A Hedonic Pricing Model of Rice in Traditional Markets

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Abstract. Every consumer would expect rice at an affordable price with a very good quality. This study aims to determine the quality of rice and estimate the hedonic price model of rice in the traditional market of Tarakan City. This research was conducted at the traditional market in Tarakan City, North Kalimantan. Analysis of the data was descriptive analysis and multiple linear regression analysis. The results showed that the quality of rice found in the traditional market in Tarakan City was medium grain. The characteristics of rice that affected rice prices were chalk grains, head grains and yellow grains. While foreign objects, small grains, red grains and broken grains had no effect on the price of rice.

Keywords: hedonic prices, traditional markets, rice

1. Introduction

Rice has a long history in the life of the Indonesian people. Most of the rice is consumed after being cooked properly. Eating rice is closely related to the culture of eating and the image of social status in the community. Consuming rice is considered to increase prestige compared to other carbohydrate sources. The wider community believes that staple foods other than rice such as corn, tubers, and sago are considered food for the poor [1]. So that rice has become an absolute food that must be fulfilled every day, even in Indonesia has developed a culture of “You have not eaten if you did not eat rice”.

The taste, preference, security and consumer acceptance of food commodities have changed greatly since the globalization of the food market [2]. Likewise demographic changes such as the level of education, the level of urbanization, and the level of participation of the female workforce along with current transportation and communication advancements, affect consumer preferences that place more emphasis on nutrition, aesthetics and quality [3]. Basically, Product quality is fundamentally expressed as the improved properties compared with normal or standard products. There is general agreement that the quality has objective and subjective dimension. Objective quality refers to the physical characteristics of the product and in particular the approval of experts, while the subjective quality is a perceived quality by consumers [4,5].

The quality of rice is largely determined by its characteristics, especially physical characteristics because physical characteristics are the most easily seen and most often noticed by consumers when buying rice [5,6]. General characteristics that mostly affect rice on the market include cleanliness, broken, color and head grain [7,8,9]. The difference in quality and quality of rice has an impact on the price difference of each variety of rice, rice with premium quality is usually sold more expensive in the market because it is considered to have better quality [3]. The price has a function as a hint of
quality and monetary sacrifice [10]. Price is seen as a consequence of the quality, because of the high quality products generally have higher production costs and a tight competition will designate the high prices products but have a low quality. Higher quality goods will reduce usability risks that increase the value that consumer perceived, which in turn increases the amount of consumption [11].

The large selection of rice products in the form of rice types, packaging, prices, tastes, and other things as well as the differences and influence of the cultural environment, social class, purchasing power, motivation, and lifestyle shape different consumer behavior. This makes producers increasingly pressured to provide rice products that are in accordance with the wishes of consumers, especially the target market segments.

In line with the development of consumer attitudes that want to improve the quality of rice, producers need to first know the things that affect consumer attitudes and which quality attributes influence the purchase of labeled rice. For this reason, it is necessary to carry out a consumer survey regarding the quality attributes of rice that most influences the attitudes of consumers in purchasing rice. The hedonic pricing method is a useful approach to assess the relationship of price and quality of a product [12, 13]. This method is important to analyze the relationship between the prices and the product characteristics. From this analysis it can be seen the implicit price of a characteristic by reduce the regression function of the attributes of a product. In general, the price of an item depends on the inherent characteristics of the goods [14, 15]. In addition, the price of rice is not only a linear sum of the implicit values of its attributes but also a combination of effects from various consumer tastes [16, 17].

This study aims to determine the quality of rice offered and to estimate the hedonic rice price model in the traditional market of Tarakan City, North Kalimantan Province, Indonesia.

2. Method

2.1. Respondents

The sample size was a number of 80 rice consumers. In multivariate studies (including multiple linear analysis), the sample size should be 10 times greater than the number of variables in the study [18]. Sample of consumers are taken by convenience method [19], i.e. customers of rice retail outlet. In this study, respondents were taken from rice buyers of retail outlet that were willing to be the respondent. Survey of consumers conducted by distributing questionnaires to be filled out by the respondents at the point of purchase after shopping.

2.2. Empirical estimation of the hedonic price model

In this research, consumer choice on the characteristics of rice based on the model Rosen [14]. It was assumed that there was a functional relationship between price and vector x’s characteristics in the form of an equation

\[ P_r = f(x_{ir}) \] (1)

The decline in the shape of the hedonic price function for empirical estimation is as follows:

\[ P_r = \sum_{i=1}^{7} \beta_{ir} x_{ir} + \varepsilon \] (2)

This equation can be rewritten as follows:

\[ P_r = \alpha + \beta_1 x_{1r} + \beta_2 x_{2r} + \ldots + \beta_7 x_{7r} + \varepsilon \] (3)

Where \( P_r \) is the observed selling price of rice, \( \varepsilon \) is stochastic error, \( x_{ir} \) is the independent variable that explains the variation of rice characteristics and \( \beta_{ir} \) is the implicit value of rice characteristics.

As a consideration in determining rice quality and expectations the relationship between price and characteristics of rice is listed in table 1 [20].
Table 1. Quality, Expectations of the Relationship between Price and Rice Characteristics

| Rice Characteristics | Unit | Quality class | Relationship |
|----------------------|------|---------------|--------------|
|                      |      | Premium | Medium | 1 | 2 | 3 |              |
| 1. Foreign object    | (%)  | 0 | 0.02 | 0.05 | 0.2 | Negative |
| 2. Chalk grain       | (%)  | 0 | 2 | 3 | 5 | Negative |
| 3. Head grain        | (%)  | 95 | 78 | 73 | 60 | Positive |
| 4. Small grain       | (%)  | 0 | 2 | 2 | 5 | Negative |
| 5. Red grain         | (%)  | 0 | 2 | 3 | 3 | Negative |
| 6. Broken grain      | (%)  | 5 | 20 | 25 | 35 | Negative |
| 7. Yellow grain      | (%)  | 0 | 2 | 3 | 5 | Negative |

2.3 Rice samples

Rice samples were taken from respondents who bought rice at the store. Tests on samples carried out on each 100gr rice with a record price of each - each sample, weighing and length of each rice samples, and observed the factors that became characteristic of rice. How to test each of the quality components above refers to the procedures listed in SNI 6128:2015 [20]. Measurements and observations were made on each grain of rice included in the study sample. Each grain of rice is measured in length and width and is observed. Length measurements were carried out using a digital caliper, whereas weight measurements to measure each characteristic were carried out using an analytical scale with a sensitivity of 0.0001g.

The testing was done to determine the quality of the rice by manually observing each grain of rice. The determination can be made in the following manner:

1. Determination of chalk grain, yellow grain and red grain.

Observe each grain of rice containing lime, brownish yellow in color, and containing a red color. Make a selection and separate the rice grains containing lime, yellow or broken and containing red with tweezers or hands. Weigh each quality criterion and a percentage of the sample rice.

\[
\text{Percentage of chalk grain} = \frac{\text{weight of chalk grain}}{\text{weight of sample}} \times 100\% \\
\text{Percentage of yellow grain} = \frac{\text{weight of yellow grain}}{\text{weight of sample}} \times 100\% \\
\text{Percentage of red grain} = \frac{\text{weight of red grain}}{\text{weight of sample}} \times 100\%
\]

2. Determination of broken grains, small grain and head grain

The steps were as follows: (a) take one of the rice that was still intact or not broken at all, (b) measure the length of the whole rice, (c) measure the length of the broken item, (d) separate it for broken items, grain groats, and whole grains. Make the whole item as a benchmark. If the rice grains were less than 0.25 of the whole grain, separate them into menir grains. If the length of rice grains is between 0.25-
0.75 of whole rice, then group these grains on broken grains. If the item length is more than 0.75 of the whole item, classify the items on the head item, (e) weigh and percentage each item in the following manner.

\[
\text{Percentage of broken grains} = \frac{\text{weight of broken grain}}{\text{weight of sample}} \times 100\% \tag{7}
\]

\[
\text{Percentage of small grain} = \frac{\text{weight of small grain}}{\text{weight of sample}} \times 100\% \tag{8}
\]

\[
\text{Percentage of head grain} = \frac{\text{weight of head grain}}{\text{weight of sample}} \times 100\% \tag{9}
\]

3. Results and discussion

3.1. General description

The area of Tarakan City is 657.33 km² with land area of 250.80 km² and sea area of 406.53 km². Based on the projected population in 2019 of 270.89 thousand inhabitants. Tarakan city has low rice production. This is because the City of Tarakan according to spatial plan is not intended as an agricultural area, but was developed as an area of economic development. In the regional spatial plan, the agricultural area in Tarakan City will not be found because agricultural land itself is part of a low density residential area. According to data from the Central Statistics Agency (BPS) in 2016 rice production in Tarakan City was 142 tons or around 0.13 % of the total rice production in North Kalimantan Province [22]. On the one hand, the average rice consumption of the population is 114.6 kg / year / capita, so the rice needs for consumption is around 30 million tons. Therefore, to meet the consumption needs of rice society need men to come from various regions in Indonesia. The rice that circulates on average originates from the islands of Sulawesi and Java, which have various types and qualities of physical characteristics.

3.2. Consumer

The role of women in the family is very important, not only as a wife for her husband but also as a policy maker in household activities such as purchasing food and cooking. Likewise in deciding the quality, quantity and place of purchase of rice. Traditional markets were still the most popular choice among housewives for buying groceries including rice; This is because the prices offered are relatively cheaper and more types of goods when compared to supermarket. The results showed that 92.50% of female respondents, 40% had primary school education, 43.75% were aged 25-35 years, and worked as a housewife. In detail can be seen in table 2.

| Table 2. Characteristics of Respondents |
|-----------------|-----------------|-----------------|-----------------|
| Aspects         | Item            | Frequency       | Percent (%)     |
| Gender          | Male            | 6               | 7.5 0           |
|                 | Female          | 74              | 92.5 0          |
| Education background | Elementary school | 32              | 40.00           |
|                 | Junior high school | 18              | 22 .50          |
|                 | Senior high school | 23              | 22 .875         |
|                 | The university  | 7               | 8.75            |
| Age             | <25 years old   | 2               | 2.50            |
|                 | 25-35 years old | 35              | 43.75           |
|                 | 36-45 years old | 26              | 32.50           |
### 3.3. Price and quality of rice

The price and quality of rice was an important component that forms the basis of consumer decisions in purchasing. Generally, consumer wants the product that they buy to be affordable but has very good quality. The average price of rice with medium and premium quality in traditional markets in Tarakan City is Rp. 12,113 and Rp. 13,417 respectively. The quality of rice can be determined by two different methods. The quality of rice can be determined by the number of foreign objects included in the rice and by the quality of the rice grain. 1.22% foreign objects found in the rice which fell into the minimum quality while if the quality were to be measured by using the quality of the grain then the rice in Tarakan fell into medium quality with 5.10% limestone grain, 78.40% head grain, 1.83% mënir grains, 0.22% red grains, 21.51% split grain and 1.15% broken grain.

### 3.4. Estimated hedonic price models

This model assumes a linear relationship between the dependent and independent variables and distributed normally which fulfilled the classical assumptions of test rules. Based on the regression analysis, the hedonic rice price model is:

$$
\hat{y} = 8.494682 - 0.017489x_1 - 0.053077x_2 + 0.273222x_3 - 0.013896x_4 - 0.002881
- 0.041724x_6 - 0.023349x_7 + \epsilon
$$

The Adjusted R-squared value of 0.89, this could be interpreted that the variation in rice prices can be explained by variations in the characteristics of rice by 89%. Meanwhile, the 11% was explained by other variables not included in the model. Simultaneously the rice characteristics variable influences the price of rice. Partially, limestone variable, head grain and damaged grains affect the price of rice, while the variables foreign objects, small grain, red grain and broken grains do not affect the price of rice. This meant that when buying rice, the physical characteristics of the first that consumers consider is whether the rice grains looks white healthy or if it has a yellowish or brownish tint, Also, if the head grain has the length of more than 0.75 of the whole grain and there is no part of rice grains that are white like chalk and not translucent.

A positive relationship occurs between head grains with the price of rice which means that if more and more head grains the price of rice will increase. Whereas the price of rice with foreign objects, limestone grains, red grains, red grains, broken grains and broken grains, a negative relationship occurs, this means that if the variables vary in number, the price of rice will decrease. More clearly can be seen in table 3.

| Table 3. Results of Regression of the Rice Hedonic Model |
|---------------------------------------------------------|
| Variable | Coefficient | t-Statistics | Prob.  |
|----------|-------------|--------------|--------|
| X_1      | -0.017489   | -0.421742    | 0.6745 |
| X_2      | -0.053077   | -2.218669    | 0.0297 |
| X_3      | 0.273222    | 2.507023     | 0.0144 |
| X_4      | -0.013896   | -1.672523    | 0.0988 |
| X_5      | -0.002881   | -0.410838    | 0.6824 |
| X_6      | -0.041724   | -1.281002    | 0.2043 |
| X_7      | -0.023349   | -4.986769    | 0.0000 |
4. Conclusion
The average price of medium and premium rice in 2019 in the city of Tarakan is Rp.12,113 and Rp. 13,417. The quality of rice circulating in the traditional market of Tarakan City is of medium quality. Variables of chalk grains, head grains and yellow grains affect the price of rice, while the variables of foreign objects, small grains, red grains and broken grains do not affect the price of rice. A positive relationship occurs between the price of rice and head grain, while between the price of rice and foreign objects, chalky grains, broken grains, red grains, red grains and broken grains there is a negative relationship.

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