

## DEMAND FOR THE MAIN VEGETABLES IN JAVA ISLAND

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### ABSTRACT

The World Health Organization estimated that a low vegetable intake is a contributing risk factor for mortality in the world. Indonesia was a country that had a very low intake of vegetables. This paper looked at some of issues on the demand side. What were the factors that shaped consumption behaviour related to vegetables, and what was its relative importance in different provinces at varying levels of development, different expenditure groups and the education groups in Java Island. The purpose of this study was to estimate the Java Island households' demands for vegetables. By using SUSENAS 2008 data, the demands for the main vegetables were analyzed with Linear Approximation Almost Ideal Demand System (LA-AIDS) Model. The estimated demand elasticity showed that the demand for six vegetables were found to increase when per capita income rose. Most of the vegetables were found to respond substantially to changes in their own prices and in the directions as expected with estimated negative own-price elasticity.

**Key words:** horticulture, expenditure, demand elasticity, economics model, AIDS

### INTRODUCTION

The agricultural sector is still the proper sector that is the mainstay in the national economic development. The distribution of Gross Domestic Product (GDP) according to the business field based on valid price showed the importance of the role of the agricultural sector, where this sector occupied the second rank from the nine business field sectors at GDP Indonesia in 2012 (BPS, 2014). The growth rate of GDP in the agricultural sector always increased every year from 2007 to 2012. The subsector of food crops was one subsector having the quite high growth rate of 6 percent per year, and the main contributor on the GPD's agricultural sector.

Vegetables are horticultural commodities which have lately become the focus of attention along with an increase in knowledge of the community on the importance of preserving health. The community has realized that vegetables not only important as the daily serving in the household, but also has several strategic roles, one of them as the foodstuff nourishing of vitamin and mineral sources for the community. The in-availability of vegetable consumption was found out as one factors that caused the hearth and cancer diseases, which were two main death causes in the world this time. FAO recommended that every person should consume fruit and vegetable of 400 g per day or 146 kg per year. Especially for the vegetable consumption, 116 kg per capita per year was recommended (FAO, 2007). As revealed by Novianti (2003), vegetables also had another strategic role in the national economy, i.e. as: income source and the working opportunity for rural people and the business opportunity for entrepreneur; provides raw material for the agroindustry supporting the process of industrialization; the importing substitution commodity and the exporting commodity which its

contribution was very important toward the country's foreign exchange, and the market for non agricultural commodities like the industrial sector (fertilizer, pesticide, agricultural equipment) and service sector (transportation, finance, and communications).

At the moment, vegetable production is still centered in Java Island with more than 50% of vegetable production in Indonesia coming from Java Island. The supporting geographical condition, the infrastructure and manpower made Java Island able to fulfill the market demand in Java Island itself and could also distribute to outside Java Island, mainly the area which could not produce certain vegetables or the area which is still not able to fulfill the vegetable demand (Moeis, 2003).

The vegetable consumption per capita of Indonesian community increased to a quite high level, since GEMA SAYURAN program was started in some regions. In 2007, vegetable consumption reached 39.39 kg per capita per year. But it was necessary to remember that the figure was still not reaching half of standard suggested by WHO/FAO, i.e. of 116 kg per capita per year. Indonesia was still grouped into the country having the very low vegetable consumption if compared with some other countries. Based on the statistical data which was issued by FAO (FAOSTAT) in 2005, some developed countries had fulfilled the standard of WHO/FAO even China consumed the vegetables twice that of the standard suggested.

The high consumption level of some vegetable commodities in the community demanded the quite high availability also in the market. The constraint of commodity availability would make the consumption decreasing or replaced by other commodity so that the possibility of substitution among vegetables could happen, from the local to import commodity like garlic. In some years, most of national garlic consumption was the import result because the production of local garlic price could not compete to fulfill the community demand which was increasing, even the production level and the planting area tended to decrease. This related to failure in achievement of price efficiency in developing countries so the local prices tended to be above the international prices (Firdaus and Gunawan, 2012; Piadozo, 2013).

Detail review on factors affecting consumption of vegetables can be seen in Othman et al. (2012), Liu (2003) and Pollard et al. (2002). Individuals with higher education, income and social status have a higher consumption of vegetables than those with lower education, income and social class status (Johansson & Andersen, 1998; McClelland *et al.* 1998). A similar study also has been conducted in Malaysia to measure the socio-demographic factors among Malaysians. Steven et al. (2011) found that education, age, ethnicity, income, location of residence, smoking status and health condition were significant predictors of vegetables consumption. These were in line with previous findings from the United States Department of Agriculture, that the major factors affecting vegetables consumptions were income, age and education (Biing, 2004). Other studies found that the vegetable consumption was influenced by price level, income and household's preference (Pusat Penelitian Sosial Ekonomi Pertanian, 2001; Ruel et al., 2005). The household's preference in the matter of food was influenced by the number of household's member, the education of household's member, the habit and norms of culture, and the taste. The previous studies provided the directive that the household having the different income group would have the different preference level, likewise if the education of different household's member would influence someone's decision in choosing the food. Beside that the vegetable availability in the market and the cost for obtaining the certain commodity would cause the difference in consumption pattern for every household.

The purposes of this study are to: (1) analyze the consumption level at the household level in Java Island; (2) analyze the model of complete demand of vegetables by applying the linear approach of Almost Ideal Demand System (LA-AIDS) in Java Island; (3) analyze the impact of price change and income toward the change of vegetable consumption of household in Java Island.

## METHODOLOGY

### Data and Location of the Study

This study uses the secondary data having a source from Central Statistical Agency of Indonesia (BPS), Ministry of Agriculture, and other study results as the supporting data. Data used for analyzing the demand are the expenditure data of household's consumption in one week, i.e. data of panel National Socio Economic Survey in Indonesia (SUSENAS) in 2008 (BPS, 2009). Panel SUSENAS is the survey of core data collection and module data of consumption/expenditure and household's income. Data collected in the core describe the demographic condition seen from the individual characteristic of household's member, amongst all notes of household's member, health, education, housing and social economy. Module SUSENAS contains on quantity and value of food consumption covering 215 commodities and divided into 14 groups, expenditure for non food goods covering 108 types and divided into 6 groups, beside that module SUSENAS contains of data on income, revenue, and expenditure non consumption.

The area which becomes the study is Java Island covering 6 Provinces, including DKI Jakarta, West Java, Central Java, DI Yogyakarta, East Java, and Banten. The data used for analyzing the demands are the expenditure data per capita of consumption of 26,622 households noted consuming the vegetables in Java Island. Not all households consume every commodity, so it is conducted the justification of consumption value toward some households in this study which are not consuming all commodities. The vegetables examined carefully consist of 6 commodities i.e. spinach, legume, red onion, garlic, red chili, and small and very pungent chili. The commodities are chosen based on the amount of value of the average expenditure per capita per month in Java Island, and there is a possibility of substitution relation among typed vegetables. Some vegetables examined carefully are known as the cuisine spices in the community of Indonesia like red onion, garlic, red chili, and small and very pungent chili.

The data about the expenditure of vegetable consumption refer to the total expenditure of consumption for the last week both coming from the purchase (cash/bill) and also coming from the self production, the giving, and so on. Some households consuming vegetables from the results of plants in the home's yard or knows as agriculture subsistence has been covered here. The data are differentiated into 15 groups consisting of: (1) Java Island; (2) Java Island according to city and rural areas; (3) Java Island according to province; (4) Java Island according to income group; and (5) Java Island according to education level.

### Procedure of Data Analysis

The data processing is using the software of Statistical Analysis System (SAS). The analytical tool used is the analysis of linear approach of Almost Ideal Demand System (LA-AIDS) model which refers to Deaton and John(1980) and some previous studies (Blanciforti and Richard, 1983; Buse, 1994; Daud, 1986). LA-AIDS model used in this study is as follows:

$$w_i = \alpha_i + \sum_j \gamma_{ij} \log p_j + \beta_i \log \left( \frac{x}{p^*} \right) + \theta \log Art + \delta \log Edu + \varepsilon \log Xpd$$

where:

$w_i$  = budget share(expenditure proportion) of i commodity group, with i =1,2,3...n

$\alpha, \beta, \gamma$	=	regression parameter for intercept, vegetable expenditure (with the weighing price) and aggregate price from each commodity
$\theta, \delta, \varepsilon$	=	regression parameter for the number of household's member, education level of household's head and total expenditure of household
$P_j$	=	aggregate price of the j commodity, with j=1,2,3...n
$\frac{x}{p^*}$	=	vegetable expenditure is divided by index of weighing price
$Art$	=	number of household's member
$Edu$	=	education level of household's head
$Xpd$	=	total expenditure of household

LA-AIDS model above describes the relation between not free variable i.e. budget share/expenditure proportion of i commodity is influenced by not free variable consisting of the j commodity price, the variable of vegetable expenditure divided by the index of weighing price or more known by the index of stone price, the variable of household's member, the education variable and the variable of total expenditure which is the approach from the total income of household.

The model is the function of vegetable demand, in order to be consistent with the demand theory (Fredoun, 1997), some following requisites should be followed, i.e.:

$$\text{Adding Up : } \sum_i \alpha_i = 1 \quad \sum_i \beta_i = 0 \quad \sum_i \gamma_{ij} = 0$$

$$\text{Homogeneity : } \sum_j \gamma_{ij} = 0 \quad \text{for all } i$$

$$\text{Symmetrical : } \gamma_{ij} = \gamma_{ji}$$

The restriction is calculated by using the method of Seemingly Unrelated Regression (Sitepu and Bonar 2006). The formula used for calculating the demand elasticity from the model of LA-AIDS is as follows:

- a. Own Price Elasticity: 
$$e_{ii} = \frac{\gamma_{ii}}{w_i} - 1$$
- b. Cross Price Elasticity: 
$$e_{ij} = \frac{\gamma_{ij}}{w_i} \quad (i \neq j)$$
- c. Expenditure Elasticity: 
$$e_{ii} = 1 + \frac{\beta_i}{w_i}$$

## RESULTS AND DISCUSSIONS

Table 1 is the summary of consumption level of 6 vegetable commodities which are examined carefully in Java Island. The total expenditure per capita and the vegetable expenditure per capita are also presented. There are around 92.97 % of households consuming vegetables in Java Island, but the percentage of expenditure for vegetables is only 3.40 % compared to the total expenditure of household, even the expenditure for 6 vegetable commodities examined carefully is only 1.64 %.

The number and consumption value of 6 vegetable commodities examined carefully vary in every province. The highest consumption number in Central Java household is of 3.7 Kg/Capita/Month with the consumption value of 6,272rupiah. The number of vegetables consumed will be different with the expenditure value for the vegetables which are much depending to the price of vegetables in a certain area. Like the household in DKI Jakarta having the consumption value which is the highest although the number of vegetables consumed is only 2.3 Kg/capita/month. The lowest consumption level is the household in West Java, i.e. of 1.9 Kg/capita/month, this is enough to become the question because this province is famous with the culture of raw vegetable consumption which is very high. But it is necessary to remember that the vegetables which are examined carefully only 6 commodities which are mostly consumed by the community in Java Island, from the sixth commodities are very rare to be made the raw vegetables so that in this case, the culture cannot increase the vegetable consumption level based on the quantity in West Java. Some vegetables which are often becoming the raw vegetables in West Java amongst all: basil leaf, pokpohan leaf (*Pilea melastomoides*), lettuce leaf, and so on. Meanwhile, the vegetables are not yet becoming the commodities which are encoded in SUSENAS.

**Table 1.** Summary of the consumption level of 6 vegetable commodities in Java Island

	<b>DKI Jakarta</b>	<b>West Java</b>	<b>Central Java</b>	<b>Yogya -karta</b>	<b>East Java</b>	<b>Banten</b>	<b>Java Island</b>
Percentage of household which consumes (%)	83.65	93.44	94.77	84.22	96.41	93.57	92.97
Number (Kg/Capita/Month)	2.3	1.9	3.7	3.3	3.6	2,4	2.9
Value (Rp/Capita/Month)	8,363	6,134	6,272	6,093	6,449	6,971	6,467
Percentage toward the vegetable expenditure (%)	44.01	46.10	48.93	49.82	52.53	47.61	48.40
Percentage toward the total expenditure (%)	0.97	1.55	2.05	1.46	1.94	1.53	1.64
Total expenditure per capita (Rp/Capita/Month)	863,666	396,928	306,255	416,911	331,954	454,454	393,281
Vegetable expenditure per capita (Rp/Capita/Month)	19,002	13,306	12,819	12,230	12,278	14,641	13,363
Vegetable percentage toward the total expenditure (%)	2.20	3.35	4.19	2.93	3.70	3.22	3.40

**Parameter Analysis on Vegetable Demand in Java Island**

The coefficient value of the system determination ( $R^2$ ) from the processing result of 15 models of complete demand system of vegetables turning between 0.58 – 0.73, meaning that at least 58 % from the diversity in the not free variable i.e. the expenditure proportion of every vegetable commodity can be explained by the free variable in the model, i.e. price variable (both the own price and cross price), the total expenditure and also the demography variable consisting of the number of household's member and the education level of household's head. The estimation value of parameter of the demand model in Java Island can be seen in Table 2.

**Table 2.** Estimation value of parameter on LA-AIDS model in Java Island

	Proportion					
	Spinach Coeff (Std. Err)	Legume Coeff (Std. Err)	Red Onion Coeff (Std. Err)	Garlic Coeff (Std. Err)	Red Chili Coeff (Std. Err)	Small Chili Coeff (Std. Err)
<b>Intercept</b>	0.1503 ** (0.0032)	0.1572 ** -0.0031	0.1719 ** -0.0027	0.1926 ** -0.0027	0.1203 ** -0.0027	0.2077 ** (0.0033)
<b>Ln (Price of Spinach)</b>	0.0178 ** (0.0000)	-0.0036 ** (0.0000)	-0.0044 ** (0.0000)	-0.0037 ** (0.0000)	-0.0028 ** (0.0000)	-0.0033 ** (0.0000)
<b>Ln (Price of Legume)</b>	-0.0036 ** (0.0000)	0.0175 ** (0.0000)	-0.0042 ** (0.0000)	-0.0036 ** (0.0000)	-0.0030 ** (0.0000)	-0.0032 ** (0.0000)
<b>Ln (Price of Red Onion)</b>	-0.0044 ** (0.0000)	-0.0042 ** (0.0000)	0.0184 ** (0.0000)	-0.0035 ** (0.0000)	-0.0033 ** (0.0000)	-0.0030 ** (0.0000)
<b>Ln (Price of Garlic)</b>	-0.0037 ** (0.0000)	-0.0036 ** (0.0000)	-0.0035 ** (0.0000)	0.0168 ** (0.0000)	-0.0030 ** (0.0000)	-0.0030 ** (0.0000)
<b>Ln (Price of Red Chili)</b>	-0.0028 ** (0.0000)	-0.0030 ** (0.0000)	-0.0033 ** (0.0000)	-0.0030 ** (0.0000)	0.0154 ** (0.0000)	-0.0033 ** (0.0000)
<b>Ln (Price of Small Chili)</b>	-0.0033 ** (0.0000)	-0.0032 ** (0.0000)	-0.0030 ** (0.0000)	-0.0030 ** (0.0000)	-0.0033 ** (0.0000)	-0.0158 ** (0.0000)
<b>Ln (Number of Household Members)</b>	-0.0016 ** (0.0003)	-0.0032 ** (0.0003)	-0.0147 ** (0.0003)	-0.0151 ** (0.0003)	-0.0035 ** (0.0003)	-0.0148 ** (0.0003)
<b>Ln (Education)</b>	0.0001 ** (0.0003)	0.0009 (0.0003)	-0.0003 (0.0003)	0.0001 (0.0003)	-0.0003 (0.0003)	-0.0016 (0.0003)
<b>Ln (Income)</b>	-0.0047 ** (0.0003)	-0.0065 ** (0.0003)	-0.0045 ** (0.0002)	-0.0068 ** (0.0002)	-0.0022 ** (0.0002)	-0.0086 ** (0.0003)
<b>Ln (Stone Price Index)</b>	0.0018 ** (0.0001)	0.0043 ** (0.0001)	-0.0028 ** (0.0001)	-0.0017 ** (0.0001)	-0.0017 ** (0.0001)	-0.0001 ** (0.0001)

Most of significant levels in the parameter assumption have value of 99 %. The assumption of **own price parameter** is all significant at the level of 99 %, both for Java Island as a whole, and after being grouped in the city and rural areas, province, income group, and education level. The coefficient signs for all own price parameters have positive values, which are in accord with some

previous studies. Most of the **cross price parameter** influences the proportion of vegetable expenditure at the significant level of 99 %. All cross price parameters are signed negative except for the variables of red onion and garlic in the Province of DI Yogyakarta. Meaning that all commodities have the opposing relation between the expenditure proportion of one commodity with the price of another vegetable commodity. The higher of another commodity price is, the lower the proportion of commodity expenditure is. The variable signs positive shows the relation which in directive between the expenditure proportion and other vegetable commodity.

Most of **variables of number of household's member** are significant at the level of 95 – 99 %. Most of coefficient signs are negative. This shows that higher numbers of household's member is, the lower of proportion of commodity expenditure is for every member in the household. This is possible because the increase of food expenditure in every household not as much as the increment number of household's member, so if the expenditure is divided with the number of household's member, it will lessen the number per capita.

Most of **education variables** are not significantly at the level of 99%. It can be concluded that the education variable has no influence toward the proportion of vegetable expenditure in Java Island. The education in this study refers to higher level of formal education of household's head, does not increase understanding of the importance of vegetables for health. Consumption of vegetables is determined by local culture/habit such as in West Java, where people usually eat raw leaves when having lunch or dinner. Most of the **income variables** are significant at the level of 99%. Almost all coefficients of income variable have negative values. This shows that the expenditure proportion of the commodity has the opposing relation; where higher income is, the lower expenditure proportion of the commodity is. Although there is a possibility of the increase of vegetable consumption with the increase of income, the expenditure proportion of each commodity tends to lessen because the household will shift the expenditure to other commodities such as fruits and protein from animal sources.

#### **Analysis on Own Price Elasticity of Vegetables in Java Island**

The elasticity value is used for measuring and explaining to how far is the change reaction of quantity of each commodity toward the price change in Java Island. To account elasticities, the same procedure carried out by previous authors was applied (Green, 1990; Wardani, 2007 and Savitri, 2010). The own price elasticities for all commodities have negative value, meaning that every price increase of commodity will lessen the number of requested commodity (the assumption of *ceteris paribus*). This is in accord with the characteristic of demand function that has the negative direction. The values of own price elasticities in all commodities and all study groups show the numbers which are smaller than one, it can be said that the percentage of quantity change of each commodity is smaller than the percentage of price change of the commodity. This shows that all commodities have inelastic characteristics. The food commodity, including vegetables, will tend to be inelastic because it only has a little satisfying substitution goods.

The value of the own price elasticity grouped according to area, income group and education level in Java Island can be seen in Table 3. The varied value of own price elasticity can be analyzed further by comparing the difference among groups. The commodities of spinach, red onion and red chili in the city area have the elasticity values which are higher than the rural area, it can be said that the demand of commodity is more elastic than the city area, compared to the rural area. This shows that the community respond in the city is higher in having the attitude toward the price change of commodity, compared the rural community. The demands of legume, onion and small and very pungent chili are more elastic in the rural area.

**Table 3.** Value of own price elasticity according to area, income group and education level in Java Island

	<b>Spinach</b>	<b>Legume</b>	<b>Red Onion</b>	<b>Garlic</b>	<b>Red Chili</b>	<b>Small, Very Pungent Chili</b>
Java Island	-0.688	-0.712	-0.834	-0.837	-0.770	-0.833
City Area	-0.717	-0.700	-0.836	-0.837	-0.807	-0.823
Rural Area	-0.651	-0.723	-0.834	-0.840	-0.704	-0.837
Income Group:						
Low	-0.675	-0.728	-0.835	-0.841	-0.713	-0.839
Middle	-0.694	-0.708	-0.846	-0.840	-0.796	-0.833
High	-0.716	-0.688	-0.833	-0.833	-0.813	-0.815
Education Level:						
Low	-0.663	-0.714	-0.833	-0.838	-0.738	-0.835
Middle	-0.713	-0.721	-0.843	-0.843	-0.796	-0.831
High	-0.726	-0.702	-0.840	-0.841	-0.811	-0.821

**Analysis on Cross Price Elasticity of Vegetables in Java Island**

The amount of demand reaction toward the price changes from other commodities can be seen from the value of cross price elasticity. All commodities have the negative value of cross price elasticity in Java Island, all income groups and all education levels. The negative value shows that the commodity is the complement commodity for other commodity.

The value of cross price elasticity of red onion and garlic shows the complement relation in almost all areas, income groups, and education levels. If compared to each province, so it is found out that the commodities of red onion and garlic in DI Yogyakarta have the positive value of cross price elasticity, this shows that there is a substitution relation.

The garlic commodity is the import commodity for the last couple years, so the possibility of the lacking of availability of the commodity in the market will influence the quantity requested by the household in DI Yogyakarta. The red onion commodity has a substitution relation to the price of garlic, i.e. of 0.020, this shows that the increase of garlic price causes the increase of red onion requested by the community in DI Yogyakarta. Likewise, the demand of garlic in the Province of DI Yogyakarta has the substitution relation toward the price of red onion, i.e. of 0.021, this shows that the increase of red onion price causes the increase of garlic requested by the community in DI Yogyakarta. Table 4 shows that there is a value difference in the Province of DI Yogyakarta.

**Table 4.** Value of cross price elasticity in DI Yogyakarta

<b>Price:</b>	<b>Spinach</b>	<b>Legume</b>	<b>Red Onion</b>	<b>Garlic</b>	<b>Red Chili</b>	<b>Small, Very Pungent Chili</b>
Spinach	-	-0.068	-0.038	-0.041	-0.036	-0.029
Legume	-0.072	-	-0.038	-0.041	-0.041	-0.033
Red Onion	-0.074	-0.068	-	0.021	-0.047	-0.032



Price:	Spinach	Legume	Red Onion	Garlic	Red Chili	Small, Very Pungent Chili
Garlic	-0.075	-0.070	0.020	-	-0.041	-0.030
Red Chili	-0.042	-0.045	-0.029	-0.026	-	-0.031
Small and Very Pungent Chili	-0.047	-0.051	-0.027	-0.027	-0.044	-

#### Analysis on Expenditure Elasticity of Vegetables in Java Island

The demand reaction of commodity toward the income is very important to know, although the proportion of vegetable expenditure is very small compared to the total expenditure of household. The expenditure elasticity can see what commodity which becomes the main need in the household. What conducted in the household usually occurs in the bigger community group. The expenditure elasticity for all commodities have positive value, meaning that all commodities are normal goods so every expenditure increase in the household will cause the increase in the number of commodity requested. In all groups of areas, provinces, expenditure groups and education levels, the expenditure elasticities have positive signs. This shows that all commodities of normal goods, where the increase of expenditure is the income approach, will increase the commodity requested.

The demands of spinach, legume, and red chili area elastic, this is seen from most of the elasticity values have values of more than one. The commodities of red onion, garlic and red chili have value of less than one, this shows that the commodity is inelastic and becomes the main need for household in Java Island. The numbers of commodities requested for red onion, garlic and red chili increase with the increase of income, but the proportion of increase is smaller than the proportion of income increase. The more detailed explanation can be seen in Table 5.

**Table 5.** Value of expenditure elasticity according to area, income group and education level in Java Island

	Spinach	Legume	Red Onion	Garlic	Red Chili	Small, Very Pungent Chili
Java Island	1.032	1.071	0.975	0.984	0.975	1.001
City Area	1.021	1.075	0.979	0.967	0.989	1.014
Rural Area	1.031	1.042	0.977	1.006	0.969	0.991
Income Group:						
Low	1.028	1.043	0.980	0.996	0.976	0.995
Middle	1.034	1.071	0.964	0.973	0.993	1.013
High	1.002	1.070	0.988	0.970	0.986	1.025
Education Level:						
Low	1.046	1.062	0.975	0.988	0.972	0.992
Middle	0.974	1.060	0.983	0.997	0.980	1.018
High	1.014	1.055	0.979	0.969	0.991	1.027

This study is aimed to have some information about the consumption level at the household level in Java Island; model of complete demand of vegetables in Java Island; and the impact of price change and income toward the change of vegetable consumption of household in Java Island. It has been found that the higher number of household's member and the household's income, the lower

proportion of commodity expenditure toward the vegetable expenditure in Java Island. The own price elasticities for six vegetables are valued to be negative, meaning that every price increase of commodity will decrease the number of vegetable requested. It is also known that the demand of six vegetables is inelastic, where the value of own price elasticity which is less than one. All cross price elasticities is almost having negative value, which indicates that the commodity is the complement commodity or the complement for another commodity. The commodities of red onion and garlic have the substitution relation only in the Province of DI Yogyakarta. The expenditure elasticity for six vegetables of positive value, which means all commodities are normal goods. The expenditure elasticity for the commodities of red onion, garlic, and red chili has less than one, indicating the commodity to become the main need for the household in Java Island. Furthermore, the demands of spinach, red onion and red chili of community in the city area are more responsive toward the price compared with the community in the rural area. On the contrary, for the demand for the commodities of legume, garlic and small and very pungent chili, the community in the rural area is more responsive toward the price compared with the community in the city area.

### **CONCLUSIONS AND SUGGESTIONS**

Based on previous analysis, this study found that the higher number of household's member and the household's income, the lower proportion of commodity expenditure toward the vegetable expenditure in Java Island. AIDS model show that the own price elasticity for six vegetables which are valued to be negative, meaning that every price increase of commodity will decrease the number of vegetable requested. The demand of six vegetables is inelastic shown from the value of own price elasticity which is less than one.

Moreover the cross price elasticity is almost having negative value, which indicates that the commodity is the complement commodity or the complement for another commodity. The commodities of red onion and garlic have the substitution relation only in the Province of DI Yogyakarta. The expenditure elasticity for six vegetables of positive value, which means all commodities are normal goods. The expenditure elasticity for the commodities of red onion, garlic, and red chili has less than one, indicating the commodity to become the main need for the household in Java Island.

The demands of spinach, red onion and red chili of the communities in the city area are more responsive toward the price compared with the communities in the rural areas. On the contrary, for the demand for legume, garlic and small and very pungent chili, the communities in the rural areas are more responsive towards the price compared with the communities in the city area.

The following suggestions are given:

1. The Government of Indonesia needs to increase the vegetable consumption by forcing the socialization program and improving the distribution and provision of vegetables throughout the area.
2. The comparison between the models by using the non-linear estimation and the linear estimation need to be applied for the next study.

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