3   | Fishes                   | 66.30      | 67.87      | 73.91      | 73.20      | 70.16            | 70.57            |
| 4   | Meats                    | 42.35      | 48.63      | 28.45      | 32.09      | 35.29            | 40.23            |
| 5   | Eggs and Dairies         | 65.41      | 83.61      | 42.82      | 45.35      | 53.93            | 64.19            |
| 6   | Vegetables               | 33.28      | 35.56      | 39.55      | 40.10      | 36.47            | 37.87            |
| 7   | Nuts                     | 30.70      | 44.33      | 25.40      | 25.53      | 28.01            | 34.79            |
| 8   | Fruits                   | 40.33      | 37.67      | 37.76      | 38.86      | 39.02            | 38.27            |
| 9   | Oils and Fats            | 282.82     | 311.50     | 295.41     | 297.76     | 289.22           | 304.53           |
| 10  | Beverages                | 90.51      | 91.87      | 91.70      | 90.27      | 91.11            | 91.05            |
| 11  | Seasonings               | 11.25      | 10.93      | 11.44      | 10.31      | 11.35            | 10.62            |
| 12  | Other Consumptions       | 34.90      | 34.61      | 33.14      | 35.43      | 34.00            | 35.03            |
| 13  | Finished Foods           | 238.90     | 214.10     | 161.48     | 167.82     | 199.57           | 190.62           |
|     | Total Foods              | 1,748.21   | 1,802.03   | 1,946.26   | 1,963.18   | 1,848.80         | 1,883.81         |
Where \( n \) is Sample size, \( N \) is Population size, \( E \) is Error tolerance of 10%. So the size of samples to be examined was:

\[
 n = \frac{507,205}{1 + 0.1^2 \times 507,205} = 100 \text{ Households} 
\]  

(2)

The sampling method used was non-probability sampling, the combination of accidental sampling and purposive sampling. The samples were determined purposively based on income levels. At first, accidental sampling was done, the samples encountered would be interviewed, so the income levels were known. Once the sample size for specific income categories was known, then the samples for the other income categories would be searched. The sample size was taken based on each income category as many as 20 people. Sample size by categories of income is presented in Table 2.

**Table 2. Sample Size by Income Categories**

| No | Income Categories                      | Sample Size (People) |
|----|----------------------------------------|----------------------|
| 1  | < Rp 2,500,000                         | 20                   |
| 2  | Rp 2,500,000 – Rp 6,000,000            | 20                   |
| 3  | Rp 6,000,000 – Rp 10,000,000           | 20                   |
| 4  | > Rp 10,000,000 – Rp 15,000,000        | 20                   |
| 5  | > Rp 15,000,000                       | 20                   |
|    | **Total**                              | **100**              |

The data used in this study were primary data and secondary data. The primary data collection technique was conducted by interviewing rice consumers using structured questionnaires, while the secondary data was obtained from BPS Medan. The data were analyzed qualitatively and quantitatively. Qualitative methods were presented by interpreting and describing the data obtained, while the quantitative data obtained would be tabulated based on the activities.

The analytical methods used in this research were descriptive and multiple linear regression analysis. The descriptive analysis method was used to study the characteristics of rice consumers based on their socioeconomic conditions. The multiple-linear regression method was used to analyze the influences of consumer characteristics on the amount of rice consumption. The analysis was performed using SPSS 17 software.

Multiple-linear regression is a regression model used to analyze the effects of several independent variables on one dependent variable. The Model of the influences of consumer socioeconomic characteristics, those are age, income, the number of family members, health condition, and educational level, to the amount of rice consumption, systematically can be written as follows [16]:

\[
 Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5K + e 
\]  

(3)

Where:

- \( Y \) = The amount of rice consumption (kg/month)
- \( a \) = Constant
- \( b_1-b_5 \) = Regression coefficients
- \( e \) = Error
- \( X_1 \) = Age (year)
- \( X_2 \) = Income (Rp/month)
- \( X_3 \) = The number of family member (person)
- \( X_4 \) = Educational level (level)
- \( K \) = Health condition,
  - \( K = 1 \); cholesterol, other diseases, and healthy
  - \( K = 0 \); diabetes
3. Results and Discussion

The age of the samples ranged from 26 - 70 years. No group dominated the age of the samples, but most of the samples were aged 40 - 49 years those were 34 samples. Followed by the samples were aged 50 - 59 years those were 26 samples. Furthermore, the samples were aged 30 - 39 years those were 23 samples, 60 - 69 years those were 11 samples, 20 - 29 years those were 5 samples, and 70 - 79 years those were 1 sample. Characteristics of the sample by age groups are shown in Table 3.

Table 3. Characteristic of Sample by Age Groups

| Ages           | Total (Person) | Percentage (%) |
|----------------|----------------|----------------|
| 20 – 29 years  | 5              | 5.00           |
| 30 – 39 years  | 23             | 23.00          |
| 40 – 49 years  | 34             | 34.00          |
| 50 – 59 years  | 26             | 26.00          |
| 60 – 69 years  | 11             | 11.00          |
| 70 – 79 years  | 1              | 1.00           |
| Total          | 100            | 100.00         |

The highest sample income level was Rp 51,000,000, while the lowest was Rp 1,000,000. The highest income group was >Rp 15,000,000 and the lowest income group was <Rp 2,500,000.

The largest number of family members of sample households was 9 persons. The lowest number of family members of sample households was 1 person, while the average number of family members of sample households was 2 persons. There were 31 sample households with 0 - 3 family members, 66 sample households with 4 - 6 family members, and 3 sample households with 7 - 9 family members. Table 4 shows the number of family members of sample households by groups that had been set.

Table 4. Characteristic of Sample by The Number of Family Members Groups

| Number of Family Members | Total (Person) | Percentage (%) |
|--------------------------|----------------|----------------|
| 0 – 3 person             | 31             | 31.00          |
| 4 – 6 person             | 66             | 66.00          |
| 7 – 9 person             | 3              | 3.00           |
| Total                    | 100            | 100.00         |

The health condition of the sample was seen from the presence or absence of the illnesses. The diseases were diabetes, cholesterol, and other diseases. If the sample did not suffer from any illnesses, then the sample was declared healthy. Of the 100 samples, 20 samples were suffering from diabetes, 6 samples suffering from cholesterol, 2 samples suffering from other diseases, and the remaining 72 samples stated themselves healthy. Table 5 shows the health conditions of the sample.

Table 5. Characteristic of Sample by Health Conditions

| Health Conditions | Total (Person) | Percentage (%) |
|-------------------|----------------|----------------|
| Diabetes          | 20             | 20.00          |
| Cholesterol       | 6              | 6.00           |
| Other diseases    | 2              | 2.00           |
| Healthy           | 72             | 72.00          |
| Total             | 100            | 100.00         |

The most samples had Senior High School Education those were 62 samples. Followed by the samples had S1 education those were 15 samples. The samples had Elementary School education those were 5 samples, Junior High School education those were 13 samples, Diploma education those were 2 samples, S2 education those were 2 samples, and S3 education that was 1 sample. Table 6 shows the educational levels of the samples.
Table 6. Characteristic of Sample by Educational Levels

| Educational Levels | Total (Person) | Percentage (%) |
|--------------------|----------------|----------------|
| Elementary School  | 5              | 5.00           |
| Junior High School | 13             | 13.00          |
| Senior High School | 62             | 62.00          |
| Diploma            | 2              | 2.00           |
| S1                 | 15             | 15.00          |
| S2                 | 2              | 2.00           |
| S3                 | 1              | 1.00           |
| Total              | 100            | 100.00         |

Before the estimation of the analysis of the influences of consumer characteristics on the amount of rice consumption, it was necessary to test the assumption of Ordinary Least Square as follows.

a. Test of Normality
After passing the test of data normality with Kolmogorov Smirnov Test, the significance value obtained was 0.364 > 0.05 which means the residual data of model was distributed normally.

b. Test of Multicollinearity Symptoms
After performing the test of multicollinearity, the VIF values obtained for each variable were < 10 and Tolerance values obtained for each variable were > 0.1 which means there were no multicollinearity symptoms in the model.

c. Test of Heteroscedasticity Symptoms
After performing the test of heteroscedasticity with the graph method and Park Test, the form of the graph did not show the specific patterns, and the significance values of Park Test for each variable obtained were > 0.05 which means there were no heteroscedasticity symptoms in the model.

d. Autocorrelation Test
After performing the test of autocorrelation with Durbin-Watson Test, the Durbin-Watson value (d) obtained was du ≤ d ≤ 4 - du or 1.80 ≤ 1.990 ≤ 2.20 which means there was no positive or negative autocorrelation in the model or the trend was ρ = 0.

So after testing the OLS assumption, the final result of the estimation obtained showed the influence of consumer characteristics on the amount of rice consumption as follows.

Table 7. The Results of The Influences of Consumer Characteristics on The Amount of Rice Consumption in Medan City

| Variables            | Coefficient | Std. Error | t     | Sig   |
|----------------------|-------------|------------|-------|-------|
| Constant             | -8.010      | 5.259      | -1.523| 0.131 |
| Age                  | 0.195       | 0.072      | 2.716 | 0.008 |
| Income               | -0.153      | 0.000      | -1.600| 0.113 |
| Number of Family     | 5.422       | 0.549      | 9.882 | 0.000 |
| Member               | -0.516      | 0.765      | -0.675| 0.501 |
| Educational Level    | 1.724       | 1.776      | 0.972 | 0.334 |
| Health Condition     | 1.724       | 1.776      | 0.972 | 0.334 |

R² = 0.589  t - table = 1.671  F = 26.989  F- table = 2.769

Based on Table 7, obtained the following equation:
\[ \hat{Y} = -8.010 + 0.195 X_1 - 0.153 X_2 + 5.422 X_3 - 0.516 X_4 + 1.724 K \]

Based on the model, the coefficient of determination obtained was 0.589. It showed that 58.9% of the variation of the amount of rice consumption had been explained by age, income, number of family members, health condition, and educational level, while the remaining 41.1% was explained by other variables that had not been included in the model. The F value obtained was 26.989 > F-table = 2.769 with the significance value obtained was 0.000 < 0.05, which means that H1 was accepted. It means,
simultaneously, age, income, number of family members, health condition, and educational level significantly affect the amount of rice consumption at 95% level.

Partially, consumer characteristics that influence the amount of rice consumption are described as follows.

a. The regression coefficient of the age effect on the amount of rice consumption was 0.195 and had the positive sign, which means that if the age increases by 1 year, then the amount of rice consumption will increase by 0.195 kg/month assuming other variables are considered fixed. Based on t-test, t values of the age obtained was 2.716 > t-table = 1.671 with significance value obtained was 0.008 < 0.05, which means that H1 was accepted. It means, partially, the age significantly affects the amount of rice consumption at 95% level.

b. The regression coefficient of the income effect on the amount of rice consumption was -0.153 and had the negative sign, which means that if the income increases by 1 million Rupiah, then the amount of rice consumption will decrease by 0.153 kg/month assuming other variables are considered fixed. Based on t-test, t values of the income obtained was 1.600 < t-table = 1.671 with significance value obtained was 0.113 > 0.05, which means that H0 was accepted. It means, partially, the income does not significantly affect the amount of rice consumption at 95% level.

c. The regression coefficient of the number of family members effect on the amount of rice consumption was 5.422 and had the positive sign, which means that if the number of family members increases by 1 person, then the amount of rice consumption will increase by 5.422 kg/month assuming other variables are considered fixed. Based on t-test, t values of the number of family members obtained was 9.882 > t-table = 1.671 with significance value obtained was 0.000 < 0.05, which means that H1 was accepted. It means, partially, the number of family members significantly affect the amount of rice consumption at 95% level.

d. The regression coefficient of the educational level effect on the amount of rice consumption was -0.516 and had the negative sign, which means that if the educational level increases by 1 level, then the amount of rice consumption will decrease by 0.516 kg/month assuming other variables are considered fixed. Based on t-test, t values of the educational level obtained was 0.675 < t-table = 1.671 with significance value obtained was 0.501 > 0.05, which means that H0 was accepted. It means, partially, the educational level does not significantly affect the amount of rice consumption at 95% level.

e. The regression coefficient of the health condition effect on the amount of rice consumption was 1.724 and had the positive sign, which means that the amount of rice consumed by consumers who have cholesterol, other diseases, or in healthy condition is higher by 1.724 kg/month than the amount of rice consumed by consumers who have diabetes. Based on t-test, t values of the health condition obtained was 0.972 < t-table = 1.671 with significance value obtained was 0.334 > 0.05, which means that H0 was accepted. It means, partially, the health condition does not significantly affect the amount of rice consumption at 95% level.

4. Conclusion

Simultaneously, characteristics of rice consumers have the significant effect on the amount of rice consumed. Partially, age and the number of family members have the positive and the most significant effect on the amount of rice consumed, income and educational level have the negative effect on the amount of rice consumed, and diabetes lowers rice consumption. The implications of this research are, need different policies toward consumers of rice based on their income strata. Rice policies cannot be generalized.

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