The Role of Rice's Price in the Household Consumption in Indonesia

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SINTA 2

The Role of Rice's Price in the Household Consumption in Indonesia

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ABSTRACT
The purpose of the study was to analyze the role of rice's price in household consumption patterns in Indonesia. The method used was the Quadratic Almost Ideal Demand System (QUAIDS). The data used were obtained from the National Social Economy Survey in 2016. The results show that when the price of rice increases by one percent, the demand for other carbohydrates, eggs-milk-beans, fruits also Cigarette and processed foods will be increase. Meanwhile, in other groups, when the price of rice rises, the demand will go down. Thus, it can be concluded that households still prioritize rice consumption in their daily consumption patterns compared to other commodity groups. Therefore, the government should develop policies that encourage people to consume more diverse food groups.

Keywords: QUAIDS, Rice, Food, Households

INTRODUCTION
Food consumption in Indonesia is still dominated by food with high carbohydrates. As the consumption of the Indonesian population increases, the amount of rice consumption also increases. Before the self-sufficiency program around 1980, Indonesia's rice consumption was 19.10 million tons and then increased to nearly 25 million tons in 1989.This number was continued to increase to reach 33.30 million tons in 2015 (Setiawan, 2016). The challenge faced by Indonesia as a country with a large population is how to meet people's consumption needs. Every year the demand for rice increases with an increasing population (Silalahi *et al*., 2019). Based on the National Social Economy Survey in 2016, approximately 97percent of Indonesian depended their lives on rice as a staple food. In Indonesia, community food consumption reached 53.01 percent and among this, 51.50 percent is used for cereal consumption,whichis rice in this case (Ilham and Saptana, 2019). In addition, rice is used as a parameter for the economic and social stability of the country (Rohman and Maharani, 2018).

Timmer (2014), in his research about the changing role of rice in the Food Security of Asia and the Pacific explained that Rice is a staple food for about a third of the world's population. However as important commodities, rice price are volatile also expensive. Rice can not produce in short times and should produce in a large area meanwhile there is restriction in land avaliability for extensification. All of this are the reason why rice become a vurnelable and hightly commodity. Indonesian households get more than half the energy from food derived from rice and spend 10 percent of their income to buy rice. Meanwhile, the poor allocate 20 to 25 percent of their total expenditure to buy rice. It can be said that household's food consumption for rice is quite large compared to other food sources.

Septiadi *et al*. (2016), state in their research about effect of rice price

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policies to improve poverty, that poverty in Indonesia was influenced with negatif sign by economics growth, government expenditure for insfrastructure and income percapita. Another variable effected by positif sign was fuel price, inflation, count of imported rice, retailed price of rice in Indonesia and lag of poverty. Futhermore the relationship between poverty and retailed price of rice in Indonesia was shown by the value of long run elasticity 0.124. It means if retailed price of rice in Indonesia rises by 10 percent it will increase the number of poor population by one percent.

Rice is one of the contributors to calculating inflation urban and rural community (Malian *et al*. 2016). In their research that studied about affecting factors rice production, consumption and price and food inflation said that the change of rice price constribution to inflation rate was measured by the change of food price index (Δ IBM). In short run calculation of the change of food price index obtained value of R square was 0.62 and DW statistic 2.43. Futhermore said, variable that have impact to the change of food price index (Δ IBM) direct and indirect such as the change of domestic rice price (Δ PBD), excess demand of rice (EDB), real exchange rate (RER), grain base price, and world rice price. The change of domestic rice price (ΔPBD) has big influence to the change of food price index with value of elasticity 1.54.

For the government, rice self-sufficiency is an important policy principle and objective for importing and exporting countries in Asia. Rice is exported after domestic needs are met. As rice is a staple food for nearly all Asian countries, they ensure the stability of domestic rice prices and supply as one of the most important policies so that the country does not depend on aninternational rice market but through increased production and protecting the domestic rice market from fluctuations in the world rice market by carrying out various policy interventions on rice import and export.

Even though rice is a food commodity in most of Asia, it turns out that this commodity is classified in various forms depending on the income and price class in a country. In Malaysia, rice is classified as normal goods so that improvements can be made in terms of good processing and packaging so that the improvement of quality will increase prices (Yeong-sheng *et al*., 2009). In Nigeria, rice was previously classified as a luxury item but now it is considered as a normal item as rice consumption is no longer dominated by the high-income community but has shifted to the middle-income group (Erhabor and Ojogho, 2011). This is in line with Oyinbo's research in the same country (Oyinbo *et al.,* 2013). Most of the people who consume rice in the Philippines are poor people especially in the countryside (Lantican *et al.,* 2013). Meanwhile, in Vietnam, rice is a staple food as it is preferred for consumption compared to other food commodities (Quang, 2008). In Japan, rice is classifiedas a normal good which rejects the previous hypothesis that rice is an inferior item (Taniguchi & Chern, 2000). These studies show that rice is classified in various types, such as inferior goods, normal goods, basic goods, and luxury goods. Different types of rice classification will have different implications for decision making and setting policies.

This study aimed to analyze the role of rice price in household consumption in Indonesia compared to other food commodities.

METHODOLOGY

This study used secondary data that were taken from the 2016 National Socio-Economic Survey (NSES) data. Data analysis was performed using the econometrics approach. The model used was the QUAIDS (Quadratic Almost Ideal Demand System) model.

Almost Ideal Demand System (AIDS) was develop by Deaton and Muellbeuer to solved probleming in demand function (Deaton and Muellbauer 1980). This model have advantage then other model function

because, first this model was first order approximation in every demand system, second this model fit with axioma of consumer preferences in demand theory. Third this model have consisten function that suitable with consumers budgeting data. However this model can not dealing with nonlinear price index, so to make it linier the price index was convert to linier using Stone price index. The linier in price index was a disadvantages in using this model. Quaids was build to solved that problem. This model was improvement from Aids model that develop by Blundeell and Robin (Blundell and Robin, 1997). Quaids function exactly same with Aids function except in Quaids was added with quadratic of expenditure as a parameter that become a prove Engel Curve have nonlinier shape. If the koefisien value from quadratic of expenditure (λ_i) was zero then Quaids model transform to Aids model.

The result from the Quaids function was used to obtain cross elascticity value according to the elasticity equation. the value of cross elasticity will explain the role of rice price in household consumption.

The QUAIDS equation used is formulated as follows.

$$Wi = \alpha_i + \sum_j^n = 1\ Y_{ij}\ lnP_j + \beta_i\ ln\ (x / a(p)) + \lambda_i / b(P)\ (ln[X/a(P)\ +\ \phi LnJ\ ART + \alpha_{il}\ LnUMUTKK + \alpha_{i2} LnLPKRT + imr + u_i$$

Where as **I and j for** 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 food group, $\mathbf{w_i}$ for the share value of the i-food group compared to total food expenditure, **ln Pj** for natural logarithm of j-price, **X** for total food expenditure, **P** for stone price index, **α, β, Y** for regressionparameter, **LnJART** for natural logarithm of the number of family members, **LnLPKRT** for natural logarithm of the head of household's educational background, and **LnUMURKK** for natural logarithm of the head of household's age.

During data collection, many households did not consume the commodity in question. This can occur because the household was not consuming the commodity during the week of data collection but had or would consume it in the future. In this condition, there was a lot of missing value. To fill in the missing values while ensuring whether the missing value was influential in the model or not, the index mills ratio was used.

Missing value treatment are important to do to avoid the bias result that can shown in the model. Bias result can effect to wrong interpretation and for the final it can leading policies maker to make wrong decision.

The formula above was used to determine the price elasticity, cross elasticity, and income elasticity. The QUAIDS equation model was estimated using the SUR technique.

Income elasticity, Self-price elasticity and cross-price elasticity for each food group were estimated by the following equation:

$$\eta_i = (c_{i1} + 2c_{i2}\ \text{h}\ \frac{M}{w_i}) + 1$$

$$\epsilon_i = (b_{ij} / w_i) - (c_{i1} + 2c_{i2}\ \ln(M))\ (w_i / w_t) - \delta_{ij}$$

where δ_{ij} is Kronecker Delta. If a food group was considered as the self-price elasticity, then the value was 1 and if a food group was considered as the cross-price elasticity, then the value was 0. w_i is the share value of the i-food group.

RESULTS AND DISCUSSION

Research in household consumption pattern is depend on household characteristic that become research subject. Base on literature study differences between expenditure will cause differences in households consumption preferences. In other hand number of household member will affect the quantity and quality of commodities that consumpt. There more family member that should eat then the more number quantity of commodity that have to buy. Futhermore related to head of household's educational background, it is assumed that if the head of household well-educated (indicated by the longer education of the school) it will better knowledge about number of calories and the benefits of a commodities compared

to other commodities, so the knowledge will influence preferences in choosing product that will be consumed. Head of household's age also have influence to decition making in order to commodities selection that will consumed in family. Older head of household will consider more carbohydrate-rich commodities and a lot of vegetable and fruit composition. Also limitation because of lifestyle and healty maintenance along with age, will effect in food preferences. while age the head of the family who is relatively young has a wider variety of commodity choices and besides it is more adapted to the current lifestyle which is more eating out and consuming processed food with a food composition that is more animal protein and high in fat. For more details, it can be seen in Table 1.

Table 1, describing about the household's characteristic and the relationship between quantity and expenditure of rice that consumpt by household weekly with household's total income that using total expenditure approach weekly. From the this table it can be said that average of rice consumption perhousehold are 6.80 with the minimum in 0.07 and maximum 89.1 (this number not considering about number of family in household). For that purpose household should spending Rp 61 913.79 money every week to buying rice. Comparing with household income weekly that about Rp 867 374.3 /week , it equal to 7 percent from household's total expenditure (income). This number is lower than Timmer (2014), found that household in Indonesia spending 10 percent of their expenditure to buying rice. However this number should analize using data percapita to avoid miss interpretation and to gain the data evaluation precisely.

Table 1, shows that the average household income was Rp.3,469,492/ month/household. This was greater than the research conducted by Miranti, which earned Rp. 860,258/month (Miranti *et al*., 2016). However, this could have happened considering the smaller research area in Miranti's study, which was only in the West Java region.

As can be seen in Table 1, the lowest value of the average household expenditure was Rp. 140,635 / month while the highest was Rp89,832,560 / month. The average educational background of the household's head was 6 years or they are elementary school graduates. The average number of family members was 3.8 people and the average age of the head of the family at the time of the survey was 48.38 years.

The participation rate is the percentage of households that consume (buy) this type of food from the total number of surveyed households, which was 291,414 households. The participation rate will used to shown the quantitiy of commodity that are important and have to consumpt in household. Also this rate will shown household preference in choosing which group should to consumpt and not to consumpt. However data in household level can not distinguish between household that have large family member and the small

Table 1
Characteristics of Household Members in 2016

Variable	Mean	Minimum	Maximum
Rice consumption perhousehold (kg/household/ week)	6.80	0.07	89.1
Expenditure for rice perhousehold (Rp/household/ week)	61 913.79	1000	810 000
Income (Rp/month)	3 469 497	140 635	89 832 560
Number of household members (person)	3.8	1	27
Head of household's educational background (year)	9.6	6	21
Head of household'sage (year)	48.38	10	97

Source: Data Process, 2016

one. So to make it clear the data will be add with consumption perkapita per week.

Table 2, show about percapita consumtion and participation rates of household consumption by food type in 2016. In this table participation rate in percent give us the picture of Indonesia's household preferences in choosing group of food to consumpt.

More than 90 percent of the population consumes rice, fat, vegetables, other foods, and processed food as they are the main types of food and some are always available at homes such as rice and vegetables. This is consistent with what Siregar explains that rice is a source of carbohydrates that functions to produce energy for the human body (Siregar, 2014).

As the main carbohydrate source, the demand for rice must be met by the government. At certain times where the demand is higher than the supply, the rice is imported (Pontoh *et al.,* 2016). Nur *et al.* (2013), explain that the factors influencing rice consumption include the population, income level, the price of rice, the price of substitute products (flour), and the amount of rice production.

In contrast, the milk and meat (chicken, duck, beef, and buffalo) consumption were only reached 44.20 percent as shown in Table 2. Public consumption of both animal and vegetable protein sources were still low. This is in line with research conducted by Ilham *et al.* (2019), where they found that consumption of protein sources fluctuates based on holidays and other celebrations. In addition, low meat consumption is caused by the unit price of meat that is higher than other commodities (Nugroho & Wardhani, 2016). This lower value is also considered by restriction in production side, so decreasing in meat supply affected decreasing in demand. Also there are preference shifting in demand from animal protein to nabati protein because knowledge and to health maintenance. Also consideration about religion have donate to household's preference consume or not to consume.

Even though the level of household involvement in consuming was high for each type of food, the amount consumed was still low. Per capita consumption of each type of food was different. As can be seen in Table 2, rice consumption was classified as high at 1.74 kg/capita/week while consumption of meat per capita was low at 0.12 kg/ capita/week. Meanwhile, the consumption of fish was 0.42 kg/capita/ week,which needs to be improved as fish is an alternative protein considering that it is an important commodity in Asia (Dey *et al.,* 2008). Similar results were shown Arthatiani & Kusnadi (2018), who state that the percentage of the population who

Table 2
Per Capita Consumption and Participation Rates of Household Consumption by Food Type in 2016

Food type	Participation rate (percent)	Consumption/capita/week
Rice	97.27	1.74
Other carbohydrates	61.80	0.40
Fish	87.92	0.42
Meat	44.20	0.12
Egg, milk, and beans	78.98	2.23
Fat	96.31	0.27
Vegetables	96.17	0.76
Fruits	70.27	0.47
Other foods	99.16	0.64
Cigarettes and processed foods	94.76	25.83

Source: Data Process, 2016

consumed fish was 87.91 percent, where the highest consumption was mostly found in eastern Indonesia

The share of expenditure is the portion of the money allocated to obtain a certain type of food. The share of expenditure was calculated by dividing the expenditure of each type of food by total income. Table 3 presents the share of expenditure for each type of food and the average price of food. It can be seen that the largest share of expenditure was obtained by cigarettes and processed foods that reached 0.33 or 33percent. Meanwhile, the lowest share of expenditure was allocated to other types of carbohydrate foods, which reached 0.0329 or 3.29percent. Rice ranked second with a share of 0.18 or 18 percent. This value is lower than the percentage of public expenditure in Burkina Faso where the percentage of expenditure used to buy staple foods (cereals) is 52.3 percent of their total budget on food (Traore and Deacue, 2017).

The share of food expenditure are describing about position of commodity in household list diet in money value and how much sacrifice was made to get their needs (measured by total expenditure). The value is obtained by percentage of expenditure to buy commodity and total expenditure of household to buy food for the family. Meanwhile average price of the commodity are shown to describe about value that household should have to pay for each item. Table 3 will shown about the average share of food expenditure and the average price of food in 2016 for the detail.

Cigarettes and processed foods are a type of product that had a fairly large share of expenditure, which reached 0.33 or 33 percent of the income. The share of cigarette expenditure ranks third highest in the composition of household consumption.

In other hand the share of the other carbohydrates are the lowest. It is means that if using money as measurement, expenditure that spend to buying other carbohydrates are low, this can because two reason, about price of this commodity are cheap or because the amount of the consumption of this commoditiy are lower.

From the table shows that rice have second position in commodity that have large expenditure in household. this number not reflect that this commodity are less important than Cigarette and processed foods because the share of expenditure was determined not only by the amount consumed but also by the price of food. The more expensive the type of food, the greater the share of food in the household expenditure. The average price of each type of food is shown in Table 3. Meat and fish were foods with a more expensive price compared to the others. The price

Table 3
The Average Share of Food Expenditure and the Average Price of Food in 2016

Type of food	Share of expenditure/household	Average price(Rp/kg):
Rice	0.1807	9277.73
Other carbohydrates	0.0329	10871.04
Fish	0.0904	26674.80
Meat	0.0344	39145.91
Egg	0.0734	20661.1
Fat	0.0908	11944.25
Vegetables	0.0381	12805.07
Fruits	0.0346	9923.95
Spices and other foods	0.0864	1216.19
Cigarette and processed foods	0.3383	1905.57
Total expenditure (Rp)/capita/week	110 874.90	

Source: Data Process, 2016

of meat, fish, rice, and fruit reached Rp. 39,145/kg, Rp26,674/kg, Rp9,227/kg, and 9,923/kg, respectively. Meanwhile, the price of processed food, which had the largest share,was Rp. 2,879 per unit.

The share of expenditure to buy commodities to be consumed will affect the measurement of community food security. Saputriet *et al.* (2016), state that community food security in an area can be measured based on the number of commodities consumed, people's purchasing ability, and the level of community consumption. The results of this study show that the food security of Indonesian people is still relatively low because the share of expenditure was concentrated in certain commodities such as rice while other commodities only had a little share.

The cross-price elasticity in Table 4 shows the percentage change in the number of goods consumed due to changes in prices of other related commodities while the other variables were fixed (ceteris paribus). The cross-price elasticity also showshow rice played a role in other commodities and vice versa so that it can be seen whether the other commodity was a substitute or complementary to rice. The value of cross-price elasticity is also important because consumers will adjust the composition of the goods purchased whether there is a change in prices of the commodity-related goods. The value of cross-price elasticity can be read as the following.If the value is more than zero (positive), then the relationship between the two commodities is mutually substituted. If the value is zero, then the relationship between the two commodities is unrelated. Meanwhile, if the value is negative then the relationship is complementary.

As can be seen in Table 4, the left colums shows that the change in demand for other commodities was due to a one percent change in the price of rice, while the right illustrates the change in demand for rice due to a change in the price of other commodities by one percent. When the price of rice rose by one percent, the demand for other carbohydrate commodities increased by two percent as they were considered as a substitution. This is in line with Wijayati *et al.* (2019) and Yuliana (2018), where they found that rice and other carbohydrates have a substitute relationship. When the price of other carbohydrates rises by one percent, the demand for rice goes up by 0.3 percent.

Another commodities that have substitute with rice are eggs-milk-beans, fruits also Cigarette and processed foods dimana when the price of rice rose by one percent the demand for eggs, milk and beans, fruit also Cigarette and processed foods increased 0.032 percent, 0,079 percent and 0.022 percent for each commodities.

Tabel 4
Cross-price Elasticity of Ten Commodities in 2016

	Cross-price Elasticity another groups compare to rice	Cross-price Elasticity rice compare to another groups
Rice	-0.534	-0.534
Other carbs	0.200	0.318
Fish	-0.090	0.376
Meat	-0.094	0.208
Egg, milk, and beans	0.032	-0.064
Veg	-0.080	-0.164
Fruit	0.079	0.104
fat	-0.018	-0.137
Spices and other foods	-0.026	-0.050
Cigarette and processed foods	0.022	-0.441

Source: Data Process, 2016

Table 5
The Value of Food Income Elasticity in 2016

Commodity	Income elasticity
Rice	0.532
Other carbohydrates	0.630
Fish	0.524
Meat	0.605
Egg, milk, and beans	0.648
Vegetables	0.643
Fruits	0.448
Cooking oil	0.706
Spices and other foods	0.776
Cigarettes and processed foods	1.341

Source: Data Process, 2016

Meanwhile, the relationship between rice and fish, meat, vegetables, fat, spices and other foods, had negative values. This can be interpreted as when the price of rice rose by one percent then the demand for fish, eggs-milk-beans, vegetables, cooking oil, spices and other foods, foods decreased by 0.09 percent, 0.094 percent, 0.08percent, 0.18 percent, 0.026 percent, respectively. The results show that changes in prices of other commodities were more influential to the demand for rice compared to the contrary.

Table 5, presents the value of the total income elasticity of food commodities. The values obtained were all positive. The values were all in the range of zero to one which means that they could be classified as normal goods. The biggest income elasticity was for cigarettes and processed foods while rice had an elasticity of 1.34, which means that when income rose, the demand for rice increased by 1.34 percent.

CONCLUSION

The results show that households still prioritize rice consumption as their staple food compared to other commodity groups. In other carbohydrate, egg-milk-beans, fruit and Cigarettes and processed foods groups, an increase in the price of rice by one percent will increase the demand, but the increase in the price of rice will affected to fish, meat, milk-eggs-and-beans, vegetables, cooking oil, spices and other foods, because it will make the demand reduce. The high value of income elasticity of rice indicates that Indonesian people still prioritize rice in their consumption. The government should develop policies that encourage people to consume more diverse food groups so they can save their bundle of food and improve household nutritions.

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