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FOOD DEMAND ANALYSIS IN URBAN WEST JAVA, INDONESIA

By

Agus Pakpahan

A DISSERTATION

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ABSTRACT

FOOD DEMAND ANALYSIS IN URBAN WEST JAVA, INDONESIA

By

Agus Pakpahan

This study sought knowledge about how urban household food consumption behavior is influenced by changes in prices, expenditure, and household size and composition. This knowledge is important for food policy-makers. The Working and the Working-Theil-Suhm (WTS) model were used. Household welfare loss due to price increase and Engel's equivalence scales were also computed. Working's model showed that food expenditure elasticity of a single household is lower than that of other household sizes. Classifying food into ten commodity groups indicated that cereal, sugar, and tobacco are necessities; fish, meat and poultry, and eggs and milk are luxuries; and tuber, vegetables, soybeans and nuts, and fruit are independent of income.

Price is an important instrument for food demand policy. This research showed that increase in each commodity price significantly reduces the demand for that commodity. The examination of cross-price effects indicates that cassava is not a cereal substitute. The animal products system of commodities such as meat and poultry, fish, and eggs and milk are substitutes. In addition, examination of the effects of price increase showed that

Agus Pakpahan

urban consumer welfare is significantly determined by the price of cereal. The effect of price increase is distributed disproportionately.

Engel equivalence scales indicate that to be equally well off a larger household requires more income than does a smaller one. The magnitude of equivalence scales varied across regions in West Java. This research also showed that, *ceteris paribus*, reduction of household size will decrease demand for cereal and will increase demand for other commodities. Therefore, this research implies that family planning is a very important policy which may not only solve the problems of food-population imbalance but may also improve household nutrient intakes.

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untuk saudara-saudaraku
di indonesia
yang masih bergelut untuk
isi perut

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CHAPTER I

INTRODUCTION

Background

When policy-makers want to design, to implement, or to evaluate a certain food policy, they might want to know the impact of that policy on food consumption, food production, structural changes in food sectors, and the welfare of consumers and producers. In the case of Indonesia in general or West Java in particular, the government may want to know the impact of food price increase, changes in household income, or changes in household size on quantity demanded of an individual or a group of food commodities. A real example can be taken from the case of household size reduction in West Java. In this province we observe that there was a nine percent household size reduction during the period from 1980 to 1985, or about 1.8 percent per year (C.B.S., 1987). Based on this fact policy-makers might want to know the impact of such reduction on demand for food. Of course, knowledge about the impact of policy changes is different from a policy itself or the creation of a policy. To make a new policy we need to know both value-free positive knowledge and knowledge about values of the subject matter with which we are dealing. The latter, therefore, is much more complicated (see Johnson, 1986).

Food demand studies in Indonesia are not new. Previous demand studies in Indonesia, however, were mostly focused on a single commodity and analysis thereof was mostly based on national data. For example, Timmer (1971a,b) estimated wheat flour consumption and rice consumption, respectively; and Timmer and Alderman (1979) estimated consumption parameters for rice and cassava. The most recent study conducted by Johnson et al. (1986), using demand system framework, estimated income, price, and household size elasticities for thirteen food groups. As a consequence there is a lack of knowledge about interrelationships among commodities and food consumption behavior across regions. Knowledge about food consumption behavior in particular, or consumption behavior in general, for each region is very important for policy-makers because each region in Indonesia is composed of both different cultural groups and natural endowments. Therefore, the parameters estimated based on national data are too restrictive to be applied to a specific community. Based on this reason, this research was intent on study of the food consumption behavior of urban consumers in West Java, where Sundanese is a majority group, using the demand system approach.

Objective of the Study

In general this research sought knowledge about the impact of changes in household income, prices, and household

size and composition on demand for food in urban West Java, Indonesia. To be more specific, this research sought the following knowledge:

1. Knowledge about the relationship between food effective demand and expenditure, given constant prices and household size for five urban regions in West Java. This is the estimation of Engel's curve which is important for generating knowledge about the effect of income changes on food effective demand. One might view this as being a simple phenomenon and because it is simple that it is not important. However, Engel's estimates are crucial because :
 - (i) estimation of this curve is easier than the estimation of price effects on demand;
 - (ii) its importance and usefulness for food policy are obvious since we usually have a clearer idea about future income than about future prices;
 - (iii) in some cases income is more important than price, particularly when price does not convey reliable information.

2. Knowledge about the relative welfare of different household sizes or of household compositions. This knowledge is important because children not only give utility to their parents, but also create costs. Food costs are very obvious. This knowledge will, for example, be important for taxation policies.

3. Knowledge about the relationship between food demand and food expenditure, prices and household character-

istics under various restrictions such as symmetry and homogeneity. This knowledge may show the behavior of consumer food demand under various circumstances. The estimates themselves are, further, important for food policy analysis.

4. Knowledge about the implications of the findings as a part of means to evaluate or to design food policy in West Java. In this stage we tried to show the implications or relations between our findings and some important policy objectives.

Scope

The scope of this study was limited to the study of consumer behavior where the household was treated as a unit of analysis. It is important to state explicitly that the household rather than the individual was treated as a unit of analysis because it will make us aware that the unit in this research is different from the unit in the theory of consumer choice, which is based on individual preferences and budget constraints. Choosing the household rather than the individual as a unit of sample is unavoidable since data are based on family or household units. In addition, choosing the household rather than the individual will be more appropriate with respect to the empirical world. Most food consumption decisions are made by and within households. Finally, choosing different consumption units will

result in different policy implications (see Atkinson, 1983; Atkinson and Stiglitz, 1980:26).

The scope of the analysis was also limited to examination of the (quantitative) relationship between food consumption and household composition and size, income, and prices. In addition, equivalence scales, cost of children and welfare losses of consumers due to price increases have been computed. Finally, this research was neither an evaluation of nor research for designing a specific food policy to solve a specific food problem. This research was intended to generate knowledge which is important for food policy decision-making and not food policy itself.

Food was defined for 10 broad categories of food: cereals, tuber, fish, meat and poultry, eggs and milk, vegetable, soybeans and nuts, fruits, sugar, and tobacco. These food groups compose about 87 percent of the total food budget in West Java. Sugar, though it composes only about 3 percent of the household food budget, possesses an important position in public policy agendas. Tobacco, on the other hand, composes a large part of the household budget. For example, the proportion of tobacco expenditure in West Java samples is about 12 percent of total food expenditure. Finally, focusing analysis on food only is realistic especially when we realize that about 60 to 70 percent of total expenditure in developing countries' economy goes to food.

This research is also limited in geographic scope. It dealt only with the analysis of demand for food in the urban areas of the province of West Java. The main reasons why this research selected urban West Java as a geographic unit of analysis are: (i) we deal with specific decision makers, i.e., a governor, under whose authority may exist a specific food problem. (ii) Choosing a specific cultural background which is revealed in food habits will be appropriate as a first approximation of homogeneous preferences. Aggregating across cultural groups will be too restrictive. (iii) Environment may contribute to different patterns of food habits, kinds and quantity of food available, and the role of the household in the economy. The latter is very important in that the role of the rural household can simultaneously be as food consumer and food producer. The urban household, on the other hand, usually acts as food consumer only. Therefore, limiting the scope to the urban consumer makes the analysis simpler. (iv) Most previous food consumption studies in Indonesia were based on a national aggregate. The parameters estimated in those studies are too restrictive for a specific cultural setting. This research should not be viewed as a substitute to the national based studies but should be viewed as their complement.

Organization of the Dissertation

This dissertation was divided into eight chapters. Chapter I presented background information, the objective of the study, and the scope of the study. Conceptual framework and research methods were discussed in Chapter II and Chapter III, respectively. Chapter IV presented general descriptions of important food consumption performances in West Java which are important for doing analysis in subsequent chapters. Chapter V and Chapter VI presented the estimates of demand parameters and welfare analysis of the household, respectively. Chapter VII showed implications of findings on food price policy and Chapter VIII consisted of the summary and conclusions of this study. Finally, bibliography and the appendices were placed at the end of this volume.

CHAPTER II

CONCEPTUAL FRAMEWORK

The Allocation Models Of Consumer Demand¹

The consumer is assumed to have a nice utility function, e.g., continuously differentiable and strictly quasi-concave, to represent consumer preferences². Our problem here was to model the behavior of the consumer which is assumed to maximize his utility function subject to a linear budget constraint. The solution to this problem was used as a framework for conducting the empirical estimation of demand parameters. For complete treatment of the solution to the above problem, that is, a system of Marshallian or Hicksian demand functions see Varian (1984), Russell and Wilkinson (1978), Layard and Walters (1978) and Theil (1975).

There are at least five different available methods for modeling such a system of demand equations (see Theil and

¹ The framework is called an allocation model because it has a unique characteristic: the sum of the components equals the aggregate. Thus, if the consumer's budget during the analysis is assumed to be fixed and the consumer allocates the total expenditure among various goods and services, then the summation of expenditures across goods and services in the budget must equal total expenditure (see Theil, 1975; Bewley, 1986).

² See Varian (1984) and Russell and Wilkinson (1978) for complete discussions of axiomatic structures of consumer preferences.

Clements, 1987; Deaton, 1986; Barten, 1977; Brown and Deaton, 1972). The first one is well known as a pragmatic approach. It is a method of estimation where the specification of demand functions is neither generated from demand theory nor are the restrictions generated by demand theory utilized³. Criticism to this approach is usually associated with its lack of theoretical plausibility. Double log equations which are very popular specified demand equations, for example, violate the adding-up constraint (Yoshihara, 1969).

A second approach to demand specifications belongs to Stone's methods, that is, the specification of demand equations derived from direct utility function. The Klein-Rubin utility function is a well known utility function underlying the Linear Expenditure System of demand equations. This system of demand equations is derived based on the assumption of additivity of preferences. It fulfills theoretical demand restrictions such as homogeneity of degree zero in income and prices, symmetry, and additivity. However, this is not a flexible demand function because inferior goods are excluded (Johnson et al., 1984:64). In addition, additivity of preferences according to Deaton (1974:346) "will lead to severe distortion of measurement". That is, additivity assumptions imply approximate linear relationships between own-price elasticities and income elasticities.

³ Demand theory provides restrictions such as additivity, homogeneity of degree zero in prices and income, and symmetry of cross price effects.

Therefore, if the own-price elasticity of i increases, its income elasticity must increase as well. As a consequence, income elasticity of j must decrease.

The third well known approach of demand specification is a system of demand equations derived from an indirect utility function. A system of demand equations is derived by using Roy's identity⁴. Well known examples are the indirect translog demand system which is extensively used by Christensen, Jorgenson, and Lau (1975) and the indirect addilog demand system (Houthakker, 1960). These demand systems are both consistent with demand theory and are flexible. However, translog models have some disadvantages such as (Theil, 1980): (i) their parameters have no simple economic interpretation relative, for example, to the linear expenditure system, (ii) the number of parameters tends to increase about proportionally to the square of the number of goods, and (iii) they are nonlinear in parameters (Johnson et al., 1984). Furthermore, Flood, Finke, and Theil (1984) showed that, judged based on the behavior of the estimates of income elasticities for Japanese and Swedish data, the translog model was inferior relative to the Working model. Income elasticities for food derived from the translog model indicated that the higher the income level, the higher the value of income

⁴ Let $v(p, M)$ be an indirect utility function. Roy's identity says that
$$-\frac{\delta v / \delta p_i}{\delta v / \delta M} = x_i M.$$

elasticities for food. Finally, the indirect addilog demand system yields income elasticities which are independent of the level of income, and the cross price elasticities are only affected by the commodity whose price is changing and not on the good whose quantity is responding (Johnson, et al., 1984).

Specification of demand equations based on a specified cost function is the fourth approach. The AIDS model invented by Deaton and Muellbauer (1980b) which is generated from the PIGLOG class of preferences is a well known example of demand equations derived from a specific cost function.

The final approach is that of the specification of demand equations not based on a specific cost function, an indirect utility function, or a direct utility function. They are, however, based on a direct differentiation of a general form of Marshallian demand equations and then applying the results of utility maximization subject to budget constraint. This method was invented by Theil (Theil, 1975), and is well known as a differential approach to model demand functions. The Rotterdam model is a familiar example.

The Choice Of Functional Forms

The results of empirical demand research are largely determined by the correct specification of the algebraic functional forms used. This step is the most difficult part in the research process because there is no common agreement

among economists regarding the forms of function which are best suited to our purpose. In this respect "neither economic theory nor available empirical knowledge provide, in general, a sufficiently complete specification of the economic functional relationship so as to determine its precise algebraic form" (Lau, 1986:1516). (See also Kmenta, 1971:532). The field of empirical demand analysis provides a good example of not only how views about correct functional forms of demand equations vary among researchers, but also the views about whether we should base our specification on utility, indirect utility, cost function, or not base specification on them at all. Based upon these divergent points of view we found at least five different approaches to specifying demand functions as discussed above.

The choice of functional form discussed here is the ex ante choice of the algebraic form of the function prior to actual estimation. Therefore, there are almost unlimited candidates for algebraic functional forms, including kinds and number of variables, the forms of the functions : linear or non-linear, number of equations, etc., available to the researcher. To narrow this possibility and to avoid making an arbitrary choice of the functional forms, we need to establish criteria. Lau (1986:1520) provided five criteria for determining algebraic functional form : (i) theoretical consistency, (ii) domain of applicability, (iii) flexibility, (iv) computational facility, and (v) factual conform-

ity. Therefore, we chose the functions which meet those criteria.

Applying the above criteria reduces the field of choice. For example, the Linear Expenditure System is excluded from the field of choice because it is not flexible, e.g., inferior goods are excluded. The double log demand system is also excluded because it violates the additivity restriction, and is therefore, not consistent with the theory. However, making a choice among translog, AIDS, and Rotterdam models is quite difficult.

The Rotterdam model is not derived from a utility, an indirect utility, or a cost function, but as argued by Theil (1980), why should we believe that true consumer preferences are correctly represented by translog or PIGLOG cost functions ? Theil argued that we have no need to specify utility function or cost function to represent consumer preferences in the first place. What we need to do is utilize the results of consumer utility theory without regard to any specific utility or cost functions in order to represent consumer behavior toward price and income changes (Theil, 1980).⁵

The translog and the AIDS models are consistent with

⁵ See Theil (1975, 1980) and Theil and Clements (1987) for full discussion of the differential approach to consumer demand.

theory, and the Rotterdam model⁶ is also indirectly derived from utility theory. Furthermore, they are flexible. To choose among them, then, we need to rely on the fourth and fifth criteria presented above.

The computational facility criterion is important particularly for cases in developing countries where sophisticated computer programs are usually not available. The translog model which is non-linear in parameters requires more complicated software and demands more computing costs. However, the AIDS model is also non-linear in parameters, but we can still specify its linear version by choosing its appropriate price index, e.g., Stone's price index. The Rotterdam model, in addition, can be both, depending on the assumptions about its marginal budget share and price effects. Based on this knowledge, there might be no clear cut argument for choosing one of the functional forms among competing alternatives because they may require the same degree of computational facility.

Since these models are already in existence and have

⁶ Recent development was made by Mountain (1988). Mountain (1988) found that the approximate compensated elasticity computed at a particular budget share and income elasticity derived from the Rotterdam model are not different from elasticities generated from other functional forms. The difference is that the Rotterdam model started with expenditure shares rather than with the underlying support function, e.g., an indirect utility or cost function. The discrete Rotterdam model, like the other flexible functional forms, at the individual consumer level is a valid linear approximation in variable space. The order of approximation is no lower than that for other flexible functional forms.

been used for awhile, the fifth criterion becomes crucial in the process of choice of functional forms if the candidates for functional forms cannot be excluded by the first four criteria. The problem here is deciding what kinds of indicator or performance are appropriate to tell us that, say, functional form F conforms to reality better than other functional forms. This is a problem of interpretation of reality or fact. In the framework of logical positivism (Johnson, 1986:43) "by interpreted we mean a language in which abstract symbols are treated as standing for something regarded as part of the real world". Based on this view, an hypothesis which has passed the tests and has been accepted as a theory can be viewed as a part of the real world. Therefore, factual conformity must be subjected to a theory.

In the field of demand analysis, theory says that effects of income on quantity demanded, given constant prices, can be used to classify commodities into luxuries, necessities and inferior goods. It is commonly accepted that food is a necessity based on empirical estimation of its income elasticities (Working, 1943; Leser, 1963; Theil and Suhm, 1981; Theil and Clements, 1987). This knowledge can be used as a criterion of factual conformity. That is, a functional form conforms better with reality if it consistently predicts that food is a necessity.

Flood, Finke and Theil (1984), using Japanese and Swedish data, tested the predictive performance of the

translog and Working models based on their income elasticities. The translog model gave an unstable prediction. For Japanese data, food income elasticities increase as income level increases, but for Swedish data food income elasticities decrease as income level increases. Food income elasticities for Japanese data are unacceptable as judged by earlier findings. On the other hand, the Working model produced stable and acceptable results. For both sets of data the Working model resulted in decreased income elasticities for food as income level increased. Therefore, based on this criterion we excluded the translog model from our field of choice.

The AIDS model is the last model available. In a constant price situation this model is identical with the Working model. Another alternative is the Working-Theil-Suhm (WTS)⁷ model which is also derived, as is the AIDS, from the Working model but was generated through a differential approach to consumer demand (Theil and Suhm, 1981). This research used the WTS model because it more or less meets all of the criteria provided above. In addition, El-Eraky (1987) showed that the WTS model was superior relative to the AIDS model in estimating food demand parameters for Egypt. Since application of the WTS is still rare relative to the popular AIDS model, this also motivated the writer to use the WTS.

⁷ The name of Working-Theil-Suhm model is adopted from El-Eraky (1987).

The following sections will discuss the derivation and properties of these models.

Working's Model

Working (1943) discovered the general relationship between budget shares on commodities and total consumer expenditure. The most important findings are (i) " the proportion of total expenditure devoted to the different purposes tend to be about the same for families of the same total expenditure per person even though the families differ with respect to income, size and proportion of income saved;" and (ii) " the proportion of total expenditure that is devoted to food tends to decrease exactly in arithmetic progression as total expenditure increases in geometric progression" (Working, 1943: 45). The second result is very important as a basic foundation for both estimation of demand parameters and welfare analysis. The latter is associated with Engel's law, namely, the percentage of income spent on food is inversely related to the level of income. In addition Engel used food share as a common denominator for making welfare comparison, that is, two households have an equal welfare if they have an equal food share (see Deaton and Muellbauer, 1980a; Deaton, 1981; Deaton and Muellbauer, 1986).

The algebraic form of Working's law for food category can be expressed as:

$$(2.1) \quad w_i = a_i + b_i \log M$$

where w_i and M are the share of food in total household expenditure and total household expenditure, respectively⁸. To conform with the budget constraint we need to restrict a_i and b_i :

$$(2.2) \quad \sum_i a_i = 1, \quad \sum_i b_i = 0$$

Working's model has a typical form of relationship between its marginal budget share and its budget share, namely⁹,

$$(2.3) \quad B_i = w_i + b_i$$

where $B_i = p_i \frac{\delta x_i}{\delta M}$, i.e., marginal budget share of good i .

Therefore, in Working's model the divergences between marginal budget shares and budget shares of its corresponding commodities are determined by how significant the behavioral response, b_i , is to changes in the total expenditure, given prices and other factors remain constant.

Working's model also provides a specific form of income elasticities. The algebraic form of income elasticities derived from the Working model is:

$$^8 \quad w_i = \frac{p_i x_i}{M}, \text{ where } p_i \text{ is the } i^{\text{th}} \text{'s commodity price.}$$

⁹ This relation can be derived as follows : Multiply (2.1) by M , one obtains :

- (i) $w_i M = a_i M + b_i M \log M$. This is equivalent to :
- (ii) $p_i x_i = a_i M + b_i M \log M$. Take the derivative of (ii) with respect to M gives:
- (iii) $\delta(p_i x_i)/\delta M = a_i + b_i + b_i \log M = b_i + w_i$.

$$(2.4) \quad E_i = 1 + (b_i/w_i)$$

The values of income elasticities can take $E_i \geq 1$, $0 \leq E_i \leq 1$, and $E_i < 0$. The first condition indicates that good i is a luxury good for that class of expenditure level. The second condition implies that the good i is a necessity with respect to that income level, and the third condition implies that good i is inferior for that income level.

Another interesting case derived from Working's model is that the ratio between marginal budget share and budget share for the same commodity is equal to income elasticity for that commodity. Mathematically, it can be expressed :

$$(2.5) \quad \frac{B_i}{w_i} = [p_i \frac{\delta x_i}{\delta M}] / [\frac{p_i x_i}{M}]$$

Equation (2.5) implies that the status of a commodity i with respect to income is determined by both marginal budget share and budget share of that commodity. The value of w_i will always be greater than or equal to zero but B_i can be positive, negative or zero.

In summary, four important properties of the Working model have been shown: (i) the Working model conforms to empirical evidence of food demand parameters, particularly income elasticities for food (Working, 1943; Leser, 1963; Flood, Finke and Theil, 1984; Theil and Suhm, 1981; Seale and Theil, 1986, 1987; El-Eraky, 1987); (ii) Working's model is consistent with theory (Deaton, 1986); (iii) Working's model is flexible (El-Eraky, 1987); (iv) the Working model

allows perfect nonlinear aggregation across consumers (Muellbauer, 1975; El-Eraky, 1987).

Working's Model Including Substitution Effects

The most important elements in empirical demand analysis are the estimation of income elasticities, and compensated and uncompensated of own and cross price elasticities. Price changes have two effects: income effects and substitution effects. This section deals with the incorporation of price variables in the Working model based on a differential approach to consumer demand which is appropriate for analyzing cross-sectional data.

Most demand system studies appearing in the literature are based on time series data. For developing countries such as Indonesia, time series data are relatively scarce with respect to number of observations required for statistical estimation. In addition, time series data are also subject to criticism such as the substantial correlation existing between real income and the relative price of food, and the shifts over time in many factors not included in the equations (Crockett, 1960).

Cross-sectional data are an alternative source of information. The utilization of cross-sectional data has some advantages such as (i) avoiding the problems of serial correlation and structural changes which are usually problematic in analyzing time series data, (ii) usually more

disaggregated to a particular region or to socioeconomic aspects of the population (Green, et al., 1979). However, cross-sectional estimates are also subject to criticism especially when one wants to use such estimates for making economic forecasts. In addition, cross-sectional analysis is not appropriate for analysis of the consumption of durable goods because the time variable here is crucial.

Another criticism of cross-sectional data is that there is a lack of variation of price variables in cross-sectional data. This is not entirely true. The existence of variations in a consumer's reservation price is one possibility. Another possibility is the existence of search costs making uniform price impossible (Diamond, 1978). A good example is gasoline price. Gasoline prices in the U.S.A., even though this product is chemically homogeneous, are rarely identical from one gas station to another nearby competitor. Therefore, the existence of price variations across regions causes the existence of deviation between the observation and the mean of prices. The following is an attempt to construct a model of demand equations incorporating effects of price on quantity demanded based upon cross-sectional data¹⁰.

Let us define w_{ih}^* as a budget share for a commodity i of a household h at the prices p_i^* , i.e., the geometric average of prices across households, and average geometric

¹⁰ See Teklu and Johnson (1987) and Johnson et al. (1986) for estimates of price elasticities for food commodities in Indonesia generated from cross-sectional data.

expenditure level M_h^* . Then we have Working's model in the form :

$$(2.6) \quad w_{ih}^* = a_i + b_i \log M_h^*$$

Adding $w_{ih} - w_{ih}^*$ to the left hand side of (2.6) and rearranging terms we obtain:

$$(2.7) \quad w_{ih} = a_i + b_i \log M_h^* + (w_{ih} - w_{ih}^*)$$

where w_{ih} is the observed budget share of good i for a household h . Differences between w_{ih} and w_{ih}^* are due to the differences between prices paid by each household ($p_{1h}, p_{2h}, \dots, p_{nh}$) and the average price of each good (p_i^*). p_i^* is defined as the geometric mean of prices across households, i.e.,

$$(2.8) \quad \log p_i^* = 1/H \sum_h \log p_{ih}, \quad i = 1, 2, \dots, n; h = 1, 2, \dots, H,$$

and p_{ih} is the price of a commodity i paid by a household h .

The results of the differential approach to consumer demand gives¹¹:

$$(2.9) \quad w_i d(\log x_i) = B_i(M, p) [d(\log M) - \sum_k w_k(M, p) d(\log p_k)] \\ + \sum_j v_{ij}(M, p) [d(\log p_j) - \sum_k B_k(M, p) d(\log p_k)]$$

and assumes the parameters are constant.

The existence of $(w_{ih} - w_{ih}^*)$ can be interpreted as a result of price changes from p_i^* to p_{ih} when the real expenditure M_h^* remains constant. Within the framework of a differential approach, constant real income means that:

¹¹ See Theil (1975;1980) for a complete discussion of the derivation of this equation.

$$(2.10) \quad d(\log M) - \sum_k w_k d(\log p_k) = 0, \text{ or} \\ d(\log M) = \sum_k w_k d(\log p_k)$$

Therefore, demand equations become :

$$(2.11) \quad w_i d(\log x_i) = \sum_j v_{ij} [d(\log p_j) - \sum_k B_i d(\log p_k)]$$

Recall also the result of total differential of budget share as:

$$(2.12) \quad dw_i = w_i d \log p_i + w_i d \log x_i - w_i d \log M$$

Substituting the above results in this equation gives :

$$(2.13) \quad dw_i = w_i (d \log p_i - \sum_j d \log p_j) + \sum_j v_{ij} [d(\log p_j) - \sum_k B_i d(\log p_k)]$$

dw_i can be interpreted as $(w_{ih} - w_{ih}^*)$ and w_i is interpreted as w_{ih} and then substituting (2.13) into (2.7) gives :

$$(2.14.a) \quad y_{ih} = a_i + b_i \log M_h + \sum_j \pi_{ij} \log p_{jh}/p_j^*$$

To incorporate household composition variables we add N , N_1 and N_2 variables in the right hand side of (2.14.a) as:

$$(2.14.b) \quad y_{ih} = a_i^* + b_i^* \log M_h + \sum_j \pi_{ij}^* \log p_{jh}/p_j^* \\ + s_i \log N$$

$$(2.14.c) \quad y_{ih} = \hat{a}_i + \hat{b}_i \log M_h + \sum_j \hat{\pi}_{ij} \log p_{jh}/p_j^* \\ + s_{1i} \log N_1 + s_{2i} \log N_2$$

where $y_{ih} = w_{ih}(1 - \log p_{ih}/p_i^* + \sum_j w_{jh} \log p_{jh}/p_j^*)^{12}$, π_{ij} is an element of the $n \times n$ with rank $(n-1)$ Slutsky matrix and $\log p_i^*$ as defined in (2.8); and N , N_1 , N_2 are the size of household, the number of household members ≤ 10 years of age (children) and the number of household members > 10 years of

¹² See Theil and Suhm (1981) for derivation of this expression.

age (adults), respectively.

The homogeneity and symmetry constraints are also linear in their parameters. The adding-up restriction of WTS means that

$$(2.15) \quad \sum_i a_i = 1, \quad \sum b_i = \sum \pi_{ij} = 0.$$

The homogeneity restriction is given by

$$(2.16) \quad \sum_j \pi_{ij} = 0 \quad \text{for } i = 1, 2, \dots, n.$$

and Slutsky symmetry is given by

$$(2.17) \quad \pi_{ij} = \pi_{ji} \quad \text{for all pairs } (i, j) \text{ where } i \neq j.$$

Price and income elasticity based on the above WTS model are (i) compensated price elasticity: $e_{ii} = \pi_{ii}/w_i$

uncompensated price elasticity:

$$e^*_{ii} = e_{ii} - (w_i + b_i)$$

$$(ii) \quad \text{expenditure elasticity : } E_i = 1 + (b_i/w_i)$$

Comparing the WTS (2.14) to the AIDS (see Deaton and Muellbauer, 1980a,b) we may conclude that (i) the WTS and the AIDS will reduce to the Working model when prices are assumed constant, (ii) the substitution terms of the AIDS are much more complicated, involving double-subscripted parameters relative to the WTS which has only single subscripted parameters.

CHAPTER III

RESEARCH METHODS

Classification of Commodities

The concept of commodities involves both goods and services. Arrow and Fisher (1974) gives precise properties attached to commodity, that is : place, time, and physical properties. Shubik (1987) added ownership as an important property of commodity. The implication of those properties for empirical work is crucial, since we will have indefinite numbers of commodities which are impossible to investigate empirically. In empirical work we need a small number of commodities, that is "it is almost a necessity to simplify matters artificially so as to reduce the number of variables which are to be handled" (Samuelson, 1963:144). In other words we need to summarize the information through grouping goods together when they display similar roles in consumer behavior (Simmons, 1974:61).

The method of commodity classification in this research is as follows: (i) it is assumed that food is separable from other commodities such as housing, clothing, and so on, including leisure. It is justifiable to assume that cross price effects among highly aggregated goods vanish (Theil, 1975). (ii) Food is composed of 10 commodities such as cereal (CER), tuber (TUB), fish (FISH), meats and poultry

(MEP), eggs and milk (EGM), vegetable (VEG), soybean and nuts (SOYN), fruit (FRT), sugar (SUG), and tobacco (TOB). These ten commodities have been chosen not based on knowledge about elasticities of substitutions nor complementarity among commodity elements such as suggested by Hicks (1981) but based on our a priori knowledge about food needs and food habits among Sundanese.

The ten food groups mentioned above are assumed to represent total food consumption of the household. This assumption is realistic because those ten food groups compose the major household food expenditure (87 percent of total food expenditure). In addition, the remaining food categories are difficult to include because they have neither price nor quantity variables. The main purpose of this research was to analyze the behavior of household food consumption toward changes in total expenditure, prices and household size. Therefore, the categories of food which do not contain prices, or price variables cannot be generated from the available data, and are thus excluded from the analysis. Finally, the most important reason for excluding those kinds of food categories is that they are not important in (current) food policy issues.

Definition of Commodities

As a consequence of aggregation the term commodities as defined above is not self-explanatory. For example, the

meaning of cereal, tuber, or meat might not be directly understood. Therefore, it is necessary to clarify the term by providing elements of the aggregation.

Definition of food groups¹

Cereal (CER)

Cereal includes all types of food and food products which are produced from rice, corn or wheat: glutinous rice, rice, corn, wheat flour, corn flour, and others.

Tuber (TUB)

Tuber is a category of food including cassava and its products, sweet potatoes, potatoes, sagu, 'talas' (taro), and others.

Fish (FISH)

Fish is a category of food including sea fish, fresh-water fish, salted and dried fish, canned fish, shrimp, crabs and oysters, and others.

Meat and Poultry (MEP)

Meat and poultry are categories of food including beef, lamb, pork, chicken, and others.

Eggs and Milk (EGM)

This category of food includes eggs, fresh milk, dried milk, condensed milk, and milk products.

Vegetables (VEG)

Vegetables include chinese spinach, 'kangkung' (swamp

¹ The translation from Indonesian language to English follows Wall (1985).

cabbage), chinese cabbage, green beans, 'kacang panjang' (yard long beans), tomatoes, carrots, cucumber, cassava leaves, egg plants, bean sprouts, shallot, garlic, chili, 'petai', 'genjer', 'jengkol' (stink beans), and others.

Soya beans and Nuts (SOYN)

This category of food includes: peanuts, mungbeans, red kidney beans, soya beans, cowpeas, tofu, tempe (soya bean cake), 'tauco' (soy paste), 'oncom' (fermented cake), and others.

Fruit (FRT)

The fruit category includes oranges and tangerines, mangoes, apples, avocados, 'rambutan', 'dukuh', 'durian', 'salak' (snakeskin fruit), pineapples, bananas, papaya, 'jambu air' (rose apple), 'jambu biji' (guava), 'belimbing' (star fruit), 'sawo' (sapodilla plum), watermelon, and others.

Sugar (SUG)

Sugar includes palm sugar and granulated cane sugar.

Tobacco (TOB)

Tobacco includes clove cigarettes, cigarettes, and tobacco.

Prices of Composite Commodities and Real Food Expenditure

The commodities defined above are composite commodities. Price of commodity is defined by geometric average (Theil and Shum, 1981) and is expressed in natural logarithmic form. This is important with respect to practical usage of such

prices because the WTS and the AIDS models utilized variables defined in logarithmic form. Budget share of each individual commodity of a commodity group, for example, budget share of rice in the budget of cereal, is used as weight.

The calculation procedure is as follows:

$$(3.1) \quad \log p_i^h = \sum_{k \in i} M_k/M_i \log(M_k/X_k^h) \quad \text{unit value}$$

where p_i^h is (composite) price of commodity i paid by household h , say cereal paid by h , M_k is expenditure of household h on commodity k where k is in i , say rice or corn, M_i is household h expenditure on (composite) commodity i , and X_k^h is quantity of commodity k bought by household h . The last term of the right hand side of (3.1) equals price of commodity k per unit.

Equation (3.1) implies that we permit households to pay different prices for the same commodity. Therefore, there must be an average price for each i which differs from prices paid by households. The average price of commodity i is calculated as follows:

$$(3.2) \quad \log p_i^* = \frac{1}{H} \sum_{h=1}^H \log(p_i^h), \quad h = 1, 2, \dots, H.$$

where H is total household number. This expression is the same as (2.8) in Chapter II.

Finally, we need to calculate the price index for all commodities. This is calculated by :

$$(3.3) \quad \log p^* = \sum_{i=1}^{10} w_{ih} \log(p_i^h/p_i^*)$$

where $w_i^h = (p_i^h x_i^h)/M_h$, that is the share of commodity i in the h^{th} household food budget, M_h . Real household food expenditure is household food expenditure deflated by (3.2):

(3.4) $\log M_h = \log(M_f/p^*)$, where M_f is nominal food expenditure.

Spatial Aggregation

Spatial aggregation in this research is an aggregation of households into spatial units. Spatial unit is an administrative unit such as district or kota madya. The latter is like an urban administrative unit. Therefore, there are no rural household categories in this unit. The total number of districts and kota madya in West Java is 23.

Furthermore, district/kota madyas are aggregated into larger spatial units called regions. The criteria to aggregate those districts/kotamadyas into regions are : (i) agro-ecological similarities, (ii) contiguity of the areas, and (iii) similarities in social customs and traditions. Based on these criteria we have five regions: (1) Region A (North-West Coast): Pandeglang, Lebak, Tangerang, and Serang districts, (2) Region B (Priangan): Bogor, Sukabumi, Cianjur, Bandung districts and Kodya Bogor, Kodya Sukabumi, and Kodya Bandung, (3) Region C (East Priangan) : Sumedang, Garut, Tasikmalaya, Ciamis districts, (4) Region D (North-East Coast): Kuningan, Majalengka, Indramayu, Cirebon districts and kodya Cirebon, and (5) region E (North-Coast): Subang,

Purwakarta, Karawang and Bekasi districts. The regional unit is important for making regional comparisons such as household equivalence scales or costs of children.

Estimation of Engel Curves

Engel curves for food across household sizes

Estimation of Engel curves was classified into two categories with respect to the aggregation of commodities; first, Engel curves for food as a single aggregated commodity; and second, Engel curves for each commodity of food. In both cases we assume prices are constant. Furthermore, for the purpose of computation of Engel equivalence scales², the numbers of children and adults per household are specified as explanatory variables.

We use Working's model in the following way:

$$(3.1) \quad w_i^h = a_i^h + b_i^h \log M^h + \text{error}$$

where i refers to commodities, and h refers to household. h in this research is defined for seven household sizes, M^h is total expenditure (expenditure on food and non-food commodities) and a_i^h and b_i^h are parameters.

To conform with the budget constraint we need to restrict the parameters :

$$(3.2) \quad \sum_i a_i = 1, \quad \sum_i b_i = 0$$

and to avoid singularity of the variance-covariance matrix,

² We will discuss the estimation procedures of equivalence scales and its results in Chapter VI.

we drop the non-food equation. Since the result of dropping the non-food equation is a single equation, (3.1) was estimated by OLS.

Based on (3.1) we have seven equations, one for each household size. Error terms in (3.1) are assumed to have the following properties:

- (i) the mean of error terms is zero [$E(\epsilon_i)=0$];
- (ii) variance of error terms across observations is constant (homoskedasticity) [$E(\epsilon_i^2) = \sigma^2$];
- (iii) covariance of error terms is zero (nonauto-regression) [$E(\epsilon_i\epsilon_j) = 0$ for $i \neq j$]
- (iv) normality, i.e., ϵ_i is normally distributed (Kmenta, 1971:202).

Equation (3.1) is used to estimate Engel coefficients for food in West Java. Engel coefficients for non-food can be recovered using the property of (3.2). In addition, we are interested in comparing the results if we use expenditure of household in per capita terms:

$$(3.3) \quad w_i = a_i + b_i \log M/N + \text{error}$$

Equation (3.1) was also modified by adding number of children, N_1 , i.e., number of household members with ages ≤ 10 years; and number of adults, N_2 , i.e., number of household members with ages > 10 years, as additional explanatory variables.

$$(3.4) \quad w_i = a_i + b_i \log M + c_1 N_1 + c_2 N_2 + \text{error}$$

Here we assume number of children and number of adults are independent and are exogenously determined from household decisions. Various alternative specifications of (3.4) following Deaton (1981) such as quadratic forms involving the interactions between demographic variables and household expenditures were also attempted.³ (3.4) was used to estimate Engel's parameters for West Java samples and for samples in each region.

Measuring Effects of Household Size and Region

Besides income and prices, food demand is also determined by the size of the household. It is intuitively appealing that larger households consume more food than do smaller households, given other factors remain constant. Furthermore, size may also affect the expenditure's parameter, e.g., more percentage of additional income goes to food for a larger household. We use dummy variables to approximate the effects of size on household food consumption such as (3.8).

(3.8) $w_i^h = a_i^h + b_i^h \log M + \sum_h d_h S_h + \sum_h g_h S_h \cdot \log M + \text{error}$
 where S_h ($h=1,3,4,5,6, \geq 7$) is household size. The size of the household here is represented by dummy variables, that

³ Quadratic forms with or without interaction among variables were tried but unsuccessful because there was always singularity in the variance-covariance matrix. The singularity of the variance-covariance matrix is caused by the existence of perfect colinearity between $\log M$ and its square.

is, variables which take binary values: they have a value of 1 if they belong to a certain category of h and zero if otherwise. Table 3.1. below clarifies the problem.

To avoid perfect collinearity among dummy variables and the intercept, one of them must be dropped. In this research we dropped household size = 2 by assigning zero if the samples belong to this category (region A in the case of estimating the effects of region). As a result, the estimated equation for household size = 2 will be in the form of:

$$(3.9) \quad w_i^2 = a_i^2 + b_i^2 \log M$$

Equation (3.9) was used as a reference, namely, we compare all of the other equations to (3.9). This occurs, for example, when the coefficient of dummy variables of both intercept (d_1) and slope (g_1) of household belonging to household size = 1 are significantly different from zero. We can write the estimated equation for household belonging to household size = 1 as:

$$(3.10) \quad w_i^1 = (a_i^2 + d_1) + (b_i^2 + g_1) \log M$$

We see that the behavior of household size = 1 is measured relative to the behavior of household size = 2. The parameters of other household size categories were also measured relative to household size = 2. Therefore, household size = 2 is called a reference. The same procedure is used to measure effects of region on food consumption.

Table 3.1. Dummy structure for measuring effects of household size and of region

Variables	Dummy Structure						
	S ₁	S ₂	S ₃	S ₄	S ₅	S ₆	S ₇
H. Size:							
1	1	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	1	0	0	0	0
4	0	0	0	1	0	0	0
5	0	0	0	0	1	0	0
6	0	0	0	0	0	1	0
≥ 7	0	0	0	0	0	0	1
Region:							
	R ₁	R ₂	R ₃	R ₄	R ₅		
A	0	0	0	0	0		
B	0	1	0	0	0		
C	0	0	1	0	0		
D	0	0	0	1	0		
E	0	0	0	0	1		

The Estimation of Demand for Food : Demand System Approach

Food in this research was defined for 10 aggregated commodities (see previous section for the definition of food items). Furthermore, we assumed that food is separable from non-food commodities including leisure. The food demand system here is known as a conditional demand system.

This research utilized the WTS model of demand system as developed in Chapter II. The functional form of the WTS demand system is :

$$(3.11.a) \quad y_{ih} = a_i + b_i \log M_h + \sum_j \pi_{ij} \log p_{jh}/p_j^* + \epsilon_{ih}$$

$$(3.11.b) \quad y_{ih} = a_i^* + b_i^* \log M_h + \sum_j \pi_{ij}^* \log p_{jh}/p_j^* \\ + s_i \log N + \epsilon_{ih}^*$$

$$(3.11.c) \quad y_{ih} = \hat{a}_i + \hat{b}_i \log M_h + \sum_j \hat{\pi}_{ij} \log p_{jh}/p_j^*$$

$$+ s_{1i} \log N_1 + s_{2i} \log N_2 + \epsilon_{ih}$$

where h is an index for a household ($h = 1, 2, \dots, H$), and $i = 1, 2, \dots, 9$, and ϵ_i^h is an error term. We drop the 10th commodity to avoid singularity due to the property of total sum of elements equaling aggregate. The dropped equation can be recovered by using the homogeneity assumption. (See Theil (1975, 1980), Bewley (1986)).

The form of (3.11) is usually called seemingly unrelated regression (SUR) because the error terms in different equations are possibly mutually correlated (Kmenta, 1971: 518). Equation (3.11) can be estimated by OLS for each commodity. The resulting parameters are unbiased and consistent. However, " by estimating each equation separately and independently, we are disregarding the information about the mutual correlation of the disturbances, and the efficiency of the estimators becomes questionable " (Kmenta, 1971:518). The best linear unbiased estimator of (3.11) is given by Aitken's generalized least squares for instances when the variance-covariance matrix is known, or the Two-Stage Aitken estimator when the variance-covariance matrix is unknown. The first stage in the latter procedure is to estimate the variance-covariance matrix from ordinary least square residual as suggested by Zellner (1962). The two stage Aitken is asymptotically equivalent to Aitken's generalized least square estimator and, therefore, to the maximum likelihood estimator (Kmenta, 1971:525).

Furthermore, Aitken's estimator will be identical to OLS in two special cases : (i) when the error terms of different equations are actually unrelated, or (ii) when each of the seemingly unrelated regressions involves exactly the same explanatory variables (Kmenta, 1971:521). This is the case in demand system research. Therefore, (ii) implies that demand parameters are invariant of whether OLS or Aitken's estimator is used. However, using a system approach such as SUR provides us an opportunity to apply symmetry restriction across demand equations and to estimate them under such a circumstance. In this research we used both OLS and SUR. The earlier method is used for checking of the latter method. For SUR estimation we used an algorithm available in the SAS computer program, the two stage Aitken estimator or Zellner method. The mechanics of estimating parameters using SUR are as follows: (i) Write equations for each commodity in a form of (3.11). Then, we will have ten equations. (ii) Drop one equation, e.g., an equation for tobacco, from the estimation. Then, we have nine equations in a system. The parameters in the dropped equation can be recovered by using homogeneity restriction. (iii) Apply an algorithm of SUR available in the SAS package to estimate the parameters.

Data

A large household data set for Indonesia can be found in the National Economic Surveys (SUSENAS) conducted by the Central Bureau of Statistics. The 1980 data are called 1980 SURGASAR data. This set of data contains not only SUSENAS data but also includes other data which are usually generated from agricultural, animal husbandry, prices, and village statistics surveys. The data used in this research are data which are stored on magnetic tape. The data were obtained from Iowa State University under permission from the Central Bureau of Statistics of Indonesia.

The sampling frame was started with the division of a region into rural and urban areas. Surveys of agriculture and animal husbandry therefore are only conducted in rural areas. In this sampling frame there are two kinds of sample units: (i) a village unit, and (ii) a household unit. A village unit was made based on the 1980 population census. This sampling unit is used to select the samples up to village level. Within this sampling unit, census blocks were selected. Finally, the household samples were selected from each census block (C.B.S., 1980a).

Urban areas, except Jakarta, in all provinces were classified according to population size. A three stage sampling procedure was used. At the first stage, n villages were drawn. Furthermore, a block census was drawn randomly from each village. Finally, about 5 to 10 households were

systematically drawn from each census block after they were classified according to their main source of earnings. The overall sampling fraction was about 1/500 to 1/1000 household (C.B.S., 1980a).

This research analyzed the data of urban households in West Java from the 1980 SURGASAR data. The total number of households analyzed was 1905.

CHAPTER IV

FOOD CONSUMPTION PERFORMANCE IN WEST JAVA

Expenditure, Food Expenditure and Food Share

There are numerous ways to measure household food consumption. One of the methods used by researchers measures household consumption based on the physical amount of food items actually consumed. Other researchers use household expenditure on various food items or use the proportion of expenditure spent on food items (food shares). Each method has its advantages and limitations. For example, by using food share we have a free unit of measurement, and therefore, we may compare food consumption across commodities. Quantity of food consumed, based on this method, can be computed from the share if we have expenditure and price data.

The average weekly (total) household expenditure and household food expenditure in West Java in 1980 were Rp 14,199 and Rp 7,288, respectively; and the average food share was 51 percent. This means that the average urban household in West Java spent about one half of its total household expenditure on food. This is lower than the average food share for urban households in Indonesia (59.84 percent) in 1980 and the average food share in Java and Madura in 1976 (60.23 percent) (C.B.S., 1978, 1983). Therefore, the average household in West Java spent less of its income for food than did the national average or the average of households in Java

and Madura. According to Engel's law, the average urban household in West Java has a higher welfare level than the household in Java and Madura or in the nation.

Fig. 4.1 (see figures at the end of this chapter) shows the relationship between food share of the urban household in West Java against a natural logarithm (log) of (total) real expenditure per week. The corresponding plots indicate that food share is negatively correlated to log of real expenditure. This result supports Engel's hypothesis about the relationship between food share and income or expenditure¹.

Allocation of Food Share

Tables 4.1 and 4.2 show the average urban household expenditure and the allocation of food expenditure on each food item considered in this research. The three largest food expenditures were for cereal, meat and poultry, and tobacco. These three food items composed 56 percent of food expenditure. Expenditure for cereal was the largest because it is a main foodstuff for most Indonesians. Expenditure for meat and poultry was large not because the households consume a large amount of meat and poultry but because the price of this item is high. In these tables we also observed that cereal had the lowest variability in both expenditure and

¹ More discussions of the relationships between food share, and food commodity share and total food expenditure, food prices, and household structures can be found in the next chapters.

share in food budget.

Table 4.1. Average urban household expenditure for 10 food groups in West Java Indonesia

Food groups	Mean (Rp./Week)	Standard Deviation	Coefficient of Variation (%)*
Cereal	2513	1306	52
Tuber	240	237	99
Fish	797	810	102
Meat and Poultry	1568	1668	106
Eggs and Milk	767	906	118
Vegetables	513	424	82
Soybeans and Nuts	560	544	97
Fruit	567	768	135
Sugar	194	184	94
Tobacco	894	843	99

* Coefficient of variation (CV) was computed using the formula: $CV = (SD \times 100) / \text{mean}$

It will be interesting to observe the relations of commodity shares, e.g., share of cereal, with total food share.² We expect that the higher the food share of the household, the higher the share of cereal and the lower the shares of meat and poultry, eggs and milk, and fish.

Fig. 4.2 shows the relationships between food share and the shares of cereal, vegetables, and tuber. Our expectation was true for cereal, that is the higher the food budget share, the higher the share of cereal. This is sufficient to show that the poor spend more income for cereal, and the rich

² Food share was used instead of income or expenditure because the author believes that food share gives a better measure of household welfare than does income, especially for cases in developing countries. Furthermore, using food share as a measure of welfare is also consistent with Engel's law.

do otherwise. The relationship between proportion of expenditure on tuber and vegetable and food share was not clear. Fig. 4.2 shows that tuber consumption is increasing as food share increases but at a rate much lower than the rate of cereal. Furthermore, consumption of vegetables seems to be decreasing at a very low rate as food share increases.

Table 4.2. Average budget share and standard deviation for 10 food groups of the urban household in West Java

Food groups	Mean	Standard Deviation (SD)	Coefficient of Variation* (%)
Cereal	.30	.1027	34.2
Tuber	.02	.0190	95.0
Fish	.10	.0602	60.2
Meat and Poultry	.14	.0852	60.8
Eggs and Milk	.09	.0657	73.0
Vegetables	.06	.0294	49.0
Soybeans and Nuts	.08	.0492	61.3
Fruit	.06	.0408	68.0
Sugar	.03	.0145	48.3
Tobacco	.12	.0648	54.0
Total Food Expenses 1.00			

* Coefficient of variation (CV) was computed using the formula : $CV = (SD \times 100) / \text{mean}$

Fig. 4.3 clearly shows that as food share increases, the share of meat and poultry in household budget decreases. This is intuitively plausible because the poorer the household, the lower its purchasing power will be. Therefore, the poorer household buys less meat and poultry. This figure implies that low income households fulfill protein requirements by consuming more fish, except for households who have

a sufficiently low income, i.e., food share greater than 75 percent. The pattern of eggs and milk in relation to food share does not appear to be linear. As food share decreases (income increases) the household spends more of its income on eggs and milk. However, after its food share drops to less than about 45 percent, the household spends less of its budget on eggs and milk.

Finally, shares of tobacco, soybeans and nuts, fruit, and sugar with food share might be independent. Food share which is an approximation of household welfare does not determine the household expenditure pattern on tobacco, soybeans and nuts, fruit, and sugar (see Fig. 4.4).

Distribution of Household According to Food Share

In the above section we examined the allocation of food budget among its components. In this section we were interested in knowing the distribution of households in urban West Java according to food share. Even though this research was not a study about poverty, knowledge about distribution of households according to food share is important for food policy discussions.

Fig. 4.5 shows that the distribution of households according to food share in urban West Java more or less approximates a normal distribution. About 34 percent of households spend about 55 percent of their income on food and about 62 percent of the household samples spend more than

half of their income on food. This situation indicates that a majority of households in West Java spend a great deal of their income for food.

Summary

Cereal, meat and poultry, tobacco, and fish compose about 66 percent of the food budget. The largest food expenditure is for cereal and the lowest food expenditure is for tuber. Food share and total expenditure (including non food expenditure) seem to have a negative relationship. Furthermore, relationships between food share and each share of food groups in the food budget show : (i) cereal has a positive relationship with food share. This means that the poorer the household the larger the proportion of cereal in the food budget. (ii) In contrast, meat and poultry shows a negative relationship with food share. The rich household spends more on meat and poultry than does the poor one. (iii) As food share decreases (welfare increases) a household spends an increasing portion of its budget on eggs and milk. However, after the food share reaches about 45 percent from the right direction, the expenditure for eggs and milk declines. (iv) Fish seems to be a main source of animal protein for low income households. (v) The proportion of vegetable, tuber, tobacco, soybeans and nut, fruit, and sugar seem independent of the levels of food share (welfare). Finally, the distribution of households according to food share is approximating normal.

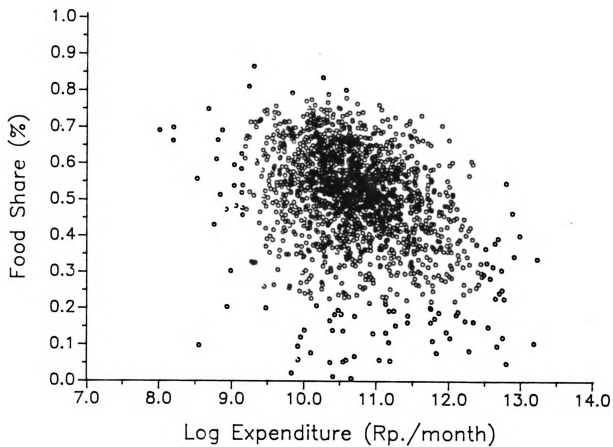


Fig.4.1. Plot between food share and log household expenditure in urban West Java, Indonesia

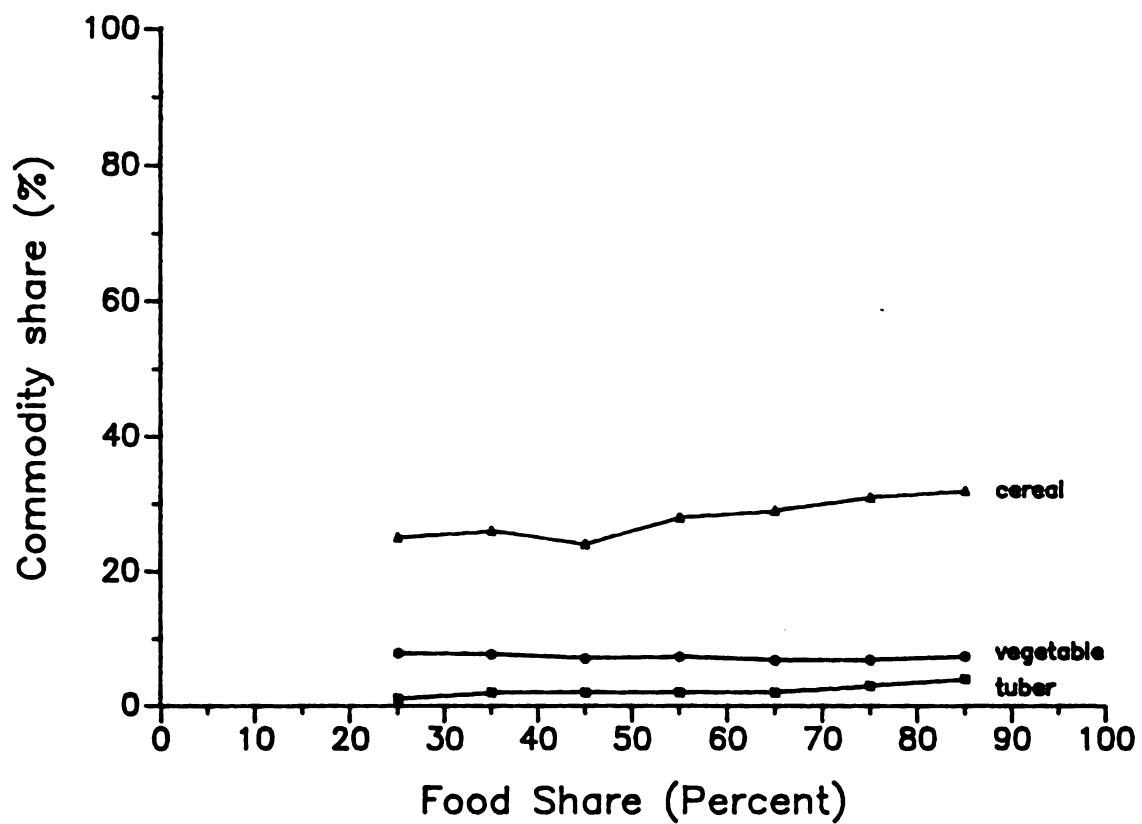


Fig. 4.2. Relationships between shares of cereals, vegetables, and tuber, and food share

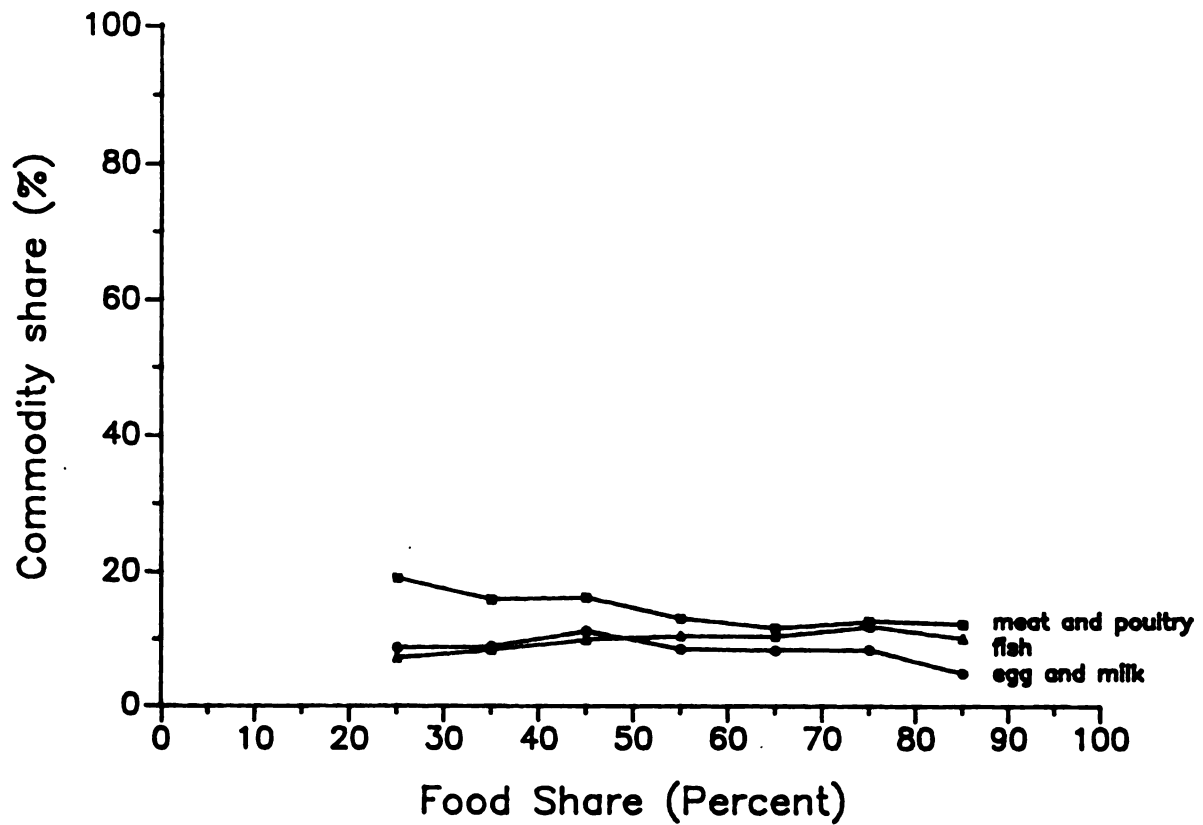


Fig. 4.3. Relationships between shares of meat and poultry, fish, eggs and milk, and food share

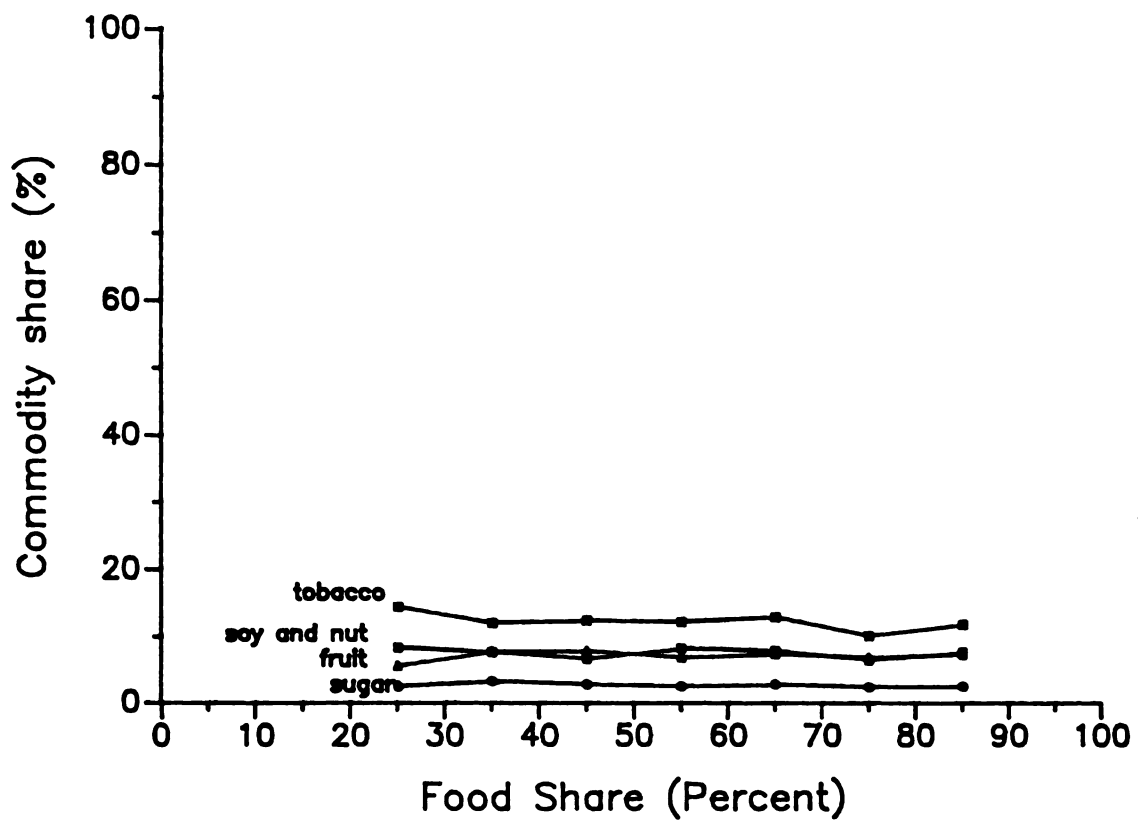


Fig. 4.4. Relationships between shares of tobacco, soybeans and nuts, fruit, sugar, and food share

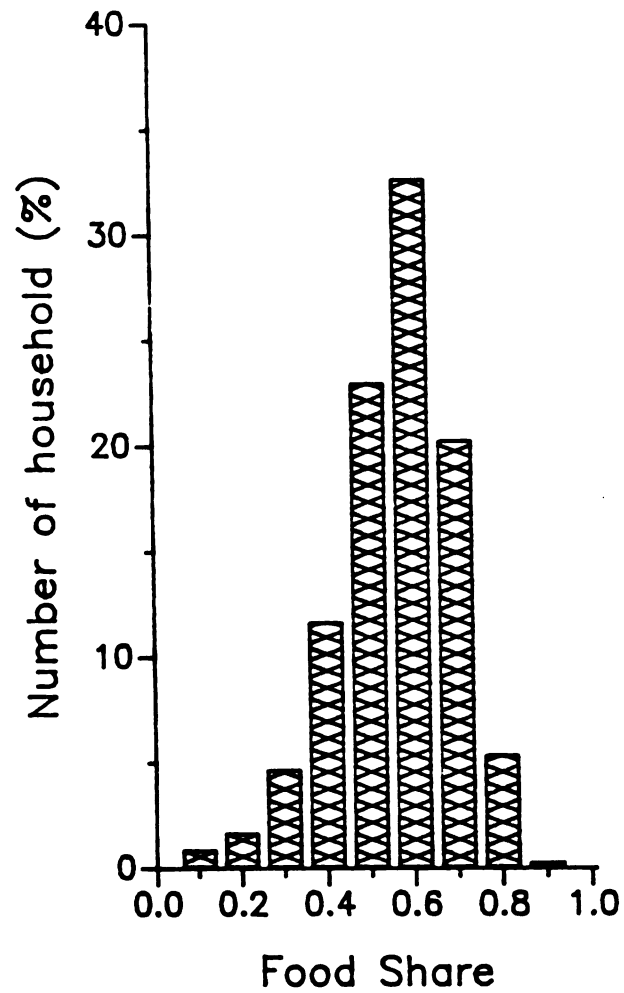


Fig. 4.5. Distribution of household samples according to food share

CHAPTER V

EFFECTS OF EXPENDITURE, PRICE AND HOUSEHOLD SIZE ON DEMAND FOR FOOD

Total food and food groups have been analyzed separately. The main purpose of this separation is that we want to know both the consumption behavior of food as an aggregated good and the consumption behavior of food as more disaggregated commodities. The earlier knowledge is important particularly for the formation of macro policy which usually deals with aggregated variables. Knowledge about household consumption of food items such as cereal, meat, and so on, furthermore, is important for specific food policy. This chapter presents the results of estimating food demand parameters in urban West Java. We limited the analysis to estimation of the effects of expenditure, food prices and household composition on food demand.

Engel Curves for Food Across Household Sizes

This section presents the estimates of effects of income and household size on food consumption, given prices and other factors remain constant. Household size is considered an important factor because any increase or reduction of size, given other factors remain constant, will affect the household's effective demand for food. Food, in this

section, was treated as a single good because we are interested in knowing about the behavior of households' food effective demand toward changes in income and household size.

Table 5.1 (p.54) presents the results of the simple regression analysis. Expenditure elasticity of food, when samples were pooled and household (total) expenditure was used as an explanatory variable, was around 0.86. In addition, it became 0.78 when expenditure per capita was used as an explanatory variable. Both figures, however, indicated that food is necessity. Furthermore, food expenditure elasticities were not constant across household size. Table 5.1 shows that food expenditure elasticity for the household size of 1 was much lower than that of other household sizes. This implies that a group of single households values food less than other household sizes and will spend more of its additional income on non-food goods than will other household sizes, provided they have the same amount of increase in income. This is intuitively plausible and conforms to empirical observations. It is possible because a single individual will have more freedom to spend income than will a married household. Married, and particularly married couples with children, given identical income levels, require more money for food since there are more members in the household in need of food. This means that household size may shape preferences and obviously shapes household budget constraints.

Table 5.2 (p.56) provides similar information to that in Table 5.1 except now we measured, using dummy variables, the effects of household size on food consumption behavior. Among dummy variables, there are only two estimates significantly different from zero, that is dummy intercept and slope for household size = 1. Thus, the intercepts and the slopes for all sizes of households, except for household size = 1, are the same as the intercept and the slope of household size = 2. This result seems to correspond to the results in Table 5.1. Equation (5.1) below denotes the effective demand behavior for food for household size = 1.

$$(5.1) \quad w = 2.1144 - 0.1991 \log M$$

Food expenditure elasticity associated with (5.1) is 0.5490.

Now, let us consider the effects of household size together with the effects of region on household food consumption. Table 5.3 (p.58) presents the results of the effects of region on the intercepts and the slopes of Working's equation. As we found in Table 5.2, the results in Table 5.3 also show no changes in information regarding the effects of household size on intercept and marginal budget shares of food, except if we use a 10 percent level of significance. That is, a single household living in region D (Kuningan, Cirebon, Kodya Cirebon, Majalengka, and Indramayu) has an equation different from the reference household and reference region (region A). Working's equation for a household size = 1 who resides in region D is:

Table 5.1. Comparison of Working's coefficients, average budget shares, food expenditure elasticities, and sum of squared error for seven household sizes in urban regions in West Java

Category	b_{hi}	w	E_{hi}	SSE	# of observations
Food:					
Pooled	-.0708	.5132	.8618	47.6583	1905
Caput	-.1124	.5132	.7810	43.6796	1905
H. size:					
1	-.1992	.4415	.5488	19.4664	65
2	-.1040	.4884	.7871	3.8457	198
3	-.0944	.5253	.8202	4.6034	310
4	-.0925	.5158	.8206	3.7710	281
5	-.1202	.5171	.7675	4.0912	316
6	-.1125	.5184	.7830	2.6968	234
7 or more	-.1102	.5187	.7875	4.7114	501
Non-food (caput)	.1124	.4868	1.2309	-	1905

Notes:

b_{hi} 's is expenditure's coefficient and a_{hi} is ignored

w is average budget share for each household size

E_{hi} is food expenditure elasticity

SSE is sum square of error of each regression

All coefficients are significantly different from zero at a 5 percent level of significance

The non-food equation is obtained from homogeneity assumption.

$$(5.2) \quad w = 1.8215 - 0.1706 \ln M$$

The food expenditure elasticity associated with (5.2) is 0.61.

Food Expenditure Elasticities Across Budget Share

In Table 5.1 we saw food expenditure elasticities for different household sizes. By construction, the Working model also provides a relationship between expenditure elasticity and budget share for each corresponding commodity. The relationships are as follows:

$$E_i = 1 + (b_i/w_i)$$

As we observe, there is an inverse relationship between E_i and w_i .

Furthermore, we are also able to classify the commodities based on the behavior of w_i and b_i . If $w_i > 0$, $b_i < 0$ and $w_i > |b_i|$, then the good is a necessity; If $w_i > 0$, $b_i < 0$ and $w_i < |b_i|$, then the good is inferior; and if $w_i = |b_i|$ and $b_i < 0$, then the commodity is neutral with respect to income changes.

Closer examination of food expenditure elasticities across food share will be interesting because food share can be used as an indicator of household welfare, i.e., the higher the food share the lower the welfare level will be. This is well known as Engel's law. The computation results of food expenditure elasticities for various food shares are presented in Table 5.4 (p.60).

Table 5.2. Effects of expenditure and household size on food share

Variable	DF	Parameter Estimates	Standard Error
Intercept	1	1.3994*	.1591
Log M	1	-0.1040*	.0181
DONE	1	0.7152*	.2619
DTHREE	1	-0.0264	.2040
DFOUR	1	-.0410	.2279
DFIVE	1	0.2382	.2123
DSIX	1	0.1957	.2186
DSEVEN	1	0.1979	.1926
DONELM	1	-0.0951*	.0306
DTHREELM	1	0.0096	.0230
DFOURLM	1	0.0115	.0254
DFIVELM	1	-0.0162	.0236
DSIXLM	1	-0.0085	.0239
DSEVENLM	1	-0.0062	.0212

Notes :

* the parameters are significantly different from zero at one percent significance level.

DONE = dummy intercept for household size =1

DTHREE = dummy intercept for household size =3

DFOUR = dummy intercept for household size = 4

DFIVE = dummy intercept for household size = 5

DSIX = dummy intercept for household size = 6

DSEVEN = dummy intercept for household size ≥ 7

DONELM = dummy slope for household size =1

DTHREELM= dummy slope for household size = 3

DFOURLM = dummy slope for household size = 4

DFIVELM = dummy slope for household size = 5

DSIXLM = dummy slope for household size = 6

DSEVENLM= dummy slope for household size ≥ 7

Reference household is a couple with no child.

In Table 5.4 we see the behavior of food expenditure elasticities across food shares. Food is an inferior good for a household with food shares less than 11 percent. On the contrary, for a household who has a high proportion of its income going to food, almost all of its additional income will also be spent for food. For example, a household with a food share of 70 percent will spend about 8.4 percent of any 10 percent additional income on food. Notice that for households whose food share is more than or equal to 30 percent, more than half of any additional income of that household goes to food. Fig. 4.5 in Chapter IV indicates that about 62 percent of the (total) samples (1905 households) spend more than half of their income for food. This group of households has food expenditure elasticities of more than 0.77 (Table 5.4). Therefore, the effects of income changes on food consumption of this group of households will be larger than for the rest of the household groups. This also implies that food subsidy will increase food consumption at least 7.7 percent for any 10 percent additional income.

Table 5.3. Effects of household size and region on food share

Variable	DF	Parameter Estimates	Standard Error
Intercept	1	1.4893*	.2345
Log M	1	-0.1145*	.0256
DB	1	0.0086	.1821
DC	1	0.2578	.2344
DD	1	-.3711+	.2053
DE	1	-0.1463	.2748
DONE	1	0.7033*	.2629
DTHREE	1	-0.0563	.2032
DFOUR	1	-0.1008	.2268
DFIVE	1	0.1534	.2121
DSIX	1	0.1651	.2181
DSEVEN	1	0.1441	.1945
DONE.Log M	1	-0.0938*	.0307
DTHREE.Log M	1	-0.0127	.0229
DFOUR.Log M	1	0.0178	.0253
DFIVE.Log M	1	-0.0072	.0235
DSIX.Log M	1	-0.0052	.0238
DSEVEN.Log M	1	-0.0004	.0214
DB.Log M	1	0.0005	.0192
DC.Log M	1	-0.0264	.0252
DD.Log M	1	0.0377+	.0218
DE.Log M	1	0.0186	.0296

Notes:

* parameter significantly different from zero at $\alpha = 1\%$

+ parameter significantly different from zero at $\alpha = 10\%$

B, C, D, and E refer to dummy variables for region B, C, D, E, respectively. Other symbols are similar to definitions in Table 5.2.

Reference household is a couple with no children living in Region A.

Effects of Household Composition on Food Consumption

Table 5.5 (p.60) presents the regression results of Working's model for food consumption for five urban regions in West Java. Two additional variables have been added to the Working model, that is, number of household members whose ages $\leq$ ten years, (N_1), and number of household members whose ages $>$ ten years, (N_2).

Parameter estimates in Table 5.5 have been derived from equation (5.3):

$$(5.3) \quad w_i^R = a_i^R + b_i^R \log M^R + c_1 N_1 + c_2 N_2 + \text{error},$$

where R refers to region ($R = A, B, C, D, E$).

Our interest here was to estimate income and household composition elasticities of food across regions. Income elasticities of food can be calculated using Working's formula as given above. Furthermore, household composition elasticities of food demand can be calculated using:

$$(5.4) \quad E_N = \frac{\frac{\delta w_i}{\delta N} \frac{N}{x_i}}{\frac{M}{p_i}} = \frac{c N}{w_i}$$

where N can be N_1 or N_2 as defined above, and c can also be c_1 or c_2 as in (5.3).

Applying the above formula and taking the values of w_i such as $w_i = 0.5132$ (see Table 5.1), and taking $N_1 = 3$, we obtain, for example, a children elasticity of demand for food in West Java of 0.14, and adult elasticity of food demand of 0.07. The latter was evaluated at $N_2 = 2$. Therefore, if the

Table 5.4. Food expenditure elasticities across food shares

Food Share (w)	Expenditure Elasticities (E _i)
0.1	-0.12
0.2	0.44
0.3	0.63
0.4	0.72
0.5	0.77
0.6	0.81
0.7	0.84
0.8	0.86
0.9	0.87

Notes:

E_i was calculated based on the Caput equation in Table 5.1

Table 5.5. Effects of expenditure and household composition on food share according to a region in West Java

Region	Intercept	Log M	N ₁	N ₂
West Java	1.4414 (.0522)	-.1101 (.0061)	.0254 (.0026)	.0176 (.0022)
A	1.6634 (.1470)	-.1412 (.0169)	.0391 (.0074)	.0272 (.0056)
B	1.4458 (.0582)	-.1101 (.0068)	.0253 (.0028)	.0162 (.0023)
C	1.6323 (.3584)	-.1228 (.0432)	.0044 (.0189)	.0076 (.0076)
D	1.1417 (.1084)	-.0836 (.0129)	.0308 (.0059)	.0203 (.0052)
E	1.2597 (.1378)	-.0888 (.0164)	.0161 (.0060)	.0207 (.0046)

Notes:

Number in the brackets is the value of the standard deviation

N₁ and N₂ are household members with age ≤ 10 years and age > 10 years, respectively.

number of children is doubled, quantity demanded for food will increase by 14 percent, given other factors remain constant. In addition, closer examination of Table 5.5 indicates that the response of food share with respect to changes in number of children is greater than the response of food share with respect to changes in numbers of adults, except for cases in regions C and E. A similar finding was reported by Deaton and Muellbauer (1986) for Indonesia using 1978 SUSENAS data. This is reasonable for developing country cases because most expenditure for children in developing countries goes to food.

Applying the income elasticity formula derived from Working's model obtained income elasticities for food: 0.78, 0.72, 0.78, 0.76, 0.83, and 0.82 for West Java (aggregate), regions A, B, C, D, and E, respectively. Differences in income elasticities across regions are not large.

Now, examine the household consumption behavior where food was disaggregated into ten groups of food. Table 5.6 (p.64) presents the results showing the effects of expenditure, number of children, and number of adults on the effective demand for each food item, given prices and other factors remain constant. Food expenditure, number of children and number of adults reveal different effects on different kinds of food. The response of most commodity shares with respect to changes in household composition is

negative, with the exception of cereal. Comparing Table 5.6 and Table 5.5 indicates that when food categories are lumped as food, the effects of number of adults and number of children on food demand are always positive. Disaggregating food into 10 commodities, however, shows that relationships between food demand and household size are negative except for cereal. The positive relationship between household size and food consumption indicates that the positive effect of household size on cereal consumption outweighs its negative effects on consumption for other food groups. Therefore, breaking food into more specific groups gives more knowledge about effects of changes in expenditure and household size toward changes in food consumption.

A positive sign of household size effects on the equation of demand for cereal indicates that an additional household member will increase demand for cereal, given other factors remain constant. At the same time, demand for meat and poultry, fish, eggs and milk decreases as household size increases. Therefore, given a fixed income, increase in household size will increase demand for cereal, but will decrease demand for other items, mainly luxury foods such as meat, fish, eggs and milk which are more expensive. This behavior is reasonable because at a given fixed income, an additional member creates cost to the household. The most obvious cost is expenditure for necessities (cereal in this case) and because income is fixed, then there must be a

reduction in spending for other goods, namely, more expensive food such as meat and poultry, fish, and eggs and milk.

Table 5.7 (p.66) indicates household composition elasticities. The number of children elasticity of demand (based on a constant price version) for cereal is 0.19 which means that demand for cereal will increase by 19 percent if the number of children is doubled, given total expenditure, number of adults and other factors remain constant. The number of adults elasticity of demand for cereal is quite high: doubling the number of adults will increase demand for cereal by 43 percent. Stated another way, reducing the number of adults, for example, from four to two will reduce the household demand for cereal by almost one half relative to initial consumption. The demand for eggs and milk, and meat and poultry will, on the other hand, decrease by 29 percent if the number of adults doubles. Doubling the number of children, moreover, will reduce demand for meat by 12 percent. Negative effects of changes of number of adults on the demand for luxury foods are obvious. Furthermore, given a fixed income, a household will also spend less on tobacco if its size increases because food is more important to serve the needs of all of the members of the household (Bojer, 1977).

Table 5.6. Parameter estimates for food groups under the Working framework when prices are assumed constant

Share	Intercept	Log M_f	Log N_1	Log N_2
CER	1.6309*	-.1658*	.0586*	.1314*
	[.1019]	[.0127]	[.0099]	[.0114]
TUB	.0593	-.0038	-.0034	.0003
	[.0319]	[.0037]	[.0029]	[.0033]
FISH	-.1364	.0272*	-.0078	-.0097
	[.0886]	[.0103]	[.0081]	[.0093]
EGM	-.2698*	.0437*	-.0128	-.0261*
	[.1026]	[.0120]	[.0094]	[.0108]
MEP	-.6813*	.0951*	-.0174	-.0406*
	[.1176]	[.0137]	[.0137]	[.0124]
VEG	.0848+	-.0012	-.0053	-.0055
	[.0469]	[.0054]	[.0042]	[.0049]
SOYN	.2132*	-.0163	-.0006	-.0083
	[.0733]	[.0086]	[.0067]	[.0077]
FRT	-.0519	-.0144	-.0075	-.0115*
	[.0655]	[.0076]	[.0059]	[.0068]
TOB	.1312	.0053	-.0061	-.0426*
	[.1021]	[.0119]	[.0093]	[.0107]

Notes:

* parameter significance at $\alpha = 5\%$

N_1 might contain zero values. SAS program treats them as missing values and those are excluded from the computation. Therefore, the parameters under the log N_1 column should be read cautiously.

Table 5.7 shows number of children and of adult elasticities for food items which were derived from both a fixed price model and prices included in the model. The comparisons of household composition elasticities of demand across models show that the WTS with and without price variables in the model gives almost the same magnitude of elasticity (see Table 5.6 and Table A.6 to identify the parameters which are significantly different from zero). This means that the effect of household size is independent

from price variables.

Expenditure Elasticities for Food Groups

Estimation of the WTS model based on assumptions of homogeneity and symmetry, and with no restrictions on parameters has been tried. Table 5.8 (p.67) below presents the results. The main hypothesis here is that fish, meat and poultry, and eggs and milk are luxury foods and the remaining of food groups are necessities.

Since what we have estimated are food conditional demand functions, expenditure elasticities are not directly obtained from the results. The following procedure was used to calculate expenditure elasticities.

We define that $x_i = f(M_f)$, where M_f is total food expenditure. M_f is assumed to be a function of total expenditure, $M_f = g(M)$. Then, by chain rule we obtain expenditure elasticity, E_i :

$$(5.4) \quad E_i = \frac{\delta \log x_i}{\delta \log M} = \frac{\delta x_i}{\delta M} \frac{M}{x_i} = \frac{\delta x_i}{\delta M_f} \frac{M_f}{x_i} \cdot \frac{\delta M_f}{\delta M} \frac{M}{M_f}$$

This can be simplified as :

$$E_i = E_i' \cdot E_f,$$

where E_i' is conditional expenditure elasticity of category i and E_f is food expenditure elasticity. We obtained E_f from Table 5.1 using the caput equation with $E_f = 0.78$.

Table 5.7. Household composition elasticities derived from a constant and a non constant price version

Commodity	constant price version ¹		Price included in estimation	
	N ₁	N ₂	N ₁	N ₂
Cereal	0.19	0.43	0.19	0.42
Tuber	-0.17	0.02	-0.22	0.05
Fish	-0.07	-0.10	-0.11	-0.16
Meat and poultry	-0.12	-0.29	-0.12	-0.28
Eggs and milk	-0.14	-0.29	-0.12	-0.21
Vegetables	-0.08	-0.09	-0.08	-0.08
Soybeans and nuts	-0.00	-0.10	-0.02	0.01
Fruit	-0.12	-0.19	-0.13	-0.20
Tobacco	-0.05	-0.35	-0.02	-0.28

Notes:

1 Computed based on Table 5.6

2 Computed based on Table A.6

Entries in Table 5.8 were calculated based on Table A.1, Table A.2 and Table A.3. Zero expenditure elasticities do not mean that there are no effects of expenditure on the consumption of such food categories, but at a 10 percent significance level the parameters are not significantly different from zero.

Based on the above results we can see that the expenditure elasticities obtained are invariant to the imposition of homogeneity and symmetry restrictions. In addition, as one usually expects, we find that meat and poultry, fish, eggs and milk are luxury foods for households in West Java. The expenditure elasticities for fish, and meat and poultry are around 1.03 and 1.23, respectively. This research also

indicates that cereal, sugar, and tobacco are necessities with expenditure elasticities of about .64, .72, and .64, respectively. Tuber, vegetables, soybeans and nuts, and fruit, however, cannot be clearly classified since their expenditure elasticities are not significantly different from zero. The latter corresponds to Fig. 4.2 and Fig. 4.4. In these figures we see that the shares of tuber, vegetables, soybeans and nuts, and fruit are independent of the food share. The last column in Table 5.8 reports results from Johnson et al. (1986).

Table 5.8. Expenditure elasticities derived from WTS

Commodity	E1	E2	E3	E4
Cereal	0.64	0.64	0.61	0.23 ^a
Tuber	0.00	0.00	0.00	
Fish	1.03	1.02	1.02	
Meat and poultry	1.23	1.22	1.22	1.48 ^b
Eggs and milk	0.96	1.00	1.11	
Vegetables	0.00	0.00	0.00	
Soybeans and nuts	0.00	0.00	0.00	
Fruit	0.00	0.00	0.00	
Sugar	0.72	0.72	0.84	0.48 ^c
Tobacco	0.64	0.64	0.76	

Notes:

E1 = No restrictions on the parameters have been imposed, estimated by OLS

E2 = Homogeneity was imposed, estimated by SUR

E3 = Symmetry was imposed, SUR

E4 = Estimates are taken from Johnson et al. (1986) where a is for rice, b for animal products, and c for sweetener

Zero is used where expenditure coefficients are not significantly different from zero at $\alpha = 10\%$.

Compensated and Uncompensated Own Price Elasticities

The main hypothesis here is well known as the law of demand. If the good is normal, (income elasticity for that good is positive but less than one), then increase in price of that good will reduce quantity demanded, given income and other factors remain constant. This hypothesis was tested by the examination of each uncompensated own price elasticity for each food group because that hypothesis deals with the Marshallian demand equations. All entries in Table 5.10 have a negative sign, therefore, our estimates support our hypothesis stated above. In addition, all own price elasticities are significantly different from zero at $\alpha = 5$ percent. This is not the case for cross-price elasticities (see the following section). It implies that own price changes are more important than cross-price changes in affecting changes in demand for each commodity.

Table 5.9 (p.70) presents compensated own price elasticities which measure the effects of price changes when the consumer is compensated. The Hicksian price effects will be identical to the Marshallian price effects if income effect of price changes of the good being considered is zero. Comparison of Table 5.9 and Table 5.10 (p.70) shows that the rows of tuber, vegetables, soybeans and nuts, and fruit in Table 5.9 and Table 5.10, respectively, contain the same magnitude of price elasticities. This means that changes in

price of those commodities do not change the real income of the consumer. The effects of price changes for those commodities are all attributed to substitution effects of price changes.

The column entries in Table 5.9 and Table 5.10 denote the compensated and uncompensated price elasticities under no restriction, symmetry, homogeneity, and block independence, respectively. We did the imposition of such restrictions on the price parameters because we are interested in knowing whether own-price coefficients are sensitive to restriction. The results of such imposition show (read Table 5.9 and Table 5.10 according to a column) that there are no big changes in magnitudes (except for sugar) and signs of both compensated and uncompensated own-price elasticities. As suggested by theory all compensated price elasticities have a negative sign which means that given a utility level, price increase will always be followed by a reduction in the quantity demanded. The figures in Table 5.9 were computed directly from the WTS estimates provided in Appendix A.

Table 5.9. Compensated own price elasticities

Commodity	e1	e2	e3	e4
Cereal	-0.54	-0.49	-0.50	-0.50
Tuber	-1.24	-1.23	-1.25	-1.24
Fish	-0.39	-0.37	-0.38	-0.38
Meat and poultry	-0.48	-0.45	-0.46	-0.48
Eggs and milk	-0.42	-0.45	-0.41	-0.42
Vegetables	-0.66	-0.72	-0.66	-0.68
Soybeans and nuts	-1.02	-0.99	-0.99	-1.02
Fruit	-0.31	-0.28	-0.24	-0.26
Sugar	-0.39	-0.05	-0.63	-0.06
Tobacco	-0.28	-0.32	-0.29	-0.26

Notes :

e1 = Parameter restrictions were not imposed, OLS

e2 = Symmetry was imposed, SUR

e3 = Homogeneity was imposed, SUR

e4 = Block independence (food, sugar, tobacco) was imposed, SUR

Table 5.10. Uncompensated own price elasticities

Commodity	e*1	e*2	e*3	e*4
Cereal	-0.73	-0.67	-0.69	-0.69
Tuber	-1.24	-1.23	-1.25	-1.24
Fish	-0.49	-0.47	-0.48	-0.48
Meat and poultry	-0.65	-0.55	-0.63	-0.65
Eggs and milk	-0.51	-0.54	-0.50	-0.50
Vegetables	-0.66	-0.72	-0.66	-0.68
Soybeans and nuts	-1.02	-0.99	-0.99	-1.02
Fruit	-0.31	-0.28	-0.24	-0.26
Sugar	-0.41	-0.07	-0.65	-0.08
Tobacco	-0.36	-0.39	-0.37	-0.34

e*1 = Parameter restrictions were not imposed, OLS

e*2 = Symmetry was imposed, SUR

e*3 = Homogeneity was imposed, SUR

e*4 = Block independence (food, sugar, tobacco) was imposed

Compensated and Uncompensated Cross-Price Elasticities

Another measure of effects of price changes derived from a demand system approach is compensated (uncompensated) cross price elasticity. As discussed in Chapter II, this elasticity measures the effects of changes of the j^{th} price on changes of demand for a commodity i . Therefore, knowledge about cross price elasticities is important for analyzing the impact of changing the price of one commodity on demand for other commodities. For example, we estimate changes of quantity demanded of meat due to changes in fish price. Since this involves cross-equation effects of price changes, we face more difficulties both in specification, estimation and in testing of the demand parameters. However, a major advantage of using a demand system approach is modeling those interactions within a unit of a system.

The compensated and uncompensated price elasticities for 10 food groups in West Java can be read in Tables A.8 - A.15. We also include own price elasticities in those tables which we thought important for making comparisons between direct and indirect effects of price changes. In this section we are interested in examining the following hypotheses:

- (i) Tuber and cereal are substitutes;
- (ii) Fish, eggs and milk, and meat are substitutes;
- (iii) Vegetables, and soybeans and nuts are substitutes;

We are mainly interested in substitutes because only for substitutes do price policies have interesting applications. This assertion is a logical consequence of constructing consumer preferences which also has important empirical relevance. If consumer preferences are represented by a Leontief utility function, for example, changes in relative price will have no effects on demand. Changes in price, of course, will affect demand through changes in real income. Therefore, changes in relative price will affect demand as long as a structure of preferences allows for substitution. Asserting cross-price elasticities is an inductive approach to infer commodities' relations.

Hypothesis (i): tuber and cereal are substitutes

It is commonly believed that cereal and tuber are close substitutes in the preferences of consumers. In fact Timmer and Alderman (1979) show that cassava and rice for Indonesian consumers are substitutes.

Table A.8 shows compensated own and cross price elasticities for urban households in West Java when demand restrictions are not imposed. We see that tuber and cereal are independent goods because at a 10 percent significance level we cannot reject our H_0 : we accept that they are independent. This finding is also consistent when homogeneity restriction is imposed. Therefore, based on this result we conclude that cereal and tuber are neither complements nor substitutes.

This research shows different consumer behavior toward price changes from Timmer and Alderman's results as mentioned above. It is possible that tuber for the West Java community is likely to be independent from other goods, particularly for urban households. Tuber for urban households is not the main staple. A low tuber budget share of the household food budget (2 percent) and high own price elasticity (-1.24) also indicate that tuber in this research is not a price inelastic commodity. A low tuber budget share is also responsible for high own-price elasticity. Evaluating own-price elasticity of tuber if, for example, the household spent 10 percent of its food budget on tuber, tuber became price inelastic (see Table 5.11, p.77). The main point here is that the demand functions do not reveal that cereal, mostly rice, has closed substitutes. This knowledge is very important for food policy since it indicates that increasing the price of cereal, for example, will not increase demand for tuber¹.

Hypothesis (ii): Fish, eggs and milk, and meat are substitutes

¹ This finding is based on cross-sectional data. An interesting question arises: will the cereal-tuber relationship change in the long run or will cross-sectional estimates shift over time? The answer may be yes or may be no because it largely depends on changes in the structure of consumer preferences. According to Crockett (1960:293) the demand parameter estimates from time series data are usually lower than those from cross-sectional data.

Animal protein food sources include fish, milk and eggs, and meat and poultry. It is intuitively reasonable to hypothesize that they are substitutes. Therefore, the cross effects of price changes should have a positive sign.

Examination of the tables in Appendix A shows correspondence to our hypothesis, with the exception of fish. Fish is not a substitute for meat and poultry and vice versa. However, if we trace back our cross-price elasticity of fish with respect to changes of demand for meat, we find a positive sign but it is not significantly different from zero at a 10 percent significance level (see, e.g., Table A.1). Therefore, we may say that eggs and milk, fish, and meat and poultry are substitutes. This finding is important for further research in the animal products system of commodities. Based on this finding, for example, meat and poultry, fish, and eggs and milk can be analyzed separately from other food commodities without harming our price effects estimates. This is important for detailed analysis of the animal product system of commodities when time and financial resources are limited.

Hypothesis (iii): vegetables, soybeans and nuts are substitutes

In hypothesis (iii) we hypothesized that vegetables and soybeans and nuts are substitutes. The reasons for proposing such an hypothesis are mainly based on empirical observations

and personal experiences.

In this research we found that soybeans and nuts, and vegetables do not reveal a relationship such as hypothesized above. Soybeans and nuts can be viewed as independent commodities such as tuber and cereal. Changes in the price of soybeans and nuts only affect demand for meat and poultry and sugar. With sugar it has complementary relationships and with meat and poultry it has substitute relationships. Vegetables, on the other hand, have a relationship with fish (complementary), meat and poultry (substitutes), eggs and milk (substitutes), and with tobacco (substitutes). We will ignore the relationship between tobacco and vegetables because such a relationship is intuitively difficult to explain.

The reasons why vegetables and, soybeans and nuts are independent are not clear intuitively. Statistically they are independent because we cannot reject H_0 at the 10 percent significance level. However, examining signs only (see e.g., Table A.1), we found that they have positive signs in their cross-effect of price changes. Therefore, they are potentially substitutes.

The examination of cross-effects of price changes for other groups of commodities can be done by the reader. The point is that by using a demand system approach we get knowledge about the relationship of one commodity to another based on consumer preferences.

Price Effects Across Commodity Shares (v_i)

In this section we are interested in examining the own price effects across commodity shares, v_i . This knowledge is important because such elasticities will show the responses of different income status of households toward price changes. For example, households which spend a large amount of their budget on cereal will have a different response toward cereal price changes from the households who spend only a small amount of their income on the same commodity. The WTS model assumes the price coefficient is constant. Then varying commodity share, v_i , we obtain cross and own price elasticity.

Table 5.11 shows that poor households which are usually characterized by a high percentage of cereal consumption are not responsive to cereal price changes relative to richer households which are usually characterized by a low percentage of cereal consumption. On the other hand, richer households which are characterized by consuming a high percentage of luxury foods such as fish, meat and poultry, and eggs and milk will not change their behavior very much if prices of such luxury commodities change. These findings are important for identifying the consequences of price control in the food market. This research, for example, suggests that price variables are not a good instrument for helping the poor if we wish to increase the consumption of necessities by the poor. Income subsidy will be better for the poor

who need more necessities because they are more responsive to income changes than to price changes. In addition, increasing the price of luxury foods, for example, will not hurt the rich very much and nor will the economy be affected. Therefore, the policy related to increasing price of luxury foods and transferring this revenue to subsidize the poor might be a plausible policy. We will continue the discussion about the effects of price changes in the next chapter.

Table 5.11. Compensated Price elasticities across commodity shares

Commodity	Commodity Share (v_i)							
(i)	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
Cereal	-1.62	-0.81	-0.54	-0.40	-0.32	-0.26	-0.23	-0.20
Tuber	-0.24	-0.12	-0.08	-0.06	-0.05	-0.04	-0.04	-0.03
Fish	-0.39	-0.20	-0.13	-0.10	-0.08	-0.07	-0.06	-0.05
Meat and Poul.	-0.66	-0.33	-0.22	-0.16	-0.13	-0.11	-0.09	-0.08
Eggs and Milk	-0.37	-0.18	-0.12	-0.09	-0.08	-0.06	-0.05	-0.04
Vegetables	-0.40	-0.20	-0.13	-0.10	-0.08	-0.06	-0.06	-0.05
Soy. and nuts	-0.82	-0.41	-0.27	-0.20	-0.16	-0.14	-0.12	-0.10
Fruit	-0.14	-0.07	-0.05	-0.04	-0.03	-0.02	-0.02	-0.02
Sugar	-0.12	-0.06	-0.04	-0.03	-0.02	-0.02	-0.02	-0.01
Tobacco	-0.34	-0.17	-0.12	-0.08	-0.06	-0.06	-0.05	-0.04

Notes : The computation of elasticities was based on Table A.1.

Summary

Food expenditure elasticities across household sizes are the same as for household size of two except for the one person household (Table 5.1). Food consumption behavior across five regions in West Java is also not different from that in region A, except for region D (Table 5.3). Furthermore, food expenditure elasticities are varied across food share (Table 5.4).

Household size and composition play an important role in household food consumption. Both Working and the WTS model show consistent effect of changes in household size on demand for food. Increasing household size will increase consumption of cereal and will decrease consumption of meat and poultry, eggs and milk, fish, and so on, *ceteris paribus*. Therefore, success in family planning programs will shift demand for kinds of food, from necessities to luxuries (Table 5.7).

As has been expected, cereal is a necessity and meat and poultry, fish, and eggs and milk are luxuries. Tuber, vegetables, soybeans and nuts, and fruit are independent from total expenditure at a ten percent level of significance. This finding is also supported by Figures 4.2 to 4.4.

All uncompensated own price elasticities have a negative sign. Therefore, none of the food groups in this research is a Giffen good. Evaluated at the mean value of each commodity share, tuber, and soybeans and nuts are price elastic

commodities. However, if the own price elasticities are evaluated at 10 percent commodity share, only cereal is price elastic (see Table 5.11). Cereal is the most important commodity in the household food budget. The compensated and uncompensated own price elasticities of cereal evaluated at its mean commodity share (30 percent) are -0.54 and -0.73, respectively. Income effect of price changes of cereal is around 1.9 percent for a 10 percent change in cereal price (see Table 5.9 and Table 5.10).

There is evidence of substitution among food commodities particularly between animal products. The most important finding is that the data do not show that cereal is a substitute for tuber for the urban West Java consumer. Therefore, our result contradicts that of Timmer and Alderman (1979). One possible reason is that we used urban West Java data but Timmer and Alderman used national data.

CHAPTER VI

WELFARE ANALYSIS OF THE HOUSEHOLD

The objectives are to present the estimates of welfare losses of households due to price increase, and to show the estimates of household Engel's equivalence scales using results presented in the previous chapter. Each section begins with a short review of the conceptual framework and procedures of computation of both welfare measures.

Welfare Effect of Food Price Changes

Compensating variation (CV) and equivalent variation (EV) are two paths of changes of welfare which are usually used in welfare analysis¹. CV of moving from situation 1 to situation 2 is defined as (Just et al., 1982:85) "the amount of income which must be taken away from a consumer (possibly negative) after a price and/or income change to restore the consumer's original welfare level"; and EV "is the amount of income that must be given to a consumer (again possibly negative) in lieu of price and income changes to leave the consumer as well off as with the change".

¹ The Marshallian Consumer's surplus is another welfare measure. This research did not use this measure because surplus values derived from the Marshallian consumer's surplus are not unique, i.e., path dependent (see Silberberg, 1978).

Hicksian demand functions can be derived from cost function using Shephard's lemma. Cost function is defined by :

$$(6.1) \quad c(u, p) = \sum p_i x_i(p, u) = M$$

Therefore, CV is represented by:

$$(6.2) \quad CV = c(p^2, u^1) - c(p^1, u^1)$$

where p^1 and p^2 is a vector of prices at initial and for prospective situations, respectively.

Following McKenzie (1983), the equation (6.2) can be approximated by a Taylor series expansion. A Taylor series expansion around the initial value of the cost function gives:

$$(6.3) \quad c(p^2, u^1) = c(p^1, u^1) + \sum_i \frac{\delta c(p^1, u^1)}{\delta p_i} dp_i \\ + \frac{1}{2} \sum_i \sum_j \frac{\delta^2 c(p^1, u^1)}{\delta p_i \delta p_j} dp_i dp_j + R$$

where R is the remainder, that is the terms higher than second order.

The expression in (6.3) is equivalent to :

$$(6.4) \quad c(p^2, u^1) \approx c(p^1, u^1) + \sum_i x_i(p^1, u^1) dp_i \\ + 1/2 \sum_i \sum_j \frac{\delta x_i(p^1, u^1)}{\delta p_j} dp_i dp_j$$

where R is ignored. By moving $c(p^1, u^1)$ to the left hand side, we obtain CV in the following manner:

$$(6.5) \quad CV = \sum_i x_i(p^1, u^1) dp_i + 1/2 \sum_i \sum_j \frac{\delta x_i(p^1, u^1)}{\delta p_j} dp_i dp_j$$

According to McKenzie (1983), (6.5) is known as Hicks's approximation to the compensating variations underlying any utility function.

If the government increases a single commodity price, p_i , holding other prices constant, then (6.5) will be simply

$$(6.6) \quad CV_i = x_i dp_i + 1/2 \frac{\delta x_i}{\delta p_i} dp_i dp_i, \quad \text{or :}$$

$$(6.7) \quad CV_i = x_i dp_i + 1/2 \frac{\delta x_i}{\delta p_i} \frac{p_i}{x_i} \frac{x_i}{p_i} dp_i dp_i$$

which can be simplified into :

$$(6.8) \quad CV_i = x_i dp_i \left(1 + \frac{dp_i}{2 p_i} e^i_i \right)$$

where e^i_i is the Hicksian price elasticity of demand.

If there are two price changes, p_i and p_j , while the remaining prices are held constant, then (6.8) becomes :

$$(6.9) \quad CV_{ij} = CV_i + CV_j + \frac{1}{2} dp_i dp_j \left(e^i_j \frac{x_i}{p_j} + e^j_i \frac{x_j}{p_i} \right)$$

(McKenzie, 1983).

Equations (6.8) were used to calculate CV, the results of which are presented in Table 6.1. Those results are derived based on the assumption that there was a 50 percent increase in price of cereal, meat and poultry, fish, and eggs and milk.

Table 6.1 shows that the position of cereal in consumer welfare in West Java is important. We see that most of the

reduction of consumer welfare is due to the reduction in cereal consumption. This happens because cereal composes about 30 percent of the food budget. A 50 percent price increase in cereal calls for consumer subsidy of Rp. 1,000/household/week. This is equivalent to the (monetary) value of consumers' losses due to price increase. That figure can also be interpreted as the amount of money a consumer is willing to pay to avoid a 50 percent price increase. The value of compensating variations should not be confused with gross domestic product or personal income because both have different methodological foundations.

Table 6.1. Compensating variation for a 50 percent price increase with average food expense/week/household = Rp 7288

Commodity	Rp./week	% of food expenditure/ week
Cereal	1001.3	13.7
Fish	339.4	4.6
Meat and poultry	474.1	6.5
Eggs and milk	305.0	4.2

Furthermore, Table 6.2 below shows the values of compensating variations across commodity shares. We see that the values of compensating variations increase as the commodity shares increase. Because we can identify that a low income household will spend a larger proportion of its income on

cereal, e.g., rice (see Fig. 4.2), then increasing the price of rice, for example, will make the lower income group suffer. On the other hand, if the government increases the price of meats, for example, lower income group households, who usually consume less of that good than do higher income groups, will not be affected significantly. Therefore, if our policy objective is to reduce under-nutrition, then increasing the price of rice is not a viable decision.

Table 6.2. Values of compensating variations across commodity shares

Commodity	Commodity Share							
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
	 Rp/Household/Week.....							
Cereal	797	942	944	1019	1034	1044	1050	1056
Fish	338	350	354	356	357	358	358	359
Meat and Poultry	456	485	494	500	502	504	506	506
Eggs and Milk	308	318	321	323	323	324	325	326

Comparisons of Households' Welfare

Equivalence scales (S_r^h) are well known measures for comparing the welfare status of a household having certain demographic characteristics h to a reference household having r characteristics. S_r^h can be defined as "deflators which are more sophisticated than mere head counting by which the budgets of different household types can be

converted to a needs corrected basis. Since they are essentially cost of living indices, they are defined through the concept of a cost function, which gives the minimum cost required to reach a given standard of living" (Muellbauer, 1977:460). As implied in the definition, comparisons are made based on actual ex post consumption levels. Therefore, the interpretation of equivalence scales should be limited to the measurement of relative standard of living in view of actual level of consumption (for a variety definitions of standard of living see Campbell (1949)).

Mathematically, equivalence scales can be expressed as follows :

$$(6.10) \quad S^h_r = \frac{c(p, u, d^h)}{c(p, u, d^r)} = M^h / M^r$$

where $c(p, u, d^h)$ and $c(p, u, d^r)$ are cost functions of households with characteristic h and reference household, respectively. Equation (6.10) shows that S^h_r is a money metric welfare measure because now we can answer how much income is needed if we wish a household h to have equal welfare with a household reference. The key point here is that we represent preferences in terms of expenditure and prices.

There is no unique way to specify functions for estimating S^h_r . In this research we use the Working equation by incorporating demographic variables as has been done by Deaton (1981) in his Sri Lankan essays, and Deaton and

Muellbauer (1986) in their cost of children studies in Sri Lanka and Indonesia. The resulting S^h_r is called Engel's equivalence scales. We assume in this section that prices are constant.

To compare household welfare we need a common denominator. In this research we follow Engel's principle that households of differing composition will have equal welfare if they have the same food share.

To make the problem clearer let us consider the following steps:

First, we specify :

$$(6.11) \quad w_i = a_i + b_i \log M + c_1 N_1 + c_2 N_2,$$

where w_i , M , N_1 , and N_2 are used as defined in the previous chapter.

Second, we determine the household reference, for example, household groups with two members and no child. We assume this is a couple without children.

Third, since we assume that a household with characteristic h has the same welfare level as the household reference if they have equal food shares, then the following equation is true:

$$(6.12) \quad a_i + b_i \log M^r + c_2 N_2^r = a_i + b_i \log M^h + c_1 N_1^h + c_2 N_2^h$$

Therefore, equivalence scales, $S^h_r = M^h/M^r$ are :

$$(6.13) \quad S^h_r = \text{Exp.} \left[\frac{1}{b_i} (c_2 (N_2^r - N_2^h) - c_1 N_1^h) \right]$$

The results of this calculation should be viewed from a pragmatic rather than an idealistic point of view because comparing two different types of household welfare is very difficult. Such difficulty lies in the fact that we observe behavior, but we evaluate the ends. The variety of ends will be more or less as many as the number of individuals. In this interpersonal comparison of welfare there is no easy way to find commonly accepted correlations between economic performance and social welfare. However, policy makers cannot afford to wait to make welfare decisions until economists resolve the theoretical problems of household welfare comparisons. This research, for example, takes for granted that the (actual) standard of living of adults is correctly indicated by the share of household budget devoted to food (Deaton and Muellbauer, 1986). Therefore, the cost of children, under the assumption that children always depend on their parents, can be directly measured by calculating the compensation that would have to be paid to the parents to maintain the household food share as it was before children.

The reasonableness of Engel's equivalence scales seems to be supported by empirical evidence that (i) the food share, or households of the same demographic composition, varies inversely with income or total expenditure. This is well known as Engel's law. And (ii), for households with the same income or total expenditure level, the food share is

positively related to the number of children.

The following table presents results of computation of equivalence scales for West Java (aggregate) and for five regions.

Table 6.3. Equivalence scales for a household with respect to a household composed of two adults and no children

Region	# of Children		
	0	1	2
W. Java	1.00	1.25	1.58
Reg. A ¹	1.00	1.32	1.74
Reg. B ²	1.00	1.19	1.42
Reg. D ³	1.00	1.44	2.09
Reg. E ⁴	1.00	1.20	1.44
Indonesia ⁵	1.00	1.58	2.22

Notes :

- 1 Region A includes : Pandeglang, Lebak, Tangerang, Serang
- 2 Region B includes : Bogor, Sukabumi, Cianjur, Bandung
- 3 Region D includes : Kuningan, Cirebon, Majalengka, Indramayu
- 4 Region E includes : Subang, Purwakarta, Karawang, Bekasi.
- 5 From Deaton and Muellbauer (1986). The corresponding children here refer to children older than five years old.

The cells in Table 6.3 can be read as follows. First, let us read the second column. All cell entries are 1.00. This is an index for reference groups, namely, a couple without children. Line 1 in that table compares S^h_r of a household with one child and a household with two children relative to a couple without children given equal food

budget shares in West Java (aggregate). Based on that table we can interpret that a couple with one child needs about 1.25 times the income of a couple without a child if the policy makers want household welfare to be identical. That number can also be interpreted as follows: the cost of the first child in West Java is one half of adult costs. Put another way, one child in West Java costs 50 percent of an adult. Comparing the results of this research and that of Deaton and Muellbauer (1986) we find that Deaton and Muellbauer's equivalence scales are larger. (It may be that the cost of children in Deaton and Muellbauer is too high for developing countries, e.g. one child costing 1.16 of an adult equivalent). The highest cost of children found based on this research is in Region D where a child costs 88 percent of an equivalent adult. The cost of one child in region B, region E, and region A are 38 percent, 40 percent, and 64 percent of an equivalent adult, respectively.

Summary

Cereal price increase caused the greatest welfare loss. The same level of price increase, e.g., 50 percent price increase, of fish, meat and poultry, and eggs and milk caused relatively the same level of welfare losses (Table 6.1). Welfare losses are not the same across the level of commodity share in the household budget: the higher the proportion of a commodity in the household budget, given the

same level of price increase, the larger the welfare losses will be (Table 6.2).

Inter-household welfare comparisons show that a couple with children requires more income for obtaining the same level of welfare. The figures vary with regions. A household with one child in West Java, for example, requires 1.25 times that of a couple without children's income to achieve the same welfare level.

CHAPTER VII

IMPLICATIONS OF RESEARCH FINDINGS FOR FOOD POLICY

This research has generated some important findings which can show the implications of government intervention to some policy instruments on food consumption in West Java. In this chapter we will discuss the implications of findings on two policy issues. First, the implication of research findings on the impact of government price intervention, e.g., increase in some food prices; and second, the impact of household size reduction, e.g., due to family planning programs or changes in preferences toward the small family unit, on food consumption. We start this chapter with a brief historical development of food price policy in Indonesia and some policy arguments made by some food policy analysts.

A Brief History of Food Price Policy in Indonesia

Rice is the most important commodity in West Java¹ and Indonesia. Food crises in this region can be interpreted as shortage of rice in that effective demand for rice is higher than effective supply of rice. Starvation, hunger, famine,

¹ This province produced about 22.2 percent of total production of rice in Indonesia in 1980 (C.B.S., 1983).

under-nutrition, and other similar words are indicators of food shortage in a region. However, there are also possibilities of famine or hunger when there is no shortage of food. Hunger in the second case, according to Sen (1981) is due to poor people not having sufficient claim on food. Whether previous hunger or famine in Indonesia is due to food shortage or is due to the distribution of claims for food, is another issue. The fact is, Indonesia has historically experienced some food crises.

The objectives of food policies in Indonesia vary from time to time. According to Timmer (1987:1) past food policy in Indonesia was characterized by " maintaining political stability through low urban food prices and total control over international trade in rice". More discussion about past food price policies in Indonesia is given by Mubyarto. Mubyarto (1983: 143-44) classified four eras of food policy in Indonesia:

- (i) Colonial era : Cheap price policy
- (ii) 1949 - 1959 : Cheap price policy (politik pangan murah);
- (iii) 1959 - 1966 : Food wage policy (politik upah natura);
- (iv) 1966- : Suppress inflation policy ("politik tekan inflasi".

Based on Mubyarto (1983) we see that a cheap price policy for food has been practiced since the colonial era.

The Dutch were interested in low food price because it lowered the cost of production on estate plantations, and therefore, products such as tea, coffee, and so on would be more competitive in the international market. The government of Indonesia from 1949-1959 was interested in a cheap price policy because the country had just taken independence, and therefore needed political support. The cheap price of food provides good environmental support to the government.

Indonesia experienced a period of hyper-inflation in 1959-66. Government officials, including the military, have a fixed income, i.e., their income is not adjusted by inflation rate. This group of officials is a group of the population which is significantly affected by high inflation rates. This group, however, is the among the country's most influential decision-makers. In order to help and to obtain political support from this group, the government used food, particularly rice, as a payment to officials (see Mubyarto, 1983).

Hyper-inflation does not provide a good environment for economic development in general and for consumer welfare in particular. Because a major component of inflation in Indonesia is the increase of rice price, keeping food price low will keep the inflation rate low. As a result, the inflation rate for food in 1982 was 9.69 percent and in 1986 was 8.83 percent (C.B.S., 1986). It is also believed that

successes in the food sector have a high positive correlation with successful performance in other sectors. Therefore, low food prices are intended not only to maintain affordability of rice for low income groups, but also to keep the inflation rate moderate which in turn facilitates economic growth in other sectors².

Hunger in 1972 made rice self-sufficiency a national priority. In 1984 this objective was reached (World-Watch, 1988:4). This is a big achievement for Indonesia particularly when we remember that in 1977-78 this country still imported about one-third of the world's rice market (Tarrant, 1980: 176)³. Therefore, the current important issue in the food sector in Indonesia is how to maintain rice self-sufficiency. Whether food self-sufficiency is the correct means for solution of Indonesia's food problems is still disputable. Rice self-sufficiency, however, is considered a good situation because sufficient rice creates a better situation for both individuals and for the economy of the nation. As Mr. Wardoyo, Indonesia's agricultural minister, says : " If the rice isn't there, the society becomes resah, unstable"⁴.

² See Mubyarto (1983) for discussion of government policies directed to farmers (producers).

³ To illustrate, in 1983 the value of rice imported by Indonesia was \$ 384.0 million. In 1985 it reduced to \$ 8.8 million (C.B.S., 1987).

⁴ The Wall Street Journal, Friday, April 1, 1988.

Western economists such as C. P. Timmer, H. Alderman, J. Dixon, and W. F. Falcon are continuously debating about why Indonesia should always depend on rice for its foodstuff. The important factor related to food consumption for Indonesia, according to Alderman and Timmer (1980) is varying quantities and proportions of rice, maize, cassava, and wheat flour in the diets of people from various income strata and substitutability of one for another as prices and income change. Even though Alderman and Timmer (1980:83) realize that "the poorest 30 percent of the population spend 37 percent of their budget on rice, and will suffer the greatest proportional loss of real income with any price rise", they consider that the government increases price of rice as a right action. The justification of this action is that the low income group will reallocate its budget on a lower quality of food which is cheaper than rice, e.g., cassava. Therefore, the demand for rice will decline. Furthermore, this policy, according to Alderman and Timmer "need not be enforced by establishing a regulatory bureaucracy but could be self-enforcing because the poor eat staples no longer attractive to the higher income groups" (Alderman and Timmer, 1980:91).

This recommendation weighs heavily on the role of prices in resource allocation, including the allocation of consumers' income. Costs of adjustment in food consumption habits in the forms of, for example, a painful feeling due

to changes in physiological reactions, a deterioration of health due to lower nutrient intake and so on are not questioned. In addition, it is implicit in Alderman and Timmer (1980) analysis that the behavior of the rice consumer is fully directed by price through exit mechanism⁵. The possibilities of riots or crimes due to lack of rice for lower income groups are also ignored. The most important question, because cheaper food such as cassava has lower nutritional quality, particularly protein (see Napitupulu, 1968; Chandra, 1988), is how low income households can at least maintain status quo nutrient intake. Even though there is possibly more remaining income if the household spends its income for cassava instead of for rice, that remainder might be not sufficient to buy protein in the form of fish, meat, poultry, and so on because they are much more expensive. As a result, more of the population will possibly be undernourished than if they eat rice as a main foodstuff (see Napitupulu, 1968). An obvious consequence is that those groups of people will have low productivity, high mortality rates, and low life expectancy because low quality food is usually cheap in monetary value but expensive in terms of quality of life. This knowledge brings us to larger issues. Food price policy, especially rice price policy, cannot be separated from ethical or moral issues.

⁵ For discussion of Exit, Voice and Loyalty concepts see Hirschman, 1970.

Without this notion, for example, it would be justifiable to use prices as a means to balance population growth and food availability by increasing the mortality rate of the poor.

Contrary to western economists, Mubyarto, who cited research results of Alfian Lains (Mubyarto, 1983:148), shows that price changes do not have a significant impact on rice production. According to Mubyarto (1983) increases in rice production and productivity are mostly due to changes in production technology, improvement in infrastructure such as irrigation, and widespread extension services. He implies that production of rice is independent of its price as long as its input prices are kept low. Technological and institutional changes are the key factors of rice production increase (see Pinstруп-Andersen and Hazell, 1985). Therefore, price of rice increase will only cause welfare losses to the consumer.

Furthermore, Alderman and Timmer's recommendation (1980) might be not so relevant for cases in Indonesia after 1985 when the country has produced sufficient rice. Why do we need to reduce demand when we have sufficient stock? Of course, we need to keep a balance between rice production and population growth. Population size, therefore, becomes an important policy instrument, in addition to prices, for balancing food demand and food supply especially in the long run. Recent developments in family planning programs indicate that the rate of population increase and household

size are declining (see C.B.S., 1987). Therefore, even though family planning is not a part of food policy the outcomes have a direct impact on food effective demand.

Implications of Food Price Increase

Food price policy deals with government intervention in the food system which controls the price of food. It can be done through various means. For example, the government can enforce limitation of acreage in order to control the accumulation of surplus. In a deficit situation the government can import food to keep prices stable. In Indonesia because the import price of rice per unit is higher than the domestic price, the policy is called a cheap price policy. As a result, consumers gain consumers' surplus but the producer loses its surplus. Some economists, e.g., C.P. Timmer, view this situation as an obstacle to increasing domestic food production⁶.

The following shows the valuation of effects of a 50 percent increase in the price of cereal, fish, and meat and poultry on changes in quantity demanded and consumers' welfare in urban West Java. It is necessary to extend the commodity beyond rice in analyzing the implications of food price increases. Even though Dixon (1979), Alderman and Timmer (1980), and Timmer and Alderman (1979) indicate

⁶ According to Timmer (1987) right price is usually not the objective of food price policy in developing countries, but wrong price usually is.

cassava as an important substitute for rice in Indonesia, it is excluded from the discussion because it takes only a small part of the consumer's food budget in West Java (2 percent), and is also independent from rice.

First, we will discuss the effects of own price changes. This is more important than cross-price effect in two respects: (i) it is intuitively more appealing to think that demand for a commodity is determined by its price, and (ii) theoretically and empirically it is easier to estimate own price effects than to estimate cross-price effects.

Table 7.1 shows that a 50 percent increase in price of cereal causes the household to reduce its demand for cereal by 34.5 percent, given its income and other prices remain constant. As a result, a new level of cereal consumption is 6.5 kg/H/week or 1.2 kg/capita/week. We see that the effect of cereal price increase on changes in cereal consumption is large because the household spends a great amount of its income on cereal, particularly rice.

Table 7.1. Effects of 50 percent price increase on changes in quantity consumed

Commodity	Initial Consumption (kg/H/week)	Percentage Consumption (%)	New Changes Level (kg/H/week)
Cereal	10.0	34.5	6.5
Fish	0.8	31.0	0.5
Meat and poultry	0.6	25.0	0.4

Notes : H stands for household. The average household size in West Java is 5.42 persons.

The consumption levels of fish, and meat and poultry are still low. Before price changes, the consumption levels are 0.14 kg/capita/week and 0.11 kg/capita/week for fish, and meat and poultry, respectively. After price increases those figures become 0.09 kg/capita/week and 0.07 kg/capita/week. Low consumption of these commodities is mainly due to high price; that is, price of fish, and meat and poultry is about 4.16 and 8.16 times of price of cereal, respectively. (Price of cereal:Fish:Meat and Poultry = 217.9: 904.4: 1770.4 Rp/kg in 1980).

Table 7.1 shows the implications of a 50 percent price increase on each commodity given other prices and income remain constant. For example, policy makers can see the implications of a 50 percent increase in price of cereal to the reduction of demand for cereal. Of course, the reduction of cereal consumed is related to the initial position of cereal consumption, and the latter is a function of income level.

Now, we turn our discussion to the cross-price effects in a system of food demand. An extensive discussion of this matter can be read in Chapter V. In this chapter we want to reemphasize some important implications of price effects on demand for other than the price changing good. The most important point is that tuber⁷ is not a substitute for cereal as Alderman and Timmer (1980) found. This might be

⁷ Cassava consists of largest percentage of tuber.

true if we observe that the household in urban West Java spent only a small amount (2 percent) of its income on tuber. Cassava is not a staple food for most Sundanese. It might, however, be the case if the household is very poor. Therefore, an increase rice price will have no effect on the level of demand for cassava. Substitutes for rice might be available in the block of cereal such as corn or wheat.

In the case of an animal products subsystem of commodity the cross-effect of price changes is more convincing. Increase in the price of eggs and milk, for example, will increase demand for fish. Even though some cross-price effect parameters in an animal products subsystem are not significantly different from zero at a 10 percent significance level, the signs of the parameters show that these commodities are substitutes. Therefore, pricing policy in this food sector can be a strategic one. For example, because land is a scarce resource in Java, then the government subsidy of fish industries rather than of meat industries, will increase demand for fish. Up to now, there is no specific price policy applied to these commodity groups as applied to rice.

The above discussions are limited to the effects of price increase on the reduction of quantity demanded. Policy makers might also be interested in knowing the value of such effects measured based on consumers' points of view. Table 6.1 and Table 6.2 in Chapter VI show such values. We

see that the household's valuation of cereal is the largest. In order to restore the household to the same initial welfare level, the government needs to subsidize the household by Rp. 1000.00/week/household. In other words, the household is willing to pay that amount to avoid a price increase of 50 percent. The values of compensating variations vary across the level of commodity shares. That is, the larger the commodity share in the budget, the higher the welfare loss. This implies that the low income household who spends a larger percentage on cereal will experience a larger welfare loss than high income group households if the price of cereal is increased.

There were 6.1 million households in West Java in 1980. Assuming they were identical, a 50 percent cereal price increase caused a total loss of welfare per week of Rp. 61 million/week⁸. Furthermore, if we believe that the resources for rice production are nearly fully employed, then producers' surplus will be negligible. Therefore, increasing the price of cereal will only reduce household welfare and increase inflation without having any effect on real output of cereal, mainly rice. This (monetary) value implication is very important information to policy makers.

⁸ We need to be aware that the values generated from this method of estimation are methodologically different from, for example, national income accounting.

Implications of Changes in Household Size and Composition

Food policy in Indonesia has nothing to do with the reduction of the size of the household. However, the effects of changes of household size and changes in composition, given other factors remain constant, will determine the patterns of demand for food. This research shows that increased household size increases effective demand for cereal and reduces demand for other groups of food, particularly luxury foods: meat and poultry, eggs and milk, fish, and so on (see Table 5.7). Changes in household size, therefore, have indirect effects on household dietary intakes. Given the same food expenditure level, a small family will consume more protein than will a large family.⁹ Household size in West Java, Java, and Indonesia has declined by 9 percent, 4 percent, and 6 percent between 1980 and 1985, respectively (C.B.S., 1987). Using the results in Table 5.7 in Chapter V¹⁰ reduction in household size by 9 percent in West Java will reduce demand for cereal

⁹ In conducting aggregate food demand analysis we also need to consider the composition of the population under investigation. This is important because differences in age composition, which are usually presented in a population pyramid, imply differences in aggregate food demand: more babies demand more milk, more labor force demands more recreation facilities, etc. Long run effects of family planning are changing the aggregate composition of the population. Therefore, this policy will have important effects on changes in consumption structure. This issue, however, is not the subject of this research.

¹⁰ We use the results derived from the WTS with prices included in the model.

by 3.8 percent, and increase demand for meat by 2.5 percent¹¹. We see that the implication of reduction of household size is not only important for budget allocation but also important for household nutrient improvement.

Knowledge about household size and its relation to household food share is also important for making household welfare comparisons. Following Engel's law that a household with an equal food share has the same welfare, we can approximate how much income is needed by a household relative to a household reference if we wish their welfare to be equivalent (see Chapter VI).

Now, let us compare the actual expenditure for household sizes of 2, 3 and 4 persons and the required expenditure if we want to make household welfare as well off as a household size of 2 in West Java. Table 7.2 below presents the results.

¹¹ Here we assume the reduction of household size belongs to ages greater than ten years of age.

Table 7.2. Comparisons of the average actual expenditures and the required expenditures based on Engel's equivalence scales

Household Size	Actual Expenditure (Rp/month)	Required Expenditure (Rp/month)
2	30,750.00	30,750.00
3	39,610.00	38,440.00
4	41,543.00	48,585.00

Notes:

- 1 The computation is based on Engel's equivalence scales in Table 6.3. (West Java).
- 2 Required expenditure is the amount of income needed by a household with characteristic h to keep its welfare equal to the welfare of a reference.

Table 7.2 shows that the average expenditure of household size = 3 in West Java is slightly higher than the expenditure required by Engel. Therefore, if the government taxes the income of household size = 3 by Rp 1,170.00 per month, it will leave the welfare of the household equal to the welfare of a household size = 2. On the other hand, a household size of 4 needs to be subsidized by Rp 7,042.00/month if we wish its welfare to be equal to the welfare of a household size = 2¹².

Information in Table 7.2 is important, for example, for taxation policy where inter-household comparisons of welfare

¹² We need to realize here that a money measure of welfare is not unique, namely, such a measure depends on the choice of reference group. Therefore, the findings will never be free from value judgment.

are considered important. Income tax which neglects household size might make the household worse off, relative to the welfare of its reference group, such as in the case of a household size of three. Therefore, the estimation of equivalence scales in Indonesia is relevant because this country has just begun to use taxation as an important policy instrument.

Summary

Cheap food price policy in Indonesia has long historical roots. The objectives vary from maintaining labor costs (during the colonial era), gaining political support (early independence era), and suppressing inflation and maintaining stability (current policy). For most western economists such policy is viewed as being inefficient. Efficiency, however, is not the only valid criterion. Equality, justice, freedom, and so on are also important norms. Therefore, the analysis based only on an efficiency criterion must be viewed as an incomplete analysis for solving real world problems.

Among ten food groups, cereal is the most important food affecting household welfare. Rice is a major component of cereal. A fifty percent cereal price increase, for example, will reduce a household welfare about Rp 1000/week, or about 14 percent of total food budget. This means that the household needs to be compensated by that

amount if we wish its welfare level to remain the same as before price increase. This is also one reason why the government is reluctant to increase rice price to a competitive price level.

Household size is an important variable affecting household effective demand. Increasing household size increases demand for cereal and decreases demand for other food commodities, given expenditure and other factors remain constant. Therefore, success in family planning will have a great impact on the structure of household demand goods and commodities in the long run. In addition, household size also affects welfare. Given food share as a welfare measure, a couple with one child in West Java, for example, needs an income 1.25 times that of a couple without children if we want them to have the same welfare level. Of course, this is the simplest way to make interhousehold welfare comparisons.

CHAPTER VIII

SUMMARY AND CONCLUSION

As has been expected income, prices, and household size play a significant role in determining household food consumption in urban West Java. In this province, households spend about 51 percent of their income for food. The largest and the lowest proportion of food expenditure go to cereal (30 percent) and tuber (2 percent), respectively. Furthermore, the second largest expenditure is for meat and poultry (14 percent). A large expenditure for meat and poultry is not because households consume a large quantity of meat and poultry but because the price of this food group is high¹. Another important household food expenditure is expenditure for tobacco. Households in this province spend about 12 percent of total food expenditure for tobacco. The remaining food expenditure is composed of fish (10 percent), eggs and milk (9 percent), vegetables (6 percent), soybeans and nuts (8 percent), fruit (6 percent), and sugar (3 percent) (see Table 4.2).

Applying Engel's measure of welfare, namely food share shows that the correlation between total food share and

¹ Consumption of meat and poultry per capita in 1980 was about 0.11 kg/week, or 0.02 kg/capita/day. The price of meat and poultry at that time was Rp 1770/kg and the price of cereals, Rp 218/kg.

the share of cereal is positive. This means that the proportion of cereal consumed by poor households is larger than the proportion of cereal consumed by rich households. Opposite relationships with the above are found for meat and poultry. The relationships between food share and the share of eggs and milk in the food budget seem not linear, namely, as food share increases up to 45 percent, the share of eggs and milk increases as well. However, the share of eggs and milk declines after food share exceeds 45 percent. Finally, the behavior of vegetables, fish, sugar, fruit, soybeans and nuts consumption seems independent from food shares (see Fig. 4.2 - Fig. 4.4).

The distribution of households, according to food shares, approximates a normal distribution with about 80 percent of the samples spending more than 40 percent of their income for food (see Fig. 4.5). Food expenditure elasticities, given food shares ≥ 40 percent, are at least 0.72 (see Table 5.4). This means that households within that range of food share will increase their food consumption at least by 7.2 percent for any 10 percent increase in income, given other factors remain constant. Furthermore, if food is classified into ten food commodities we obtained: (i) cereal, sugar, and tobacco are necessities; (ii) fish, meat and poultry, and eggs and milk are luxuries; (iii) tuber, vegetables, fruit, soybeans and nuts cannot be classified into necessities, luxuries, or inferior because

their parameters are not significantly different from zero at a 10 percent significance level (see also Figs. 4.2, 4.4). These results show that additional income will be spent to buy more commodities in group (ii) than to buy commodities in groups (i) and (iii).

Price obviously affects demand for food commodities. This study shows that all own price effects are significantly different from zero with a negative sign, given expenditure, household size and other factors remain constant. This means that own price increase will decrease quantity demanded of the commodity with increasing price, *ceteris paribus*. (See Table 5.9 and Table 5.10 for compensated and uncompensated own price elasticities). Not all cross-price effects, on the other hand, are significantly different from zero at a ten percent level of significance (Tables A.8 - A.15). Examination of cross-price effects yields: (i) tuber is not a substitute for cereal, (ii) fish, eggs and milk, and meat and poultry are substitutes, and (iii) vegetables, and soybeans and nuts are substitutes. The most important implication of cross-price elasticities for food policy in West Java is that cereal and tuber are not substitutes in urban West Java households. This result does not correspond with that of Timmer and Alderman (1979). One possible reason for the difference is that this research used West Java as a geographic unit and Timmer and Alderman (1979) used Indonesia as a geographic unit. Therefore, the

position of tuber in urban West Java consumers is different from the position of tuber in the nation. As has been shown in Table 4.3 and Fig. 4.2, tuber in urban West Java is only a small fraction of a household food budget and is independent of food share (welfare).

One of the most important instrumental variables in demand analysis is price. This research shows that a 50 percent increase in cereal price will reduce cereal quantity demanded by approximately 34.5 percent, *ceteris paribus*. The same level price increase for fish, and meat and poultry will reduce quantity demanded for these commodities by 31.0 and 25.0 percent, respectively. (See Table 7.1). In addition, increasing commodity price reduces consumer surplus. The loss of consumer surplus measures the loss of consumer welfare. The values of compensating variations show that increasing the price of cereal will cause the largest loss in consumer welfare. Using the rate of price increase of 50 percent for cereal the consumer will have the same welfare level as before the price increase if compensation of about Rp 1000/household/week is received. This is about 13.7 percent of total food expenditure. This magnitude can also be interpreted as a household's willingness to pay, that is the maximum amount the household is willing to pay to avoid a 50 percent cereal price increase. This result shows that cereal is so important for households in urban West Java. Households, in addition, need to be compensated by Rp 339,

Rp 474, and Rp 305 per week if there were a 50 percent price increase of fish, meat and poultry, and eggs and milk, respectively. Furthermore, consumer losses due to cereal price increases are not proportional : poorer households, which spend a larger proportion of their income for cereal, lose more than the rich who spend a smaller proportion of income for cereal (see Table 6.2).

Engel's equivalence scales provide us a way to compare household welfare based on comparison of their food shares. Even though this method is far from perfect, it is useful for policy analysis. Since food is one of the most important commodities in the household budget in developing countries, then food share is an appropriate measure of household welfare as proposed by Engel. This research shows that Engel's equivalence scales vary across regions in West Java. In West Java (aggregated) a couple with one child needs an income about 1.25 times the income of a couple without children. This also implies that the cost of the first child in West Java is about 50 percent of the cost of an adult. Deaton and Muellbauer (1986) reported that the cost of a first child in Indonesia was 116 percent of the cost of an adult (See Table 6.3). Our result seems more plausible than that of Deaton and Muellbauer (1986). The application of Engel's equivalence scales is shown in Table 7.2. In this table we compare the actual average expenditure/household/month for household sizes of two, three, and

four and the household expenditure for each corresponding household size based on Engel's equivalence scales. We see the actual average household expenditures are not the same as Engel's equivalence expenditures for those household sizes. For example, a household size of three has a higher actual income level than Engel's income prediction. Therefore, we would need to tax the household if we wished to make its welfare level equal to that of a household size of two. On the other hand, a household size of four requires subsidy if we want to make its welfare equal to that of a household size of two (see Table 7.2). This result implies that the household size variable is important for taxation policy particularly when equality of welfare among household size is considered.

Household size and composition variables are also important in analyzing food consumption behavior. This research shows that the single household has lower food income elasticity than other household sizes' elasticity, given income, prices and other factors remain constant. Therefore, food is less of a necessity for a single household than for a married household. In addition, given income, prices and other factors remain constant, a decrease in household size will decrease demand for cereal but will increase demand for meat and poultry, eggs and milk, and fish. We see that reduction in household size gives the household opportunities to substitute low priced food with

expensive food, e.g., cereal for meat. Therefore, family planning which is intended to reduce population or changes in individual values toward small families may have a significant impact not only in changes in quantity consumed but also in households' food composition (see Table 5.7).

Food and its relationships with human welfare involve broad dimensions. All human beings need food irrespective of their age, occupation, sex, or income status in order to maintain their health and life. Of course, there are differences in what and how much food people eat. Food adequacy will be not a problem for high income groups of people. To maintain adequate food, however, forces low income groups of people to allocate most of their labor and time for it. Because the poor have a smaller endowment than the rich, the price mechanism in a market exchange economy may exclude the poor from food transactions. This is what has been proposed by Timmer and Alderman (1979) and Alderman and Timmer (1980) for the case of rice in Indonesia. That is, they proposed the government increase price of rice for efficiency reasons even though the data show that the low income groups will suffer. Based on this notion, I think that it will be beneficial to seek knowledge beyond the efficiency norm. Other criteria such as equality, fairness, and justice are also important. Therefore, the ethical analysis of food price policy is a very important subject for future food policy research.

In the area of demand system research, furthermore, the relaxation of the separability assumption between demand for goods and demand for leisure will be a good topic for future research particularly when data become available. The simultaneous consideration between demand for goods and demand for leisure connects the relationships between income, labor supply, wage rate, and demand for goods. Therefore, this specification will provide us richer choice variables which are not only important for food policy but also are important for broader policy perspectives, e.g., effect of household income taxation on food demand and household labor supply. Finally, the writer suggests that studying food consumption behavior for each region which has different cultural background and has different economic structure will generate important knowledge relevant for development objectives.

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APPENDICES

Table A.1. Parameter estimates for food commodities using IHS in West Java without imposing restrictions

Commodity	LNHVAL	DPCER	DPTUB	DPFISH	DPMEP	DPEGM	DPVEG	DPSON	DPFRT	DPSUG	DPTOB
CER	-0.0674 [.0131]	-0.1616 [.0518]	-0.0034 [.0124]	-0.0024 [.0150]	0.0183 [.0226]	-0.0049 [.0094]	0.0333 [.0202]	-0.0181 [.0190]	-0.0214 [.0124]	0.1313 [.0538]	0.0197 [.0185]
TUB	-0.0005 [.0022]	-0.0002 [.0085]	-0.0249 [.0020]	0.0042 [.0024]	0.0047 [.0037]	0.0014 [.0015]	-0.0016 [.0033]	0.0022 [.0031]	-0.0012 [.0020]	-0.0105 [.0080]	-0.0029 [.0185]
FISH	0.0232 [.0082]	0.0335 [.0326]	0.002 [.0078]	-0.039 [.0094]	-0.007 [.0142]	0.0146 [.0058]	0.0041 [.0126]	0.0012 [.0119]	-0.0042 [.0078]	-0.0242 [.0338]	-0.0122 [.0116]
MEP	0.0656 [.0108]	-0.0084 [.0428]	0.0196 [.0102]	0.0012 [.0124]	-0.0668 [.0187]	-0.0053 [.0077]	-0.038 [.0166]	0.038 [.0158]	-0.0006 [.0102]	-0.0213 [.0444]	0.0214 [.0152]
EGM	0.0144 [.0084]	0.1 [.0331]	0.0047 [.0079]	0.0165 [.0095]	0.0244 [.0144]	-0.0375 [.0059]	0.0098 [.0128]	0.0181 [.0121]	0.0199 [.0079]	-0.0264 [.0343]	-0.0058 [.0118]
VEG	-0.004 [.0038]	-0.0185 [.0149]	-0.0049 [.0036]	-0.0079 [.0043]	0.0192 [.0065]	0.0069 [.0026]	-0.0399 [.0058]	0.0044 [.0054]	-0.001 [.0036]	-0.0137 [.0154]	0.1014 [.0053]
SON	0.0026 [.0062]	0.0037 [.0244]	0.0085 [.0058]	0.0051 [.0071]	0.0102 [.0106]	0.0012 [.0044]	0.0051 [.0095]	-0.0817 [.0089]	0.003 [.0058]	0.0101 [.0254]	0.0021 [.0087]
FRT	-0.0018 [.0057]	0.0258 [.0226]	-0.0046 [.0054]	0.0099 [.0065]	-0.0022 [.0098]	0.0067 [.0041]	0.0168 [.0088]	0.0076 [.0082]	-0.0148 [.0054]	-0.0365 [.0234]	0 [.0081]
SUG	-0.0042 [.0019]	0.0148 [.0076]	-0.0006 [.0018]	0.0062 [.0022]	0.0084 [.0033]	0.004 [.0013]	0.0006 [.0029]	-0.0096 [.0028]	0.0026 [.0018]	-0.0119 [.0079]	0.0012 [.0027]
TOB	-0.0286 [.0088]	-0.0272 [.0349]	-0.0030 [.0084]	0.0109 [.0101]	-0.0226 [.0152]	0.0124 [.0063]	0.0099 [.0136]	0.0393 [.0128]	0.0176 [.0084]	0.0039 [.0362]	-0.0347 [.0124]

Notes : 1. Number in the brackets indicates standard deviation for each parameter

Table A.2. Parameter estimates for food groups using the WTS model when homogeneity was imposed

Commodity	INTER.	LNHVAL	DPCER	DPTUB	DPFISH	DPMEP	DPEGM	DPVEG	DPSOYN	DPFRT	DPSUG	DPTOB
CER	0.9372 [.1186]	-0.0683 [.0129]	-0.051 [.0438]	-0.0035 [.0124]	-0.0221 [.0149]	0.0194 [.0224]	-0.005 [.0094]	0.0341 [.0200]	-0.0161 [.0181]	-0.0214 [.0124]	0.1444 [.0416]	0.0212 [.0181]
TUB	0.0408 [.0197]	-0.0014 [.0021]	0.0102 [.0072]	-0.0025 [.0021]	0.0045 [.0024]	0.0058 [.0037]	0.0014 [.0016]	-0.0009 [.0033]	0.0042 [.0030]	-0.0012 [.0021]	0.0024 [.0069]	-0.0015 [.0030]
FISH	-0.1056 [.0744]	0.0226 [.0081]	0.0397 [.0275]	0.0019 [.0078]	-0.0387 [.0094]	0.0076 [.0141]	0.0146 [.0058]	0.0045 [.0126]	0.0024 [.0115]	-0.0042 [.0078]	-0.0166 [.0261]	-0.0113 [.0114]
MEP	-0.4583 [.0981]	0.0638 [.0106]	0.0133 [.0362]	0.0194 [.0102]	0.0021 [.0124]	-0.0646 [.0186]	-0.0054 [.0077]	-0.0362 [.0166]	0.0422 [.0151]	-0.0006 [.0102]	0.0055 [.0344]	0.0244 [.0150]
EGM	-0.0844 [.0766]	0.0178 [.0083]	0.0551 [.0283]	0.0051 [.0080]	0.0148 [.0096]	0.02012 [.0145]	-0.0372 [.0060]	0.0064 [.0129]	0.0095 [.0118]	0.0199 [.0080]	-0.0819 [.0268]	-0.0119 [.0012]
VEG	0.1048 [.0341]	-0.0038 [.0037]	0.0156 [.0126]	-0.0049 [.0036]	0.0078 [.0043]	0.0189 [.0064]	0.0069 [.0027]	-0.0402 [.0058]	0.0038 [.0052]	-0.001 [.0036]	-0.0172 [.0120]	0.01 [.0052]
SOYN	0.0626 [.0560]	0.0016 [.0061]	0.0155 [.0207]	0.0084 [.0058]	0.0056 [.0071]	0.0114 [.0106]	0.0012 [.0044]	0.006 [.0094]	-0.0794 [.0086]	0.003 [.0058]	0.0246 [.0196]	0.0036 [.0085]
FRT	0.0739 [.0516]	-0.0015 [.0056]	0.0243 [.0191]	-0.0045 [.0054]	0.0098 [.0065]	-0.0026 [.0098]	0.0067 [.0041]	0.0165 [.0087]	0.0068 [.0080]	-0.0148 [.0054]	-0.0418 [.0181]	-0.0006 [.0078]
SUG	0.0638 [.0176]	-0.0038 [.0038]	0.0091 [.0064]	-0.0006 [.0018]	0.006 [.0022]	0.0078 [.0033]	0.0041 [.0014]	0.0001 [.0030]	-0.0107 [.0027]	0.0026 [.0018]	-0.0189 [.0062]	0.0004 [.0026]
TOB	0.3734 [.0800]	-0.0282 [.0087]	-0.0318 [.0295]	0.003 [.0083]	0.0107 [.0101]	-0.023 [.0151]	0.0124 [.0063]	0.0096 [.0135]	0.0384 [.0123]	0.0176 [.0083]	-0.0017 [.0280]	-0.0353 [.0122]

Table A.3 Parameter estimates of demand for food groups when symmetry was imposed

Commodity	INTER.	LNHVAL	DP CER	DPTUB	DPTFISH	DPMEP	DPEGN	DPVEG	DP SOYN	DPFRT	DP SUG
CER	1.0631 [.1130]	-0.0823 [.0122]	-0.147 [.0378]	0.0036 [.0061]	-0.0139 [.0125]	0.0134 [.0110]	-0.0021 [.0085]	0.0134 [.0110]	0.007 [.0129]	-0.008 [.0095]	0.0226 [.0072]
TUB	0.0404 [.0188]	-0.0012 [.0021]		-0.0248 [.0019]	0.0043 [.0023]	0.0066 [.0034]	0.0016 [.0014]	-0.003 [.0024]	0.0048 [.0026]	-0.0011 [.0018]	-0.0009 [.0017]
FISH	-0.10224 [.0693]	0.0221 [.0074]			-0.0372 [.0092]	0.0056 [.0091]	0.0131 [.0049]	0.0062 [.0040]	0.0043 [.0059]	0.0034 [.0049]	0.006 [.0022]
MEP	-0.4639 [.0917]	0.0646 [.0099]			-0.0526 [.0161]		0.0006 [.0066]	0.0131 [.0059]	0.0221 [.0086]	-0.0032 [.0069]	0.0089 [.0032]
EGN	-0.1881 [.0698]	0.0295 [.0075]					-0.0406 [.0058]	0.0066 [.0026]	0.0022 [.0040]	0.0068 [.0035]	0.0042 [.0014]
VEG	0.1014 [.0336]	-0.0034 [.0036]					-0.0436 [.0056]	0.0042 [.0046]	0.0015 [.0032]	-0.0002 [.0029]	-0.0002 [.0029]
SOYN	0.0715 [.0533]	0.0009 [.0058]						-0.0794 [.0085]	0.0052 [.0046]	-0.0091 [.0026]	-0.0091 [.0026]
FRT	0.0323 [.0488]	0.0034 [.0052]							-0.0167 [.0052]	0.0025 [.0018]	0.0025 [.0018]
SUG	0.0705 [.0175]	-0.0046 [.0019]								-0.0015 [.0075]	-0.0015 [.0075]

Table A.4. Parameter estimates of 10 food groups when block independence between food, sugar, and tobacco was imposed

[illegible]

Table A.5 Parameter estimates for 10 food groups when real food expenditure was expressed in percapita term

Commodity	INTER.	LHWCAP	DP CER	DPTUB	DP FISH	DP MEP	DP EGM	DP VEG	DP SOYN	DP FRT	DP SUG	DP T08
CER	1.5596 [.0814]	-0.1677 [.0109]	-0.0924 [.0396]	-0.0046 [.0094]	-0.0052 [.0114]	0.012 [.0172]	0.0008 [.0071]	0.0369 [.0153]	-0.0096 [.0142]	0.0052 [.0096]	0.0229 [.0416]	0.0251 [.0141]
TUB	0.0238 [.0176]	0.0007 [.0024]	-0.0009 [.0086]	-0.0249 [.0020]	0.0041 [.0024]	0.0047 [.0037]	0.0014 [.0015]	-0.0018 [.0033]	0.0019 [.0031]	-0.0015 [.0021]	-0.0095 [.0090]	-0.0031 [.0030]
FISH	-0.2241 [.0651]	0.0439 [.0087]	0.0185 [.0317]	0.0026 [.0075]	-0.0434 [.0092]	0.0089 [.0138]	0.0137 [.0056]	0.0038 [.0122]	0.0007 [.0114]	-0.0101 [.0076]	0.0008 [.0332]	-0.0129 [.0112]
MEP	-0.4954 [.0861]	0.0838 [.0116]	-0.0248 [.0419]	0.0221 [.0099]	-0.0071 [.0121]	-0.0619 [.0182]	-0.0051 [.0075]	-0.0354 [.0162]	0.0439 [.0151]	-0.0073 [.0101]	0.0136 [.0440]	0.0221 [.0148]
EGM	-0.1358 [.0674]	0.0283 [.0090]	0.09 [.0328]	0.0051 [.0078]	0.0136 [.0094]	0.0257 [.0142]	-0.0382 [.0058]	0.0096 [.0126]	0.0176 [.0118]	0.0161 [.0079]	-0.0099 [.0344]	-0.0064 [.0116]
VEG	0.0368 [.0308]	0.0044 [.0041]	0.0134 [.0149]	-0.0052 [.0036]	0.0074 [.0043]	0.0191 [.0056]	0.0062 [.0026]	-0.04 [.0058]	0.0023 [.0054]	-0.0028 [.0036]	-0.0073 [.0157]	0.0096 [.0053]
SOYN	0.0778 [.0505]	0.0002 [.0068]	0.0051 [.0246]	0.0686 [.0058]	0.0051 [.0071]	0.0104 [.0106]	0.0014 [.0044]	0.0054 [.0095]	-0.0809 [.0088]	0.0034 [.0059]	0.0086 [.0258]	0.0023 [.0087]
FRT	-0.0196 [.0464]	0.0106 [.0062]	0.0206 [.0226]	-0.0048 [.0054]	0.0088 [.0065]	-0.0021 [.0098]	0.0058 [.0040]	0.0158 [.0087]	0.0052 [.0081]	-0.0178 [.0054]	-0.0259 [.0237]	-0.0009 [.0080]
SUG	0.0672 [.0177]	-0.0042 [.0019]	0.0148 [.0076]	-0.0006 [.0018]	0.0062 [.0022]	0.0084 [.0033]	0.004 [.0014]	0.0005 [.0029]	-0.0096 [.0028]	0.0026 [.0018]	-0.0119 [.0079]	0.0012 [.0027]
T08	0.3763 [.0809]	-0.0285 [.0088]	-0.0272 [.0349]	0.0029 [.0084]	0.0109 [.0101]	-0.0226 [.0152]	0.0124 [.0063]	0.0099 [.0136]	0.0392 [.0128]	0.0176 [.0083]	0.0039 [.0362]	-0.0347 [.0124]

Table A.6. Parameter estimates of food groups when log number of children and log number of adult were incorporated

Commodity	INTER.	LHVCAP	DP CER	DPTUB	DP FISH	DP MEP	DPEGM	DP VEG	DP SOYN	DP FRT	DP SUG	LINCHLD	LINADULT
CER	1.6021 [.1255]	-0.1619 [.0149]	-0.1122 [.0448]	-0.0044 [.0108]	-0.0071 [.0129]	0.0129 [.0194]	0.0019 [.0079]	0.0234 [.0172]	-0.0085 [.0175]	0.0069 [.0111]	0.0273 [.0471]	0.0575 [.0101]	0.1276 [.0124]
TUB	0.0262 [.0295]	0.0006 [.0035]	-0.0001 [.0106]	-0.0266 [.0025]	0.0035 [.0030]	0.0044 [.0046]	0.0009 [.0018]	-0.0016 [.0040]	0.004 [.0041]	-0.0022 [.0026]	-0.0098 [.011]	-0.0044 [.0024]	0.0011 [.0029]
FISH	-0.1716 [.1001]	0.0325 [.0119]	0.0186 [.0358]	0.0001 [.0086]	-0.0344 [.0102]	0.0018 [.0155]	0.0144 [.0063]	0.0084 [.0137]	0.0001 [.0140]	-0.0108 [.0089]	0.0019 [.0376]	-0.0107 [.0081]	-0.0162 [.0099]
MEP	-0.6846 [.1299]	0.095 [.0154]	-0.0619 [.0464]	0.0254 [.0112]	-0.0066 [.0133]	-0.0556 [.0201]	-0.0042 [.0082]	-0.0397 [.0178]	0.041 [.0182]	-0.0104 [.0116]	0.0097 [.0487]	-0.0174 [.0104]	-0.0394 [.0128]
EGM	-0.2095 [.1072]	0.0346 [.0128]	0.1103 [.0383]	0.0032 [.0092]	0.0132 [.0110]	0.0214 [.0166]	-0.0392 [.0067]	0.0134 [.0147]	0.0101 [.0150]	0.017 [.0096]	-0.0009 [.0402]	-0.0116 [.0086]	-0.0194 [.0106]
VEG	0.0726 [.0479]	0.001 [.0057]	0.0155 [.0172]	-0.0075 [.0041]	0.0059 [.0049]	0.0252 [.0074]	0.0061 [.0030]	-0.0438 [.0066]	0.0044 [.0067]	-0.0024 [.0042]	-0.0093 [.0180]	-0.0052 [.0038]	-0.0048 [.0047]
SOYN	0.0938 [.0761]	-0.0016 [.009]	0.0124 [.0272]	0.0049 [.0066]	0.0056 [.0078]	0.0151 [.0118]	0.0011 [.0048]	0.0062 [.0104]	-0.0756 [.0106]	0.0022 [.0067]	0.0054 [.0286]	-0.0013 [.0061]	0.0004 [.0075]
FRT	-0.054 [.0743]	0.0148 [.0088]	0.0421 [.0266]	-0.0088 [.0064]	0.0098 [.0076]	0 [.0115]	0.0051 [.0046]	0.0089 [.0102]	0.0064 [.0104]	-0.0171 [.0066]	-0.0332 [.0278]	-0.008 [.0060]	-0.0121 [.0074]
SUG	0.0836 [.015]	-0.0068 [.0027]	-0.0167 [.0083]	0.0009 [.0028]	0.0068 [.0025]	0.0087 [.0036]	0.0044 [.0013]	0.0008 [.0032]	-0.0096 [.0030]	0.0036 [.0020]	-0.0134 [.0062]	-0.0026 [.0432]	-0.0341 [.0114]

Table A.7. Parameter estimates of demand for food groups when household size is incorporated

Commodity	INTER.	LINCAP	DPOER	DPTUB	DPFISH	DPMEP	DPEGM	DPVEG	DPSON	DPFRT	DPUG	LMSIZE
CER	1.5419 [.1022]	-0.1654 [.0124]	-0.0896 [.0399]	-0.0041 [.0094]	-0.0057 [.0115]	0.0119 [.0173]	0.0011 [.0071]	0.0354 [.0154]	-0.0101 [.0146]	0.0068 [.0096]	0.0236 [.0419]	0.1677 [.0122]
TUB	0.0309 [.0219]	0 [.0026]	-0.0011 [.0085]	-0.0249 [.0020]	0.0041 [.0024]	0.0043 [.0037]	0.0014 [.0015]	-0.0014 [.0033]	0.0022 [.0031]	-0.0016 [.0021]	-0.0097 [.0090]	-0.0012 [.0028]
FISH	-0.2542 [.0814]	0.0464 [.0098]	0.0152 [.0318]	0.002 [.0076]	-0.0428 [.0091]	0.0086 [.0138]	0.0131 [.0057]	0.004 [.0122]	-0.0006 [.0016]	-0.0116 [.0076]	0.0016 [.0334]	-0.0404 [.0098]
MEP	-0.7192 [.1056]	0.1051 [.0128]	-0.0324 [.0412]	0.0207 [.0098]	-0.0058 [.0119]	-0.0643 [.0179]	-0.0071 [.0074]	-0.0404 [.0159]	0.0348 [.0150]	-0.0095 [.0099]	0.0205 [.0432]	-0.0651 [.0126]
EGM	-0.1524 [.0842]	0.0297 [.0102]	0.0883 [.0328]	0.0048 [.0078]	0.0139 [.0095]	0.0254 [.0142]	-0.0386 [.0059]	0.0096 [.0126]	0.0168 [.0120]	0.0153 [.0079]	-0.0094 [.0345]	-0.0264 [.0101]
VEG	0.0724 [.0386]	0.0014 [.0046]	0.0165 [.0150]	-0.0046 [.0036]	0.0069 [.0043]	0.0195 [.0065]	0.0068 [.0027]	0.0406 [.0058]	0.0039 [.0054]	-0.0016 [.0036]	-0.0084 [.0158]	-0.0082 [.0046]
SOYN	0.0596 [.0631]	0.0019 [.0076]	0.0046 [.0246]	0.0086 [.0058]	0.0052 [.0071]	0.0102 [.0106]	0.0013 [.0044]	0.005 [.0095]	-0.0816 [.0099]	0.0033 [.0059]	0.0092 [.0258]	0.0013 [.0076]
FRT	0.0231 [.0577]	0.0066 [.0069]	0.0225 [.0226]	-0.0044 [.0054]	0.0084 [.0065]	-0.0016 [.0098]	0.0062 [.0041]	0.0166 [.0087]	0.0069 [.0082]	-0.0172 [.0054]	-0.0272 [.0236]	-0.0144 [.0069]
SUG	0.0842 [.0196]	-0.0069 [.0024]	0.0169 [.0076]	-0.0006 [.0018]	0.0066 [.0022]	0.0082 [.0033]	0.0042 [.0014]	0.0006 [.0029]	-0.0094 [.0027]	0.0034 [.0018]	-0.0149 [.0080]	0.0047 [.0023]

Table A.8. Compensated own and cross price elasticities for food groups of urban household in West Java (without imposing homogeneity)

Commodity	CER	TUB	FISH	MEP	EGM	VEG	SOYN	FRT	SUG	TOB
CER	-.54					.11				
TUB		-1.24	.21							
FISH			-.39		.15					
MEP		.14		-.48		-.27	.27			
EGM	1.11		.18	.27	-.42			.22		
VEG			-.13	.32	.11	-.66				.17
SOYN							-1.02			
FRT								-.31		
SUG	.49		.20	.28	.13		-.32			
TOB					.10					-.28

Table A.9. Compensated own and cross price elasticities for food groups of urban household in West Java (imposing homogeneity)

Commodity	CER	TUB	FISH	MEP	EGM	VEG	SOYN	FRT	SUG	TOB
CER	-.50					.11			.48	
TUB		-1.25	.22					.24		
FISH			-.38		.14					
MEP		.14		-.46		.26	.30			
EGM					-.41			.22	-.91	
VEG			.13	.31		-.66	-.72			-.16
SOYN							-.99		-.11	
FRT					.11	.27		-.24	-.69	
SUG			.20	.26	.14		-.36			-.63
TOBACCO					.10		.31	.14		-.29

Table A.10. Compensated own and cross price elasticities for food groups of urban household in West Java (imposing symmetry) (SUR)

Commodity	CER	TUB	FISH	MEP	EGM	VEG	SOYN	FRT	SUG
CER	- .49								.07
TUB		-1.23	.21	.33			.24		
FISH			-.37		.13				.06
MEP				-.45		.09	.16		.29
EGM					-.45	.07		.08	.04
VEG						-.72			
SOYN							- .99		-.11
FRT								-.28	
SUG									-.05

Table A.11. Compensated own and cross price elasticities for food groups of urban household in West Java (block independence between food, sugar, and tobacco)

[illegible]

Table A.12. Uncompensated own and cross price elasticities for food groups of urban household in West Java (without imposing homogeneity)

Commodity	CER	TUB	FISH	MEP	EGM	VEG	SOYN	FRT	SUG	TOB
CER	-.73					.07				
TUB		-1.24	.21							
FISH			-.49		.05					
MEP		.12		-.65		-.34	.17			
EGM	.82		.08	.13	-.51			.16		
VEG			-.13	.32	.12	-.66				.17
SOYN							-1.02			
FRT								-.31		
SUG	.27		.12	.18	.06		- .38			
TOB					.04					-.36

Table A.13. Uncompensated own and cross price elasticities for food groups of urban household in West Java (imposing homogeneity)

Commodity	CER	TUB	FISH	MEP	EGM	VEG	SOYN	FRT	SUG	TOB
CER	-.69					.00			.28	
TUB		-1.25	.22							
FISH			-.48		.04					
MEP		.11		-.63		.18		.20		
EGM	.31				-.50			.16	-.94	
VEG			.13	.31		-.66				
SOYN							-.99			
FRT					.11	.27		-.24	-.69	
SUG			.13	.17	.08		-.41			-.64
TOBACCO					.03		.25	.08		-.37

Table A.14. Uncompensated own and cross price elasticities for food groups of urban household in West Java (imposing symmetry) (SUR)

Commodity	CER	TUB	FISH	MEP	EGM	VEG	SOYN	FRT	SUG
CER	- .67								.05
TUB		-1.23	.21	.33			.24		
FISH			-.47	.04					.03
MEP				-.55		.02	.06		.25
EGM					-.54	.00		.01	.01
VEG						-.72			
SOYN							-.99		-.14
FRT								-.28	
SUG									-.07

Table A.15. Uncompensated own and cross price elasticities for food groups of urban household in West Java (assuming block independence food sugar and tobacco)

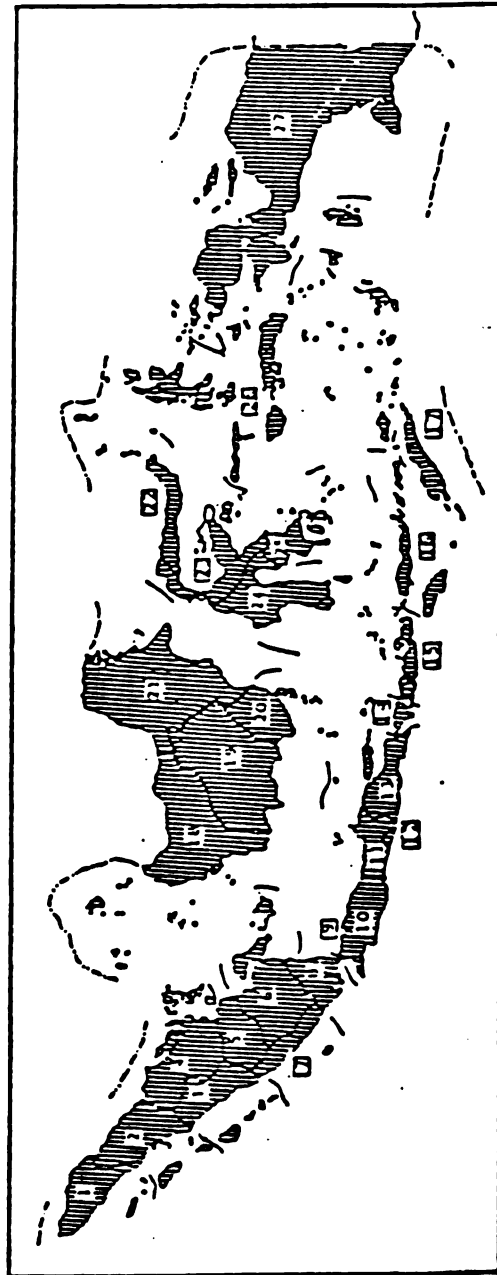
[illegible]

Table B.1. Nutritive values of tropical root crops (per 100g edible portion)

Crop	Food Energy kJ	Moisture %	Protein g	Total CHO and Fiber g	Calcium mg	Phosphorus mg	Iron mg	Potassium mg	Carotene Equivalent µg	Thiamine mg	Riboflavin mg	Niacin mg	Ascorbic Acid mg	Folic Acid µg
Cassava	565	65.5	1.0	32.4	26	32	0.9	394	0	0.05	0.04	0.6	34	24.2
Sweet Potatoes														
White	452	72.8	1.0	25.1	21	50	0.9	210	35	0.14	0.05	0.7	21	52.0
Yellow	481	70.7	1.2	27.1	36	56	0.9	304	1680	0.12	0.05	0.6	30	
Potatoes	335	77.8	2.0	19.1	9	55	0.7	451	30	0.11	0.04	1.2	14	
Yams	452	71.8	2.0	25.1	22	39	1.0	294	0	0.10	0.04	0.07		
Taro and tannia	393	75.4	2.2	21.0	34	62	1.2	448	11.3	0.12	0.04	1.0	8	
Giant taro	255	84.0	0.6	14.8	30	50	1.0		0	0.05			5	
Giant swamp taro	548		0.9	31.0	334	56	1.2		0	0.05	0.07	0.88		
Elephant yam	339	78.5	2.0	18.4	38	38	2.4	416	0	0.06	0.02	1.7	6	
Taro leaves	255	81.4	4.0	11.9	162	69	1.0	963	5535	0.13	0.34	1.5	63	163.0

Source : Chandra, 1988

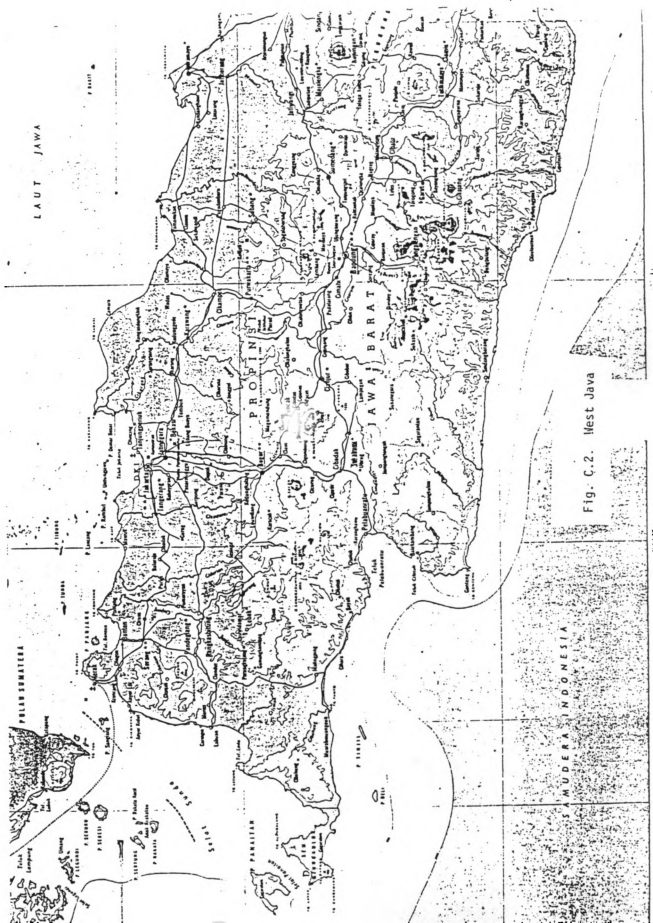
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Fig. C.1. Indonesia



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