

DETERMINANTS OF HOUSEHOLD FOOD SECURITY: A COMPARATIVE ANALYSIS OF EASTERN AND WESTERN INDONESIA

Determinan Ketahanan Pangan Rumah Tangga: Analisis Perbandingan Indonesia Timur dan Barat

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ABSTRACT

Indonesian Food Security Council in 2009 issued a Food Security and Vulnerability Atlas (FSVA) which stated that there were 100 districts in Indonesia which were most vulnerable to food insecurity and 79% of which were located in eastern region. By using Susenas regular data in 2008, this study aimed to analyze determinants of household food security in eastern compared to western region. The ordered logistic regression model was employed to investigate the determinants of household food security. The result showed that most of households in Indonesia were vulnerable to food insecurity (41.76%). The percentage in eastern region (48.56%) was higher than that in western region (41.76%). Increase in expenditure equivalent, age and education level of household head, female household head, small household size, household head's occupation in non-agriculture and urban household would increase the probability of a household to become food secure in both regions. The difference was in the factor of access to electricity in eastern and access to safe drinking water and loan in western region. Policies which aim to increase education, credit access, and intensive family planning have big roles in improving household food security.

[**Keywords:** Food security, household, Eastern Indonesia, Western Indonesia, ordered logistic]

ABSTRAK

Dewan Ketahanan Pangan Indonesia pada tahun 2009 mempublikasikan Atlas Ketahanan dan Kerentanan Pangan yang menyatakan bahwa terdapat 100 kabupaten di Indonesia yang sangat rentan terhadap kerawanan pangan dan 79% di antaranya berada di kawasan timur. Dengan menggunakan data Susenas reguler tahun 2008, penelitian ini menganalisis determinan ketahanan pangan rumah tangga di kawasan timur untuk dibandingkan dengan yang berada di kawasan barat. Regresi logistik ordinal digunakan untuk mengetahui determinan ketahanan pangan rumah tangga. Hasil analisis menunjukkan bahwa mayoritas rumah tangga di Indonesia rentan terhadap kerawanan pangan (41,76%). Persentase di kawasan timur lebih tinggi (48,56%) daripada di kawasan barat (41,76%). Peningkatan pengeluaran ekuivalen rumah tangga, peningkatan usia dan level pendidikan kepala rumah tangga, jumlah anggota

rumah tangga kecil, pekerjaan kepala rumah tangga di sektor non-pertanian, kepala rumah tangga perempuan, dan lokasi rumah tangga di perkotaan meningkatkan peluang rumah tangga menjadi tahan pangan baik di kawasan timur maupun di kawasan barat. Perbedaannya terdapat pada faktor akses terhadap listrik di kawasan timur serta akses terhadap air bersih dan kredit di kawasan barat. Kebijakan yang bertujuan untuk meningkatkan pendidikan, akses kredit, dan perencanaan keluarga berencana memiliki peran yang besar dalam meningkatkan ketahanan pangan rumah tangga.

[**Kata kunci:** Ketahanan pangan, rumah tangga, kawasan timur Indonesia, kawasan barat Indonesia, logistik ordinal]

INTRODUCTION

Food insecurity and food vulnerability are two big issues being faced by Indonesia. Food security itself has been becoming the focus of national development since post-independence in 1952 until now. Unfortunately, the food policies applied in Indonesia are more emphasized on self-sufficiency in rice production as the main staple food. This policy led the government tried to keep the prices of this commodity remain low and affordable by all the population since the colonial period (Mears Moeljono 1981 in Prabowo 2010). In 1979 until 1989, the national strategy had been changed from self-sufficiency in rice production into self-sufficiency in food production followed by the achievement of rice self-sufficiency in 1984. However, this achievement did not last long. In the reform era after 2000, the strategy of self-sufficiency in rice production was still being done. In 2004 achievement in increasing food production showed encouraging results, but the result has not been able to gain a national food security (Lassa 2005).

In 2009, Indonesian Food Security Council issued a Food Security and Vulnerability Atlas (FSVA) which stated that there were 100 districts in Indonesia

which were most vulnerable to food insecurity based on the composite food security index. Of the 100 districts, 79 of which (79%) are located in Eastern Indonesia (DKP WFP 2009). This condition shows that the implemented food security policy in Indonesia which emphasizes mostly on rice production is not able to tackle the problems of availability, accessibility, utilization and stability of food security. Therefore, handling the problem of food vulnerability and food insecurity in Indonesia must simultaneously involve all factors including food availability, food accessibility, food utilization and food stability.

According to the definition of food security by Indonesian Food Law No.7 in 1996, food security is defined as a condition in which food is fulfilled in each household, reflected by sufficient food supply both in terms of its amount and quality, safety, equality and affordability. Therefore, it is highly important to analyze food security in household level since analysis in district or regional level will not automatically guarantee food security in household level. Based on the above description, this study aimed to analyze determinants of household food security in Eastern Indonesia for then compared to those in Western Indonesia to get more information on the cause of food vulnerability and food insecurity in both regions for deciding the proper policy implications. According to Indonesian Presidential Decree No. 44 in 2002 about Development Board in Eastern Indonesia, the provinces in Eastern Indonesia cover West Nusa Tenggara, East Nusa Tenggara, West Kalimantan, Central Kalimantan, South Kalimantan, East Kalimantan, North Sulawesi, Central Sulawesi, South Sulawesi, Southeast Sulawesi, Gorontalo, West Sulawesi, Maluku, North Maluku, Papua and West Papua, while in Western Indonesia there are Nanggroe Aceh Darussalam, North Sumatra, West Sumatra, Riau, Jambi, South Sumatra, Bengkulu, Lampung, Bangka Belitung Islands, Riau Islands, DKI Jakarta, West Java, Central Java, Yogyakarta, East Java, Banten and Bali (Bappenas 2009).

MATERIALS AND METHODS

Framework

The widely accepted definition of food security is a situation when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life through four pillars of food security including food availability, food accessibility, food utilization and food

stability. Food availability is a condition when sufficient quantities and qualities of food are available. Food accessibility is a resource needed to obtain sufficient quantity and quality of food. Food utilization is the way to use and process food through adequate diet, clean water, sanitation and health care to meet a state of nutritional well-being. Food stability is a condition to ensure a population, households or individual have access to sufficient quantity and quality of food at all times, which is not susceptible to shocks including economic, climate related crisis or cyclical patterns (FAO 2007; Carletto 2013). To overcome the problem of food security, full attention must be given to the four pillars above (Capone *et al.* 2014). There is previous study done by Rachmaningsih (2012) to analyse food security in Eastern Indonesia, however food security in regional level is not guarantee food security in household level.

In this study, the factors in the pillars of food availability which are predicted affecting food security of household are food aid and per adult-equivalent household expenditure (FAO 2006; Headey and Ecker 2012). In the pillar of food accessibility, the factors of per adult-equivalent expenditure, education of household head, age of household head, main occupation of household head and household location are the factors that are predicted affecting household access to food (Omotesho *et al.* 2006; Bogale and Shimelis 2009; Nurlatifah 2011; Sihite 2011; Capone *et al.* 2013). In the pillar of food utilization, household location and access to safe drinking water and electricity are predicted affecting household utilization of food (Khan and Gill 2009). Finally, in the pillar of food stability, family size and access to loan are predicted as the factors affecting stability of household food security (Maxwell 1996; Obamiro *et al.* 2003 in Olayemi 2012).

A household can be classified into four degrees of food security including food security, food vulnerability, lack of consumption and food insecurity according to Jonsson and Toole (1991) as cited in Maxwell *et al.* (2000). The categories are based on calorie availability and share of food expenditure of a household (Table 1).

Indicators Used to Measure Household Food Security

Per Adult-Equivalent Calorie Availability

Calorie availability shows the amount of calories consumed by a person a day. This indicator is useful when price information is unavailable by plotting

Table 1. Cross classification of food security.

Percentage of calorie availability	Share of food expenditure	
	Low ($< 60\%$ of total expenditure)	High ($\geq 60\%$ of total expenditure)
Adequate ($> 80\%$ of calories of reference adult)	Food secure (1 st category)	Vulnerable (2 nd category)
Inadequate ($\leq 80\%$ of calories of reference adult)	Lack of consumption (3 rd category)	Food insecure (4 th category)

Source: Jonsson and Toole in Maxwell *et al.* (2000)

expenditure per capita or per adult-equivalent against food consumption (in calories per person per day) to determine expenditure level at which a household acquires enough food (Haughton and Khandker 2009). In this study, per adult-equivalent scale is used to consider the composition of each family such as gender and age (Lewbel 1989, 2006; Claro *et al.* 2010; Jorgenson and Slesnick 2012). The formula used to calculate adult-equivalent calorie availability in Claro *et al.* (2010) is written as follows:

$$\frac{\text{Total calorie intake per day in a household (kcal day}^{-1}\text{)}}{\text{Total adult equivalent factors}} \dots\dots\dots(1)$$

$$\frac{\text{Total adult equivalent factors = Calorie requirements for each age group and gender (kcal day}^{-1}\text{)}}{\text{Calorie of reference adult (kg day}^{-1}\text{)}} \dots\dots\dots(2)$$

Where:
 Calorie of reference adult = average calories per adult-equivalent of women and men from 19 to 50 years of age.
 Calorie requirements for each age group and gender = minimum calorie intake by age and gender (Table 2).

Per Adult-Equivalent Share of Food Expenditure

The share of food expenditure is simply showed by the ratio of food expenditure to total expenditure in a household for a month. This is based on the study held by Ernest Engel in 1857 (Fernando 2011). In this

Table 2. Minimum calorie intake by age and gender in Indonesia, 2004.

Age group/gender	Age	Calorie intake (kcal day ⁻¹)
Children	< 1	550
	1-3	1000
	4-6	1550
	7-9	1800
Men	10-12	2050
	13-15	2400
	16-18	2600
	19-29	2550
	30-49	2350
	50-59	2250
	≥ 60	2050
Women	10-12	2050
	13-15	2350
	16-18	2200
	19-29	1900
	30-49	1800
	50-59	1750
	≥ 60	1600

Source: Hardiansyah *et al.* (2010).

study, per adult-equivalent share of food expenditure is used to consider different consumption needs of different ages and gender. To calculate the scale, World Bank method of adult-equivalent scale is used by the formulation as follows:

$$\text{Adult-equivalent scale} = N_{\text{adults}} + (N_{\text{children}} \times 0.5) \dots\dots (3)$$

Where:
 N_{adults} = number of adults and N_{children} = number of children under 15 years.

Finally, the formulation used to calculate per adult-equivalent share of expenditure is:

$$\frac{\text{Per adult-equivalent food expenditure (Rp person}^{-1}\text{) = Spending on food expenditure (Rp month}^{-1}\text{)}}{\text{Adult-equivalent scale}} \dots\dots\dots (4)$$

Type and Data Source

This study only used secondary data from regular Susenas data (National Socio Economic Survey). This survey was conducted by the Indonesian Central Statistics Bureau (BPS) since 1963. There are two kinds of Susenas data available in Indonesia. First is

Susenas panel data which are collected every year and since 2011 it has been collected every three months. Second is Susenas regular data which are collected every three years. Susenas regular data cover three moduls which are published separately. From the three years, in the first year a survey was done on the modules of consumption and expenditure, in the second year a survey was done on the modules of household welfare, social culture, travel and criminality, and in the third year, a survey was done on the modules of health, nutrition, education and housing. Besides, annually BPS do a survey to give basic information about the household and household members. This kind of data is covered in Susenas kor.

The data used in this study were Susenas module of consumption and expenditure which were collected in July 2008 and Susenas kor 2008. Both data cover 285,904 households from Eastern and Western region. The consumption module covers food consumption from 14 food groups and 215 food items, while food consumption expenditure includes the total consumption expenditure over the past week both derived from the purchase (cash or non-cash) and own production and delivery (BPS-SIRUSA 2008).

The sampling method was done by using probability proportional to size to determine census block from Susenas listing 2008 which contains all households in Indonesia. If a cencus block contains more than 150 households, the cencus block was then divided into sub-cencus blocks. From these cencus blocks and sub-cencus blocks, 16 households were chosen systematically. Data processing was done by using SPSS 18.

Data Analysis

Data analysis in this study used ordered logistic regression as the degree of household food security as dependent variable was arranged in ordinal outcomes. The model for dependent variable was derived from a latent variable model which is determined by:

$$y_i^* = x_i + e_i \quad e_i | x_i \sim \text{Normal}(0,1) \dots \dots \dots (5)$$

The model for k independent variables with P-1 levels of dependent variables is written as follows:

$$\text{Ln} \left(\frac{\sum \text{pr}(Y \leq j | x)}{1 - \sum \text{pr}(Y \leq j | x)} \right) = \alpha_j + \beta_i X_{i,1}$$

$$i = 1 \dots k, j = 1, 2, \dots, p-1 \dots \dots \dots (6)$$

Where:

- y_j = threshold
- β_i = parameter
- $X_{i,1}$ = sets of factors or predictors

The ordinal categories (y_i) in this study were food insecure (1), lack of consumption (2), food vulnerable (3), and food secure (4) with the model as follows:

$$y_i = \beta_0 + \beta_1 \logexp_i + \beta_2 Raskin_i + \beta_3 hhgender_i + \beta_4 hhage_i + \beta_5 hhedu_i + \beta_6 hhoccup_i + \beta_7 rural_i + \beta_8 size_i + \beta_9 water_i + \beta_{10} electric_i + \beta_{11} loan_i + e_i \dots \dots \dots (7)$$

Where *logexp* refers to expenditure equivalent (percent day⁻¹), *raskin* refers to access to food aid (1= receiver, 0 = non-receiver), *hhgender* refers to gender of household head (1 = female, 0 = male), *hhage* refers to age of household head (1 = <18 years or adolescence, 2 = 18-40 years or early adulthood, 3 = 40-60 years or middle adulthood and 4 = >60 years or aging), *hhedu* refers to level of education of household head (1 = no schooling/did not complete, 2 = 6 years of schooling, 3 = 9 years of schooling, 4 = 12 years of schooling, 5 = college), *hhoccup* refers to main occupation of household head (1 = agriculture, 0 = non-agriculture), *rural* refers to household location (1 = urban, 0 = rural), *size* refers to family size (1 = ≤ 4 people, 2 = 5-7 people, 3 = ≥ 7 people), *water* refers to access to safe drinking water (1 = access, 0 = not access), *electric* refers to access to electricity (1 = access, 0 = not access), *loan* refers to access to credit (1 = access, 0 = not access) and *i* refers to 1,2,3...n households.

RESULTS AND DISCUSSION

Food Security Indicators in Eastern and Western Indonesia

Per Adult-Equivalent Calorie Availability

Results from adult-equivalent scale determined calorie of reference adult from the mean calorie intake of women and men from 19 to 50 years of age by 2127.833 kcal person⁻¹ day⁻¹. From this result, the average Indonesian household calorie consumption per adult-equivalence was equal to 2327.031 kcal person⁻¹ day⁻¹ while in Eastern Indonesia was 2354.782 kcal person⁻¹ day⁻¹ and in Western Indonesia was 2310.838 kcal person⁻¹ day⁻¹. A problem comes out when the data contain outliers. To overcome this problem, per adult-equivalent calorie availability was counted in

log distribution. The components of log calorie availability which were more and less than the three standard deviations of the mean (99.7% of the data) were eliminated and considered as outliers. This reduced the data set into 279,207 households (Fig. 1).

The province with the highest number of households with per adult-equivalent calorie intake below the reference adult on average was East Java, then followed by Central Java and West Java. All of those provinces are in Western Indonesia. There was South Sulawesi in Eastern Indonesia, however the number

of households was still no more than a half of that in East Java (Fig. 2).

When the number of households was compared with the total households in each provinces, the province with the highest percentage of households below the reference calorie were those in Eastern region, including North Maluku, Southeast Sulawesi, Central Kalimantan, Gorontalo, West Sulawesi and Papua. In Western region, Bangka Belitung Islands had the highest percentage. East Java had only 16% of total number of households of 10.121.200. The

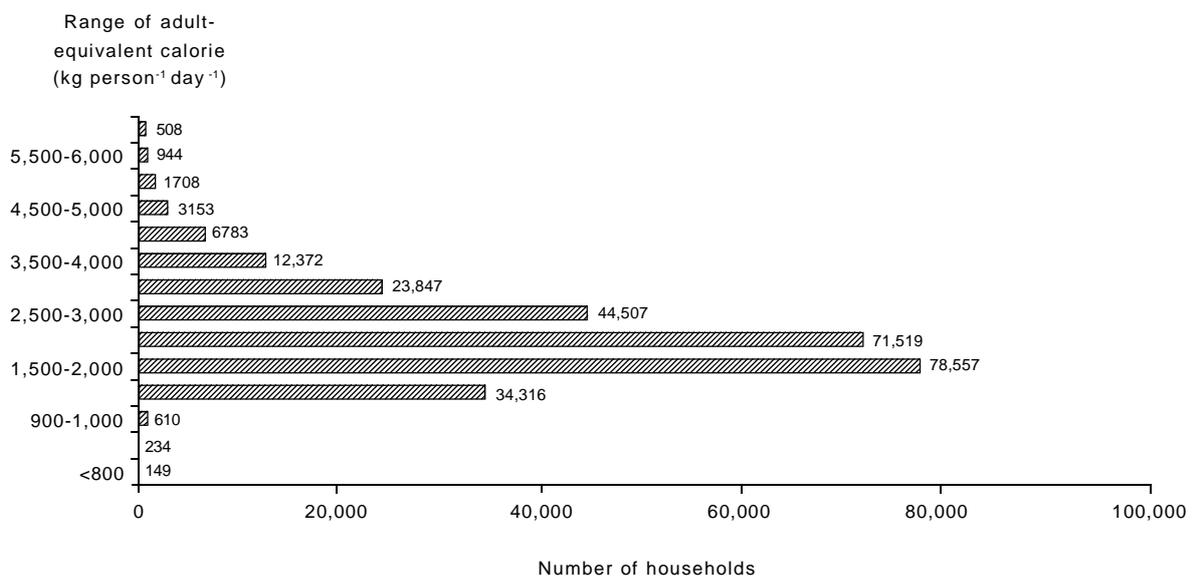


Fig. 1. Distribution of calorie availability per adult-equivalence in Indonesia.

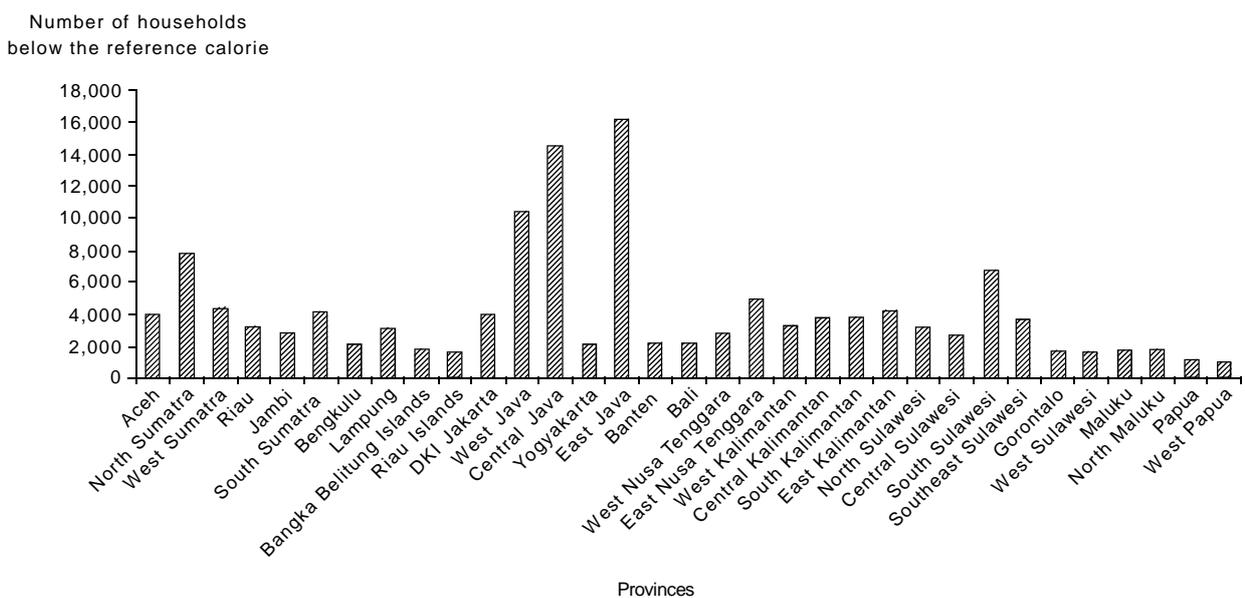


Fig 2. Number of households below the reference calorie from 33 provinces in Indonesia.

same was shown in Central Java which had only 17% and West Java which had only 10%. Those small percentages are due to the high number of households in those provinces (Fig. 3).

The average percentages of calorie availabilities in both regions were above 60%. This indicates that the average households in Indonesia already met the standards of adequacy of calories according to Jonsson and Toole (Table 3).

Per Adult-Equivalent Share of Expenditure

Distributions of per adult-equivalent expenditure shows that as the range number of per adult-equivalent household expenditure increased, the number of households with that amount of expenditures decreased. The biggest number of households in Indonesia was in the range of per adult-equivalent of less than IDR500,000 month⁻¹ (Fig. 4).

As Engle Law stated that when a person’s income increases, the percentage of expenditure spent on food items decreases while the percentage of expenditure spent on non-food items increases (Table 4). For example, in Eastern Indonesia for the lowest quartile of household expenditure, the average share of food expenditure spent by a household on average was 67.132%, for the second quartile was 64.767%, for the third quartile was 61.776% and for the fourth quartile was 55.943%. On the side of non-food items, the average share of food expenditure from the lowest

quartile of household expenditure was 32.867%, for the second quartile was 35.232%, for the third quartile was 38.223% and for the fourth quartile was 44.056%.

In Eastern Indonesia there were only two provinces those are Bali and East Kalimantan with per adult-equivalent share of food expenditure less than 60%, while in Western Indonesia there were six provinces those are Riau Islands, Bangka Belitung Islands, DKI Jakarta, Central Java, Yogyakarta and Banten. The

Table 3. Three-standard error bands for calorie availability per adult-equivalent based on the log distribution of calorie available per person (percent).

Calorie per adult-equivalence	Observation	Mean ¹⁾	Std.Dev	Min.	Max.
Indonesia ²⁾	279,207	109.361	39.146	35.254	301.262
Rural	178,501	110.563	39.813	35.254	301.262
Urban	100,706	107.230	37.840	35.306	301.080
Eastern ³⁾	102,885	110.665	41.358	35.254	301.262
Rural	76,060	110.312	41.371	35.254	301.262
Urban	26,825	111.667	41.306	35.306	301.048
Western ⁴⁾	176,322	108.600	37.774	35.285	301.209
Rural	102,441	110.750	38.615	35.285	301.209
Urban	73,881	105.620	36.367	36.206	301.080

¹⁾Two-sample t test share calorie between regions; t statistic = -13.4519; p-value = 0.0000

²⁾t statistic = -21.6201; p-value = 0.0000

³⁾t-statistic = 4.6121; p-value = 0.0000

⁴⁾t statistic = -28.1982; p-value = 0.0000

Households below the reference calorie (%)

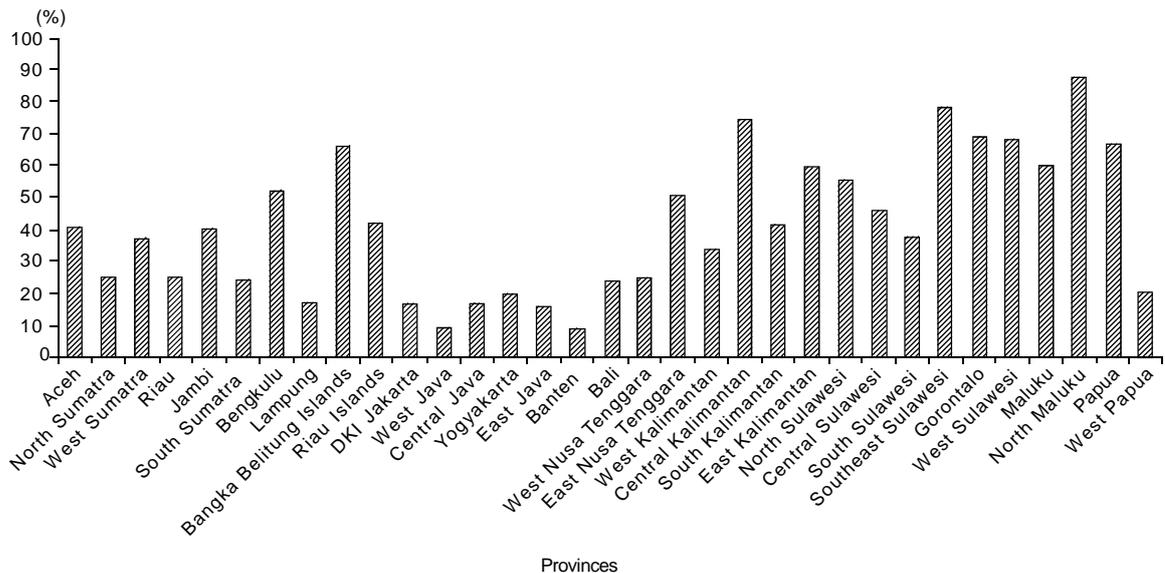


Fig. 3. Percentage of households below the reference calorie from 33 provinces in Indonesia.

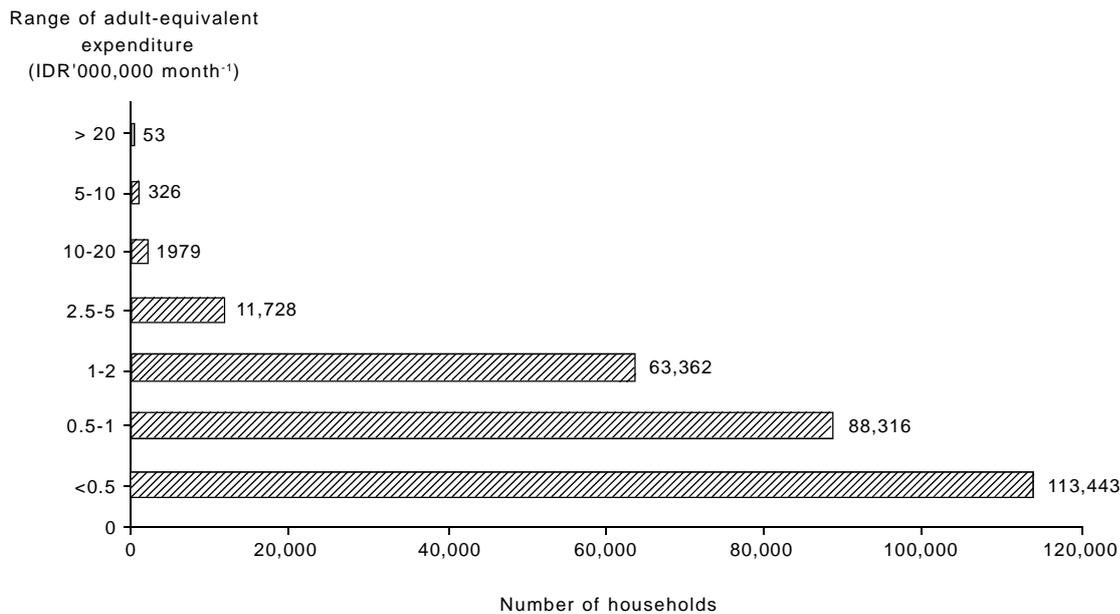


Fig. 4. Distribution of per adult-equivalent household expenditure in Indonesia.

Table 4. Average share of food and non-food expenditure per adult-equivalence by expenditure quartiles and food groups in Indonesia.

Expenditure	Mean (Rp month ⁻¹) ¹⁾	Expenditure quartiles ²⁾ (%)			
		1	2	3	4
Indonesia	895,019.90				
Eastern	846,316.40				
Food	487,275.90	67.132	64.767	61.776	55.943
Non-food	359,040.60	32.867	35.232	38.223	44.056
Western	923,438.60				
Food	491,353.30	64.427	61.794	58.783	52.405
Non-food	432,085.30	35.572	38.205	41.216	47.594

¹⁾Two-sample t test between region

²⁾One-way ANOVA between expenditure quartiles, all p-value = 0.0000.

province with the highest number of households with share of food expenditure more or equal than 60% and less than 60% was East Java (Fig. 5).

Determinants of Household Food Security in Eastern and Western Indonesia

First, test was done by including regions variable into the model to see the effect of different regions to household food security. Results obtained showed that the variables of region, expenditure equivalent, gender of household head, age of household head, household location, education of household head, household size, main occupation of household head,

access to safe drinking water, access to electricity and access to loan were all significant as determinants of household food security in Indonesia (Table 5). Model evaluation was done by looking at likelihood ratio test in G statistics. The G value was 23,442.230 with p-value of 0.000, means null hypothesis is rejected, the model is fit and at least there is one variable that can describe household food security.

Correct Classification Rate (CCR) shows how precise the model can predict the degree of household food security. In this study, CCR was equal to 0.691. This shows that the accuracy of the model to predict food security degree of households was 69.1%.

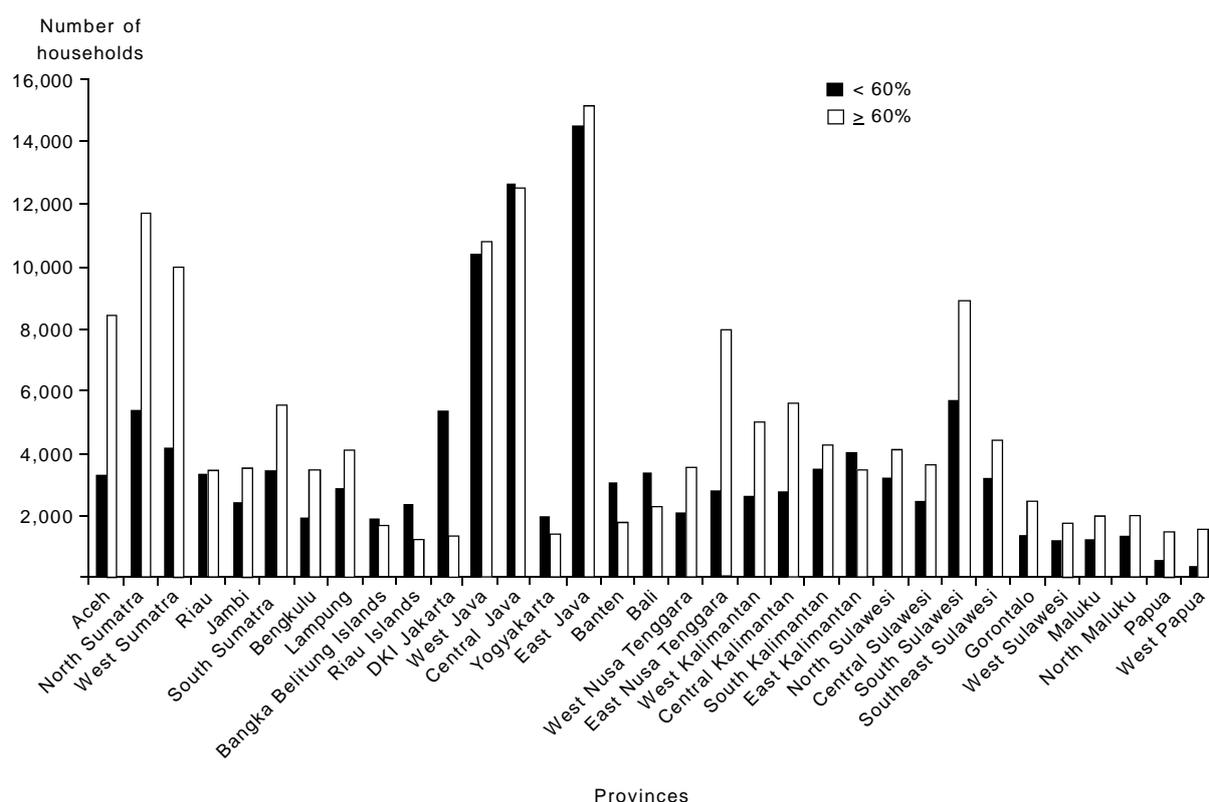


Fig. 5. Distribution of per adult-equivalent share of food expenditure in Indonesia.

Table 5. Determinants of household food security in Indonesia.

Independent variables	Coefficients	P-value	Odds ratio	G statistics	Correct classification rate (CCR)
Region	0.163	0.000***	1.177	23,442.230	0.691
Log expenditure equivalent	0.483	0.000***	1.621		
Raskin (food aid)	-0.003	-0.749	0.997	P-value =	
Gender of household head	-0.400	0.000***	0.670	0.000	
Age of household head					
18-40 years (early adulthood)	-0.246	0.005**	0.782		
40-60 years (middle adulthood)	-0.044	0.616	0.957		
More than 60 years (aging)	0.061	0.488	1.062		
Education of household head					
6 years of schooling	-0.345	0.000***	0.708		
9 years of schooling	-0.455	0.000***	0.635		
12 years of schooling	-0.929	0.000***	0.395		
College	-1.210	0.000***	0.298		
Main occupation of household head	0.224	0.000***	1.252		
Household location	-0.128	0.000***	0.880		
Household size					
5-7 people	-0.371	0.000***	0.690		
More than 7 people	-0.754	0.000***	0.470		
Access to safe drinking water	0.091	0.000***	1.095		
Access to electricity	0.108	0.000***	1.115		
Access to loan	0.065	0.000***	1.067		
Constant	-6.035	0.000***	0.002		
N	254,977				

, * Significant at 5% and 1%, respectively

Region significantly affects household food security in Indonesia. The odds ratio value of 1.177 indicates that probability of Western region to be household food secure was 1.177 times higher than probability of Eastern region to be household food secure.

Second, separate analyses on Eastern and Western region show that the factors of household expenditure equivalent, gender, education, main occupation of household head, age of household head, household location, household size and access to electricity significantly affected household food security in the Eastern region (Table 6). In Western region, the factors were quite the same. The differences were in the factor of access to electricity which was not significant in Western region (Table 7) and the factors of access to safe drinking water and access to loan which were significant as determinants of household food security in Western Indonesia.

The coefficient of expenditure equivalent had a positive sign. It means that increase in household expenditure increases the predicted probability of household to be food secure. Odds ratio of 1.297 in Eastern and 1.376 in Western region show that 1% increase in household expenditure would increase probability of households to be food secure by 1.297 times than probability to be food insecure in Eastern

region and 1.376 times in Western region. The probability was a bit higher in Western region.

Increase in education level of household head would increase probability of household to be food secure in both regions. The probability was higher in Western region for the level of 6 years of schooling, 9 years of schooling, and college. In the level of 12 years of schooling, the probability was the same. This is in accordance with the study done by Nurlatifah (2011).

The same direction was also applied on the variable of age of household head. Increase in age of household head would increase probability of household to be food secure in both regions. The probability in this variable was higher in the Eastern region. Household heads with the age of more than 60 years were more food secure than the young people. This is in accordance with the study done by Bogale and Shimelis (2009) and Nurlatifah (2011).

Household location in rural areas decreased probability of household to be food secure in both regions. The probability was a bit higher in Eastern region. The average food expenditure in rural areas was IDR296,662.8 month⁻¹ which was lower than that in urban areas of IDR433,146.1 month⁻¹. Since most of the observed households in Eastern Indonesia live in rural areas (74.64%) then it leads to the problem of

Table 6. Determinants of household food security in Eastern Indonesia.

Independent variables	Coefficients	P-value	Odds ratio	G statistics	Correct classification rate (CCR)
Log expenditure equivalent	0.260	0.000***	1.297	3,962,519	0.5061
<i>Raskin</i> (food aid)	0.014	0.266	1.014	P-value =	
Gender of household head	0.318	0.000***	1.374	0.000	
Age of household head					
Less than 18 years (adolescence)	-0.164	0.158	0.849		
18-40 years (early adulthood)	-0.158	0.000***	0.854		
40-60 years (middle adulthood)	-0.135	0.000***	0.874		
Education of household head					
6 years of schooling	0.105	0.000***	1.111		
9 years of schooling	0.407	0.000***	1.502		
12 years of schooling	0.512	0.000***	1.669		
College	0.862	0.000***	2.368		
Main occupation of household head	-0.183	0.000***	0.833		
Household location	0.042	0.004***	1.043		
Household size					
Less than 4 people					
5-7 people					
Access to safe drinking water	0.001	0.957	0.999		
Access to electricity	0.062	0.000***	0.940		
Access to loan	0.030	0.175	0.970		
N	254,977				

*** Significant at 1%, respectively

Table 7. Determinants of household food security in Western Indonesia.

Independent variables	Coefficients	P-value	Odds ratio	G statistics	Correct classification rate (CCR)
Log expenditure equivalent	0.319	0.000***	1.376	7,321,375	0.5067
<i>Raskin</i> (food aid)	0.015	0.121	1.015	P-value =	
Gender of household head	0.279	0.000***	1.322	0.000	
Age of household head					
Less than 18 years (adolescence)	-0.214	0.032**	0.807		
18-40 years (early adulthood)	-0.187	0.000***	0.829		
40-60 years (middle adulthood)	-0.139	0.000***	0.870		
Education of household head					
6 years of schooling	0.127	0.000***	1.135		
9 years of schooling	0.421	0.000***	1.523		
12 years of schooling	0.512	0.000***	1.669		
College	0.889	0.000***	2.433		
Main occupation of household head	-0.048	0.000***	0.953		
Household location	0.035	0.000**	1.036		
Household size					
Less than 4 people	0.631	0.000***	1.879		
5-7 people	0.369	0.000***	1.446		
Access to safe drinking water	0.027	0.020**	0.973		
Access to electricity	0.024	0.195	0.976		
Access to loan	0.061	0.000***	0.941		

** , *** Significant at 5% and 1%, respectively

food accessibility. Besides, according to Haughton and Khandker (2009), rural households generally can obtain food cheaper because food is typically less expensive in rural areas, but because the problem of income, people in rural areas are more willing to consume foodstuffs which are cheaper per calorie such as cassava rather than rice.

Occupation of household head in agriculture decreased probability of household to be food secure in both regions. The probability was higher in the Western region. The activities in agriculture include farming, hunting, fishing and forestry. This finding is in accordance with the study by Omotesho *et al.* (2010) and Zurayk (2010) which showed that working in agriculture decreased probability of households to be food secure. This is due to the landless and small farming activity. According to Indonesian farmers union (SPI), in Indonesia 70% of population live in rural areas with main occupation in agriculture (IFAD 2011). From the data in this study, 76.34% of households worked in agriculture while only 23.66% of households worked in non-agriculture. Results of the last Agricultural Census in 2003 shows that the number of small farming families reached 13.7 million and projected to be 15.6 million in 2008. Suppose each household had three children, the number of poors amounted to 78 million people (SPI 2010). This number is almost 50% of total population. Female

household head increased probability of household to be food secure. This is in accordance with the study done by Ibnouf (2009) which stated that women are more likely to be more rationale compared to men in terms of decision making for allocation of relatively scarce resources (income and food) to maximize the utility of their household. Besides, they also played a role in food preparation, food processing and food provisioning which enhanced their household nutrition status.

Access to electricity increased probability of household to be food secure in Eastern region. This is because household can consume more type of food and save food from perish through electric refrigerator as stated by Khan and Gill (2009). Access to loan increased probability of household to be food secure in Western Indonesia. There were 14,856 households accessing at least one of the five types of loan including *Program Nasional Pemberdayaan Masyarakat (PNPM) Mandiri* as one of the government program to reduce poverty through community empowerment, *Kredit Usaha Rakyat (KUR)* which is given to small enterprises in agriculture, fishery, industry, forestry and financial services, loan from bank, cooperative, and individual loan. The largest number of households with access to those types of loan came from those whom per adult-equivalent household expenditure of less than IDR2,500,000 per

month. This shows that loan is effective as one of factors to increase the probability of households to be food secure.

Access to safe drinking water increased probability of household to be food secure in Western region. This is in accordance with the study done by Khan and Gill (2009) which stated that access to safe drinking water affects utilization of food.

Small household size increased probability of household to be food secure in both regions. The probability was higher in the Western region. This is in accordance with the study done by Obamiro *et al.* (2003) and Olayemi (2012).

CONCLUSION AND POLICY IMPLICATION

On the average, the calorie availabilities of households in Eastern and Western Indonesia have been already more than the requirements to be food secure (more than 80%). However, the share of food expenditure is also still more than 60% lead to the food vulnerable households. The households with this characteristic are susceptible to the shocks. The problem of food vulnerability is not only applied in Eastern Indonesia, but also in Western Indonesia.

The factors of expenditure equivalent, gender of household head, age of household head, education of household head, main occupation of household head, household location and household size are all significant determinants of household food security in Eastern and Western Indonesia. The difference is in the factors of access to electricity which is not significant in Eastern Indonesia and access to loan and safe drinking water which are only significant in Western Indonesia.

Policies which aim to increase education to children and improve knowledge and skill of adult through providing them with some training or field school and encouraging the more intensive family planning for the future (next generation) have big role in improving household food security. So does to increase household access to loans which can be used in productive activities to generate incomes.

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