ANALYSIS OF FOOD DEMAND IN INDONESIA

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Abstract

This paper is at analyzing food demand system in Indonesia using the 1990's National Socio-Economic Survey (SUSENAS) data. Using an Almost Ideal Demand System (AIDS), the food demand parameter sand elasticities were estimated both in aggregated and disaggregated levels, that is an urban-rural and house hold's income disaggregation, respectively. There sults show that during the 1987-1990 period, the share of food expenditure in general has been declining relative to non-food, in cating an increasing welfare of the society. Never the less, the increase in welfare appears to have been joyed by urban citizens than those living in the rural areas. This conclusion is so supported by the fact that the expenditure shares on protein-food (fish, meat, eggs, milk, and legumes) in urban areas are higher than those in the rural area. The analysis found that : (1) The price demand elasticity for a number of food groups, including cereals and tuber, tend to decline as income increasing, (2) The income elasticity of demand for cereals is low eras income levels get higher, and the opposite is true for the protein-sources of food. There are difficulties of this analysis is there for confirm that increasing income of the society will go along with the promotion of food diversification in consumption.

Key words: Food, Demand, Analyisis

INTRODUCTION

One of the very basic needs for humans is foodFood is a source of energy needed by humans to sustain life. Therefore, it is natural that in many countries the government pays considerable attention to issues related to food, both from the supply and demand side. Issues related to the supply aspect and often receive major attention include price levels, production, food availability and distribution to consumers. Meanwhile, from the demand side, various aspects that are used as indicators by decision makers include the level of consumer income, the level of food prices and the consumer's response to the food demand if there is a change in the level of income and or changes in the price of the food.

Food problems in Indonesia are very relevant to be studied, this is consideringthat the share of food expenditure to total household expenditure in 1990 was still quite high at around 67 percent and 51% for rural and urban households, respectively (Central Bureau of Statistics, 1990). For comparison, the share of household food expenditure in the United States and Japan in 1975 was 12.76 percent and 22.28 percent, respectively (Theil and Clements, 1987 datum Pakpahan, A. et al., 1993).

With the background as described above, some interesting things to study include how is the allocation of the share of food expenditure distributed among various food groups consumed by households? Are there differences in the distribution of the share of food expenditure for households in rural and urban areas and how does it work for households with different income levels? If there is a change in prices and household income levels, how

will household demand respond to the food consumed? Are there differences in these responses between households in rural and urban areas and between different income classes?

RESEARCH METHOD

Scope of Analysis

In accordance with the research objectives, the analysis is aimed at calculating the share of food expenditure, the food demand system, the elasticity of demand, as well as the income elasticity of each food group (details of the grouping of types of food are presented in Appendix Table I). The analysis was carried out for households in aggregate (national), rural areas, urban areas and according to income class, namely low, medium, and high income classes. Many analyzes of this kind have been carried out (Kuntjoro, 1984; Daud, 1986; Rachmat and Erwidodo 1993). However, previous studies used SUSENAS data before 1990 and/or analyzed more aggregated food groups or for certain types of commodities.

Analysis Method

The calculation of the share of expenditure for each food group is calculated against the total expenditure on food. World Bank criteria are used to classify households into three income classes based on their distribution. After ranking, the low income household group is the lowest 40 percent of the income sample, the high income group is the highest 20 percent income group and the rest of them are the middle income class. In the analysis, the level of income is proxied by the level of household expenditure.

To estimate the food demand system, the elasticity of demand and the elasticity of household income, the Almost Ideal Demand System (AIDS) demand model is used. This model was developed by Deaton and Muellbuer (1980) and has been widely applied in Indonesia, including Suryana, (1986); David (1983); Rachmat and Erwidodo (1993). Meanwhile, Blanciforti and Green (1983) used the model for various food groups in the United States. Meanwhile, Budiono (1978) examines the elasticity of demand for various goods in Indonesia. The advantages of the AIDS model are that it is quite flexible and can be used to test the restriction of the demand function such as symmetry, homogeneity and "adding up".

lOg C(U,}3) + Zkk ION Pk + 2ZkZjYkj lOg) lOgPj + u pk k (1)

Using the Shephard Lemma [c(u,p)/Pt] = Qi we get:

$$\frac{jp^{PiQi}\ Pi}{M\ c(u,p)\ Pt} \quad \frac{C\ 8logc}{8logPi} \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ (2)$$

Wi = or + ZYijlogPj + iu§onkPk§k …… (3)

where : ?2 (Yij + Yji) – Yjj

From the duality relationship on demand, we can get an indirect utility function. By plugging the indirect utility function into equation (3), we get the form of the "share" function (W;) as follows:

Wi = oi + ZjYijlogPj + âilog (M) …… (4)

Where P is income divided by the price index P.

Equation (4) presents a system of consistent demand functions if it satisfies the following restrictions:

Engel aggregation/adding up : £ti - I j ZJ{j - 0; (6)

By the nature of aggregation/adding up means that the sum of requests is an expense. The nature of homogeneity means that demand is homogeneous with zero degree in price and in expenditure. While the nature of symmetry also means that the decrease in cross-price from demand is symmetrical. In addition, the theory of consumer behavior is also "weak separability" (Leontief, 1947 in Teklu and Johnson 1980). Through this characteristic, a commodity group can be divided into sub-groups which are assumed to have some common characteristics. Each sub-group can consist of a number of commodities. Furthermore, if the Stonelog P*= ZbWklOgPr index is applied to equation (4), it will be obtained:

Wi(p,x) = eg + ZYijlogPj + I (M/P)

This function is known as the linear approximation of AIDS.

Parameter estimation of AIDS model is carried out by distinguishing aggregate data (national), village, city, low, medium, and high income groups. It should be noted that the expenditure elasticity value obtained from the calculation using the AIDS model is the expenditure elasticity of each eating groupon total food expenditure and the estimation results are suspected to be biased upwards. Forto obtain the elasticity of expenditure from each food group to total household expenditure, the elasticity value calculated from the AIDS model is corrected (multiplied) by the elasticity value of food expenditure to total household expenditure (r{F).

The elasticity of food expenditure to total household expenditure is estimated through a linear logarithm model as follows:

In Yp = a + monthYT

Where :

Yp = total food expenditure

YT = total household expenditure

Expenditure elasticity of certain food groups to total household expenditure (income elasticity) is calculated based on the following formula:

Where :

$\eta_{iT} = \eta_F . \eta_i$

9iT = income elasticity of the i-th food group.

rlF = elasticity of food expenditure to total household expenditure.

rJi= the elasticity of expenditure of food group i to total food expenditure (the results of the analysis of the modelAIDS)

data

The data used in this analysis is the 1990 SUSENAS data from the Central Bureau of Statistics in the form of household consumption and expenditure data. Data processing was carried out on all sample households, by grouping several households into one Primary Sampling Unit (PSU). Thus, as an example unit, it is no longer a household but a PSU. This is based on the consideration that not all sample households consume all of the commodities analyzed. Rachmat and Erwidodo (1993) concluded that estimating the AIDS model using the PSU resulted in predictions that were more in line with demand theory than using the household analysis unit.

RESULT AND DISCUSSION

Food Expenditure Share

Before examining the contribution of each food group to total food expenditure, it is first given an overview of the share of food and non-food expenditure for the total household in the 1990 SUSENAS example (Table 1). From Table 1 it can be seen that both in aggregate and by region and income class, the share of food expenditure still shows a fairly large portion (on average more than 50 percent of household expenditure is allocated for food expenditure). If the share of food expenditure is used as an indicator of the level of welfare, the data in 1990 compared to 1987 show that in the aggregate there has been a decline in the share of food expenditure. This shows an increase in community welfare. However, the increase in welfare was enjoyed by many city dwellers, shown by the share of food expenditure in cities which decreased from around 52 percent in 1987 to around 51 percent in 1990. Meanwhile, rural households relatively did not enjoy this increase in welfare because the share of food expenditure did not decrease during the period 1987-1990, there was even a tendency slightly increased. However, when viewed from the increase in per capita income, it turns out that the increase is greater in the village than in the city (34.4 percent in the village and 31.8 percent in the city). This indicates that although the increase in per capita income in cities is lower, the level of awareness and knowledge of nutrition and food diversification of urban residents is better, as can be seen from the reallocation of decreased food consumption to be allocated to non-food and between types of food.

Table 1. Share of household food and non-food expenditure SUSENAS 1987 and 1990

Type	Indonesia		City		Opinion class•)		
Expenditure	1987	1990	1987	1990	Low	Currently	Tall
Food	61.28	60.36	67.21	67.41	52.36	51.40	73.23	59.60	38.22
Non Food	38.72	39.64	32.79	32.59	47.64	48.60	26.77	40,40	61.68
Toul	ioo	lfD	lfD		HD	in	ion	in	l on
Rpfknp/month	22125	30271	18073	24296	33413	44029	11695	43884	13977
pcningkaun		36.8		34.4		31.8	-	-	

Notes: •) SUSENAS 1990 Publication

In addition, Table 1 also shows that in rural areas the share of food expenditure is higher than in urban areas. Meanwhile, when analyzed by income class, it is seen that the share of food expenditure decreases with increasing income class. This is in line with the Working law (Working, 1943 in Pakpahan, A. et al. 1993) which states that the share of food expenditure has a negative relationship with household expenditure. In other words, the share of food expenditure decreases proportionally according to the logarithmic increase in household expenditure.

The case study of two villages in West Java conducted by Sajuti (1990) found the

opposite situation to the above statement. The results of the study actually concluded that the level of total household income had a positive relationship with food expenditure. However, food expenditure in Sajuti's (1990) study was limited to expenditure on rice, meat, fish, eggs, tofu, sugar and cooking oil.

Table 2. The share of expenditure for each food group to total expenditure, then based on direction and income class, 1990

				Income Class		
Food Group	Indonesia	Village	City	Low	Currently	Tall
1. Grains	0.32495	0.349IXI	0.25657	0.39113	0.31389	0.21518
2. Tubers	0TI24384	0.02415	0.01138	0.02911	0.01706	0.01223
3. Fish	) 0.08437	0.09292	0.09846	0.07990	0.10149	0.10851
4. Meat	/ 0.04967	0.04556	0.05931	0.03970	0.04693	0.06901
5. Eggs & Milk	0.03988	0.03242	0.06024	0.02609	0.03942	0.06622
6. Vegetables	0.09047	0.09206	0.08594	0.09309	0.08976	0.08666
7. Peanuts	0.03990	0.03948	0.04100	0.04262	0.03847	0.03770
8. Fruits	0.04982	0.04764	0.05595	0.04021	0.05143	0.%544
9. Fat	0.04837	0.05040	0.04260	0.05251	0.04760	0.HI65
10. Drink ingredients	0.%276	0.06425	0.05853	0.06627	0.06253	0.05623
11. Spices	0.03376	0.03480	0.03078	0.03470	0.03421	0.03097
12. Other food	0.01222	0.01158	0.01373	0.01137	0.01120	0.01531
13. Food & Noodles numan so	0.07594	0.%188	0.11391	0.06033	0.07576	0.12347
14. Tobacco & Betel	0.07729	0.07711	0.07775	0.07313	0.08232	0.07553

When examined in more detail the share of food expenditure against variousfood groups consumed by households, it is seen that the grain group (in which rice is included) has the largest contribution, covering 32 percent of total food expenditure (Table 2), while the other types of food groups each have a share of less than 10 percent of total food expenditure. The 1981 SUSENAS data analyzed by Daud (1986) showed similar results, namely 32.3 percent of food expenditure was allocated to the rice/yam group. The same is true for households in urban and rural areas and for the three income class groups. However, if the household grouping is observed further, there is a tendency that the proportion of household grain group expenditures in the city is lower than in the village. nuts, fruits and prepared food and beverages for urban households is relatively higher than for rural households. Kuntjoro (1984) and Daud (1986) also found similar results.

If the analysis is differentiated by income level, it can be seen that:

1) The higher the income class, the lower the share of expenditure on grains, the same thing happened for the share of expenditure on tubers, vegetables and oils and fats.
2) The share of expenditure on fish, meat, eggs and milk, nuts, fruit budhan as well as food and beverages seems to be getting bigger with the higher income class.

Table3. The elasticity of demand (own price) of each food group based on the region andincome class

Kelompok makanan	Indonesia	Village	City	Income Class		
				Low	Currently	Tall
1. Grains	-0.57338	-0.64020	-0.51166	-0.67251	-0.77874	-0.56149
2. Tubers	-I.(O346	-0.97521	-0.89995	-1.00961	-0.85556	-0.84563
3. kan	-0.66497	-0.59516	-0.83055	-0.70052	-0.66485	-0.72115
4.Meat	-0.95754	-1.07608	-0.77354	-1.12539	-1.10711	-0.81177
5.Eggs & Milk	-0.57335	-0.68904	-0.56878	-0.76d74	-0.70RJ0	-0.62917
6.Vegetables	-0.94803	-0.95424	-0.91140	-0.95517	-0.96300	-0.89785
7. Nuts	-1.22032	-1.22254	-1.19025	-1.22775	-1.09919	-1.04286
8.Fruits	-0.64736	-0.62921	-0.63583	-0.75434	-0.72444	-0.65480
9.Oils&Fats	-1.04488	-1.04618	-1.08333	-1.03684	-1.12872	-0.94677
10.Bhn drink	-1.03158	-1.%326	-0.95467	-1.03690	-1.07217	-0.99269
11. Spices	-0.85917	-0.83418	-0.89887	-0.87193	-0.84327	-0.85887
12. Other food	-1.04630	-1.03468	-1.06345	-1.17055	-0.98486	-1.02897
13. Prepared food	-1.02862	-1.04689	-0.99263	-1.07041	-1.06560	-1.01391
14. Tobacco Cigarettes	&-0.71815	-0.70731	-0.2£i6l0	-0.73525	-0.44401	-1.29566

Predicted Parameter Analysis

With the AIDS model, the results of the estimation of household food demand functions are presented in Appendix Tables 2 to Appendix Tables 4. From the estimated parameter values, it can be stated that almost all the estimated parameter values show a significant contribution to the model, this is indicated by the 99 percent confidence level (a). = 0.01), only a small part of the estimated value of the parameter is not real or real at the level of n = 0.05. This shows that prices and income levels are explanatory factors of changes in the share of expenditure for each commodity consumed or in other words, the share of consumption expenditure for commodities is a function of the prices of all commodities consumed and household income.

Elasticity of Demand

As has been disclosed in the analytical method that from the estimated coefficients of the demand system parameters, the elasticity of demand for each food group can be calculated. The results of these calculations are presented in Table 3. From Table 3 it can be seen that the elasticity of demand for the price itself has a negative sign, this is in accordance with the theory that demand decreases with the higher level of the price of the commodity concerned.

If the analysis is differentiated by region, it is seen that in almost all food groups, demand in rural areas is relatively more elastic than in urban areas, except for fish, fruits and oils and fats. This shows that the response of households in rural areas to food demand (if there is a change in food prices) is relatively larger than households in urban areas.

By groupingFood ingredients that are more aggregated in the 1981 SUSENAS data (i.e. rice/yam, fish, meat, eggs/milk, nuts/vegetables/fruits and other groups), Daud (1986) found the value of own price elasticity and relatively lower and the value is between the two or when the elasticity value of the food group is analyzed in Table 3. For example, the

elasticity value of the rice/ sweet potato group obtained by Daud (1986) is 0.93 ; 0.97 and 0.76 for Indonesia, cities and villages, respectively. Meanwhile, the results of the 1990 SUSENAS data analysis showed that the elasticity values (own prices) for the grains group were 0.57, 0.51 and 0.64 for Indonesia, cities and villages, while for the tubers the values were 1.00; 0.90 and 0.97.

The elasticity of food demand in the three income classes shows the following trend:

1) For the tubers, meat, eggs & milk, nuts, and processed foods, the groups are relatively less elastic with increasing income class,
2) For other food groups (other than (1) there is no consistent pattern between income class groups. This shows that the elasticity of demand for various food groups in a household is influenced by the level of income of the household concerned.

The elasticity of demand (cross) between commodities shows the change in the quantity demanded of a commodity (group) due to changes in the price of other commodities, where the relationship between (groups) of these commodities can be complementary (complementary) or substitute (substitute). The negative sign of the cross-elasticity value between commodities shows the relationship between the two commodities is complementary, while the positive sign indicates that the relationship between the commodities is substitution. The results of the estimated cross-elasticity analysis between commodities for Indonesian aggregated (pooled) data are presented in Appendix Table 8. From Appendix Table 8, several interesting points can be stated as follows:

a. In aggregate, the groups of grains and tubers have a positive cross-elasticity value, which also means that the relationship between the two commodity groups has a positive cross-elasticity valuecan replace each other.
b. The negative sign of cross elasticity between the grains and other groups indicates the existence of a complementarity relationship between the groupsgrains with other food groups.
c. In general, there is a substitution relationship between groups of side dishes (fish and meat, fish and eggs, meat and eggs) which is indicated by a positive sign of the cross elasticity value. This is in accordance with the fact that the use for consumption of each of these food groups can replace each other.

Table 4. Income elasticity of each food group by region and income class

food group	Indo-**nesia**	Village	**KOtR**	Income Class		
				Low	Currently	Tall
1. Grains	0.2802	0.3177	0.2485	0.5508	0.2441	0.1712
2. Tubers	0.3839	0.4528	0.3059	0.8502	0.3782	0.2244
3. Fish	0.4358	0.5217	0.3558	0.7(J02	0.3480	0.2180
4. Meat	0.3762	0.3794	0.3226	0.4395	0.1866	0.22%
5. Eggs & Milk	0.3933	0.4299	0.3103	0.3619	0.2258	0.1773
6. Vegetables	0.3743	0.4419	0.3153	0.7129	0.3047	0.1953
7. Nuts	0.2937	0.2958	0.2859	0.5068	0.1869	0.1737
8. Fruits	1.4984	0.6055	0.3977	0.8285	0.3470	0.2350
9. Oils & Fats	0.35£D	0.4057	0.2955	0.6601	0.2735	0.1842
10. Drinks	0.4049	0.4937	0.3179	0.8361	0.3411	0.2092

11. Spices	0.3736	0.4222	0.3341	0.6165	0.2960	0.2136
12. Other food	0.4129	0.3781	0.4163	0.4767	0.2422	0.2363
13. Prepared Food	0.8899	0.9219	0.6930	1.4162	0.5876	0.3988
14. Tobacco & Cigarettes	0.3871	0.4517	0.3363	0.6288	0.3270	0.2100

Note: The elasticity of food expenditure to total household expenditure (r}F) is 0.3945 (Indonesia), 0.4356 (Rural), 0.3513 (Urban), 0.6569 (Low income), 0.3034 (Medium income) and 0.2201 (high income).

CONCLUSIONS AND RECOMMENDATIONS

Increase in community welfare. However, the increase in welfare was enjoyed by many city dwellers, shown by the share of food expenditure in cities which decreased from around 52 percent in 1987 to around 51 percent in 1990. Meanwhile, rural households relatively did not enjoy this increase in welfare because the share of food expenditure did not decrease during the period 1987-1990, there was even a tendency slightly increased. To estimate the food demand system, the elasticity of demand and the elasticity of household income, the Almost Ideal Demand System (AIDS) demand model is used. This model was developed by and has been widely applied in Indonesia.

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