Estimation of Demand Elasticity for Food Commodities in Java Island

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Abstract

Food availability is a development priority. Along with the increasing population growth, safe and nutritious food is rising. Analysis of food consumption patterns is needed to estimate the demand for agricultural products. This study attempts to analyze consumption patterns and food demand for several commodities in Java by using the 2010-2017 National Socio-Economic Survey data collected by Statistics Indonesia. Results of this study are: 1) the demand for quantity of rice is not elastic to income; (2) the demand for quantity of fresh fish, shrimp, beef and chicken meat is elastic to income; (3) the budget elasticity of fresh fish, shrimp, beef and chicken meat is also large, which means that households will increase the quantity and budget for these three commodities; (4) quantity and budget elasticity in rural are generally greater than urban; (5) in urban areas, budget elasticity is greater than quantity elasticity for all commodities, while in rural, budget elasticity is smaller than quantity elasticity, except for sugar, fresh fish and shrimp; (6) there has been a shift in the proportion of food expenditure on Java, e.g. the proportion of expenditures for grains decreases and the proportion of expenditures for prepared food and beverages increases.

Key words : Food Consumption, Elasticity, Income, Price, Budget.

How to Cite: Devi, L., & Purnomosidi, R. (2019). Estimation of Demand Elasticity for Food Commodities in Java Island. *JEJAK: Jurnal Ekonomi dan Kebijakan*, 12(1), 54-67. doi:https://doi.org/10.15294/jejak.v12i1.18824

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INTRODUCTION

Analysis of food consumption patterns and their response to changes in income and prices is needed to estimate the demand for agricultural products in the future, so that a country's food security could be achieved. Food consumption is determined by several factors, i.e. nutrient requirement, the amount of money for food, individual specific needs and cultural pattern. Thus, food consumption analysis is on the periphery of several disciplines (Bhargava, 1991). Food demand analysis remains as an important issue for economists because healthy and well-nourished society will result in good productivity capacity in terms of work, which in turn affects GDP at the aggregate level (Hayat, Hussain and Yousaf, 2016).

Food consumption provides information about the type and amount of food consumed by a person or group of people (family or household) at a certain time (Kementerian Perdagangan, 2014). In general, consumption can be classified into two broad categories, namely food consumption and non-food consumption. At a certain level of income, households will allocate their income to meet these two needs. Naturally the quantity of food needed by a person will reach its maximum point while non-food needs will not have a limit.

Thus, the amount of income spent on food from a household can be used as a guide of its welfare level. In other words, household with higher expenditure on food has less welfare. Conversely, the smaller the share of food expenditure, the more prosperous the household (Mulyanto, 2005). In the condition of limited income, food became priority, so that in low income groups, a large portion of their income is used to buy food.

Along with the increase in income, there will gradually be a shift in spending patterns, namely a decrease in the portion of income spent on food and an increase in the portion of income spent on non-food (BKP, 2010). At the level of very low income spent or disposable income, the household expenditure is greater than its income. This means that consumption expenditure is not only financed by its income but also from other sources such as savings made in the past, assets selling, or from borrowing. The higher the disposable income received by households, the greater the food consumption. However, the increase in food consumption that will occur is lower than the prevailing income (Rachman and Erwidodo, 1994).

Elasticity is used to measure the magnitude of the response or sensitivity of the dependent variable if there is a change in certain independent variables. The size of the sensitivity can be seen from the magnitude of the elasticity coefficient or elasticity index. The demand price elasticity is used to determine the amount of change in the quantity of goods demanded due to changes in the price of the goods themselves. Income elasticity is used to measure changes in the number of goods demanded as a result of changes in income (Mankiw, 2014).

Income elasticity is stated to be inelastic if the elasticity coefficient is less than one, that is, if the change in income causes only a small change in the amount requested. Income elasticity is called elastic when changes in income increase demand that is greater than changes in income. Various types of food and agricultural products have less elastic income elasticities, e.g. changes in demand is less than changes in income. Durable and luxury goods

are more elastic when compared with agricultural goods (Sukirno, 2009). Food demand analysis based on elasticity estimation serves as one of the basis of food security policy formulation. Cornelsen et al (2016) pointed out that price elasticity of demand is a common used to measure the rela- tionship between food prices and food consumption. Ulubasoglu et al (2016) underlined the importance of elasticity to formulate food policy. They stated that knowing the values of the relevant elasticities can help economists to draw right food security policies.

The formulation of food security policy should provide output that can lead to a stabilization of food availability based on independence, increased ease and ability to access food. Food security policy must be able to increase the quantity and quality of food consumption as well as to increase balanced nutrition based on local food, to improve the nutritional status of the community and to improve food quality and security. One example of food security policies is fiscal-food policy such as taxes to alter relative food prices so as to change diets ((Colchero *et al.*, 2015; Gibson and Romeo, 2017) or cash transfers to increase nutrient availability among poor households (Skoufias, Tiwari and Zaman, 2012).

There has been several studies with the topic of food consumption in Indonesia, i.e. studies by Rachman and Erwidodo (1994); Jensen and Manrique (1998); Saliem (2002); Pangaribowo and Tsegai (2011); Nur *et al.* (2012); Skoufias, Tiwari and Zaman (2012) Faharuddin *et al.* (2015); Kuntjoro (2016). Rachman and Erwidodo (1994) conducted a study of food demand systems in Indonesia

using the AIDS model. The data used were SUSENAS data in 1990. Their results showed that, in the period 1987 - 1990, the share of food expenditure generally declined when compared to non-food expenditure. This meant that there had been an increase in people's welfare. Jensen and Manrique (1998) stated the importance of classifying income groups in analyzing food demand. They classified households in Indonesia into four income groups, namely: lower income groups, lower middle income, upper middle income, and upper income. The analytical method used was the Linear Approximation from Almost Ideal Demand System (LA/AIDS). The results showed that the demand for food in the upper middle income and income groups was responsive to changes in prices, income, and demographic variables. Demand for food in the lower income group was responsive to changes in prices and income. Demand for food in the lower middle-income group was responsive to changes in income and changes in commodity prices for rice and fish.

Study by Saliem (2002) aimed to analyze the patterns of consumption and demand for food in the Eastern Indonesia Region (*Kawasan Timur Indonesia*/KTI) by using SUSENAS data in 1996. The method used was descriptive method to study consumption patterns and the LA/AIDS model to analyze food demand. The results showed that: (1) rice was dominant in the budget structure, contribution of energy and household protein in KTI; (2) in various provinces in the KTI between 1979-1996 there had been a shift from the pattern of non-rice staple food to the rice staple food pattern; (3) consumption of carbohydrate-based food in rural areas of KTI was higher than in urban areas, but it was the opposite for protein-source foods; (4) the higher the level of income the higher the level of food

consumption; (5) food demand for rural . Household in KTI was more responsive to changes prices and income than households in the urban areas, and the higher the level of income, the less responsive to changes in prices and income, (6) the variable number of household members and education of the head of household had a significant effect on household food demand in KTI.

Pangaribowo and Tsegai (2011) applied the QUAIDS model to analyze food demand in Indonesia. The purpose of their study was to analyze the response of Indonesian household demand to food prices, changes in income, and other socioeconomic factors. The results of the analysis showed that there was a significant difference of food demand pattern between rural and urban households and between income groups. Price elasticity increased in the period 1997 - 2007, indicating that the public was increasingly responsive to price changes.

Study by Nur *et al.* (2012) aimed to: 1) identify the factors that influence the level of consumption of rice, soybeans and beef nationally; 2) estimate the elasticity of demand and supply of rice, soybeans, and beef; 3) estimate the consumption of rice, soybeans and beef for the period 2011 - 2013; and 4) recommend policies related to the production and consumption of rice, soybeans and beef. Two methods were used in this study, namely the OLS method to estimate the elasticity of supply and demand as well as the Linear Approximation from Almost Ideal Demand System (LA/AIDS) model to estimate the consumption of those commodities. Results of the analysis showed that the consumption of rice and soybeans

was inelastic to prices, while the consumption of beef was elastic to the price of beef itself.

Skoufias, Tiwari and Zaman (2012) attempted to determine whether cash transfers and nutrition supplement programs in Indonesia were the best policy to increase nutrient availability among poor households during the 2008 global food price crisis. Results of the study were that income elasticities of some key micronutrients, such as iron, calcium, and vitamin Bl, were significantly higher in a crisis year than in a normal year, yet the income elasticities of others, such as vitamin C, remain close to zero. These results suggested that cash transfer programs might be even more effective during crises to ensure the consumption of essential micronutrients, but nutrition supplement programs were also likely required.

Faharuddin *et al.* (2015) applied the development of a basic AIDS model namely QUAIDS to analyze food consumption patterns in South Sumatra using data from the 2013 SUSENAS household survey. The results of the study were that all food groups had positive income elasticity and negative price elasticity, consistent with demand theory, but expenditure elasticity was higher than price elasticity. Recommendation based on the results of the study was that, in relation to people's consumption patterns, the policy of increasing household income was more important than the policy of maintaining price stability.

Kuntjoro (2016) calculated the value of income elasticity from the demand for rice in Indonesia as a basis to draw a policy of providing rice for the population. The data used was the 1978 Susenas data. Kuntjoro divided Indonesian population into three groups based on calorie consumption and 15 regions, seven rural areas

and eight urban areas. The model used was the quadratic logarithm. The results showed that: 1) the demand for rice was less elastic to income changes; 2) the income elasticity of demand for rice in rural areas were higher than that of urban areas and 3) the budget elasticity for rice was higher than its price elasticity.

Food security is one of the development priorities in Indonesian Government Work Plan (Rencana Kerja Pemerintah/RKP). Based on the 2017 Global Food Security Index (GFSI) which was compiled by The Economist Intelligence Unit, compared to Southeast Asian countries, Indonesia's food security position was still below Singapore, Malaysia, Thailand and Vietnam. Indonesia's food security in 2017 was in the 69th position, while the positions of Singapore, Malaysia, Thailand and Vietnam were 4, 41, 55 and 64 respectively. However, Indonesia's position had increased compared to its position in 2016, that was at number 71 (The Economist Intelligence Unit, 2017).

Food production in Indonesia was still dominated by Java, which was more than 50 percent (Idris, 2017). On the other hand, Java Island was also the region with the largest population in Indonesia. In Java, DKI Jakarta Province had a share of food expenditure of 39.94 percent, which meant it was the province with the lowest share of food expenditure while the highest was West Java Province which was 51.01 percent. This means that, in Java, the differences in food consumption patterns were still quite large. In other words, there were still big differences in the level of food security between provinces in Java (BPS, 2017). The average percentage of per month per capita expenditure for food in

2017 was 50.94 percent and non-food was 49.06 percent. This number means that food expenditure for the Indonesian population was still slightly larger than for non-food. Rural areas had a share of food expenditure of 58.66 percent, therefore food security in rural areas was lower than urban areas which had a share of food expenditure of 46.70 percent (BPS, 2017).

This study attemps to analyze changes in food demand as a result of changes in income for households in rural and urban areas of Java. Java Island is used as a case study in this study because, according to the results of SUSENAS in March 2017, there are still high inequalities in the level of food security between provinces in Java. The hypotheses of this study, which are based on theory and previous studies, are as follows: Grains and tubers food group have the lowest income elasticity, while meat, egg and milk food group have the highest income elasticity; Quantity elasticity and budget elasticity in rural areas are generally greater than in urban areas

A deeper understanding of food demand elasticity will help to predict future demand for food products with various levels of prices and income. Therefore, it can help the government to formulate food security policies in Indonesia..

RESEARCH METHOD

According to Mudassar, Aziz and Anwar (2012), consumption adjustment of households in response to changes in income and price is crucial determinant of the effects of various shocks to market prices and commodity supplies. Consumption data contains information about quantity and budget for the items consumed (Kuntjoro, 2016). Food purchasing power of a household can be seen from the data of food expenditure. To calculate quantity and budget elasiticity of certain food

commodity, data of the commodity price and quantity consumed are needed. Figure 1 explains the analytical framework used in this study.
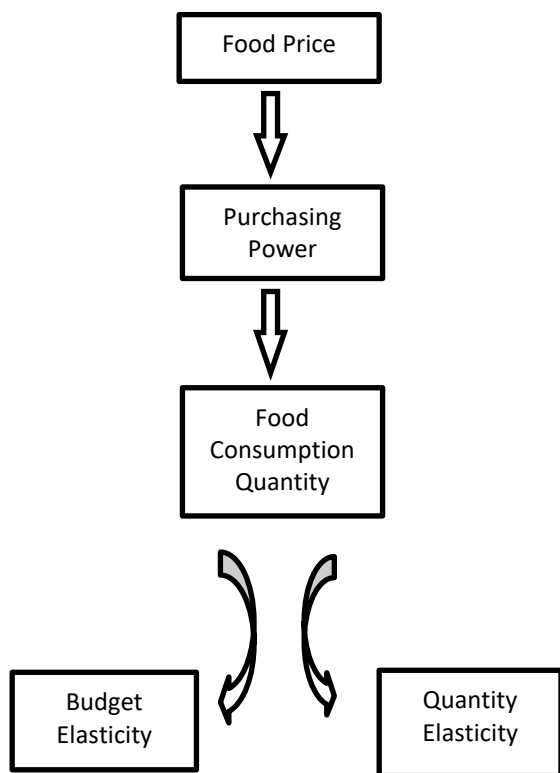

Figure 1. Analytical Framework

Data used in this analysis are 2010-2017 National Socio-Economic Survey data from Statistics Indonesia in the form of: 1) data on expenditure for food in rural and urban areas, 2) consumption quantity for each group of food commodities in rural and urban areas and 3) the value of commodities consumed for each group of food and beverage commodities in rural and urban areas. The data analyzed are data from 6 provinces in Java.

Kuntjoro (2016) explains that the measurement of income elasticity of demand can be divided into quantity elasticity and budget elasticity. Quantity elasticity indicates changes in the quantity of goods demanded

when there is a change in income, while the budget elasticity is a change in the expenditure of goods if there is an increase in total expenditure as a result of changes in income. If the function of the demand for a goods is known as $q = f(y)$, the income elasticity can be calculated as follows:

$$n_i = \frac{\partial q_i / q_i}{\partial y / y}$$

Where:
n_i : quantity elasticity of goods i to income
q_i : consumption quantity of goods i as a measure of demand of commodity i
∂q_i : changes in consumption quantity of goods
y : income
∂y : changes in income

If it is known that the function of a goods' budget was $E_{xi} = f(E_x)$, the expenditure elasticity can be calculated as follows:

$$E_i = \frac{\partial E_{xi} / E_{xi}}{\partial E_x / E_x}$$

Where:
E_i : budget elasticity of goods i to total budget
E_{xi} : budget of goods i
E_x : total budget
∂E_x : changes in total budget

The budget elasticity can be changed to quantity elasticity using the following formula:

$$E_i . E_y - E_{iy} = n_i$$

Where:
E_i : budget elasticity of goods i to total expenditure
E_y : budget elasticity of income that shows changes on total budget as a result of changes in income
E_{iy} : price elasticity of income that is used as a measurement of changes in consumption

quantity of goods i, as a result of changes in income

n_i : quantity elasticity of goods i to income

The estimator model of income elasticity, namely the effect of changes in income to expenditure is adopted from the model used by Kuntjoro (2016) to calculate the income elasticity of rice. The models used are as follows:

$\log q_i = a + b_1 \log y + b_2 (\log y)^2$ ...... (1)

$\log E_x = c + g_1 \log y + g_2 (\log y)^2$ ...... (2)

Where:

q_i : consumption quantity of i

E_x : consumption value of i per month or budget for i per month

a, c : constant

y : per capita total expenditure in one month which was the proximity value of income

b_1 and g_1 was the expected value of coefficient $\log y$

b_2 and g_2 was the expected value of coefficient $(\log y)^2$

In this study, the proxy to q_i is the data of the quantity of food consumed each month. Variable E_x is proxied with the value of the type of food consumed each month. Income (y) is proxied by using household expenditure

data for food commodities. The coefficients obtained from regression estimation are then used in the calculation of the estimated income elasticity as follows:

$\eta = b_1 + 2b_2 (average \ of \log y)$ .... (3)

$\varepsilon = g_1 + 2g_2 (average \ of \log y)$ .... (4)

With η is the quantity elasticity of income and ε is the budget elasticity of income.

RESULTS AND DISCUSSION

Engel's law states that when household income increases, the percentage of income spent on food decreases while the proportion spent on other goods increases (Clements and Si, 2018). Faharuddin *et al.* (2015) points out that developing countries has a relatively large proportion of food consumption expenditure, which is close to 50% of total per capita expenditure.

Hayat, Hussain and Yousaf (2016) add that there is a direct relation between an increase in percentage spending on food, market prices and income level. The increase in food spending shows an increase in poverty and consequently high vulnerability to food insecurity. The description of food expenditure in urban and rural provinces of Java in 2011 - 2017 is summarized in Table 1 and Table 2.

Table 1. Average Percentage of Monthly Per Capita Expenditures in Urban Areas of Java Island, 2007-2017 (%)

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
DKI Jakarta	35.28	36.34	38.14	38.94	33.76	36.99	39.47	36.48	34.71	36.89	39.94
West Java	44.91	46.64	45.29	48.65	45.53	49.64	48.02	44.59	44.21	46.20	48.68
Central Java	46.06	48.09	48.74	48.64	45.58	49.79	45.97	46.86	42.81	45.84	47.34
DI Yogyakarta	39.27	40.40	42.53	41.28	43.11	45.07	42.98	38.04	35.57	37.88	40.25
East Java	44.78	45.99	48.43	49.41	46.59	46.37	45.58	47.15	41.39	45.33	46.45
Banten	40.86	41.99	43.46	41.80	43.98	48.93	50.01	47.67	43.76	43.87	47.00
Java Island	41.86	43.24	44.43	44.79	43.09	46.13	45.34	43.47	40.41	42.67	44.94

Source: BPS, 2018

Table 1 shows that the proportion of food expenditure in urban Java is close to 50%. The average proportion of food expenditure in the 2007 - 2017 period is 43.67%. This figure is smaller than the national proportion of 45.13%.

In 2017, the proportion of the smallest food expenditure is owned by DKI Jakarta Province by 37% and the largest number is owned by Central Java at 46.88%.

Table 2. Average Percentage of Monthly Per Capita Expenditures in Rural Areas of Java Island, 2007-2017 (%)

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
DKI Jakarta	-	-	-	-	-	-	-	-	-	-	-
West Java	59.61	58.97	59.34	60.50	59.72	61.51	62.20	58.53	57.95	57.02	60.02
Central Java	55.56	56.49	55.98	56.00	54.15	55.54	55.90	55.91	53.06	53.17	55.53
DI Yogyakarta	49.77	50.67	50.45	52.88	47.43	51.91	53.75	59.00	52.22	50.08	54.19
East Java	54.61	55.33	55.32	56.52	56.50	58.46	56.93	57.27	52.51	54.82	57.94
Banten	61.66	61.12	57.66	59.38	60.07	60.23	61.85	61.42	59.03	59.05	61.54
Java Island	56.24	56.52	55.75	57.06	55.57	57.53	58.13	58.43	54.95	54.83	57.85

Source: BPS, 2018

In general, the proportion of food expenditure will be greater in rural areas compared to urban areas. This also happens in Java. The average proportion of food expenditure in rural Java in the period 2007 - 2017 is 56.62% (Table 2). This figure is smaller than the national average of 58.17%, but greater than non-food expenditure. DI Yogyakarta Province is the province with the lowest food expenditure in rural areas among other provinces in Java, while the province with the highest food expenditure is Banten Province.

Figure 2 shows the development of the percentage of rural and urban per capita food expenditure in Java. The proportion of food expenditure on Java, both in rural and urban areas, tends to be in the range of 50% for rural areas and 40% for urban areas. Thus, in accordance with Engel's Law, it can be concluded that the urban population has a higher level of welfare compared to the rural population, indicated by the proportion of food expenditure in rural areas that exceeds 50%.
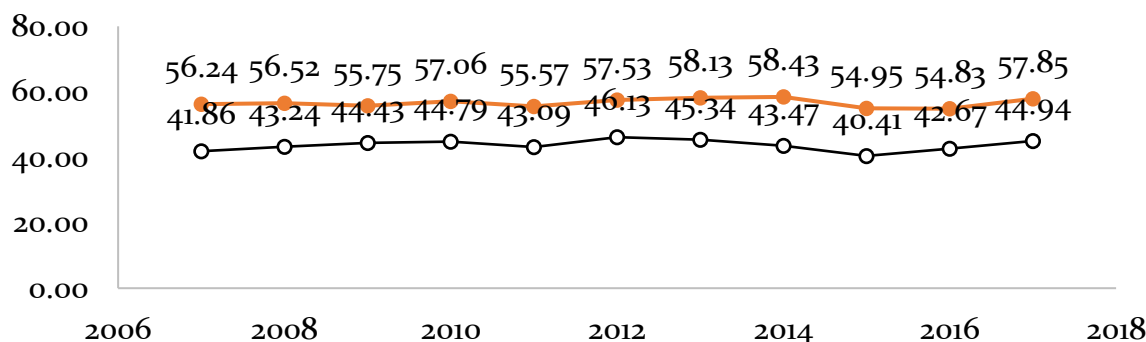

Figure 2. Percentage of Food Expenditure Per Capita Rural and Urban Java Island, 2007-2017 (%)
Source: BPS, 2018

BPS SUSENAS data divides food groups into 14 food subgroups. Each of these subgroups and their types of commodities is summarized in Table 3.

Table 3. Food Subgroup

No	Subgroup	Food Commodities
1.	Grains	Rice/sticky rice, fresh corn with husk, dry shelled corn, rice flour/corn flour/flour and others
2.	Tubers	Cassava, sweet potatoes, sago, taro, dried cassava/cassava flour, others
3.	Fish	Fish, shrimp, squid, clam (fresh or preserved)
4.	Meat	Meat (beef, buffalo, goat, pork, broiler chicken, free-range chicken, other poultry, other meat), shredded beef, beef jerky, canned meat, liver, innards, bones with a bit of adhering meat, bones
5.	Eggs and milk	Chicken eggs, duck eggs, quail eggs, other eggs, salted eggs, pure milk, factory liquid milk, sweetened condensed milk, milk powder, baby milk powder, cheese and other dairy products
6.	Vegetables	All types of vegetables including chillies
7.	Legumes	Peanuts, soybeans, mung beans, other beans, tofu, tempeh, fermented soybeans, *oncom* (fermented sediment from production of tempeh)
8.	Fruits	All kinds of fruits including canned fruit
9.	Oil and fat	Cooking oil, coconut oil, corn oil, coconut, margarine and others
10.	Beverages stuff	Sugar, tea, coffee, chocolate (instant/powder)
11.	Spices	Salt, candlenut, pepper, coriander, tamarind, nutmeg, cloves, shrimp paste, soy sauce, flavoring, chili sauce, prepared cooking spices
12.	Miscellaneous food items	Instant noodles, wet noodles, dried egg noodles, rice noodles
13.	Prepared food and beverages	Bread, *gado-gado*, biscuit, mung bean porridge, meatball noodles, children's snacks, chicken noodles
14.	Tobaccos and betel nut	White cigarettes, clove cigarettes, filtered clove cigarettes, shag tobacco, betel nut, *pinang*, *gambir*

Source: BPS (2018) and Faharuddin *et al.* (2015)

Figure 3 illustrates the proportion of food subgroup consumption in term of monthly average expenditure per capita in urban areas of Java Island in 2010 and 2017. In 2010, the biggest proportion is for prepared food and beverages, while the lowest is for tubers. In 2017, the proportion is still the same. People prefer to buy prepared food and beverages, which are indicated by a percentage value of 40.6%. Grains and betel nut and tobacco are the second and third proportion for the food subgroups.

The figure also shows that fish, vegetables, eggs and milk are preferable than

meat in 2010. However, in 2017, expenditure proportion for meat increases, indicating that
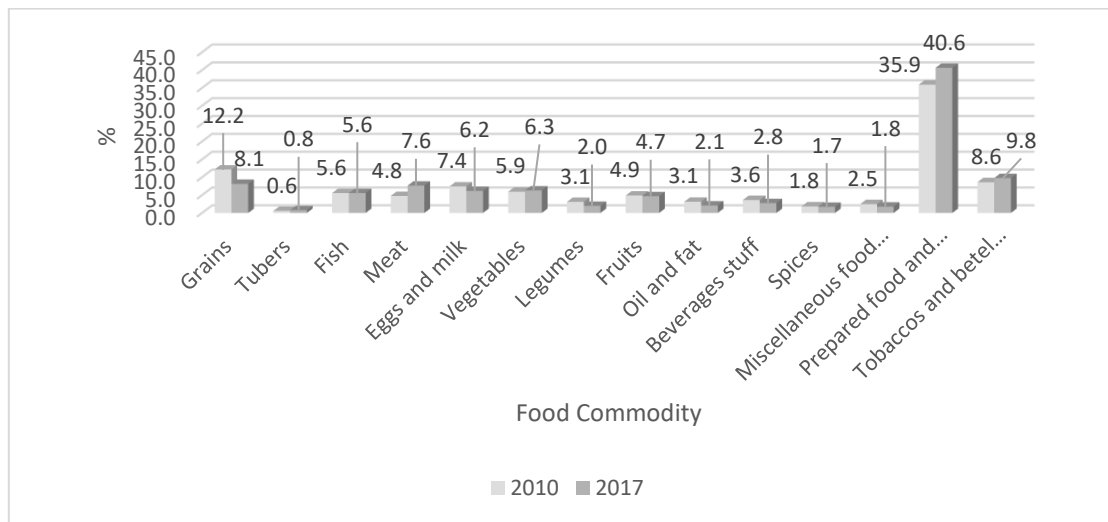
there might be an increase in income per capita.

Figure 3. Expenditure Proportion of Food Subgroups in Urban Areas of Java, 2010 and 2017
Source: BPS, 2018

In contrast to urban areas, in 2010, the consumption of prepared food and beverage subgroup in rural areas is not much different from the consumption of grains (Figure 4). However, in 2017, there is a shift in the consumption pattern. Consumption of prepared food and beverages increases from 24% to 31% and consumption of grains

decreases from 21% to 13%. Furthermore, similar to urban areas, the consumption of tobacco and betel nut in the rural areas is also in the top three of main food consumption. Consumption of vegetables is higher in rural areas compared to urban areas. Vegetable consumption in rural areas also exceeds fish, meat and eggs and milk consumption.
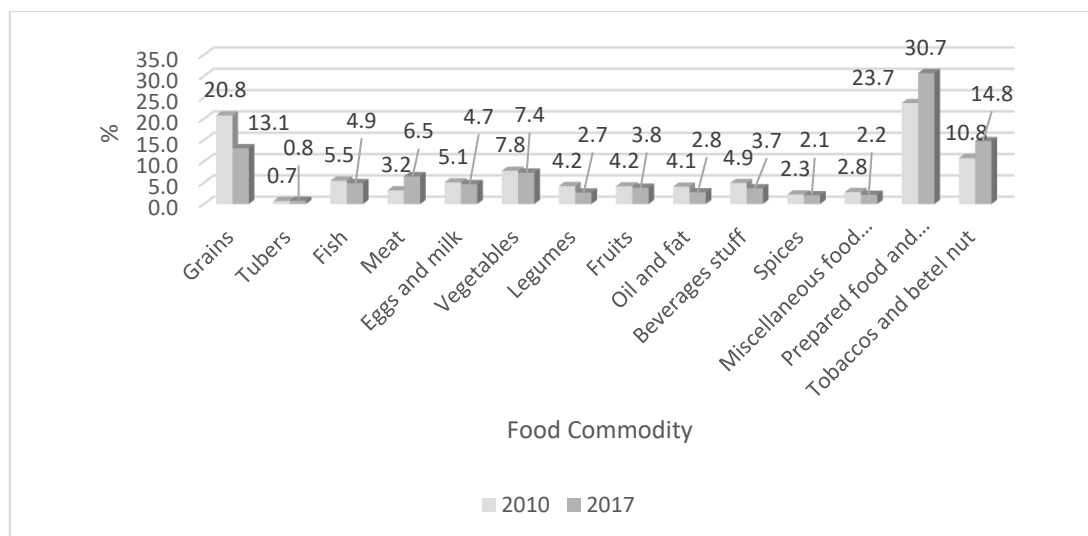

Figure 4. Expenditure Proportion of Food Subgroups in Rural Areas of Java, 2010 and 2017
Source: BPS, 2018

Table 1. Quantity and Budget Elasticity of Selected Food Commodities in Urban Areas of Java Island

No	Commodity	b_1	b_2	η	g_1	g_2	ε
1	Rice	23.8	-2.1	-0.051	69.1	-6.0	0.364
2	Fresh fish and shrimp	132.9	-11.6	0.891	184.3	-16.1	1.780
3	Beef	359.6	-31.0	7.707	456.7	-39.5	8.144
4	Chicken meat	167.5	-14.7	0.904	204.7	-17.9	1.121
5	Chicken egg	-16.9	1.5	0.037	-15.5	1.4	0.075
6	Tempe	95.3	-8.4	0.036	132.0	-11.6	0.137
7	Oil	63.8	-5.6	0.335	-11.1	1.0	0.404
8	Sugar	51.4	-4.5	0.144	18.0	-1.5	0.470

Source: processed data

Note: data of chicken eggs are 2015-2017 data

Quantity and Budget Elasticity, the food commodities calculated for their elasticity in this study are rice, fresh fish and shrimp, beef, chicken, chicken eggs, tempeh, oil and sugar. The selection of the food commodities is based on the availability of data. The coefficients obtained from the results of multiple regression estimations of equation (1) and (2) are then used to calculate the quantity elasticity (η) and budget elasticity (ε) using equations (3) and (4) for each selected food commodity (rice, fresh fish and shrimp, beef, chicken meat, chicken eggs, tempeh, oil and sugar).

Table 4 and table 5 summarize the value of quantity elasticity and budget elasticity for each selected food commodity in urban and rural areas of Java.Table 4 shows that, in urban areas, all numbers of ε are greater than numbers of η. This means, if food commodity prices rose, urban households will switch to substitute food commodities. The demand for rice is inelastic to the changes in income. This result is also obtained in the study of Kuntjoro (2016) and Nur et al. (2012), e.g. rice is inelastic in urban and rural areas. In the country with rice/grains as staple food such as in Pakistan, food grains are also inelastic (Hayat, Hussain

and Yousaf, 2016). Conversely, in Australia, rice is not staple food, so demand for rice has the strong response to price changes (Ulubasoglu et al., 2016).

Fresh fish and shrimp, chicken meat, chicken eggs, tempeh, oil and sugar are classified as daily necessity goods as their quantity elasticities are less than 1. A less than 1 elasticity also indicates that the demand for those food commodities is not elastic to changes in income. Only three commodities have a quantity elasticity and a budget elasticity more than 0.5, namely fresh fish and shrimp, beef and chicken meat. This means urban households will alter the quantity and budget for the three commodities if there is a change in income. A more than 1 elasticity value in urban areas is only owned by beef. It can be interpreted that beef is a luxury item. This finding is also found in the study of Hayat, Hussain and Yousaf (2016). In Pakistan for the year of 2010, food grains, pulses, ghee, sugar and vegetables are necessities, while milk and meat are luxuries.In urban areas, budget elasticity is greater than quantity elasticity for all commodities. Faharuddin et al. (2015) find similar results, e.g. expenditure elasticity is higher than price

elasticity, so that they recommend that the policy of increasing household income is more important than the policy of maintaining price stability.

Table 5 shows that, in general, when compared between urban and rural areas, food commodities in rural areas are more elastic to changes in income. This finding accords with the study of Saliem (2002) that food demand for rural household in KTI in 1996 is more responsive to changes in prices and income than households in the urban areas. As in urban areas, households in rural areas will reduce the quantity and budget for commodities of fresh shrimp, beef, and chicken meat. However, for rural households, oil and sugar are more elastic than in urban areas. Furthermore, contrary to urban areas, budget elasticity in rural areas is smaller than quantity elasticity, except for sugar and fresh fish and shrimp. Rice, chicken egg, tempe and sugar is inelastic both for quantity and budget elasticity.

Mhurchu et al. (2013) find that demand for food is relatively inelastic in New Zealand in the year of 2007 to 2010. However, they emphasize that the elasticity number is still important because the effect of price changes to change consumer purchasing accumulates across an entire population. From the results of this study, it can be concluded that the rice, chicken egg and tempe are the main diet of rural households.The shift in household consumption patterns, which is not dominated by rice, was shown by the proportion of total expenditure on food.

Expenditures for grains in rural and urban areas have a proportion of 12% and 21%, respectively, of total food expenditure in 2010. Eight years later in 2017, the proportion of expenditures for grains in rural and urban areas for rural and urban areas decreases to 13% and 8%, respectively. Expenditures on prepared food and beverages dominate household food expenditure, both in rural and urban areas. Thus, if income increases, households in Java prefer to buy prepared food and beverages rather than rice.

Table 5. Quantity and Budget Elasticity of Selected Food Commodities in Rural Areas of Java Island

No	Commodity	b_1	b_2	η	g_1	g_2	ε
1	Rice	8.9	-0.8	-0.143	67.4	-5.9	0.113
2	Fresh fish and shrimp	184.7	-16.1	1.217	223.6	-19.5	1.727
3	Beef	1387.7	-121.0	12.950	1019.1	-88.6	12.516
4	Chicken meat	288.8	-25.2	2.443	319.4	-27.9	2.424
5	Chicken egg	-89.4	7.8	0.144	-193.8	16.9	-0.076
6	Tempe	84.2	-7.4	0.223	85.0	-7.5	-0.138
7	Oil	103.6	-9.1	0.538	77.7	-6.8	0.375
8	Sugar	68.2	-6.0	0.264	115.8	-10.1	0.682

Source: processed data

Note: data of chicken eggs are 2015-2017 data

CONCLUSION

The results of calculating the elasticity of selected food commodities in Java in the year of 2010-2017 are as follows: (1) the demand for quantity of rice is not elastic to income, both in urban and rural areas; (2) the demand for quantity of fresh fish and shrimp, beef and chicken meat is very elastic to income, both in urban and rural areas; (3) the budget elasticity of fresh fish and shrimp, beef and chicken meat is also large, which means that households will increase the quantity and budget for these three commodities if their income increases; (4) quantity elasticity and budget elasticity in rural areas are generally greater than in urban areas; (5) in urban areas, budget elasticity is greater than quantity elasticity for all commodities, while in rural areas, budget elasticity is smaller than quantity elasticity, except for sugar and fresh fish and shrimp; (6) there has been a shift in the proportion of food expenditure on Java, e.g. the proportion of expenditures for grains decreases and the proportion of expenditures for prepared food and beverages increases in the period 2010-2017

The income elasticity of demand for selected food commodities is a value that indicates the amount of quantity and budget changes if there is a change in income. There has been a shift in household consumption patterns that rice is no longer being a staple food. Therefore, food diversification is needed. Fresh fish and shrimp, beef and chicken meat are very elastic to changes in income. Thus, improvement in household nutrition through consumption of these three types of food can be achieved if the price stability of those commodities was managed

regularly. However, such policy may be more suitable for rural areas where quantity elasticity is greater than budget elasticity. In urban areas where quantity elasticity is smaller than budget elasticity, the policy of increasing household income may be more important than the policy of maintaining price stability.

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