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# **RURAL ECONOMIES**



# STRATEGIC FOOD COMMODITY DEMAND FOR POOR RURAL HOUSEHOLDS IN INDONESIA

Ana Arifatus Sa'diyah<sup>1\*)</sup>

Ratya Anindita<sup>2)</sup>, Nuhfil Hanani<sup>2)</sup>, Abdul Wahib Muhaimin<sup>2)</sup>

<sup>1</sup>Departement of Agribusiness, Faculty of Agriculture,  
University of Tribhuwana Tunggaladewi, Indonesia

<sup>2</sup>Departement of Socio Economics, Faculty of Agriculture,  
University of Brawijaya, Indonesia

\*Corresponding author: [arifatus\\_sa@yahoo.co.id](mailto:arifatus_sa@yahoo.co.id)

## ABSTRACT

Demand analysis of the strategic commodities of poor rural households can be used as policy reference. The main focus of the study is to estimate the poor rural income and price elasticities. The Linear Approximate Almost Ideal Demand System (LAAIDS) is used to estimate the parameters of poor rural households. The empirical result for the specified model for demand functions (LAAIDS) illustrate that all estimated coefficients agree with a priori theoretical expectations. The expenditure elasticities are positive for corn, meat, shallot, chili, and sugar. The expenditure elasticities are negative for rice. According to the values of the cross-price elasticities, among commodity have substitution and complementary relationship are observed.

**Key word:** LAAIDS, SUR, price and expenditure elasticities

## INTRODUCTION

Rice, corn, meat, onion, chili, and sugar are six of Indonesia's seven strategic commodities. As a strategic commodity, these six strategic commodities are always consumed by Indonesian households (Deptan, 2014; Amang, 1995; Simatupang, 2012). Consumption of strategic commodities is carried out either by rural households, urban households, poor households, non-poor households, and poor rural households. The pattern of consumption of each household is different. Differences in household consumption patterns are influenced by income levels, number of household members, the price of each commodity, and so on (Yu, 2008; Widarjono, 2013, Hayat, 2017)

Consumption The number of poor Indonesians in rural areas in 2017 amounted to 16.31 million. This number decreased compared to the previous year which amounted to 17.10 million (Suhariyanto). The National Team for the Acceleration of Poverty Reduction (2014) argues that household consumption expenditure in Indonesia is relatively higher compared to other consumption expenditures. The increase in food prices will affect the purchasing power of households, especially poor households. High inflation in staple foods has a negative impact on poor households, as almost 65% of their consumption is spent on food.

The problem of poverty has existed since time immemorial. In the past, people generally became poor not because of lack of food, but poor in the form of lack of convenience or material. The causes of poverty are three things: poverty caused by the physical and mental condition of a person, poverty due to natural disasters, and artificial poverty (Yuliana, 2014). According Assegaf (2015) poverty reduction needs to be done by using various perspectives, because poverty is a multidimensional problem. The world's concern for this issue is shown by poverty alleviation in one of the main targets and targets of the concept of sustainable development goals that will adorn the face of world development during 2015 to 2030 (Hoelman, 2015). As a commitment to poverty alleviation, programs have been pursued by both central and local government, including the provision of basic needs, such as poor rice (Raskin), health and education services, expansion of employment opportunities, agricultural development, credit schemes, construction of infrastructure and assistance, sanitation counseling and other programs (Hureirah, 2005)

The fact that the reduced poverty rate is not proportional to the government's budget. Data from the Ministry of Finance show that in the last six years the poverty alleviation budget has increased significantly from Rp 74.3 billions (2011) to 212.2 billions rupiah (2016) or up by 186 percent. But the irony is that the poor population reduced by only 7 percent during that time or on average only able to reduce poverty by about 1.17 percent per year (BPS, 2016). This condition indicates that to eradicate household from poverty need big budget.

Research on the effects of food consumption on poverty in a region has long been an important study to better understand the importance of the food sector and poverty alleviation (Seale, 2014). Poverty is closely related to the fulfillment of basic needs of both food and non-food. The large proportion of expenditures for food consumption on all household expenditures can be an indicator of poverty. The higher the public welfare of a country then the share of food expenditure of the population will be smaller, vice versa (Deaton and Muellbauer, 1980).

Good understanding of the study of the consumption of poor households in rural areas is expected to contribute in formulating public policies related to poverty alleviation. The objectives of this study are: (1) to analyze the factors that influence the food consumption of poor households in rural areas, and (2) to analyze the effect of changes in food prices and income on food demand.

## **MATERIAL AND METHODS**

The poor rural households was chosen for study. Data for this study is obtained from SUSENAS (Indonesian National Socioeconomic Survey) for the year 2016. Susenas an electronic copy of the data sets for poor rural household, with a total sample of 20.629 households.

### **Empirical Frame work of AIDS model**

Model analisis yang digunakan dalam penelitian ini adalah model almost Ideal Demand system (AIDS). Model AIDS ini digunakan karena dapat memberikan perkiraan elastisitas harga, elastisitas silang, dan elastisitas

pengeluaran. Meskipun AIDS adalah model nonlinear, penggunaan indeks harga stone dapat memecahkan masalah nonlinear sehingga memudahkan estimasi. Secara matematis, model AIDS yang digunakan adalah sebagai berikut:

$$W_i = \alpha_0 + \sum_j \gamma_{ij} \log p_j + \beta_i \log(X/P) \quad (1)$$

P adalah indeks harga, didefinisikan sebagai berikut:

$$\log P = \alpha_0 + \sum_i \alpha_i \log P_i + \frac{1}{2} \sum_i \sum_j \gamma_{ij}^* \log P_i \log P_j \quad (2)$$

Untuk mencegah non-linearity dan mengurangi efek multikolinieritas dalam model, persamaan (2) biasanya didekati dengan Stone's Price Index :  $\log P^* = \sum_i W_i \log P_i$ . Dengan demikian, AIDS berubah menjadi Linear Approximation AIDS (LA/AIDS). Dan model LA/AIDS inilah yang akan digunakan dalam penelitian.

The following form of AIDS model was used in the present analysis to estimate the system of demand functions for food items like rice, corn, meat, salloot, chili, and sugar. From the estimated demand function price and income elasticities were derived. Following Deaton and Muellbauer (1980), the linier aproximation AIDS was used:

$$W_i = \alpha_0 + \sum_j \gamma_{ij} \log p_j + \beta_i \log(X/P^*) \quad (3)$$

Where,  $W_i$  is average budget share of the  $i^{\text{th}}$  commodity,  $P_j$  is price of the  $j^{\text{th}}$  commodity,  $X$  is expenditure on food commodities (rice, corn, meat, salloot, chili, and sugar),  $\ln P^*$  is price index, and  $\alpha_0$ ,  $\gamma_{ij}$ , and  $\beta_i$  are the parameters that need to be estimated.

The demand elasticities are calculated as functions of the estimated parameters, and they have standard implications. The specific form of expenditure elasticity ( $\eta_i$ ), wich measures sensitivity of demand in response to changes in consumption expenditure, is as:

$$\eta_i = 1 + \frac{\beta_i}{w_i} \quad (4)$$

The uncompensated (Marshallian) own-price elasticity ( $\epsilon_{ii}^M$ ) and cross-price elasticity ( $\epsilon_{ij}^M$ ) measure how a change in the price of one product affects the demand of this product and other products with the total expenditure and other price held constant. The spesific form of uncompensated own and cross price elasticities is as, respectively:

$$\epsilon_{ii}^M = -1 + \frac{\gamma_i}{w_i} - \beta_i \quad (5)$$

$$\epsilon_{ij}^M = \frac{\gamma_{ij}}{w_i} - \beta_i \frac{w_j}{w_i} \quad (6)$$

The compensated (Hicksian) price elasticities own and cross ( $\epsilon_{ii}^H$  and  $\epsilon_{ij}^H$ )

Which measures the price effects on the demand assuming the real expenditure  $X/P^*$  is constant, is describe as:

$$\epsilon_{ii}^H = -1 + \frac{\gamma_i}{w_i} + w_i \quad (7)$$

$$\epsilon_{ij}^H = \frac{\gamma_{ij}}{w_i} + w_j \quad (8)$$

To ensure that the assumption of maximizing satisfaction is not violated, there are three restrictions that must be inserted into the model:

1. Adding-up:  
 $\sum_i \alpha_i = 1, \sum_i \alpha_{ij} = 0, \sum_i \beta_i = 0$ , allows an expenditure share of a single value.
2. Symmetry:



$C_{ij} = C_{ji}$ , shows the consistency of consumer's choices

3. Homogeneity

$\sum_j C_{ij} = 0$ , which is based on the assumption that changes are proportional in to all prices and expenditures do not affect the number of purchased items.

## RESULT AND DISCUSSION

The above model in first equation was initially estimated for the poor rural. The empirical result for the specified model for demand functions (LAAIDS) illustrate that all estimated coefficients agree with a priori theoretical expectations.

Table 1 displays the estimates of the structural parameters for food groups of the LAAIDS model for poor rural households. The parameters estimates satisfy the symmetry, the homogeneity, and the adding up restriction. Overall, it can also be seen from the estimated results that a reasonable number of coefficients of the explanatory variables are significant.

However of interest to researchers and policy makers is the knowledge concerning elasticities of demand for food. According to value of the expenditure elasticities, the selected food groups are classified as inferior goods ( $\eta_i < 0$ ), necessities ( $0 < \eta_i < 1$ ), or luxuries ( $\eta_i > 1$ ). Demand for a specific commodity is defined as price inelastic (elastic), if the absolute value of its own-price elasticity is lower than unity (larger than unity).

Pairs of commodities are denoted as substitutes or complements if their compensated cross-price elasticities are positive or negative, respectively. Compensated elasticities indicate the change in demand for a commodity due to a price variation, when the real expenditure change caused by this price variation is compensated by an expenditure variation so that utility is kept constant.

### Estimation of Strategic Commodity Demand

The use of the LA-AIDS model in a sample of rural poor households in Indonesia with the price parameters of each commodity, income (expenditure), number of household members, and IMR variable. Simultaneously, independent variables such as household expenditure, strategic commodity prices, number of household members in the LA-AIDS model can be used to estimate the strategic commodity share budget.

The LAAIDS model was analyzed by the SUR method which explicitly included the possibility of contemporaneous correlation. Contemporaneous correlation is the occurrence of correlation between disturbances derived from different equations at a given time. In addition, the combined estimation with this method will be more efficient because the resulting coefficients have more adequate variance (Adriansyah, 1997)

Tabel 1 shows the function parameters of strategic commodity demands in Indonesia in year 2016 . The coefficients of determination  $R^2$  in the demand model for poor rural households were 0.9241, showed that the decisions to consume food commodities was very much affected by other food commodity prices as well as the level of income. Next, the suspected variable

for expenditures of food commodity consumption decisions was very much affected by the size of income, where the positive sign in the equation shows that if increases occurred in the income of the people, consumption of plant food commodities will also increase. Conversely, a negative sign in the equation shows that the proportion of demand for food commodities will decrease along with a decrease in the level of income.

Based on table 2 can be explained explanation influence of price, household size, IMR, and expenditure variable to each strategic commodity as follows:

#### 1. Rice

The results of the analysis show that all coefficients of own price, corn price, meat price, shallot price, chili price, sugar price, households size, IMR, and total expenditure are all significant at 1% level of significance. The coefficient of own price variable of -0.5411 can be interpreted that each price increase alone by 1% then the proportion of rice expenditure will decrease by 0.5411%. The value of the corn price coefficient of 0.2790 means that each increase in corn price of 1%, then the proportion of rice expenditure will rise by 0.2790%. This means that between corn and rice there is a complementary relationship whereas the government hopes that between rice and corn commodities are mutually substituted. The price of corn has a significant effect on the proportion of rice expenditure. The value of meat price coefficient of 0.1769, meaning that there is an increase of meat price by 1% then the proportion of rice expenditure will rise by 0.1769%.

#### 2. Corn

The price variables, the price of rice, the price of meat, the price of shallot, the price of chili, the price of sugar, household size, IMR, and total expenditure have a significant effect on the proportion of corn expenditure, with a significance level of 1%. The value of rice price coefficient of 0.2790 means that any increase in rice price of 1% will increase the proportion of corn expenditure by 0.2790%. Rice and corn are mutually substituted commodities, so the increase in rice prices will cause households to switch to corn consumption. The value of the total expenditure coefficient of 0.4804 means that any increase in expenditure / income will result in an increase in the proportion of corn expenditure by 0.4804. The total coefficient value of household expenditure of 0,0508 shows the total increase of household expenditure will cause the increase of corn consumption expenditure, but only 0,0508.

#### 3. Meat

The significant proportion of meat expenditure at a 1% significance level is influenced by own price, rice price, corn price, shallot price, chili price, sugar price, household size, and total household expenditure. The interpretation of the total expenditure coefficient value of 0.3155 is that an increase in household expenditures by 1% will increase the proportion of rural poor household expenditure for meat consumption by 0.3155%.

#### 4. Shallot

The results showed that the proportion of onion expenditure was significantly influenced by the price of rice, the price of corn, the price of beef, the price of onion, the price of chili, the price of sugar, the number of household members, the total expenditure, and the IMR. The IMR variable is a variable used to avoid biased estimation results due to zero consumption. The value of IMR variable coefficient of -1.3808 means that the increase of IMR variable by 1% will cause a decrease in the proportion of onion consumption expenditure by 1.3808%.

#### 5. Chilli

The chili that was analyzed was a combination of large red chili and cayenne chili. The proportion of chili commodity expenditure is influenced by the price of rice, the price of corn, the price of maet, the price of shallot, the price of sugar, hoseholds size, the total expenditure, and the IMR variable. The influence of each independent variable is statistically significant at the significance level of 1% and 5%.

#### 6. Sugar

The proportion of sugar expenditure is influenced by own price, rice price, corn price, meat price, shallot price, sugar price, Households size, total expenditure, and IMR variable. The influence of each independent variable is statistically significant at the significance level of 1% and 5%. The value of corn coefficient of 0.0508 means that a corn price increase of 1% will increase the consumption of sugar by 0.0508%.

### **Expenditure (income) Elasticities and Marginal Expenditure Share**

The effect of changes in expenditure on strategic commodities on demand for each strategic commodity is called the expenditure elasticity. Theoretically, the expenditure elasticity is the percentage change in the quantity of goods demanded in response to a change in expenditure of one percent. The expenditure elasticity is

calculated by involving the coefficient values derived from the LA / AIDS model discussed earlier, and calculated using the formula (4).

Table 3 displays the expenditure consumption (income) elasticities and marginal expenditure share for the food sub the groups for the poor rural households. For the poor rural households, according to value of the expenditure elasticities rice and shallot is necessities goods ( $0 < \eta_i < 1$ ). Corn, meat, chilli, and sugar is luxury good because value of the expenditure elasticities more than one ( $\eta_i > 1$ ).

Another interesting finding is that rice for poor rural household have negative value. This means if consumer income increases, then the demand for food commodities will decreas. This condition is caused by poor rural households consumption of rice is sufficient, so that once there is an increase in income then households will soon increase consumption of other commodities.

The value of income elasticity of corn is 15,6898, meaning that the increase of income by one percent will increase corn consumption by 15.6889 percent. This proves that corn is no longer the staple food for rural poor

households. Corn is a luxury for poor rural households. This is somewhat contrary to the existing theory.

The demand for sugar for poor households in rural areas is elastic to household income. Sugar is still a luxurious commodity for poor households in the countryside. The income elasticity of granulated sugar amounted to 1.9996, meaning that a 10 percent increase in income will lead to an increase in demand for sugar by 19.996 percent.

Meat is a strategic commodity that has the highest income elasticity compared to rice, corn, shallot, chili, and sugar. Meat commodities are very sensitive to increasing income of poor rural households. This is due to the low income levels of poor rural households, which causes households unable to buy meat.

The marginal analysis of expenditure share is used to determine the level of changes in the allocation of expenditure share of a commodity in the future when there is a change in expenditure / income (Asare, 2012). The marginal value of rice commodity share expenditure of -0.1028 shows that in the future there will be a decrease in the budget for consumption of rice commodities in poor rural households. This condition indicates that poor rural households diversify food from rice to other commodities. This is in line with government efforts to reduce rice consumption and improve local food (Ariani, 2010).

### **Uncompensated Own-Price and Cross-Price Elasticities**

Uncompensated own-price elasticities of demand for all food groups are negatif and consistent with the a priori expectation (Azis, 2011; Gould, 2004), exception corn. The absolute amounts of these elasticities for all food groups are lower than unity except for meats in rural and urban households as displays in table 4 and 5.

changes in strategic commodities. All strategic commodities have a negative price elasticity of their own. This corresponds to the theory that the demand curve has downward sloping. The value of rice elasticity is inelastic because its value is less than one, which means that its consumption is not affected by price easily. The inelastic nature of the elasticity of rice commodities due to rice is the main consumption of poor households in rural areas. The value of rice elasticity with negative sign means that the increase of rice price will decrease rice consumption. The rise in rice prices causes households to reduce rice consumption and diversify their staple food consumption to cover their carbohydrate needs. According Mauludyani (2008) the higher the income, the demand for rice tends to be less elastic to the price of rice. The value of rice elasticity of -0.8277 indicates that poor households in rural areas do not have high income.

The maet commodity has its own highest price elasticity value, that is -35,90035. The value indicates if the price of meat increased by 10% then the demand for meat will decrease by 359,0035%.

Cross price elasticity has two possible values, namely negative and positive. The negative value of cross price elasticity indicates that the relationship between the two commodities is complementary. Conversely, a

positive cross-price elasticity value indicates the relationship between two substituted commodities.

The cross-price elasticity of rice commodities all have a negative value, indicating that rice has a complementary relationship with corn, meat, shallot, chili, and sugar. Rice is complementary to the most closely related to meat. The value of cross-price elasticity of rice to meat is -0.7001, which means the increase of meat price by 10% will only decrease demand for rice equal to 7,001%. While other complementary commodities will only reduce demand for rice less than 7,001%. This shows that rice demand is unresponsive to the price change of complementary goods.

Unlike rice commodities, the price elasticity of shallot has a positive value, indicating that shallot has substitution relationship with rice, corn, meat, chili, and sugar. This is somewhat distorted from the theory, shallot supposed complementary relationship between the shallot with chili commodity.

### **Compensated Own-Price and Cross-Price Elasticities**

The Hicksian own price elasticity value (Table 3) shows that rice and chilli are inelastic with elasticity values of -0.9304 and -0.9798 (less than one). Rice is more inelastic than chillies, because with a 10% increase in rice prices will only cause a decrease in rice demand by 9,304%. This is because rice is a staple food source of carbohydrates for poor households in rural areas.

Corn, meat and sugar commodities are elastic with values of -0.45073; -0.35,5866; and -0,1,03337. The value of the elasticity of beef commodities has the highest value, which means the amount of demand depends on the price level. Beef is a commodity that has not been bought by poor households in rural areas.

Table 3 shows a complementary relationship between rice and corn, beef, onion, chili, and sugar; between corn and rice, beef, onion, chili, and sugar; as well as between beef with rice, corn, onion and sugar. While substitution relation occurs between onion with rice, corn, and sugar; and between sugar and rice, corn, beef, onion, and chili.

The magnitude of the elasticity value shows the high level of interrelationship between strategic commodities. It is generally seen that the complementary relationship of meat with rice, corn, shallot, chilli and sugar is very strong because the value of elasticity is greater than one. While the substitution relationship between onion with rice and sugar that occurs is not too strong because the value of elasticity less than one. So is the substitution relationship between sugar and rice, corn, meat, shallot and chilli.

The elasticity of strategic commodity food demand has implications for the consumption and improvement of food consumption of poor households in rural areas. The following implications are as follows:

1. The increase in strategic food prices will decrease its consumption. Therefore, efforts to stabilize food prices are very important in order to improve the consumption of poor households in rural areas can be achieved.

2. Revenue increase causes a decrease in rice consumption. This is because the consumption of rice is excessive, so it needs to do various efforts that support the decline in rice consumption through the acceleration of the implementation of the mainstream rice diversification program in addition to sustainable rice.

### **CONCLUSION AND SUGGESTION**

It is explored that the expenditure and price elasticities for selected food groups are relatively high in Indonesia. Food subsidies can be better targeted to the poor rural household by subsidizing food items and distributing are known to be concentrated. It is important that a number of different food sources be consumed and effort should be made to encourage a wide variety of food to improve the nutritional quality of the Indonesian's diet and health of the population.

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Table 1 Parameter Estimates of LAAIDS for Poor Rural Households

Variable	Rice	Corn	Beef	Shallot	Chilli	Sugar
Constant	7.7453*	-6.6280*	-2.0552*	1.2028*	1.0401*	-0.3050*
Price of rice	-0.5411*	0.2790*	0.1769*	0.0061*	0.0283*	0.0508*
Price of corn	0.2790*	-0.1158*	-0.1389*	0.0067*	0.0021*	-0.0333*
Price of Meat	0.1769*	-0.1389*	-0.0466*	-0.0064*	0.0067*	0.0082*
Price of shallot	0.0061*	0.0067*	-0.0064*	0.0041*	-0.0030*	-0.0076*
Price of chilli	0.0283*	0.0021*	0.0067*	-0.0030*	-0.0030*	0.0221*
Price of sugar	0.0508*	-0.0333*	0.0082*	-0.0076*	-0.0091*	-0.0091*
Total Expenditure	-0.8739*	0.4804*	0.3155*	-0.0022*	0.0002**	0.0799*
Household size	0.7980*	-0.4657*	-0.2805*	0.0069*	0.0030*	-0.0617*
IMR	3.6176*	1.4372*	-1.2423*	-1.3808*	-1.5099*	-0.9218*
B	0.0210*	0.0620*	-0.0526*	-0.0066*	-0.0049*	-0.0189*
R <sup>2</sup>	0.9989	0.9997	0.9998	1.0000	1.0000	1.0000

**Note:** Single and double asterisk denote statistical significance at the 1% and 5% respectively

**Source:** estimated

Table 2. Expenditure Elasticities and Marginal Expenditure share for Poor Rural Household in Indonesia

Commodity	Expenditure Elasticity	Marginal Expenditure Share
Rice	-0.1333	-0.1028
Corn	15.6898	0.5132
Meat	235.4475	0.3169
Shallot	0.9559	0.0468
Chilli	1.0037	0.0661
Sugar	1.9996	0.1598



Table 3. Elasticities of Demand for Strategic Commodity in Indonesia

Komoditas	Rice	Corn	Meat	Shallot	Chilli	Sugar
<b>Uncompensated</b>						
Rice	<b>-0.8277</b>	-0.6646	-0.7001	-0.6461	-0.6269	-0.6110
Corn	-14.8684	<b>-5.0204</b>	-3.5598	-4.2592	-4.5079	-4.7140
Meat	215.3885	-42.2559	<b>-35.9035</b>	-46.0662	-50.0363	-53.3248
Shallot	0.1184	0.0858	0.0844	<b>-0.9135</b>	0.0883	0.0879
Chilli	-0.0478	-0.0450	-0.0449	-0.0451	<b>-1.0459</b>	-0.0452
Sugar	-0.8656	-0.1274	-0.0961	-0.1437	-0.1606	<b>-1.1935</b>
<b>Compensated</b>						
Rice	<b>-0.9304</b>	-0.6689	-0.7003	-0.6527	-0.6357	-0.6217
Corn	-2.7688	<b>-4.5073</b>	-3.5386	-3.4910	-3.4741	-3.4601
Meat	-33.8168	-34.5552	<b>-35.5866</b>	-34.5390	34.5220	-34.5080
Shallot	0.8555	0.1171	0.0857	<b>-0.8667</b>	0.1502	0.1643
Chilli	0.7255	-0.0130	-0.0443	0.0033	<b>-0.9798</b>	0.0342
Sugar	0.6576	0.1126	0.0813	0.1289	0.1458	<b>-1.0337</b>