AN ANALYSIS OF THE DEMAND FOR FOOD IN EGYPT

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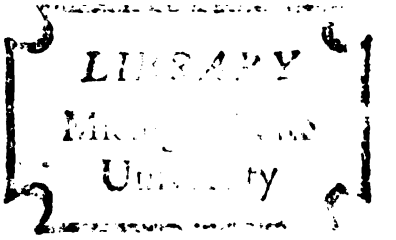

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ABSTRACT

AN ANALYSIS OF THE DEMAND FOR FOOD IN EGYPT

By Ragaa A. Hassan

The accumulating evidence of what seems to be a chronically precarious food situation in Egypt has, in recent years, increased the general concern about her food problem, and heightened the interest in carrying out this analytical investigation. Much information is required, particularly for planning purposes, about the changing structure of the Egyptian food economy during the process of economic growth. Such information would facilitate the more efficient use of planning techniques in programming development projects in the country.

This study has focused on estimating parameters determining the demand for food in Egypt. These estimates were used, along with estimates for the annual rate of growth in GNP, and the projected rates of population growth, to estimate the aggregate demand for food products in 1975 and 1985. To accomplish this, several types of data, cross-sectional and time-series, were utilized, and more than one model of analysis was introduced. However, it should be emphasized that, in a sense, the study was one-sided as it focused on the demand side of the food problem. Little attempt was made to analyze supply or to project it.

In the cross-sectional analysis, which was based on the published data of the household budget survey of 1958/59, the demand for food was assumed to depend on income, size of the household, and location. Three alternative functional forms were considered: (1) logarithmic, (2) semi-logarithmic, and (3) log-inverse. Of these three functions, the logarithmic relationship seemed to provide the best fit. The results drawn from it were utilized in projecting demand.

Throughout the cross-sectional analysis, estimates for income elasticity of demand for food groups and individual food items were calculated for both urban and rural areas, and a weighted average was introduced to provide an estimate for the entire population.

The results of the cross-sectional analysis indicate that two-thirds of the total expenditures in rural areas were spent on food and beverages, compared to about one-half in urban areas. Using Lorenz curves, total expenditures and food expenditures were shown to be more equally distributed in rural areas than in urban areas. Two explanations were offered in this connection: First, that qualities and therefore prices paid differ much more in urban areas, and second, that incomes, occupations, and social status, and tastes vary greatly in urban areas.

The income elasticity of demand for food in Egypt was not as high as results from other countries' data suggested. The .67 elasticity coefficient for Egypt is intermediate rather than high in comparison with estimates for other countries.

The relations between quantity and expenditure elasticity figures were as expected, expenditure elasticities being higher than quantity elasticities.

High income elasticities for home-produced wheat, maize, and millet induced a detailed discussion of grain consumption patterns. This, in turn, resulted in the use of an indirect method to project the demand for wheat and maize.

Although household size was expected to be an important factor in the demand for food, its significance failed to materialize when the effect of the household type, based on its size, was tested by the analysis of variance procedure. However, when the number of consumption units was included in the regression analysis, this variable produced a coefficient with a value that differed significantly from zero.

Two methods were used for estimating price parameters. A combined model utilizing cross-sectional and time-series data was applied to six products for which sufficient time-series data were available. For other products, a newer mathematical approach based on several assumptions about the

relationship between income elasticities and price elasticities was utilized. The results of the combined model were not very satisfactory in terms of statistical significance. However, the mathematical model produced fairly reasonable results suggesting that further exploration of the technique might prove to be of a considerable value.

Projections of food demand were undertaken in the usual manner. Two population projections were utilized based on different assumptions about fertility rates. Rates of growth in per capita income were estimated. Using these rates, together with the income elasticity coefficients obtained in this study, demand projections were made for 1975 and 1985 for commodity groups and individual food items.

Turning to the estimated percentage increase in total demand for commodity groups, it was shown that the highest projected increases were for fruit (about 100 percent in 1975 and 260 percent in 1985); meat, fish, and eggs (85 and 220 percent); milk and dairy products (80 and 200 percent); and tea, coffee, and other stimulants (85 and 216 percent). The lowest projected increases were for cereals and starches; dried legumes; and oils and fats. The last three groups were projected to increased by about 55 percent in 1975 and about 130 percent in 1985. This, however, still implies a very high increase in the demand for these products.

When these projections were made on per capita basis, an increase in most items was observed. It should be emphasized, however, that a part of this increase would be absorbed in a shift to higher quality products rather than higher quantities as per capita income rises.

The study has shown that rather large increases in the demand for food products are to be expected. This demand has to be fulfilled through increasing food production, increasing food imports, or some combination of the two. Prospects for increasing productivity seem best for certain crops such as maize, vegetables, fruit, oil crops, sugar cane, and livestock products. There is little doubt that increased productivity can greatly aid in solving the food problem for one generation. Yet, it is hard to see how it could do so for a population that will almost double in about twenty-five years. The only feasible path, given the present state of technology, seems to be a drastic effort to decrease the rate of population growth.

The findings of this study raise questions about the extent to which the nation would be able to provide its food supplies, and also the question of trade policy with regard to food products. It has been often argued that Egypt should stop producing wheat, and concentrate her land and water

resources in products for which she has greater comparative advantage such as cotton, rice, oil crops, as well as sugar and vegetables. This would imply greater dependence on trade, but if imports were matched by exports of other crops with higher value, there should be no cause for concern. However, for sounder decisions to be made in the area of trade policy, more analytical studies are needed particularly for grains for which shortages seem to be alarming.

AN ANALYSIS OF THE DEMAND FOR FOOD IN EGYPT

By

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DEDICATION

To the memory of my father Abdel-Rassoul Hassan, to whom I owe my education and the delight in knowledge, and to my daughters: Mona and Susan.

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In writing this thesis, I am deeply indebted to several people who have given me both encouragement and help during the course of my study.

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Mrs. Vranna Salender typed parts of the early drafts. The final copy was typed by Miss Patricia Riley. This has been very much appreciated.

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Though the study has benefitted from the suggestions and comments of several scholars, colleagues, and friends, the responsibility of any errors or mistakes remains absolutely my own.

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CHAPTER I

THE PROBLEM

1.1 Introduction

The annual income per capita in Egypt is about $140 which places her among the poorer countries in the world. Where the per capita income is low, a high proportion of it has to be spent on agricultural products, since these are the first necessities of life, especially in tropical countries. Also, where the level of education is low, the productive capacity of the population is tied closely to the natural environment. A country with a low per capita income can spend very little on education and health care and its people cannot look far ahead, with the result that they tend to prefer activities and investments with immediate benefits.

Egypt has shown a marked desire to develop economically. This desire has been expressed by the government, but nonetheless is strongly felt by many different groups of the population. This in turn, has resulted in the adoption of the first five year plan that was put into operation in 1960/1961. The principal objective of the plan, which contains a broad ten-year plan composed of more specific five-year plans, was to double the national income over a period of ten years. This

means an annual rate of growth of about 7.2 percent, which, given the Egyptian population growth rates, implies an annual growth rate in per capita income of about 4 to 4.5 percent.

The striking characteristic of the first five-year plan was the major importance given to the industrial sector. The sector was programed to contribute more than half the planned increase in income (Table 1). Together with agriculture, the two sectors were expected to provide nearly 75 percent of the planned increase in income over that period. The planned growth in services was relatively small. The net result was planned to be a structural transformation as the share of industry in national income could increase from 21 percent to 28 percent of total income. In the second five-year plan, services were to play a larger role with a relatively slow rate of expansion in both agriculture and industry as compared to the first five-year plan.

By the end of the first five-year plan in 1964/65, the achieved growth rate was actually about 6 percent which approaches the plan target. If this growth rate continued, the national income would double over a period of 12 years.

1.2 The Relation Between Economic Development and Food Consumption

As the development process takes place, major changes occur in the structure of the demand for food which affect the flow

Table 1. Plan Income Targets by Sectors (in million LE[1] at constant 1959/60 prices)

Sectors	National Income	Target Income		Implied Annual Compound Growth Rates	
	1959/60	1964/65	1969/70	1959/60 to 1964/65	1964/65 to 1969/70
Agriculture	400	512	627	5.1	4.1
Industry	273	540	802	14.6	8.2
Services[2]	609	743	1135	4.4	8.9
Total	1282	1795	2564	7.0	7.4

[1] LE stands for Egyptian pound for which the official rate of exchange is LE 1 = $2.30 at the present time.

[2] Includes trade and finance, transportation, housing, education, health care, and other services.

Source: UAR National Planning Committee, General Frame of the Five Year Plan for Economic and Social Development, July 1960-June 1965, Cairo, 1960.

of food products from farms to consumers' markets. As family income rises, there will usually be an internal transfer from agricultural to non-agricultural employment. Labor and other production factors will migrate to industry. These changes may be slow due to psychological inhibitions, fewness of profitable opportunities for industries, and the associated costs of urbanization. They also may be slow in the economies where gross domestic product is growing only slightly faster then population. However slow, the important point remains that these transfers must be compatible with the rise in per capita consumption levels. It can be said that the most important of these structural changes are the increasing income per capita and the mass movement of labor and other factors of production from rural to urban areas.[1]

The balancing problem is further aggravated in most less developed countries by the fact that the sharp decline in the death rates has not yet been followed by any significant change in the gross reproduction rate. The result is a "population explosion".[2] Population growth alone can thus be estimated

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[1]Robert Stevens, "Elasticity of Food Consumption Associated with Changes in Income in Developing Countries", Foreign Agricultural Economic Report, No. 23, Economic Research Division, U.S.D.A., 1965.

[2]United Nations, Dept. of Economic and Social Affairs, "The Future Growth of World Population", Population Studies No. 28, N.Y., 1958.

to require an increase in food production by as much as 3 percent annually to maintain present levels of food consumption.

There is no doubt that the population increase can hamper the process of economic growth. It has been estimated that the developing countries as a group achieved a rate of increase in GNP of 4.4 percent a year during the period (1950-1960) as compared to a rate of 4.0 percent for the European Free Trade Area countries, yet the population grew in the former at an average annual rate of 2.0 percent, compared to a rate of .5 percent for the latter.[1] The conclusion with regard to the rate of growth of GNP per capita is quite obvious.

It has long been observed that "economic development and population growth are related in mutual causation".[2] Egypt provides an interesting case study for those wishing to test theories about the interrelationship between the population and economic growth. A high population growth rate of about 2.5 percent, together with rapid social change contributed to the severe food shortages in certain commodities that the country has recently experienced. This trend is expected to continue as the interaction of economic development and social factors culminates in an increased demand for food, thus food

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[1]H.J. Arnold, Aid for Development, the Bodley Head, London, 1966, p. 24.

[2]Report of the Ad Hoc Committee of Experts on Long Range Program of Work in the Field of Population, Economic and Social Council, United Nations, Oct. 1964, p. 6.

production or food imports have to be increased greatly to meet the growing demand which will be intensified by the suspected high income elasticity of demand.

The accumulating evidence of what seems to be a chronically precarious food situation in Egypt has in recent years increased the general concern about its food problems, and heightened the interest in carrying out this analytical investigation. While high population growth rates are a major factor in the increasing demand for food, the high income elasticity of demand, urbanization, and rapid social changes will also have a great impact on the future food consumption patterns in the country.

In addition to its apparent importance, food has a unique place in the economies of less developed countries, for it represents the major product of the rural sector or the so called "subsistence sector". It is possible with few assumptions about the structure of the economy to determine the outcome of the interacting prices and income elasticities of demand in the two sectors on the consumption of food and/or any other product, and see how the rural migration mechanism would operate.[1]

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[1]See: Stephen Enke, Economics for Development, Prentice Hall, Inc., 1965, pp. (127-139).

1.3 The Objectives and Basic Hypotheses

Economic planning requires much information about the changing structure of the Egyptian food economy during the process of economic growth. Such information would facilitate the more efficient and more economical use of planning techniques in programming development projects in the country.

In this study, the objective was to estimate the income and price elasticities of demand for major food products, and then to use these estimates, along with estimates for the annual rate of growth in GNP, and the projected rates of population growth to estimate the future demand for food products. Specifically the objectives of this study are:

(1) To investigate the determinants of the demand for food and their magnitude.

(2) To estimate income and price elasticities of demand for food in general, for food commodity groups, and for basic food items.

(3) To utilize this information in projecting future consumption levels for different commodity groups and specific food items in 1975 and 1985, and to relate these projections to the economic development plans and the long-run potentials of agriculture.

The study therefore focused on estimating parameters determining the demand for food. To accomplish this, different types of data, time-series and cross-sectional, are utilized, and more than one model of analysis is introduced.

The underlying hypotheses for the study were as follows:

(1) The income elasticities of demand for food in general and for most individual food items, are relatively high in Egypt as compared to developed nations.

(2) Major differences in consumption patterns do exist between urban and rural areas, with urbanites consuming more food in absolute terms, but spend relatively less of their incomes on it.

(3) The income expenditure elasticity differs significantly from the income quantity elasticity, at least for certain items such as meat, fish, and fruit, where qualitative differences exist. This is mainly because, other things equal, as income rises, a family tends to consume better qualities and thus expend more.

(4) Increasing per capita income is the most significant factor affecting the demand for food.[1] Further, the

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[1]The term "the demand for food" deserves a word of explanation. We recognize that there is no such things as a "demand" for food. Instead, there are demands for meat, wheat, eggs, potatoes, and other products that provide food. However, in this context, what is actually meant by the elasticity of demand for food is not the quantity elasticity but rather the expenditure elasticity based upon total food expenditures.

demand for animal proteins and fruits and vegetables will rise faster as the income elasticity of demand for these products is expected to be relatively high.

(5) With the present trend in production and the rate of population growth and unless some drastic measures are taken to increase local food production, increase food imports, or a combination of both; the country will face severe shortages in many food products by 1975.

The study starts by introducing the basic features of the Egyptian economy, which is believed to be very important as a background within which the nature and scope of the food problem can be evaluated. Chapter 3 discusses the concepts and techniques used in the analysis, and introduces the reader to the sources of information utilized in the study.

Chapters 4 and 5, concentrate on the results of the statistical analysis. Each starts with an introductory section that explores the ideas of using the types of data used, its advantages and limitations. The two chapters are related to each other and in fact complementary. The income elasticity coefficients obtained and presented in chapter 4 are used in formulating the combined model in chapter 5. The price elasticities presented in section 5.1 are used to estimate money flexibility and therefore to estimate price parameters

for commodities for which reliable time series data were not available.

Chapter VI presents an overall projection of the demand for food products in 1975 and 1985. This chapter is followed by a summary and conclusions.

CHAPTER II

THE BASIC FEATURES OF THE EGYPTIAN ECONOMY

2.1 Introduction

During the forties and early fifties, the Egyptian economy was based on private enterprise system with a very limited government role. Distribution of income and wealth were extremely unequal. The new regime that took over in 1952 had, as its immediate purpose, the carrying out of land reforms which placed a ceiling of 200 feddans[1] on the ownership of land. The ceiling was subsequently lowered to 100 feddans. Land possessed by individuals in excess of that amount was expropriated and gradually redistributed. The Suez war of 1956 carried with it the nationalization of British and French properties, which involved the main part of the banking and insurance system and other segments of large business and industries. These properties, which were managed by specially assigned governmental bodies, formed the foundation of what was to be known later as the public sector.[2]

An economic planning was begun on a large scale in 1958/59, private enterprise was expected to play an important role in the

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[1]A feddan, the area unit in Egypt, is equivalent to 1.038 acres, or 4,201 square meters.

[2]See: Bent Hansen and Girgis Marzouk, Development and Economic Policy in the U.A.R. (Egypt), North-Holland Publishing Company, Amsterdam, 1965.

implementation of the plan by fulfilling the savings and investment targets laid down by the plan. Nevertheless, in 1961 large-scale nationalization followed which involved all big industries and trade enterprises. The main economic justification for such a decision was to bring investment and savings under the direct control of the government. There were other political motives behind the nationalizations, for the role of private enterprises in the implementation of the plan had never been well defined. Nor was there on the part of government, any encouragement or incentives for private investors to participate effectively in the plan.

These gradual and subsequent steps have in effect transformed the country's productive system from a private enterprise market economy into an unique mixed system in which the most significant economic decisions concerning production and investment are taken by the state.

2.2 Land Area and Agricultural Production

The area of Egypt is about one million square kilometers, or nearly 238 million feddans, of which only about 5,967,000 feddans or about 2.5 percent, are cultivated. However, as the average rate of cropping per feddan is 1.68 crops a year, this gives the country an equivalent to 10,954,000 feddans of cropped

area. It is important, in this respect, to distinguish between the cultivated area and cropped area. The cultivated area is the number of feddans actually planted, whereas the cropped area, also expressed in feddans, is the cultivated area multiplied by the number of crops grown annually under the perennial irrigation where several crops can be planted in rotation in the same area. The area that can be cultivated depends entirely upon the elevation of the land in relation to the nearest water supply.

The country's dependence on the agriculture sector can be emphasized by pointing out that not only over one-quarter of the national income and one-half of its employment is currently derived from agriculture, but also large portions of industry, commerce, finance, and transporation are centered around the agricultural sector.[1] Despite the notable expansion in the industrial production and its concomitant impact on the economy, agriculture has continued to play a principal role in the country's economic life.

The agricultural sector in Egypt has made four major contributions to the process of economic development:

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[1]Gamal Eleish, "The Applicability and Utilization of the Input-Output Model in a Developing Economy: the Case of Egypt Examined", a paper presented at the International Conference on Input-Output Techniques, Geneva, September 1961.

Table 2. Net Value Added and the Size of the Working Force by Sectors in 1959/60 and 1964/65

Sector	Net Value Added (LE mill.)		Labor force (000)	
	1959/60	1964/65*	1959/60	1964/65
Agriculture	399.9	511.7	4220	4660
Industry and electricity	273.4	540.3	632	846
Transport and communication	97.5	117.5	219	226
Financial services	13.2	18.6	21	30
Others	593.5	725.6	1811	2098
Total	13775.	1913.7	6903	7860

*plan targets

Source: National Planning Committee, General Frame of the First Five-Year Plan, Cairo, 1962.

(1) It has stimulated the growth of basic agricultural inputs industries such as chemicals and farm machinery. The development of the fertilizers industry illustrates this point. The local production of fertilizers which started in 1947 at a modest level of 15 thousand tons increased in thirteen years to reach 443 thousand tons in 1960.[1]

(2) The implementation of many agricultural development schemes and the rise in net cash income of the farm population, provided a rising demand for many manufactured products.

(3) The expansion and diversification of agricultural exports made available the foreign exchange needed to pay for the import of machinery and capital goods upon which economic growth depends.

(4) Finally, the agricultural sector has carried the heavy burden of the provision of increased food supplies to meet the growing and more diversified demand for food. This is indeed a critical and major task. Failure to expand food supplies to meet the rising demand is bound to jeopardize economic grwoth since there is likely to be a notable rise in food prices which could add to the inflationary pressure. Though the country has had to supplement the locally produced food supplies by imports, particularly wheat, the local production has managed to meet a good part of the food requirements.

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[1]UAR Ministry of Agriculture, Annuaire Statistique, 1964.

Table 3. Value of Agriculture Output 1960-1964 (in L.E. million)

Groups of products	1960	1961	1962	1963	1964
field crops	380	326	397	405	453
vegetables	39	42	51	60	67
fruits	26	24	29	32	33
animal products	105	110	116	131	163
Total	550	502	593	628	721

Source: UAR Ministry of Agriculture, The Monthly Bulletin of Agricultural Economics and Statistics, Vol. 17, July 1966, pp. (55-56).

A variety of crops are grown in Egypt. With the exception of cotton, rice, and onions, they are grown mainly for domestic consumption. The index of agricultural output shows an average rate of increase in total production of about 6 percent during the last decade.[1] It is desirable, for the purpose of this study, to separate food and non-food products. Over the period from 1937 to 1960, there were times when food output grew ahead of the population. However, over the whole period food production rose by 46 percent while the population increased by 64 percent, a divergence that resulted in a 10 percent fall in per capita food supplied from domestic sources.[2]

The major field crops grown in Egypt are cotton, wheat, corn, rice, maize, clover, onions and sugar-cane. Of less importance are beans, nuts, sesame, and flax. The area put to field crops amounts to about 9,750,000 feddans annually, or about 94 percent of the cropped area. To this group of farm products about 63 percent of the value of agricultural output is attributed.[3] Cotton is the principal cash crop and the main source of foreign exchange from the agricultural sector. It makes up about 16 percent of the field crops cropped area and

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[1]Donald C. Mead, Growth and Structural Change in the Egyptian Economy, Richard Irwin, Inc., 1967, p. 56.

[2]Donald C. Mead, Ibid., p. 59.

[3]The figures refer to 1964 data.

accounts for about 35 percent of the group's output value. Egypt is the main supplier of long-stable cotton to the world; it produces about 40 percent of the world's long varieties and nearly 50 percent of the extra long-stable cotton. About 30 percent of the total annual cotton production which amounts to around 450,000 tons is locally manufactured.

Wheat normally occupies about 13.5 percent of the field crops area and makes up to 12 percent of its value. Rice is the second largest agricultural export commodity and is one of the crops that will be expanded in acreage after the completion of the Aswan High Dam. Onions form the third largest agricultural export as about 40 percent of the crop, or about 260,000 tons are exported annually. Major legume crops include beans, lentils, and peas. The principal oil crops grown in Egypt include groundnuts and sesame.

Vegetables and fruits together occupy nearly 7.1 percent of the total cropped area and normally make up about 14 percent of the value of agricultural output.

Livestock production represents an important segment of the agricultural production as it accounts for about 23 percent of the value of agricultural output of L.E. 168 millions.

Table 4 shows the area, production and value for total output for major agricultural products.

Table 4. Area, Production, and Value of Total Output for Major Crops in 1964

	Area	Production	Value of total output	Percent of cropped area	Percent of value of ag. output
	feddans (000)	metric tons (000)	L.E. (000)		
A. Field Crops					
cotton	1611	504	157,083	14.7	21.8
wheat	1295	1,499	53,959	11.8	7.5
corn	1660	1,934	57,172	15.2	8.0
rice	962	2,036	40,098	8.8	5.6
beans	408	340	21,581	3.7	3.0
millet	494	740	18,932	4.5	2.6
sugar-cane	134	5,150	12,389	1.2	1.7
onions*	134	647	6,923	1.2	.9
others	3481		84,486	31.8	11.7
Total field crops	10,179		452,621	92.9	62.8
B. Vegetables	608	4,278	67,303	5.6	9.3
C. Fruits	167	1,144	33,223	1.5	4.6
D. Livestock & Dairy Products			167,763		23.3
Total	10,954		720,910	100	100

*Production and value of onions include interplanted crop.

Source: U.A.R. Ministry of Agriculture, The Monthly Bulletin of Agricultural Economics and Statistics, Vol. 17, July 1966.

Egypt's annual per capita income places her among the underdeveloped regions of the world. Despite this it is hard to say that the Egyptian agriculture is primitive and backward as is often the case for underdeveloped countries. According to the figures of the Food and Agriculture Organization of the United Nations for output per acre in 1965/66, Egypt ranked fifth for cotton (nearly 30% above the United States), fourteenth for wheat, twelfth for maize, third for rice (ahead of Japan), first for chick-peas, lentils and millet. Japanese yields per acre are roughtly at the same level as in Egypt for all major crops grown in both countries.[1] This is not to deny the possible scope for improvement and increases in agricultural output particularly through the use of better seeds with higher yields, but the point is that with the present level of technology and organization, the agricultural sector in Egypt stands close to intensive cultivation, and that the scope of simple improvement by applying better techniques would therefore seem limited.

This might explain the fact that the problem of rural poverty in Egypt is much more difficult to eliminate than is

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[1] Food and Agriculture Organization of the United Nations, Production Yearbook, 1966, Vol. 20, Rome 1967.

the case for many less developed countries. Poverty seems to be a result of "unfortunate factor proportions and not merely of an inefficient agriculture."[1]

After 1970, the scheduled completion date for the Aswan High Dam, the cultivable land is to be increased by almost one-third. Yet, the high rate of the population growth is bound to outstrip any possible increase in the land area. Unless some economical method was to be found for desalting sea water for agricultural purposes,[2] or the rate of population growth to decline rapidly, the land-man ratio is expected to fall still further.

2.3 The Demographic Picture

The Egyptian demographic picture represents an interesting case study of a rapidly growing population with almost constant age structure. Egypt was cited in the development literature as an example of the overpopulated areas in which the famous

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[1]Donald C. Mead, Growth and Structural Change in the Egyptian Economy, op. cit., p. 74.

[2]At the present writing, there is a project under discussion by a special committee in the U.S. government to study the utilization of the nuclear power in desalting sea water. The U.A.R. government has expressed its interest in the project, but it is doubtful if any funds could be made available for the project. See: Dwight D. Eisenhower, "A Proposal for Our Time", Reader's Digest, June 1968.

Arthur Lewis' type theories for economic development with "unlimited" supply of labor is applicable.[1] Though these theories have been challenged on various grounds, the fact is that the population has continued to grow more rapidly than the cultivable area, and that despite the substantial expansion in employment opportunities outside agriculture, the land-man ratio for both total and agricultural populations has continued to fall.

The population of Egypt, according to the 1960 census, had reached about 26 millions, and is estimated to be slightly less than 30 millions in 1969. Of the total population, about 62 percent are rural. The annual compound rate of population growth based upon the period 1947 - 1960 is estimated to be about 2.4%.[2] This high rate of population growth creates a very different problem for a country already believed to be overpopulated, as it makes it harder for the expansion of the so-called "modern sector" to match the increasing supply of labor. Despite the continuous efforts to apply a policy of population control, and the measures that have been taken

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[1] See: W. Arthur Lewis, "Economic Development with Unlimited Supplies of Labor", in: A. Agrawala and S. Singh (eds.), The Economics of Underdevelopment, Oxford Univ. Press, 1963, pp. (400-449).

[2] The rate, r was estimated by applying $P_n = P_o (1+r)^n$

in the field of family planning this high rate of population growth is expected to continue, the reason being the substantial decrease in the crude death rates which is estimated to be 16 per thousand in recent years as compared to a rate of 31.9 per thousand in 1947/48.[1]

Table 5. Urban and Rural Populations in Successive Censuses from 1927 to 1960

Year	Urban	Rural	Total
	000	000	000
1927	3,770	10,707	14,177
1937	4,436	11,484	15,920
1947	6,262	12,704	18,966
1960	9,864	16,120	25,984

Source: U.A.R. Department of Statistics and Census, Population Census, 1960, Cairo, 1963, Vol. 2

The committee of experts which was formed in 1962 by the government to study the population trends in the country

[1] H. Abdel-Aty, "Life-Table Functions for Egypt", The Mil-Bank Memorial Fund Quarterly, Vol. 39, No. 2, April 1961, pp. (350-7).

made five different assumptions with regard to the future trends of the fertility rates for the period from 1960 to 1995.[1]

Five projections were made based upon the five assumptions about the fertility rates. The projections are shown in Table 6, with the first projection considered the maximum or the upper limit and the last being the lower limit.

Table 6. Projected Size of the Total Population (in millions)

Assumption	Estimated Population		Compound Annual Rate of Increase		
	1970	1985	1960-1970 %	1970-1985 %	1960-1985 %
1	34.5	52.5	2.8	2.8	2.8
2	34.0	48.3	2.7	2.4	2.5
3	34.5	48.4	2.8	2.3	2.5
4	33.4	43.6	2.5	1.8	2.1
5	31.7	38.8	2.0	1.4	1.6

Source: U.A.R. Central Statistical Committee, Population Trends in the U.A.R., Cairo 1962, p. 53.

The fertility rates have major implications on the projected population size as well as on the age distribution. However,

[1]These assumptions are discussed in Ch. VI, Sec. 6.2.

we tend to believe that fertility rates are not likely to decline substantially within a period of one or two decades. Therefore, the Egyptian demographic picture in the coming twenty-five years is expected to be dominated by some decline in mortality, with fertility rates constant or falling very little. This would imply a further rise in the rate of population growth. It is thus reasonable and safe to assume that the growth rate will be in the range of 2.5 to 2.8 per year at least within the next fifteen years.

2.4 The Trends of National Income

Over the period from 1952/63 to 1969/60, national income measured in current prices increased from L.E. 806 million to L. E. 1285 million, with a total increase of 59.4 percent and an annual compound rate of annual increase of 6.9 percent. However, over that period the wholesale price index for all commodities increased by about 18 percent. In constant prices of 1959/60, national income increased from 949 million to L.E. 1285 million with 35.4 percent increase over the seven year period, and an average compound rate of annual increase of about 4.5 percent.

Over the First Five-Year Plan period, from 1960/61 to 1964/65, national income increased from its original level of L.E. 1285 million in 1959/60 to L.E. 1905 million in

1964/65 in current prices or L.E. 1762 million in constant prices of 1959/60. The increase being about 48.2 percent in current prices and 37.1 percent in constant prices, with an average compound rate of annual increase of 8.2 percent and 6.5 percent, respectively. If this trend is sustainable in the future, it would be considered a remarkable achievement.

The original objective of the first Five-Year Plan was to increase national income in constant prices over the five-year period by L.E. 510 million or 40 percent.[1] The realized increase over the plan period amounted to L.E. 477 million or 37.1 percent comprising 94 percent of the planned increase in national income.

As can be shown in Tables 7 and 8, the increase in national income in 1961/62 was slight and as low as 2.4 percent in current prices and 3.3 percent in constant prices of 1959/60 over the previous year. This was mainly due to the bad cotton crop in that year, and a resulting decline in agricultural income by about L.E. 30 million below 1960/61 and 1959/60 levels. Fluctuations in the cotton crop was responsible also for the relatively high increase in national income in 1959/60 and for its decline in constant prices in 1955/56.

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[1]U.A.R. National Planning Committee, op. cit.

Table 7. National Income and National Income Indices in Current Prices and in Constant 1959/60 Prices, 1952/53 to 1964/65

Year	National Income L.E. million		National Income Indices 1959/60 = 100	
	current prices	1959/60 prices	current prices	1959/60 prices
1952/53	806	949	62.7	73.8
1953/54	847	1026	65.9	79.8
1954/55	920	1096	71.6	85.3
1955/56	965	1037	75.1	80.7
1956/57	1067	1057	83.0	82.3
1957/58	1126	1129	87.6	87.9
1958/59	1157	1160	77.8	90.3
1959/60	1285	1285	100.0	100.0
1960/61	1389	1364	108.5	106.1
1961/62	1422	1412	110.7	109.9
1962/63	1537	1533	119.6	119.3
1963/64	1719	1648	133.8	128.2
1964/65	1905	1762	148.2	137.1

Source: Calculated from Table B1 in the appendix.

Table 8. Percentage Shares of Sectors in National Income, 1959/60 to 1964/65

Sectors	1959/ 1960	1960/ 1961	1961/ 1962	1962/ 1963	1963/ 1964	1964/ 1965
Agriculture	31.5	29.5	26.4	27.8	27.5	26.7
Manufacture and Electricity	20.7	21.9	23.1	22.7	23.5	23.5
Construction	3.7	3.2	5.2	5.4	5.8	5.3
Transport	7.2	7.5	8.3	8.3	8.7	8.6
Housing	5.7	5.4	5.4	5.1	4.8	4.6
Trade and Finance	10.0	10.6	10.8	10.1	9.0	9.2
Other Services	21.2	21.9	20.8	20.6	20.6	22.1
Total	100	100	100	100	100	100

Source: Calculated from table B3 in the appendix.

All sectors of the economy contributed to the increase in national income, but the proportion of that contribution as well as the rate of growth varied from one sector to another. Thus, over the period from 1952/53 to 1959/60, income from agriculture increased by L.E. 153 million or about 61 percent. Income from manufacturing and electricity increased by L.E. 139 million or 109 percent. Income derived from construction, transport, trade and finance together increased by L.E. 118 million or 78 percent. Income from other services increased by L.E. 69 million or some 25 percent.

Over the same period, 1952/53 to 1959/60, the share of agriculture in the national income remained around 32 percent. Manufacture and electricity increased from 15.8 percent to 20.7 percent. Trade and finance showed a slight increase, while construction and transportation remained around 3.5 percent and 6.5 percent, respectively. The share of other services declined from about 34 percent to 27 percent.[1]

During the first Five-Year Plan income from agriculture increased by L.E. 65 million or about 16 percent. Income from

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[1]See tables B3, B4, and B5 in the appendix.

manufacturing and electricity increased by L.E. 148 million or 55.6 percent. Income from construction increased by L.E. 46 million or 98 percent. Transportation increased its contribution to national income by L.E. 59 million or about 63 percent. Trade and finance increased by L.E. 33 million or 25.6 percent. Income from other services increased by about 42 percent. Therefore, of the overall increase in national income, agriculture contributed 13.4 percent, manufacture and electricity 31.0 percent, construction and transport contributed together 27.5 percent, while other services contributed 31.7 percent.

The low rate of growth in the agricultural sector as compared to that of manufacture and electricity reflects the emphasis placed on the later sectors in the allocation of investments of the five year plan. However, the rate of growth in agriculture is expected to increase over the second five-year plan period due to the completion of the Aswan High Dam, scheduled for 1970, and other associated programs.

Because other sectors of the economy expanded at a higher rate than agriculture during the first five-year plan, the share of agriculture in the national income declined from about 31.5 percent in 1959/60 to 26.7 percent in 1964/65, while the share of manufacture and electricity increased from 20.7 percent to 23.5 percent. This trend is expected to continue over the years to come, because of the greater emphasis the planners put on industrialization and urbanization.

This expansion was accompanied by a growing deficit in the balance of payment. Economic theory indicates that such a deficit means either a higher level of consumption with the production level and the rate of investment constant, or an increase in capital formation with the consumption level constant, or some combination of the two. Needless to say, Egypt is not the only developing nation with a balance of payment problem. Though aggregate consumption has increased, the apparent growing deficit in the balance of payments can be mainly attributed to the planning efforts in recent years which increased investments share of national income from 13.3 percent in 1959/60 to 21.6 in 1963/64.

2.5 Aggregate Food Consumption

Food consumption plays an important role in the economies of less developed nations for several reaons. In addition of being the major product of the so-called "subsistence sector", the ratio of food expenditures to total income is a well known criterion to measure the well-being of an individual or of a nation. As Engel believed that "the poorer is a family, the greater is the proportion of the total outgo

which must be used for food".[1] This famous relation depicts the simple fact that the higher the proportion of income spent on food, the lower will be the expenditures on other items which, together with food, measures the individual's or the nation's prosperity.

Food deficiency is a well known phenomenon in less developed areas. However, in this respect one should distinguish between two different aspects of food deficiency. Quantitative deficiency as measured in terms of calorie intake is usually referred to as undernourishment, while qualitative deficiency, or the nutritional side as measured by the lack or adequacy of particular essential nutrients is known as malnutrition or malnourishment.[2]

In dealing with the quantitative aspects of the food problem in Egypt, we have to consider two sources of bias in the aggregate figures: (1) that information on actual consumption levels or the balance sheets is based upon several derivations and conversions that are subject to certain errors,

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[1]As quoted in C. C. Zimmerman, "Ernest Engle's Law of Expenditures for Food", Quarterly Journal of Economics, 1932-3, p. 80.

[2]George R. Allen, "The World's Food Shortage: Nutritional Requirements and the Demand for Food", Iowa State University Center for Agricultural and Economic Adjustment, Food--One Tool in International Economic Development, Ames, Iowa, 1965, pp. 32-59.

and (2) that the national averages do not reveal the disparities in income distribution and food consumption.

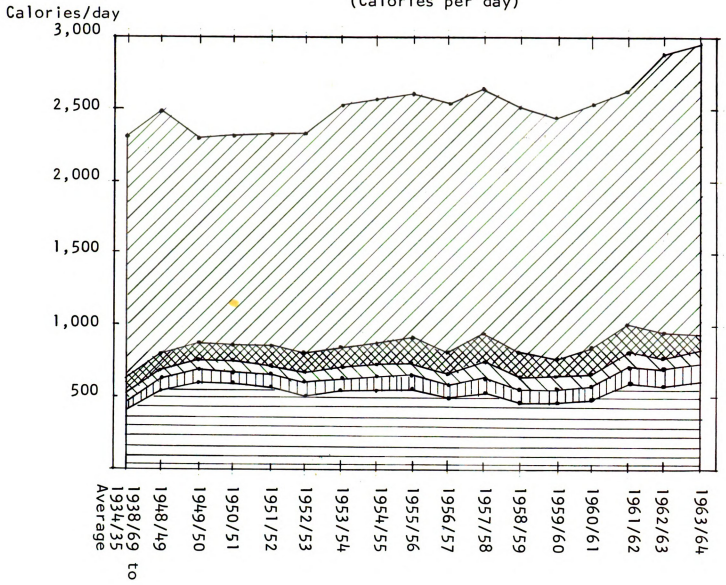
Table 9. Per Capita Food Consumption in Egypt, 1948/50 to 1964/65

Years	Calories	Fat	Total Protein	Animal Protein
	number/day	grams/day	grams/day	grams/day
1948/50	2360	38.5	69.4	12.5
1951/53	2340	26.0	67.8	10.7
1954/56	2470	37.0	71.7	12.2
1957/59	2530	39.5	73.5	11.9
1960/62	2670	42.0	79.0	12.2
1963/64	2890	47.8	85.5	12.6
1964/65	2930	49.1	84.1	12.6

Source: Collected from: Food and Agriculture Organization of the United Nations, Production Yearbook, several volumes

Food consumption in Egypt, in terms of calories, has shown some improvement over the last three decades as it is shown in figure 1. The composition of calories sources has remained almost constant, with cereals, potatoes and other starchy roots constituting about 70 percent of the total calorie intake.

Figure 1. Net Food Supply Per Capita, 1934/35-1963/64
(Calories per day)



Source: Appendix

Calorie figures reveal the fact that the food situation in Egypt cannot be characterized as a case of undernourishment, as it is well above the calorie requirements in Egypt as estimated by the Food and Agriculture Organization. It would be rather a case of malnutrition. There is no clear-cut definition of the extent of malnutrition in a certain country, but it is a well-established criterion that if the ratio of calories derived from cereals, sugar, and starches to total calorie intake exceeds two-thirds, that is a clear evidence of serious malnutrition.[1]

The pressure of population growth and rising incomes upon food supplies is increasing and will continue to increase. The present increases in population practically swallow up all increases in production and leave the general standards of living still very low. From 1937 to 1947 the population grew by about 20 percent, while food production seems to have risen by slightly less than that, with the result that food consumption per capita in 1948 was somewhat around its prewar level. Therefore, with the decline in the rate of increase of food production combined with the population growth, Egypt

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[1]Food and Agriculture Organization of the United Nations, Second World Food Survey, Rome 1952, p. 13.

shifted from being a net food exporter in 1947 to becoming a net food importer. These imports which accounted for L.E. 27 million in 1950, and L.E. 35 million in 1951, have made it possible to maintain the level of food consumption. The failure of agricultural production to keep pace with the rapid growth of population was a major factor behind the launching of the planning schemes in 1959/60.

From 1952 to 1960, the situation changed drastically. Food production increased by more than 30 percent,[1] while the population grew by about 22 percent. Net food imports decreased. Wheat imports decreased from over one million tons in 1952 to only 10 thousand in 1954, and none was imported in 1955. Maize imports declined substantially and rice exports rose. Since 1960, food imports began to rise again mainly under U.S. Public Law 480, and there was a massive increase of net food imports reaching about L.E. 62 million in 1963. The share of net imports to total domestic food supply rose from 2-3 percent in 1960 to 10-12 percent in 1963. Egypt's agricultural imports from the United States under P.L. 480 increased from 12 million dollars worth of agricultural products to $782 million in 1966.[2] These were mainly food products of which wheat constituted a major part.

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[1]See table B6 in the appendix.

[2]See table B7 in the appendix.

Of all food items, cereals stand as a major source of nourishment to the Egyptian population. Wheat, maize, and rice provide almost half of the calorie intake. Over the past two decades these crops have continued to increase in production. Cereal crops as a group increased by about 40 percent over the last two decades. Fruits and vegetables almost doubled and livestock production increased by some 85 percent. Yet the population pressure allowed only a slight improvement in the levels of consumption, as measured by calories.

2.6 Summary

The population of Egypt in 1969 is estimated to be slightly less than 30,000,000. It is increasing at an annual rate of about 2.5 percent, a fact of major concern to the government, since the per capita income is extremely low and the amount of arable land is limited. More than 60 percent of this population is rural.

The most notable feature of the geography of Egypt is the Nile river, in whose valley almost all of the people live. The completion of the Aswan High Dam, scheduled in 1970, will not only increase the arable land by about one-third, but also will put the river and all water resources under full control for the first time in its long history.

The government of the UAR exercises substantial powers over the national economy. The second five-year plan is under way with full government control. Though efforts were directed toward industrialization in recent years, agriculture is still the basis of the national economy. The fertile Nile valley yields grains, cotton, fruits, and sugar cane, at levels nearing the highest in the world.

The serious challenge is one of fostering rapid progress in economic development, including production of more food to help feed the growing population and to meet the rising demand for higher quality diet. To achieve such a goal would require enormous efforts if the population continues to increase at the present rate and practically swallow up any increase in production and leave the general level of living still very low.

CHAPTER III

CONCEPTUAL FRAMEWORK AND TECHNIQUES

3.1 Source of Information

This study depended heavily upon the information collected in two household budget surveys. The first was conducted during the period from October 1958 to November 1959 by the Egyptian Central Statistical Committee with technical assistance from the International Labor Office of the United Nations. The second survey was conducted over the period from April 1964 to January 1966 which was subdivided into four sub-periods during which information was collected.

These surveys had, as a major purpose, the development of a representative picture of family living conditions by recording the amounts spent and the quantities consumed by a sample of household units and to evaluate the economic status of the households with regard to their total outlay and the changes in their assets and liabilities over time.

Because of the difficulties of sample selection and data collection, household budget surveys are rarely designed to be completely representative of the entire population of a country. In addition, such inquiries often omit certain

elements such as family income, tax payments, or cash holdings, giving more emphasis to the consumption expenditures of the households. In order to approximate a near "cetris paribus" situation, households were stratified into "homogeneous groups". This stratification is based on the location of the household, rural or urban, and household size.

Households were grouped by total expenditure levels. The average expenditure by household groupings are the basic data used for fitting the consumption function. In the calculation of the regression coefficients these group averages were weighted by the number of the households in each group. The procedure used will be elaborated in section (3) of this chapter.

The Central Statistical Committee of Egypt stated that the household surveys were conducted in order to permit the achievement of, among other things, the following two principal objectives: (1) To obtain data useful in the construction of a general cost-of-living index, and two sub-indices, one for urban and another for rural communities, and (2) to measure income elasticity of expenditures for various expenditure categories.[1]

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[1] International Labor Office, Report to the Government of The United Arab Republic on Family Budget Survey and on the New Consumer Price Indices in the Southern Region of the U.A.R. (Egypt), Geneva 1960, p. 9.

The reliability of information derived from such household surveys depends upon, among other factors, the representativeness of the sample. There were in fact two samples taken, one for urban households and another for rural households. Table 10 shows the size of these two samples as compared to the total population.

Total household consumption expenditures were measured during both a month and a year for different categories of goods. It was measured in both value and quantity for current consumption commodities, and in value only for durable and semi-durable goods, services, transfer payments and other outlays.

Table 10. The Size of the First Household Budget Survey and Its Percentage of the Population

Location of House-holds	Total number of households in the sample	Total number of individuals in the sample	Total population (Jan.'60)	% total population
Urban	3,145	17,468	9,864,000	0.18
Rural	3,037	16,487	16,120,000	0.18
Total	6,182	33,955	25,984,000	0.13

Source: UAR Central Statistical Committee, Household Budget Survey in the Egyptian Region, 1958-59, Cairo, April 1961. (in Arabic).

The major methodological difference between the second survey of 1964-1966 and that of 1958-1959, is that it consists of four different data collecting rounds in which a stratified representative sample was drawn and each sample was studied in a specific month as shown in table 11.

The total number of the households studied in this second survey was 13,817, out of which 9,317 were living in urban areas and 4,500 were living in rural areas.

The procedures were used for collecting information were as follows:

(1) For some items, mainly food, information was obtained about the month preceding to the study month.

(2) For other items, such as clothes, data were collected for the preceding three month period.

(3) For durable goods, data were collected for the preceding year.

The complete results of this second survey are not yet available. Some general information, together with the preliminary results of its first round, were published in Arabic in 1967. These preliminary results were the principal source of information used in this study.

Table 11. Periods Covered and the Month of Study in the 1964-66 Household Budget Survey

Survey rounds	Period Covered		Method of Study
	from	to	
First	April 1, 1964	March 31, 1965	April 1965
Second	July 1, 1964	June 30, 1965	July 1965
Third	October 1, 1964	September 30, 1965	Oct. 1965
Fourth	January 1, 1965	December 31, 1965	Jan. 1966

Total expenditures have been used in many studies as a fairly reliable estimate of the household income. The latter is usually recorded with less accuracy than the former which is equal to the sum of all expenditures on various items, food and non-food. Total consumption expenditures consists of the sum of actual consumption expenditures of the household plus the value, at the local retail prices of the home produced goods consumed by the household.

It should be pointed out, in this regard, that the share of private gross disposable income in gross national income in Egypt has fallen since 1960, while public net disposable income has risen. The household's control on the volume of present consumption deferred for the sake of higher future

consumption, in other words, on saving, is no longer significant. Although households are still free and are, in fact, encouraged by the government to save, their savings form only a small proportion of the total. Therefore, since savings are not likely to change greatly as a proportion of income, the eleasticity of demand based upon total expenditures is not expected to differ much from that based upon income.

As it will be explained in section (4) of this chapter, time-series data will be used to supplement the cross-sectional information. It is assumed that prices and indeed other market variables are held constant in a single cross-section sample, thus the income parameters or, more precisely, the relationship between food consumption and total expenditures can be estimated efficiently using such data. Although time series data alone can be used to estimate both price parameters and income parameters, there are methodological reasons for pooling the two types of data that will be discussed later.

Per capita consumption figures were derived through several conputations. The production, exports, imports, losses, seeds and population data were used for calculating per capita consumption for most products. With respect to meat, data are collected for all meat from the slaughter

houses together with imports of frozen meats. Local production data for milk and dairy products are for all sources of milk together with exports and imports data. Consumption figures are calculated for fresh milk, butter, ghee, and cheese.

The source of the population projections is the findings of the research carried out by the committee of experts which was formed by the Egyptian government in 1962 to study the population trends in the country.[1]

3.2 Analytical Procedures

Increasingly, it is being realized that aggregate consumption functions derived from time-series data are not sufficient for forecasting consumption or for demand analysis. In addition to the difficulties involved in obtaining a homogeneous sequence of data that covers a reasonable length of time, its enlargement in size by taking more frequent observations will raise the question of the presence of serial correlation and the observations can no longer be considered independent. In such a situation three alternatives can be considered: (1) The use of cross-sectional data or as it is

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[1]UAR Central Statistical Committee, Population Trends in the U.A.R., Cairo, 1962.

called the household surveys, (2) Pooling the two types of data, and (3) The utilization of mathematical relationships, based upon certain assumptions, to estimate the required parameters. The present study, moved in these three directions.

Three models of analysis will hence be introduced: (1) A cross-sectional model of analysis, (2) A combined model for cross-sectional and time series data, and (3) A model for estimating price parameters from cross-sectional information.

In establishing this procedural framework, and in the analysis there were four assumptions:

1. It is assumed that all other variables, not explicitly included in the analysis were constant. This applies mainly to institutional and political situations.

2. No substantial change in the price relationships among different products within the country.

3. That there are differences in the consumption patterns as between rural and urban areas to the extent that might justify our dealing with the two sectors separately in various occasions.

4. That a reasonable amount of homogeneity does exist in the data. This assumption applies to both types of data used

in this study. In time-series data it is assumed that periods of time are homogeneous except for the differences in the explicit variables, and for random effect. This seems likely in view of the relative shortness of the time period that the data covers. The assumption for cross-sectional information implies the homogenity of different households, except for the differences accounted for in the measured variables and a random error. This assumption cannot technically be proven but it is necessary.

3.3 The Cross-Sectional Model

Calculations were performed on the original data to provide information about the average annual expenditures for food per household.[1] The households are classified according to their total annual expenditures and their size within rural and urban location categories.

The task was to analyze the relationship between consumption (in terms of physical consumption or consumption expenditures), annual income (as indicated by annual total expenditures), location, and family size. The number of consumption units rather than the actual number of household members (also available), is used as a more meaningful indicator of the household size, in order to take account of the age variation.

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[1] See Tables B 13 and B 14.

The economic model we assume to identify the relationship between these variables can be written symbolically as follows:

$$D_f = f\ (I, S, L)$$

or that the demand for food D_f, is a function of annual income I, household size, S, and location L.

It is apparent that these variables are not the only ones that influence the demand for food. The price factor is the most important variable that we have omitted from the demand function.[1] This has been done purposely because of the nature of our cross-sectional sample which assumes a constant price at the time of data collecting. With the exception of price, the other major variables influencing the demand for food have been included.

The choice of a function or a mathematical form to express this relation is a matter of great importance. The calculated income elasticities will depend on the type of function that has been fitted. The criteria used in the selection of the proper function were: (1) statistical accuracy, (2) its economic relevance within the framework of the economic theory, and (3) simplicity of the computation.

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[1] Differences between urban and rural price relatives may show up in the location variable.

Practical considerations limit the choice of the function to four types: linear, semi-logarithmic, the logarithmic and log-inverse functions.

A linear function is apparently the simplest and was frequently used in the literature, but it is now generally regarded as unsuited for the analysis of income-food consumption relationships in particular. Its basic assumption is that the coefficient of elasticity tends toward unity as income increases indefinitely, which is not the logical relationship in the case of food consumption.[1] For this reason the linear function was not utilized in this study.

The logarithmic function which takes the form:

$$\log Y = \alpha + \beta \log X + \mu$$

has been extensively used in the literature. Its utilization has been popular for its known convenient advantage that the regression coefficient, B, is equal to the elasticity coefficient. It permits an easier introduction of the effects of the household size[2] and is also considered satisfactory

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[1]As an example of the use of a linear function in a consumption income relationships, see: R. G. Allen and A. L. Bowley, Family Expenditure, London, 1935.

[2]See: S. J. Prais and H. S. Houthakker, The Analysis of Family Budgets, Cambridge (England), 1955.

when "food consumption is expressed in terms of expenditures rather than in terms of quantities"[1] and when the income range is sufficiently narrow. Like the linear function, the logarithmic function does not allow for a "saturation" level of food consumption as income grows toward infinity. This "saturation level" or the hypothetical highest possible level of consumption is very high and approaches infinity.

The semi-logarithmic function that takes the form:

$$Y = \alpha + \beta \log X + \mu$$

is also used very often, and is preferred when food consumption is expressed in terms of quantitites.[2] It has been recommended to fit the consumption of food "necessities" though it does not allow for a saturation level.[3]

The log inverse function with the general form:

$$\log Y = \alpha - \frac{\beta}{X} + \mu$$

which has a saturation level seems to provide a better fit when "food consumption is expressed in terms of quantities and when the data available covers a broad income range.[4]

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[1]L. M. Goreux, "Income and Food Consumption", Monthly Bulletin of Agricultural Economics and Statistics, FAO, Vol. IX, No. 10, October 1960, pp. (1-13).

[2]L. M. Goreux, Ibid.

[3]S. J. Prais and H. S. Houthakker, op. cit.

[4]L. M. Goreux, op. cit.

The analysis was confined to the last three functions, namely, the logarithmic, and semi-logarithmic, and the log inverse.

The Logarithmic Model

A logarithmic function is used to express the economic model as a statistical model. The function will take the form:

$$\log \frac{Xri}{X_r} = B_{oi} + B_{1i} \log \frac{Yrt}{X_{1r}} + B_{2i} \log X_{1r} + B_{3i} X_{2r} + u_i$$

Where:

X_{ri} = the average household expenditures of the r-th total expenditures group, on the i-th commodity, measured in Egyptian Pounds.
X_{1r} = the average number of consumption units per household in the r-th total expenditures group.
Y_{rt} = the average households total expenditures in the r-th groups, measured in Egyptian Pounds, at time t.
X_{2r} = a variable that takes a value of zero for any observation from the rural households, and a value of one for any observation from the urban households.

B_{oi}, B_{1i}, B_{2i}, B_{3i} = parameters to be estimated
u_i = a disturbance term, assumed to satisfy the ordinary least squares assumptions.

X_{2r}, the dummy variable, is introduced in order to take some account of locational and indeed social differences in consumption between rural and urban households. It permits the mean consumption to differ between them while the responses in income or household size is equal for each. It is expected that, in general, the coefficient B_{3i} will be negative, partly

because urban households are expected to make less demand on physical energy, and partly because social and educational differences between rural and urban areas are likely to make, other things equal, for a higher non-food expenditures by the households of urban areas, with the consequent need for economy in food expenditures.

The coefficient B_{1i} represents the total expenditures elasticity estimate. The logarithmic relationship has the property of constant elasticity.[1] It will, ideally, represent the way a typical household would behave under different income situations, holding other variables constant. It is used as a criterion to classify items consumed as necessities or luxuries. Assumptions can be made as whether to consider this coefficient as fairly representative of the income elasticity of demand, or to reduce it by a certain factor related to the marginal propensity to consume, to give a better estimate of the income elasticity of demand. However, it can be argued that total expenditures, which is used here as an

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[1]To prove this, assume a linear log relation for both quantity and income log q = a + b log I, applying the principles of differentiation we have I/q. dq/dI = b/I, or dq/dI. I/q = b.

indicator of income is a better explanatory factor because it is more closely related to the permanent economic status than income which is more likely to include transitory and unexpected elements.[1]

The coefficient B_{2i} represents the extent to which households consume more or less per consumption unit simply because, other things equal, they contain a large or small number of consumption units. A positive value of B_{2i} indicates that large households consume more per consumption unit than do small ones for a given income per consumption unit. We may expect this factor not to be very important because the commodities are broadly defined, and because our data were not sufficiently detailed to permit the inclusion of such factors as the "size" of the product in our analysis. This coefficient also may tell us something about the households' economies of scale. As the size of the household increases, its food outlay is expected to increase but at a lower rate than that of the increase in size.

Having defined our model, a simple mathematical transformation can be performed on it in order to facilitate computation:

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[1]Lawrence R. Klein, An Introduction to Econometrics, Prentice-Hall, Inc., 1962, p. 58.

$$\log X_{ri} = B_{oi} + B_{1i} \log Y_{rt} + (1 + B_{2i} - B_{1i}) \log X_{1r} + B_{3i}X_{2r} + ui$$

or

$$\log X_{ri} = B_{oi} + B_{1i} \log Y_{rt} + B'_{2i} \log Y_{1r} + B_{3i} X_{2r} + u_i$$

where: $B'_{2i} = 1 + B_{2i} + B_{1i}$

A final point should be considered. Since the data we are using are averages for groups of households with certain annual total expenditures rather than individual observations for each household, it is desirable to weigh each observation by the number of households on which it is based in order to take into account the sampling error affecting the estimated averages.

Let N_r indicate the number of households in the r-th group, and let Z_i and Z_j any two variables in our original equations, then,

$$\sum_r N_r Z_{ir} - \sum_r N_r Z_{ir} \sum_r N_r Z_{jr} / \sum_r N_r$$

Will be the weighted sum of products of Z_i and Z_j adjusted for means. This process should be performed before applying our model as well as any of the subsequent models.

The Semi-Logarithmic Model

The semi-logarithmic model as used in our analysis will take the following form:

$$\frac{X_{ri}}{X_{1r}} = B_{0i} + \log \frac{Y_{rt}}{X_{1r}} + B_{2i} \log X_{1r} + B_{3i} X_{2r} + u_i$$

where:

X_{ri} = the average household's annual expenditures of the r-th total expenditure group, on the i-th commodity.

X_{1r} = the average number of consumption units per household in the r-th total expenditure group.

Y_{rt} = the average household's annual expenditures on all commodities in the r-th group, at time t.

X_{2r} = a variable that takes a value of zero for any observation from the rural households and a value of one for any observation from the urban households.

B_{0i}, B_{1i}, B_{2i}, B_{3i} = parameters to be estimated.

u_i = a disturbance term, assumed to satisfy the ordinary least squares assumptions.

X_{2r} is a dummy variable introduced for the same purpose as in the logarithmic model, that is to take account of the locational and social differences in the consumption patterns as between rural and urban areas.

The coefficient B_{1i} represents the slope of the relationship curve that corresponds to each value of the ratio X_{ri}/X_{1r}. In this model we end up with a set of elasticities each corresponding to a total expenditure group and an average number of consumption units. The coefficient of income elasticity of demand, or more precisely the total expenditure elasticity for

the i-th commodity will be equal to $B_{1i} \cdot X_{1r}/X_{ri}$.

Again, for the purpose of facilitating computations, the model can be expressed in the following convenient form:

$$X'_{ri} = B_{0i} + B_{1i} \log Y_{rt} + B'_{2i} \log X_{1r} + B_{3i}X_{2r} + u_i$$

Where:

$$X'_{ri} = X_{ri}/X_{1r}$$

$$B'_{2i} = B_{2i} - B_{1i}$$

The Log-Inverse Model

The following function implies that the consumption of a particular item or group of items, expressed in log terms, is a function of the total annual expenditures expressed in log-inverse form, and the average number of consumption units expressed in log form. Therefore, except for the total annual expenditures, the function is similar to the double logarithmic function explained earlier in this chapter.

Symbolically, the function can be written as follows:

$$\text{Log} \frac{X_{ri}}{X_{1r}} = B_{0i} - B_{1i} \frac{X_{1r}}{Y_{rt}} + B_{2i} \log X_{1r} + B_{3i} X_{2r} + u_i$$

or:

$$\log X_{ri} = B_{0_i} - B_{1i} X_{1r}/Y_{rt} + B'_{2i} \log X_{1r} + B_{3i} X_{2r} + u_i$$

as we define $B'_{2i} = 1 + B_{2i}$

Where:

X_{ri} = the average household's annual expenditures of the r-th total expenditures groups, on the i-th commodity.

X_{1r} = the average number of consumption units per household in the r-th total expenditures groups.

Y_{rt} = the average household's annual expenditures on all commodities in the r-th group, at time t.

X_{2r} = a variable that takes a value of zero for any observation from the rural households and a value of one for any observation from the urban households.

B_{0i}, B_{1i}, B_{2i}, B_{3i} = parameters to be estimated.

u_i = a disturbance term, assumed to satisfy the ordinary least squares assumptions.

The total expenditures elasticity coefficient for this function will be equal to $B_{1i}\ X_1/Y$. However, this coefficient is calculated on the assumption that the logarithms used in the function are Neperian logarithms. If decimal logarithms were used a correction factor would be necessary and the elasticity coefficient will be equal to $2.3026\ B.X_1/Y$.

3.4 The Combined Model for Cross-Sectional and Time-Series Data

In a single cross-section sample, it is assumed that prices and other market variables are held constant, thus the

net relationship of demand and income can be estimated using such data. The idea of pooling the cross-sectional and time-series data, as will be elaborated in chapter 5, implies the use of an independent estimate of demand parameters associated with income in estimating the demand parameters associated with prices.

Our model will be, with few modifications, similar to that applied by Stone[1] in his study to estimate the demand for a number of food products in the United Kingdom.

The demand function for items of food products is assumed to take the following logarithmic form:

$$\log X_{rt} = \alpha + \beta \log Y_{rt} + \gamma \log P_{rt}/P_t + \delta \log P_{st}/P_t + u_{rt}$$

Where:

X_{rt} = consumption expenditures on the r-th food item per consumption unit in period t.

Y_{rt} = total expenditures per consumption unit in period t.

P_{rt} = price index of the r-th food item in period t.

P_{st} = price index of the related s-th product in period t.

P_t = price index of all consumer goods in period t.

$\alpha, \beta, \gamma, \delta$ = parameters to be estimated.

u_{rt} = the error term, assumed to satisfy the ordinary least squares assumptions

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[1] Richard Stone (and others), Consumers' Expenditures and Behavior in the United Kingdom, 1920-1938, Cambridge University Press, 1954, Vol. I.

The consumption unit scale was constructed in the way explained in the following chapter. As for the price index of the related products P_{st}, this variable will be omitted for some equations, and will be expanded to include more than one related product for other equations, depending upon the nature of the product in question.

Total expenditures, as mentioned earlier, will be used as an indicator of total income, a practice that has the effect of scaling down the computed elasticity by a constant factor.

The pooling technique will be as follows:

(a) An estimate of B, the expenditure elasticity of demand is to be obtained from the cross-sectional analysis as described earlier. This estimate will be substituted directly into our new equation by forming a synthetic variable from aggregative time series data, call it z_t,

$$z_{it} = \log x_{it} - \hat{B} \log y_t$$

Where:

$\hat{B}$ = an estimate of B, derived from cross-sectional analysis.

X_{it} = the per capita consumption expenditures on product i, in time period t.

y_t = per capita income in time period t.

The multiple regression equation can be estimated for that variable and the relative prices for the product in question and also for the related product or products.

$$z_{it} = \alpha_i + B_{ij} \log P_{jt}/P_t + u_i$$

(2) If a serial correlation, which is defined as the correlation between a series of observations and the time series lagged by one or more units, if found to be significant and positive, the systematic disturbance can be partially substracted by converting the variables entering the equation into the first differences of the actual observations.

3.5 A Model for Estimating Price Parameters from Cross-Sectional Information

The idea behind introducing this model is to estimate price elasticities for commodities or groups of commodities for which time series data are not available, by drawing conclusions about these parameters from the budget proportion spent on the commodity and the Engel elasticity.

The model is based upon certain mathematical relationships and assumptions about the "representative consumer", and the want structure independence of certain groups of commodities. If these assumptions are accepted as reasonable it would be possible "to go very far in this direction".[1]

The model is applied for a number of commodities, and will be further elaborated in chapter V.

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[1]Ragnar Frish, "A Complete Scheme for Computing All Direct and Cross Demand Elasticities in a Model with Many Sectors", Econometrica, Vol. 27, April 1959, p. 177.

CHAPTER IV

ANALYSIS OF THE CROSS-SECTIONAL DATA

4.1 Some Considerations Concerning the Utilization of Cross-Sectional Data in Analytical Income-Consumption Studies

The use of cross-sectional data has made a great contribution to econometrics that dates back to the days of Le Play and Engel. Engel used Belgian cross-sectional data to give empirical support to his famous assertion that the lower the family's money income, the greater the percentage of that income spent for food, and that the percentage of family income spent for food is, therefore, the best measure for determining the level of living. The term "Engel curve" is still widely used to show the variations in food expenditures associated with the variations in the family income.

In recent years, cross-sectional data have been commonly used in econometrics to form a basis for part of the macroeconomic model structure. This tendency has been influenced to a great extent by the discontent about the nature of aggregate data. Though the practice has its associated complications, household-to-household variation in expenditure, size, and other variables; estimates of income elasticity of demand and estimates of other parameters, can be calculated and used in constructing an overall macroeconomic model.

The popularity of using household expenditure surveys for a wide variety of purposes stems from two basic reasons. The first is the frequent occurence of collinearity[1] in time-series data, a problem that seems to be less severe in cross-section data[2]. The second is the desire to construct more complicated behavioral models[3].

An argument can also be made that under the specific conditions of less developed countries, the estimation of the consumption levels can probably be obtained more efficiently and accurately through the household expenditure surveys. Under such conditions we usually lack consistent time-series samples over a reasonable length of time. Though the size of the sample can be enlarged by taking more frequent observations, say by months or weeks instead of years, the problem of serial correlation, or the interdependence between successive sample values, sets a limit to the enlarging process, and large sample theory can no longer be applicable. Cross-sectional surveys provide large samples of hundreds or thousands of observations, to which large sample theory is applicable, and useful estimates of the parameters can be obtained.

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[1]Collinearity is the tendency of many economic series to move together in the same trend over time.

[2]Edwin Kuh, "Validity of Cross-Sectionally Estimated Behavior Equations in Time-Series Applications", Econometrica, Vol. 27, 1959.

[3]Edwin Kuh, Ibid.

Although prices paid, and qualities consumed by different households differ, and it is reasonable to expect that these differences are systematically related to income levels, it is assumed that over the given period of data collection, the whole sample faces the same "market situation". Prices paid, interest and wage rates, and other variables can be said to be held constant over that period of time.[1]

Several problems that represent limitations in the use of aggregate time-series data can be easily handled through the use of such "disaggregated information". The study of the frequency distribution of estimated random disturbances, the study of the distributional effects, and the inclusion of demographic, attitudinal, and other variables in the behavior equations are examples of such points[2]. The data can be handled so as to yield the form of the functional relationships between dependent and explanatory variables.

These advantages are best realized when data on individual households are available, but they can be captured to a considerable extent even if, as in our samples, households

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[1]Lawrence Klein, An Introduction to Econometrics, op. cit. p. 55.

[2]Lawrence Klein, "Estimating Patterns of Savings from Sample Survey Data", Econometrica, Vol. 19, 1951.

are grouped by income levels or total expenditures brackets. Such groups of households are rendered nearly homogeneous by their cross classification on several characteristics simultaneously. In calculating estimates for the parameters, these averages should be weighted by the number of households in each bracket to take into account the sampling error affecting the estimated averages.

Yet, these surveys have their own set of problems that include "the possibility of bias due to educating the reporting families, loss of randomness due to 'fall out', and some difficulty in keeping track of changing economic and social characteristics of the sample"[1].

4.2 Definition of the Variables

The Household

The household unit is defined as comprising of persons sharing the same roof and making their expenses, at least for major items of the budget, out of a common fund. According to such definition, family budget surveys should be referred to as "household budget surveys". In addition to this general

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[1]Marguerite C. Burk, "Some Analysis of Income-Food Relationships", Journal of the American Statistical Association, Vol. 53, 1958.

definition, the Egyptian surveys retained as an additional criterion, that any person staying with the household for less than fifteen days during the preceding month of data collection should be treated as a visitor and not as a member of the household.

Total Expenditures

Total household expenditures were measured during both a month and a year. The expenditure schedules used in the budget make provisions for recording separately quantities and values of home-produced products or products taken from the household stocks that were consumed during the period in question. The imputed values of services paid for in kind were shown separately in the category of miscellaneous items and non-consumption outgo. No general measure was taken, however, to distinguish purchased consumption from consumption in kind so as to arrive at an estimate of the degree of monetisation for different categories of consumption items and various groups of consumers. As it will be shown later in this chapter, home-produced consumption of wheat, maize, and millets was distinguished from purchased consumption.

Expenditure categories include: (1) current consumption commodities, for which information on value and quantity was obtained; (2) durable and semi-durable goods, which include

clothes, linen, furniture and household equipment, and other durables such as automobiles, appliances, etc.; (3) services that include medical expenses, education, sports, and cultural pursuits, transportation and other expenses; (4) other outlays which include rent and other related expenses, and other expenditures on goods and services; and (5) transfer payment such as gifts, donations, etc.

Although data has been obtained with regard to personal savings and investment, and hence estimates for families' personal incomes were computed, for a number of reasons this information has never been published.

Data were published for rural and urban areas, and the households were classified into thirteen groups based upon their total annual expenditures. The number of households within each group is shown in Table 12.

Consumption Expenditures

Consumption expenditures include all the items considered in total expenditures except for the transfer payments. Data were given during a year and a month for the consumption expenditures classified into twenty-two broad categories. These are: (1) cereals and starches, (2) dried legumes, (3) meat, fish, and eggs; (4) fats and oils; (5) milk and dairy products; (6) vegetables; (7) fruits; (8) sugar and

Table 12. Distribution of Households According to their Total Expenditures Brackets, 1958/59 and 1964/65

Expenditures categories (in Egyptian pounds)	Number of households					
	1958/59 survey			1964/65 survey		
	urban	rural	total	urban	rural	total
less than 25	6	42	48	10	18	28
25	65	279	344	110	123	233
50	165	460	625	211	218	429
75	251	442	693	339	352	691
100	602	748	1350	1112	997	2109
150	512	443	955	1329	854	2183
200	356	246	602	1165	615	1780
250	269	134	403	961	420	1381
300	377	127	504	1419	469	1888
400	307	89	396	1356	290	1646
600	131	18	149	588	85	673
800	45	4	49	277	23	300
1000 and more	59	5	64	440	36	476
Total	3145	3037	6182	9317	4500	13817

Source: For 1958/59, U.A.R. Central Statistical Committee, Household Budget Survey in the Egyptian Region, Cairo, April 1961. (in Arabic)

For 1964/65, U.A.R. Administration of Public Mobilization, The Preliminary Results of the Household Budget Survey, 1965, Cairo, May 1967. (in Arabic).

sugaries; (9) other foodstuffs; (1) beverages and refreshments; (11) stimulants; (12) fuel and lighting materials; (13) cosmetics; (14) domestic cleaning materials; (15) clothes and linen; (16) furniture and household equipment; (17) other durable goods; (18) educational, cultural and sports pursuits; (19) medical expenses; (20) transportation; (21) other services; (22) miscellaneous.

Food Expenditures

Though food expenditures were not specified as a single item, we consider food expenditures to include the first eleven expenditures categories.

Further data for specified food items were made available both on a yearly and monthly basis, and in terms of quantity and value. Of these we will utilize information on the following items: (1) wheat (home-produced and purchased); (2) maize (home-produced and purchased); (3) millet (home-produced and purchased); (4) flour; (5) bread; (6) rice; (7) macaroni; (8) beans; (9) lentils; (10) meat; (11) poultry; (12) fresh fish; (13) eggs; (14) oils; (15) saturated oils; (16) milk; (17) white cheese; (18) whey cheese; (19) butter; (20) ghee; (21) potatoes; (22) onions; (23) tomatoes; (24) citrus fruit; (25) dates; (26) sugar; (27) tea; and (28) coffee.

The Household Size

Households, in both rural and urban areas, were classified generally to three groups, small, medium, and large. Small households are those with one to three members, medium with four to six, and large with seven members and more. Data were given for different expenditures brakcets for each group of households simultaneously.

The Consumption Unit

Consumption expenditures on specific commodities are usually experessed on a per capita or per household basis. It is an established argument that both are rather misleading concepts due to the differences in the age-sex composition from one household to another.[1] One way to handle this problem is by constructing an age-sex equivalent scale in which each age-sex type is expressed as a proportion of some standard type.[2] In the household budget surveys in Egypt, the adult male is assumed to be equivalent to one consumption unit. The classification is based on calorie requirements by age and sex groupings. The scale is shown in Table 13.

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[1]H. Wold and L. Jureen, Demand Analysis, John Wiley and Sons, New York, N.Y., 1953, p. 233.

[2]David William Price, Age-Sex Equivalent Scales for United States Food Expenditures - Their Computation and Application, Ph.D. Thesis, Michigan State University, 1963.

Table 13. Consumption Units Scale

Age	Sex	Consumption units
Less than 13 years	male and female	.6
13 years to less than 50	male	1.0
	female	.7
50 years and older	male	.8
	female	.5

Source: Same as Table 12

Using a scale of this type would improve the data, and give a more meaningful comparison of food expenditure between two individual households, or groups of households with different age-sex composition. Therefore, in our analysis, the household size will be expressed not in terms of number of individuals, but rather in numbers of consumption units. With such age-sex variation accounted for, other different characteristics can be analyzed.

4.3 Results of the Analysis

4.3.1 Introduction

The present section will deal with the results drawn from the analysis of the cross-sectional survey. It will start with a depiction of the food consumption patterns as revealed by the household budget survey. Then the results of the statistical analysis in which the relationships between the consumption expenditures for different food items, i's and total expenditure brackets, r's are discussed.

Symbolically, x_{ri} represents the average household's expenditures of the r-th total expenditures bracket on the i-th item. Variables x_{r1} and x_{r12} represent the average household's annual expenditures on 12 commodity groups as follows:

x_{r1} : cereals and starches.

x_{r2} : dried legumes.

x_{r3} : meat, fish, and eggs.

x_{r4} : oils and fats.

x_{r5} : milk and dairy products.

x_{r6} : vegetables;

x_{r7} : fruits.

x_{r8} : sugar and sugaries.

x_{r9} : beverages.

x_{r10} : tea, coffee, and other stimulants.

x_{r11} : other food stuff.

x_{r12} : total food.

Variables from x_{r13} to x_{r46} stand for average household's expenditures on particular food items measured in Egyptian Pounds, while variables x'_{r13} to x'_{r46} represent the quantities consumed of these items measured in kilograms. These food items are:

$x_{r\ 13}$ and x'_{r13} : wheat (home produced).

$x_{r\ 14}$ and x'_{r14} : wheat (purchased).

$x_{r\ 15}$ and x'_{r15} : wheat (total).

$x_{r\ 16}$ and x'_{r16} : corn (home produced).

$x_{r\ 17}$ and x'_{r17} : corn (purchased)

$x_{r\ 18}$ and x'_{r18} : total corn.

$x_{r\ 19}$ and x'_{r19} : millet (home produced)

$x_{r\ 20}$ and x'_{r20} : millet (purchased).

$x_{r\ 21}$ and x'_{r21} : total millet.

$x_{r\ 22}$ and x'_{r22} : flour.

$x_{r\ 23}$ and x'_{r23} : bread.

$x_{r\ 24}$ and x'_{r24} : rice.

$x_{r\ 25}$ and x'_{r25} : macaroni.

$x_{r\ 26}$ and x'_{r26} : beans.

x_{r27} and x'_{r27} : lentils.

$x_{r\ 28}$ and x'_{r28} : meat (all kinds)

$x_{r\ 29}$ and x'_{r29} : poultry.

$x_{r\ 30}$ and x'_{r30} : fresh fish.

$x_{r\ 31}$ and x'_{r31} : eggs. (in numbers)

$x_{r\ 32}$ and x'_{r32} : oils.

$x_{r\ 33}$ and x'_{r33} : margarine and saturated oils.

$x_{r\ 34}$ and x'_{r34} : milk.

$x_{r\ 35}$ and x'_{r35} : white cheese.

$x_{r\ 36}$ and x'_{r36} : whey cheese.

$x_{r\ 37}$ and x'_{r37} : butter.

$x_{r\ 38}$ and x'_{r38} : ghee.

$x_{r\ 39}$ and x'_{r39} : potatoes.

$x_{r\ 40}$ and x'_{r40} : onions.

$x_{r\ 41}$ and x'_{r41} : tomatoes.

$x_{r\ 42}$ and x'_{r42} : citrus.

$x_{r\ 43}$ and x'_{r43} : dates.

$x_{r\ 44}$ and x'_{r44} : sugar.

$x_{r\ 45}$ and x'_{r45} : tea.

$x_{r\ 46}$ and x'_{r46} : coffee.

Variables from x_{1i} and x_{13j} stand for average household's annual categories, where r = 1, 2, ..., 13. The value of this variable for any certain bracket differs between rural and urban areas and between different household types, as the actual average total annual expenditures is used in quantifying its value.

x_{1i} : total annual expenditures less than L.E. 25.

x_{2i} : total annual expenditures from L.E. 25 to less than L.E. 50.

x_{3i} : total annual expenditures from L.E. 50 to less than L.E. 75.

x_{4i} : total annual expenditures from L.E. 75 to less than L.E. 100.

x_{5i} : total annual expenditures from L.E. 100 to less than L.E. 150.

x_{6i} : total annual expenditures from L.E. 150 to less than L.E. 200.

x_{7i} : total annual expenditures from L.E. 200 to less than L.E. 250.

x_{8i} : total annual expenditures from L.E. 250 to less than L.E. 300.

x_{9i} : total annual expenditures from L.E. 300 to less than L.E. 400.

x_{10i} : total annual expenditures from L.E. 400 to less than L.E. 600.

x_{11i} : total annual expenditures from L.E. 600 to less than L.E. 800.

x_{12i} : total annual expenditures from L.E. 800 to less than L.E. 1000.

x_{13i} : total annual expenditures of L.E. 1000 and more.

The impact of the household size is expressed in terms of consumption units x_{1r}, that is, the average number of consumption units per household in the r-th total expenditures brackets, where r = 1, 2, ..., 13. The values that this variable take are shown in Table 14 for different types of households.

Table 14. Average Number of Consumption Units per Household for Different Household Types.*

Annual total expenditures groups	Urban Areas				Rural Areas			
	large	medium	small	total	large	medium	small	total
1	-	-	.83	.83	-	2.00	.78	.81
2	4.00	3.00	.95	1.21	5.00	3.12	1.27	1.57
3	4.80	3.42	1.41	2.09	5.09	3.25	1.82	2.49
4	5.14	3.35	1.72	2.78	5.21	3.40	1.89	3.09
5	5.27	3.51	1.85	3.43	5.48	3.58	2.10	3.76
6	5.52	3.61	1.82	3.78	5.96	3.84	2.03	4.64
7	5.55	3.74	2.13	4.15	6.39	3.93	1.89	5.46
8	5.84	3.84	1.92	4.46	6.99	3.94	2.33	6.07
9	6.11	3.84	1.92	4.90	8.14	3.96	2.50	7.16
10	6.67	3.81	2.07	5.28	9.07	4.08	2.25	8.09
11	7.04	3.86	2.00	5.37	9.94	3.00	-	9.55
12	7.27	3.67	2.40	5.29	14.00	-	-	14.00
13	7.50	3.95	2.00	5.98	13.25	4.00	-	11.40

*Small households are those with one to three members, medium with four to six, and large with seven and more.

Source: Calculated from: UAR Central Statistical Committee, The Household Budget Survey, op. cit.

As indicated earlier in chapter 3, x_{2r} is a dummy variable that takes a value of zero for any observation from the rural areas, and a value of one from any observation from the urban areas.

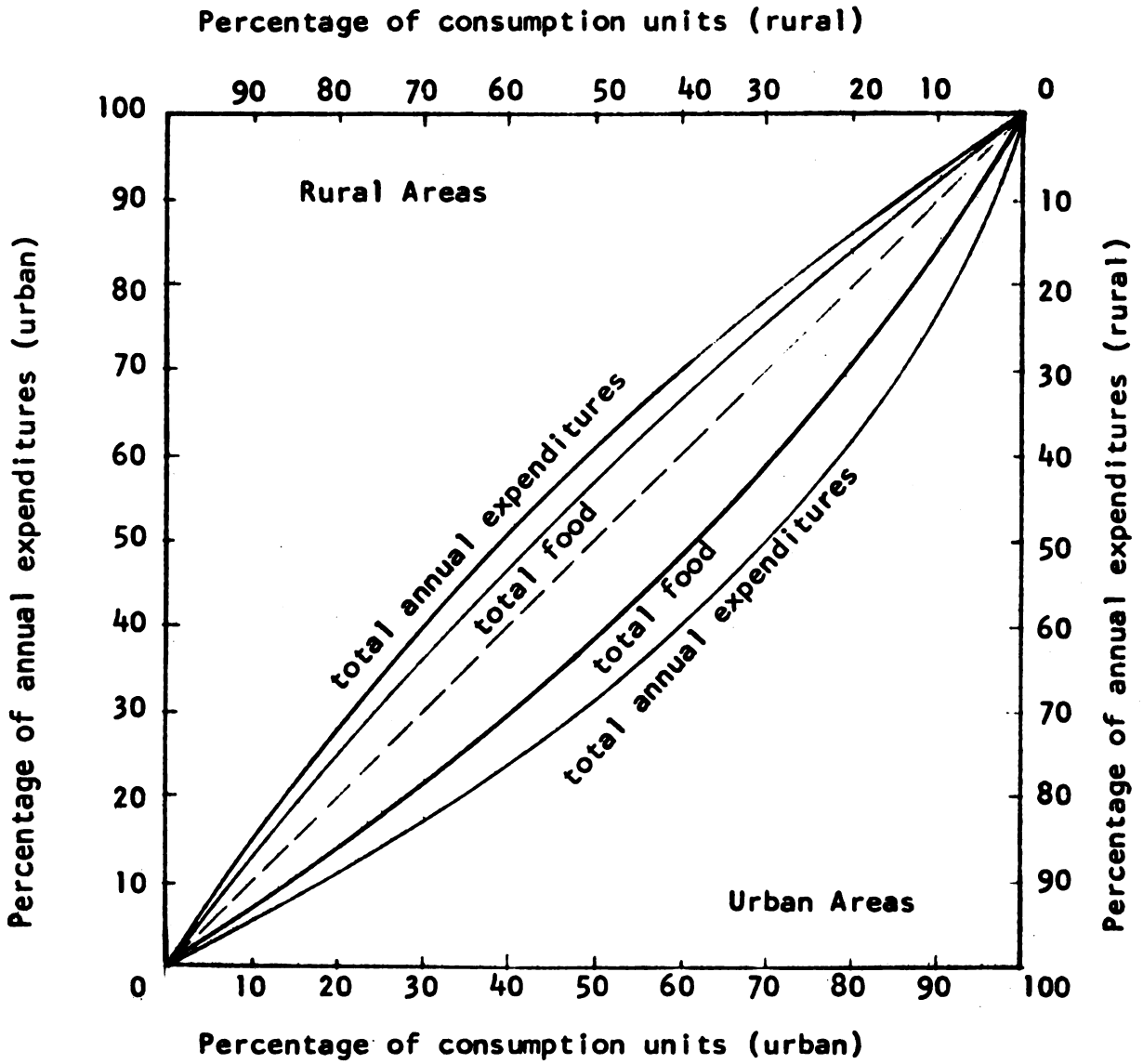
4.3.2 Food Consumption Patterns

The household budget data reveals certain information about the equality or inequality in the distribution of total annual expenditures, which is considered as a meaningful indicator of income, in the distribution of food expenditures, as well as expenditures on specific individual items or groups of commodities.

This distribution can best be shown by a collection of Lorenz curves. A Lorenz curve is a graphic device showing the cumulative percentage relationships between two variables. The diagonal line represents complete equality; that is 10 percent of the spending units spend 10 percent of the total expenditures. In figures 2, 3, and 4, cumulative percentages of consumption units is shown against cumulative percentages of expenditures.

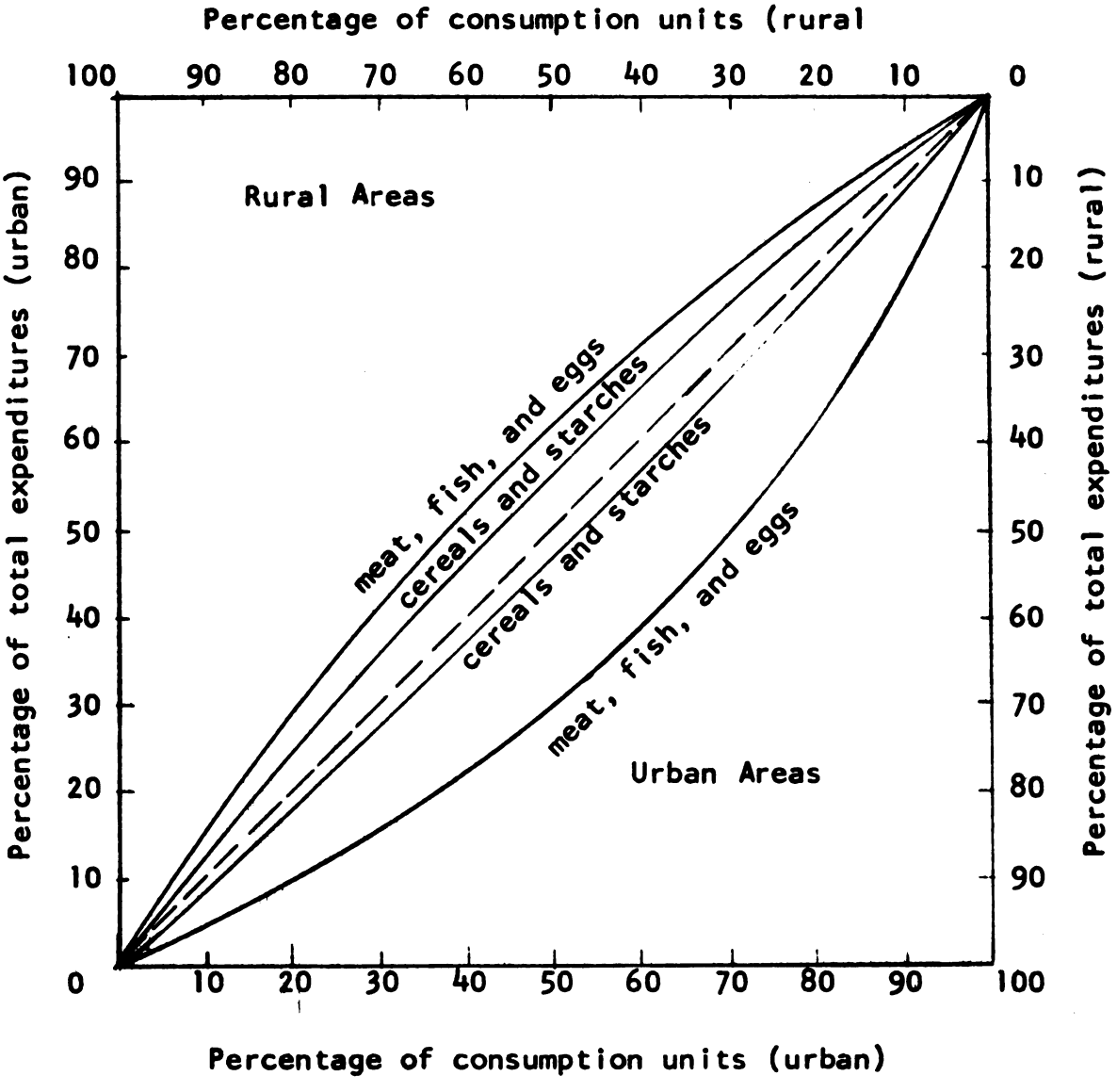
It is obvious that total expenditures and total food expenditures are more equally distributed in rural areas than in urban areas. Two explanations can be offered in this connection. First, qualities as well as prices paid, differ

Figure 2. Lorenz Curves for Total Annual Expenditures and Food Expenditures in Urban and Rural Areas



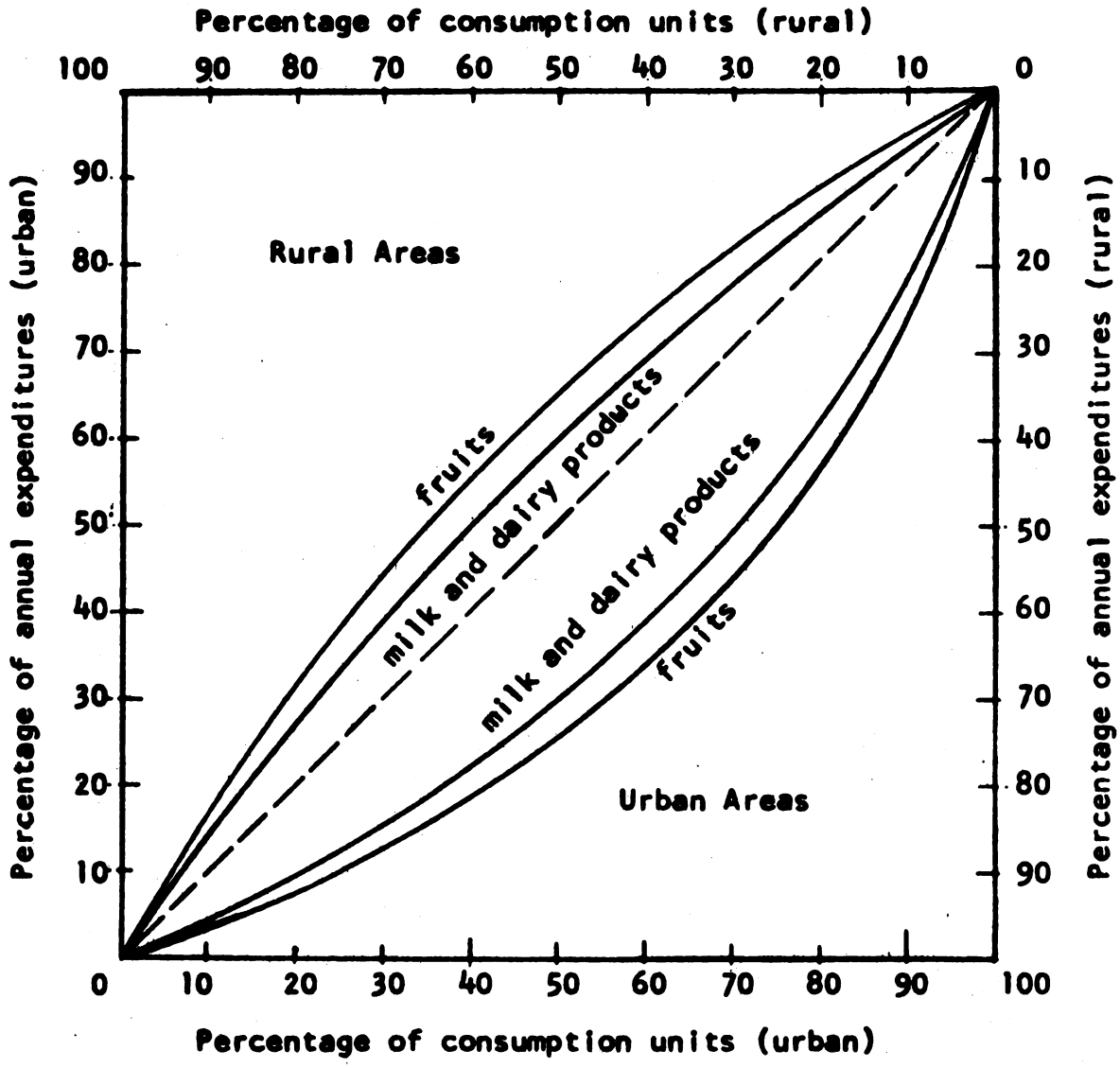
Source: Calculated from UAR Central Statistical Committee, op. cit.

Figure 3. Lorez Curves for Cereals and Starches, and Meat, Fish, and Eggs, in Urban and Rural Areas



Source: See Figure 2.

Figure 4. Lorenz Curves for Fruits, and Milk and Dairy Products in Urban and Rural Areas



Source: See Figure 2.

much more in urban areas; and second, incomes, occupations, social status, and tastes vary greatly in urban areas.

Fruits and meat are the most unequally distributed in both rural and urban areas. Fifty-two percent of the consumption units share only 32 percent of the expenditures on meat, fish, and eggs; and 27 percent of the expenditures on fruits in urban areas. The corresponding shares of expenditures on these items for 49 percent of consumption units in rural areas are 38 percent and 34 percent. This inequality in the distribution of expenditures on these "expensive" items of the food budget, can be understood in the light of price and quality differentials, as they are not considered among the "basic" items, and therefore are not subject to price controls. The lower income groups do not necessarily consume relatively less quantities, but rather lower qualities.

Expenditures on food and beverages account for about 50 percent of the total annual expenditures in urban areas, and more than 66 percent in rural areas, with an overall average of about 58 percent, a very high percentage as compared to 22 percent in the United States, 23 percent in Canada, 47 percent in Yugoslavia, and 52 percent in Ceylon.[1]

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[1]United Nations, Statistical Yearbook, New York, 1961, pp. (297-9).

Table 15. Percentage of Items of Total Annual Expenditures in Rural and Urban Areas, Based on the Household Budget Survey, 1958/59

Budget Items	Urban	Rural	Weighted average
	percent	percent	percent
Food and beverages	50.1	64.4	58.2
Clothing and linen	8.2	7.8	8.0
Fuel and lighting material	3.5	3.5	3.5
Cosmetic and domestic cleaning materials	9.7	1.6	5.8
Education	3.6	1.0	2.0
Medical expenses	3.0	2.0	2.5
Transportation	3.9	1.8	2.9
Other expenses (inc. housing)	18.0	15.9	17.1
Total	100	100	100

Source: Calculated from: UAR Central Statistical Committee, The Household Budget Survey, op. cit., pp. (355-6)

More than one-third of the expenditures on food items goes to cereals and starches. In rural areas, the share of cereals and starches is as high as 42 percent. Meat, fish, and eggs, the sources of animal protein, account for about one-fifth. However, the distribution of total expenditures, as shown in Table 16, does not reveal the whole picture as the prices of most cereals and other "basic" items are usually controlled and/or subsidized, while other items, such as meat, fish, fruit are relatively more expensive, and out of reach for a considerable segment of the consumers.

Table 16. Percentage of Items of Food Expenditures in Urban and Rural Areas, Based on the Household Budget Survey, 1958/59

Food items	Urban	Rural	Weighted average
	percent	percent	percent
Cereals and starches	27.4	41.8	34.5
Dried legumes	2.6	4.2	3.4
Meat, fish, and eggs	21.2	17.1	19.2
Oils and fats	3.8	2.4	3.1
Milk and dairy products	12.8	12.6	12.7
Vegetables	7.4	5.1	6.3
Fruit	6.4	3.0	4.7
Sugar and sugaries	6.4	6.5	6.4
Other food stuff	5.8	2.0	3.9
Beverages	6.2	5.3	5.8
Total	100	100	100

Source: Same as Table 15.

4.3.3. Comparisons of the Results of the Three Models

The three single-equation models used in the cross-sectional analysis were:[1]

(1) A double logarithmic model:

$$\log X_{ri}/X_{1r} = B_{0i} + B_{1i} \log Y_r/X_{1r} + B_{2i} \log X_{1r} + B_{3i} \log X_{2r} + U_i$$

(2) A semi-logarithmic model:

$$X_{ri}/X_{1r} = B_{0i} + B_{1i} \log Y_r/X_{1r} + B_{2i} \log X_{1r} + B_{ei} \log X_{2i} + U_i$$

(3) A log-inverse model:

$$\log X_{ri}/X_{1r} = B_{0i} - B_{1i} X_{1r}/Y_r + B_{2i} \log X_{1r} + B_{3i} \log X_{2r} + U_i$$

These three models are further simplified to take the following more convenient forms:

(1) $\log X_{ri} = B_{0i} + B_{1i} \log Y_r + B'_{2i} \log X_{1r} + B_{3i} \log X_{2r} + U_i$

where: $B'_{2i} = 1 + B_{2i} - B_{1i}$

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[1] For definition of the variables and mathematical symbols, the reader is referred to Chapter 3.

$$(2)\quad X'_{ri} = B_{0i} + B_{1i} \log Y_r + B'_{2i} \log X'_{1r} + B_{3i} \log X_{2r} + U_i$$

where: $X'_{ri} = X_{ri}/X_{1r}$

and $B'_{2i} = B_{2i} - B_{1i}$

$$(3)\quad \log X_{ri} = B_{0i} - B_{1i} X_{1r}/Y_{rt} + B'_{2i} \log X_{1r} + B_{3i} X_{2r} + U_i$$

where: $B'_{2i} = 1 + B_{2i}$

The purpose of this transformation was mainly to facilitate the computation process. Thus, the coefficients can be estimated as desired as long as there is a mathematical relationship between B_{2i} and B'_{2i}.[1]

In presenting the results, the following format was used: The standard error of the estimated parameters were given in parenthesis below the estimates. The coefficient of determination[2], adjusted for the number of degrees of freedom, was

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[1] Though the estimate b_{2i} can easily be calculated there is a problem in calculating the standard error of the coefficient,

$$s_{b2i} = \sqrt{s^2_{b1i} + s^2_{b2i} - 2 \text{ Cov. } b_{1i} \cdot b'_{2i}}$$

However, knowing that the upper limit of the quantity Cov. b_{1i}, b'_{2i} is $(s^2_{b1i} \cdot s^2_{b2i})^{1/2}$ according to Cauchy-Schwarz inequality, which in most cases was a very small value, an assumption was made that this covariance is equal to zero. This particular coefficient was not used in the combined model, nor does the calculation of its exact standard error affect the results in any way.

[2] $\bar{R}^2 = 1 - (1-R^2)\ N-1/N-P-1$, gives the exact split of the variance of the dependent variable into explained and unexplained variance.

denoted by $\bar{R}^2$. The standard error of estimate (or the standard error of the residuals, i.e. the square root of the error sum of squares divided by the number of the degrees of freedom), was denoted by S · S is an estimate of how well the regression line fits the data or the "goodness of fit."

The close examination of the results of the three models, particularly the value of $\bar{R}^2$ and S, reveals that the logarithmic function provided the best fit in terms of $\bar{R}^2$ and S, or the analysis of variance for overall regression. The log-inverse model provided a fit almost close to the logarithmic, while the semi-logarithmic function provided for the least satisfactory results in terms of the goodness of fit. It is for that reason that the emphasis in the analysis was put on the logarithmic and the log-inverse fittings.

The estimated relationships for total food expenditures from the three models were as follows:

<u>The double logarithmic function</u>:

$$\log X_{ri}/X_{1r} = .3845 + .6428 \log Y_r/X_{1r} + .0259 \log X_{1r}$$
$$(.0169)\ (.0093) \qquad (.0141)$$
$$+ .0150 \log X_{2r}$$
$$(.0040)$$

$\bar{R}^2 = .994$ $\qquad$ $S = .0124$

The semi-logarithmic function:

$$X_{ri}/X_{1r} = -63.0621 + 60.9745 \log Y_r/X_{1r} + 3.4556 \log X_{1r}$$
$$\qquad\qquad (4.2787) \quad (2.2537) \qquad\qquad (3.9620)$$
$$-.4283 \log X_{2r}$$
$$(1.0152)$$

$$\bar{R}^2 = .9651 \qquad\qquad S = 3.1282$$

The log-inverse function:

$$\log X_{ri}/X_{1r} = 1.9824 + 16.1314\, X_{1r}/Y_r + .0698 \log X_{1r}$$
$$\qquad\qquad (.0576) \quad (.8576) \qquad\qquad (.9296)$$
$$- .0015 \log X_{2r}$$
$$(.0011)$$

$$\bar{R}^2 = .9873 \qquad\qquad S = .0437$$

The total expenditures elasticity coefficient for total food was .64 from the logarithmic model, .84 from the semi-log model, and .70 from the log-inverse function.[1] The elasticity coefficient based upon the logarithmic function is constant over the range of the function. The log-inverse elasticity depends on the total expenditures level, and the above value was calculated at its mean. The semi-logarithmic elasticity

[1]Though these values are considered here, there is a weighting problem involved and was discussed in the next section.

Table 17. Values of $\bar{R}^2$ and S for the Combined Analysis of Urban and Rural Areas

Commodity groups	Logarithmic		Semi-logarithmic		Log-inverse	
	$\bar{R}^2$	S	$\bar{R}^2$	S	$\bar{R}^2$	S
Cereals & starches	.9972	.0343	.7573	.9644	.9819	.0441
Dried legumes	.8943	.0609	.7702	.1796	.9645	.0650
Meat, fish, eggs	.9967	.0031	.9341	1.3091	.9749	.0717
Oils & fats	.9947	.0355	.9094	.1519	.9413	.0949
Milk and dairy products	.9890	.0638	.9224	.7405	.9831	.0581
Vegetables	.9907	.0491	.9225	.3366	.9559	.0809
Fruit	.9934	.0555	.9133	.5217	.9749	.0865
Sugar & sugaries	.9929	.9425	.9245	.2882	.9785	.0546
Beverages	.9922	.0466	.9154	.3166	.9635	.9756
Tea, coffee, & other stimulants	.9760	.1066	.8710	.8235	.9527	.1212
Other food stuff	.9494	.1098	.8769	.3465	.8314	.1900
Total food	.9994	.0124	.9651	3.1282	.9873	.0437

Table 18. Values of $\bar{R}^2$ and S for Urban Areas

Commodity groups	Logarithmic		Semi-logarithmic		Log-inverse	
	$\bar{R}^2$	S	$\bar{R}^2$	S	$\bar{R}^2$	S
Cereals & starches	.9992	.0142	.8281	.2959	.9980	.0130
Dried legumes	.9877	.0626	.6585	.1068	.9826	.0394
Meat, fish eggs	.9979	.0333	.9755	1.0119	.9907	.0458
Oils and fats	.9947	.0423	.8745	.1824	.9729	.9548
Milk and dairy products	.9938	.0596	.9825	.4591	.9937	.0366
Vegetables	.9974	.0325	.9726	.2424	.9877	.0431
Fruit	.9940	.0655	.9834	.2892	.9948	.0395
Sugar and sugaries	.9973	.0457	.9521	.2621	.9877	.0402
Beverages	.9940	.0503	.9447	.3121	.9814	.0519
Tea, coffee & other stimulants	.9918	.0721	.9789	.5339	.9581	.1065
Other food stuff	.9916	.0406	.8366	.2779	.9570	.0583
Total food	.9996	.0117	.9738	3.2745	.9875	.0422

Table 19. Values of $\bar{R}^2$ and S for Rural Areas

Commodity groups	Logarithmic		Semi-logarithmic		Log-inverse	
	$\bar{R}^2$	S	$\bar{R}^2$	S	$\bar{R}^2$	S
Cereals & starches	.9979	.0170	.9759	.3662	.9975	.0183
Dried legumes	.9984	.0283	.9801	.0761	.9965	.0232
Meat, fish, eggs	.9971	.0228	.9440	.7008	.9893	.0441
Oils and fats	.9828	.0476	.6414	.0694	.9805	.0503
Milk and dairy products	.9843	.0555	.9527	.3089	.9971	.0238
Vegetables	.9934	.0275	.9116	.1456	.9860	.0402
Fruit	.9965	.0293	.9653	.1324	.9930	.0415
Sugar and sugaries	.9931	.0317	.8689	.3199	.9746	.0610
Beverages	.9880	.0424	.8384	.2761	.9680	.0709
Tea, coffee & other stimulants	.9884	.0994	.8181	.9637	.9424	.1429
Other food stuff	.9124	.1011	.0380	.1072	.9049	.1053
Total food	.9993	.0106	.9655	2.2065	.9934	.0322

depends upon the level of food expenditures, and its value presented above was calculated as its mean.[1] In fact, the log-inverse elasticity coefficient differs from 1.8575 for a total expenditures level of L.E. 20 per consumption unit to .1061 for a total annual expenditures level of L.E. 350 per consumption unit.[2]

Two consumption functions for food were derived from estimated relationships between total annual expenditures and food expenditures from the logarithmic and the log-inverse fitting; they are shown in table 20 and in figure 5.

The preceding discussion has focused merely on introducing the results of the three models. However, a major point should be emphasized at this stage, that is the sample proportional representation of the urban and rural population. As the discussion of the results was pursued further, a "weighted" set of elasticity coefficients based upon the separate estimates for urban and rural areas was introduced, as elaborated in the following section.

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[1]For the semi-log model $e = .4343^{B_1} \cdot X_{1r}$

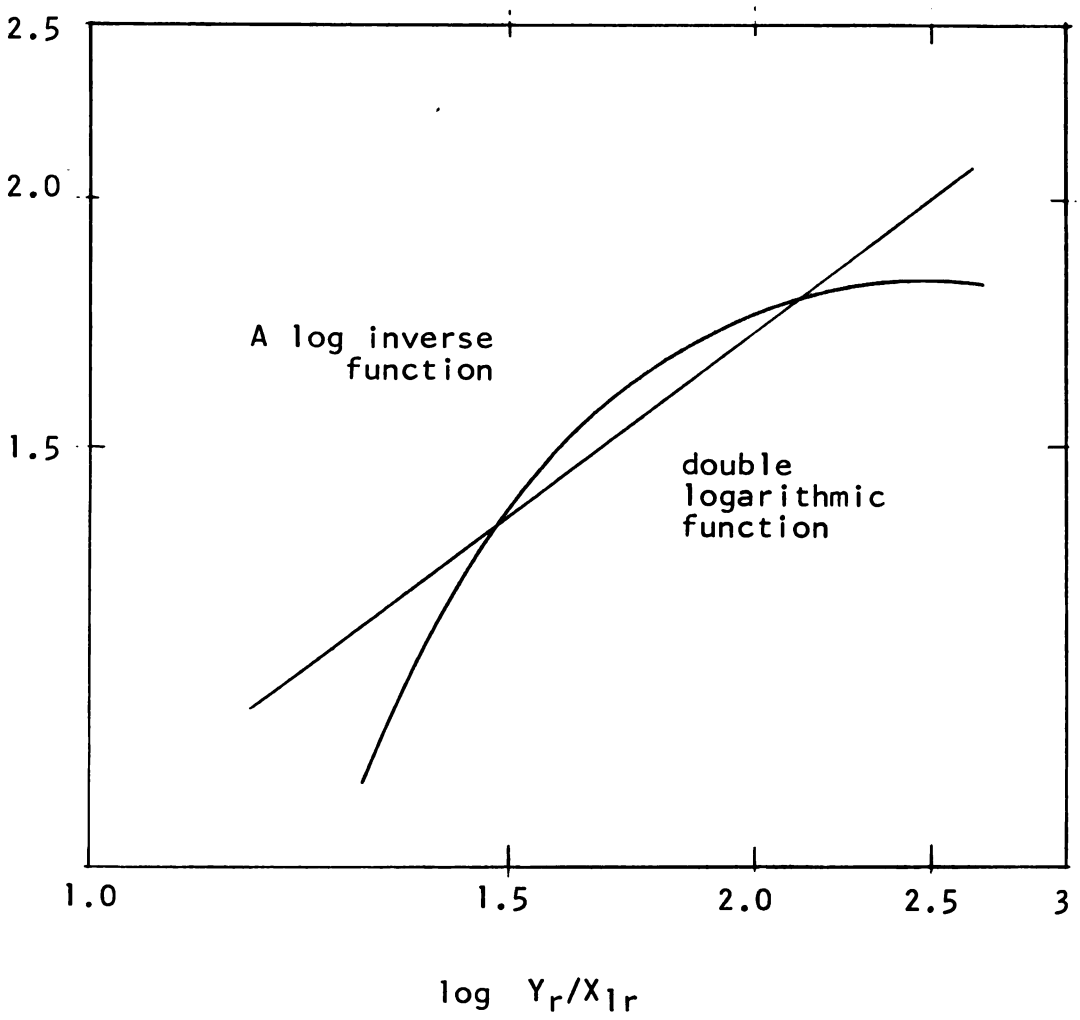
[2]For the log-inverse model $e = 2.3026\ (B_1/Y_r) \cdot Y_{1r}$

Table 20. Food Consumption Functions Derived From Logarithmic and Log-inverse Models

Total Annual Expenditures per Cons. Unit Y_r/X_{1r}	Food Consumption Functions			
	A log function derived from: $\log X_{ri}/X_{1r} = .384 + .6428 \log Y_r/X_{1r} + .0295 \log X_{1r}$		A log-inverse function derived from: $\log X_{ri}/X_{1r} = 1.9824 + 16.1314 X_{1r}/Y_r + .0698 \log X_{1r}$	
	Total food exp. per cons. unit	e	Total food exp. per cons. unit	e*
L.E.	L.E.		L.E.	
20	17.8	.64	12.8	1.86
50	32.0	.64	39.0	.74
100	50.0	.64	56.4	.37
150	64.7	.64	64.0	.24
200	77.9	.64	68.1	.18
250	90.1	.64	70.7	.14
300	101.4	.64	72.4	.12
250	111.9	.64	73.4	.11

*Elasticity coefficient for the log-inverse function was measured at the mean of the total annual expenditures (income).

Figure 5. A Logarithmic and a Log Inverse Food Expenditure Functions



Source: Table 21

4.3.4 Analysis of the Commodity Groups

Commodity groups analyzed in this study include: (1) cereals and starches, (2) dried legumes, (3) meat, fish, and eggs, (4) oils and fats, (5) milk and dairy products, (6) vegetables, (7) fruit, (8) sugar and sugaries, (9) beverages, (10) tea, coffee, and other stimulants, and (11) other food stuff. Relationships were estimated for each of these groups for urban and rural areas separately and for the whole sample, with a dummy variable included for the locational difference. Estimates were also obtained for different household sizes within urban and rural areas.

The estimated relationships from the double logarithmic function are shown in the Appendix[1]. The elasticity coefficients were derived from these relationships and are shown in table 21.

Further consideration of the figures presented in these tables suggested that the estimated elasticity coefficient for the sample as a whole, when the two samples are combined in one model, cannot be considered as a reliable estimate for further analysis. The reason is that it is based on the total number of observations in the household budget sample. The

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[1]See Tables B9 and B10 in the Appendix.

Table 21. Total Expenditures Elasticity of Demand for Commodity Groups and Total Food, Estimated from the Logarithmic and the Log-Inverse Models for Urban and Rural Areas

Commodity groups	logarithmic		log-inverse*	
	urban	rural	urban	rural
Cereals & starches	.1035	.4081	.0757	.5083
Dried legumes	.1752	.5790	.1104	.7281
Meat, fish, & eggs	1.0199	.9745	.7428	1.2000
Oils and fats	.4387	.2912	.2974	.3530
Milk & dairy products	.9409	.8194	.6792	1.0574
Vegetables	.6845	.7292	.4880	.6420
Fruit	1.2395	1.2900	.9075	1.6032
Sugar and sugaries	.6323	.7206	.4498	.8558
Beverages	.7120	.7005	.5001	.8219
Tea, coffee & other	.7318	1.2866	.5133	1.5105
Other food stuff	.3545	.5455	.2461	.4914
Total food	.6331	.6887	.4533	.8446

*Estimates for elasticity coefficients are estimated at the mean of total annual expenditures for each region.

Table 22. Total Expenditures Elasticity of Demand for Commodity Groups and Total Food - Weighted Coefficients*

Commodity groups	logarithmic function	log-inverse function**
Cereals & starches	.2923	.3429
Dried legumes	.4255	.4934
Meat, fish & eggs	.9917	1.0263
Oils and fats	.3472	.3318
Milk and dairy products	.8656	.9137
Vegetables	.5882	.5835
Fruit	1.2708	1.3388
Sugar and sugaries	.6870	.7012
Beverages	.7049	.6996
Tea, coffee, & others	.9758	1.1316
Other food stuff	.4729	.3982
Total food	.6676	.6959

*Based upon the separate estimates of elasticity coefficients in the two regions with the appropriate weight given to each.

**The original estimates are calculated at the mean of total annual expenditures.

sample, though randomly selected within the urban and rural areas, is not a proportionate sample as only 48.5 percent of the individuals in the sample are rural while the corresponding rural percentage of the total population at the same time was about 62 percent. Another path through the complexity of the aggregation problem, though not necessarily an unerring one, is to calculate a set of "weighted" coefficients based upon the separate urban and rural estimated coefficients.

Examination of these "weighted" elasticities makes it possible to classify the studied commodity groups into three categories, according to the magnitude of their elasticity coefficients:

(1) Commodity groups with a relatively low income elasticity[1], which include cereals and starches, dried legumes or pulses, and oils and fats.

(2) Commodity groups with intermediate income elasticity which include sugar and sugaries, vegetables, and beverages.

(3) Commodity groups with a relatively higher income elasticity; this includes meat, fish and eggs, milk and dairy products, fruit, tea, coffee and other stimulants.

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[1]Unless otherwise cited, the income elasticity and the total expenditures elasticity were used interchangeably.

The coefficient of determination, $\bar{R}^2$, was generally high. It has a value more than .95 for all commodity groups except for the logarithmic fitting of the dried legumes which was .89. $\bar{R}^2$ was exceptionally high for meat, fish, and eggs, oils and fats, and fruits. For total food, the logarithmic fitting provided a value for $\bar{R}^2$ as high as .9994.

The elasticity coefficients were the lowest for cereals and starches and were lower in urban than in rural areas. The low elasticity coefficient for the group in general was expected due to the inclusion of many items in the group and the wide range of substitutability involved. The lower coefficient for the urban areas can be attributed to the relatively low budget proportion spent on the group in urban areas as will be shown when the individual commodities are analyzed. For similar reasons, dried legumes elasticities vary significantly between urban and rural areas. It rises from around .15 in urban areas to about .60 in rural areas.

Tea, coffee, and other stimulants which include cigarettes, tobacco, and liquor provide a significant variation between rural and urban areas. While the elasticity coefficient for this group was about .7 for urban areas, it reaches a high level of about 1.3 in rural areas. With the lack of other recreational facilities in rural areas, as income rises

consumers tend to spend more time and money in the café, the only social institution available. The variation is also observed between the estimates of the logarithmic function and the log-inverse function. The basic differences between the two functions as to the constant coefficient in the log function, and the existence of a saturation level in the log-inverse function, are responsible for this discrepency.

When urban and rural areas are combined in one model and a dummy variable that takes a value of one for any observation from urban areas and a value of zero for any observation from rural areas was included, the coefficient B_{3i} associated with that variable was generally negative. Except for oils and fats, vegetables, fruits, and beverages, this coefficient had a negative value. This result confirms the early expectations. Households in urban areas tend to make less demand on physical energy products as income rises. Further, environmental and social factors would encourage households, other things equal, to spend more on non-food items as income rises.

Table 23 shows the values obtained for B_{3i}, the dummy variable coefficient. It should be mentioned here that despite the problem of the proportional representativeness of the sample, the values of that coefficient are not affected and are valid.

Table 23. Estimates for B_{3i}, from the Logarithmic and the Log-inverse Models for Commodity Groups

Commodity Groups	Logarithmic Model	Log-inverse Model
Cereals and starches	- .0917	- .0055
Dried legumes	- .1419	- .0079
Meat, fish, and eggs	- .0302	- .0030
Oils and fats	+ .2003	+ .0132
Milk and dairy products	- .0667	- .0052
Vegetables	+ .0918	+ .0064
Fruit	+ .0632	+ .0041
Sugar and sugaries	- .0306	- .0081
Beverages	+ .0183	+ .0009
Tea, coffee, & others	- .0588	- .0033
Other food stuff	+ .4720	+ .0303
Total food	- .0150	- .0015

4.3.5 Analysis of Individual Food Items

Individual food items analyzed in this study include wheat, maize, millet, flour, bread, rice, macaroni, beans, lentils, meat, poultry, fresh fish, eggs, oils, saturated oils, milk, white cheese, whey cheese, butter, ghee, potatoes, onions, tomatoes, cirtrus, dates, sugar, tea, and coffee.

Elasticity coefficients was computed for both quantities consumed and total expenditures. The results derived from both the double logarithmic and the log-inverse models are presented in Tables 24, 25, 27.

Another set of "weighted" elasticity coefficients was also calculated, with the proper weight given to the separate urban and rural estimates. These coefficients are presented in Table 26.

It would be noted that, in general, the expenditure elasticity is higher than the quantity elasticity; in certain cases they were much higher. This is a result of the fact that households with higher income tend to consume superior quality items at higher prices in the same general line of product than do, other things equal, low income consumers. It is for that reason that the disagreement between the two elasticities was most apparent in commodities with a high level of quality differential, such as rice, macaroni, meat, poultry, fresh

Table 24. Quantity Elasticity Coefficients from the Logarithmic and the Log-Inverse Models in Urban and Rural Areas

Commodities	Logarithmic Model		Log-inverse Model*	
	Urban areas	Rural areas	Urban areas	Rural areas
Flour	-.6661	-2.3752	-.5776	-2.7720
Bread	.1961	-1.2429	.1872	1.3837
Rice	.3308	.7311	.4594	.9141
Macaroni	.8457	2.3588	.9020	2.9104
Beans	.1527	.5275	.1620	.6669
Lentils	.1181	.2722	.1242	.3074
Meat	.8160	.7464	.8321	.9011
Poultry	1.6439	1.8360	1.7279	2.2331
Fresh fish	.3934	.8128	.4268	1.0098
Eggs	1.1415	1.2966	1.1872	1.5432
Oils	.2018	.1633	.2041	.2162
Saturated oils	.5361	.7643	.5486	.8904
Milk	.8357	1.7240	.8563	2.1182
White cheese	1.1327	1.6163	1.1610	1.9338
Whey cheese	-.6336	- .7274	-.6930	- .8487
Butter	.8124	- .0644	.8531	- .1478
Ghee	.9573	.9479	.9907	1.1268
Potatoes	.4852	.8988	.4841	1.1126
Onions	.1506	.0298	.1370	.0366
Tomatoes	.3743	.2183	.3908	.2768
Citrus	1.0175	1.4752	1.0617	1.7901
Dates	.3024	.4950	.3224	.6131
Sugar	.2412	.4079	.2510	.4543
Tea	.0248	.2864	.0399	.3030
Coffee	1.6002	2.1692	1.6796	2.5144

*Calculated at the mean of total annual expenditures.

Table 25. Expenditure Elasticity Coefficients from the Log and the Log-inverse Models in Urban and Rural Areas

Commodities	Logarithmic Model		Log-inverse Model	
	Urban areas	Rural areas	Urban areas	Rural areas
Flour	- .5201	-2.3883	- .4319	-2.7917
Bread	.1961	-1.2429	.1892	-1.3837
Rice	.4042	1.1297	.4242	1.4014
Macaroni	.9101	2.6782	.9634	3.2832
Beans	.0205	.6150	.1636	.7612
Lentils	.0716	.4196	.0809	.5043
Meat	.9358	.7574	.9583	.9216
Poultry	1.7301	1.9251	1.8150	2.3288
Fresh fish	.7636	1.1527	.8069	1.4247
Eggs	1.2351	1.3298	1.2821	1.5917
Oils	.2888	.3532	.2844	.4247
Saturated oils	.2876	.7245	.6051	.8425
Milk	.9897	1.7463	1.0394	2.1509
White cheese	1.1884	1.9283	1.2165	2.3495
Whey cheese	.5368	- .5381	- .5997	- .6277
Butter	.9218	.0591	.9839	.0012
Ghee	1.0141	.9882	1.0476	1.1750
Potatoes	.5768	1.0234	.5765	1.2537
Onions	.2348	.1273	.2175	.1408
Tomatoes	.5452	.3633	.5619	.4537
Citrus	1.2126	1.5420	1.2688	1.8727
Dates	.4492	.7327	.4673	.9018
Sugar	.3963	.5012	.4065	.5649
Tea	.0973	.3286	.0753	.3606
Coffee	1.5889	2.1692	1.6589	2.6740

Table 26. Total Expenditures Elasticity of Demand for the Individual Food Items, Weighted Coefficients*

Commodities	Double Log Function		Log-inverse Function**	
	Quantity	Value	Quantity	Value
Flour	-1.7257	-1.6784	-1.9381	-1.8950
Bread	- .6961	- .6961	- .7867	- .7867
Rice	.5790	.8540	.7033	1.0300
Macaroni	1.7838	2.0063	2.1472	2.4017
Beans	.3850	..3891	.4750	.5341
Lentils	.2136	.2874	.2377	.3434
Meat	.7728	.8252	.8749	.9355
Poultry	1.7630	1.8510	2.0411	2.1335
Fresh fish	.6534	1.0048	.7883	1.1899
Eggs	1.2377	1.2938	1.4079	1.4740
Oils	.1779	.3287	.2116	.3714
Saturated oils	.6776	.5585	.7607	.7523
Milk	1.3864	1.4588	1.6386	1.7285
White cheese	1.4325	1.6471	1.6401	1.9189
Whey cheese	- .6917	- .5367	- .7895	- .6171
Butter	.2680	.3888	.2325	.3746
Ghee	.9515	.9980	1.0751	1.1266
Potatoes	.7416	.8537	.8738	.9964
Onions	.0757	.1681	.0747	.1699
Tomatoes	.2772	.4324	.3201	.4948
Citrus	1.3013	1.4182	1.5132	1.6432
Dates	.4218	.6250	.5026	.7367
Sugar	.3445	.4613	.3770	.5047
Tea	.1870	.2407	.2030	.2522
Coffee	1.9530	1.9487	2.1972	2.2883

*Based upon separate estimates of elasticity coefficients in rural and urban areas.

**The original estimates are calculated at the mean of total annual expenditures.

Table 27. Total Expenditures Elasticity Coefficients for Wheat, Maize and Millet

	Quantity Elasticity					
	Logarithmic Model			Log-inverse Model*		
	Urban	Rural	Weighted	Urban	Rural	Weighted**
Wheat:						
home-produced	1.0752	2.5538	1.9919	1.1885	3.1294	2.3918
purchased	-.2725	-.5076	-.4183	-.3217	-.6593	-.5313
Total	.0838	1.0387	.6758	.0592	1.2905	.8227
Maize:						
home-produced	.5270	1.6401	1.2172	.6632	2.0736	1.5376
purchased	-.6228	-.9274	-.8116	-.5899	-1.1563	-.9410
total	-.2519	.0226	-.1097	-.2265	.0014	-.0852
Millet:						
home-produced	-.2443	1.6440	..9264	-.1935	2.0547	1.2000
purchased	-1.1512	-1.1174	-1.1302	-1.3079	-1.5354	-1.4489
total	-.8900	.1303	-.4190	-.9974	.0763	-.3317

*Calculated at the mean of the total annual expenditures.

**Based upon the separate estimates for urban and rural areas.

Table 27, continued

	Expenditure Elasticity					
	Logarithmic Model			Log-inverse Model*		
	Urban	Rural	Weighted	Urban	Rural	Weighted**
Wheat:						
home-produced	1.1345	2.4705	1.5828	1.0932	3.1295	2.3557
purchased	-.2776	-.6318	-.4972	-.3180	-.8082	.6219
total	.0780	.9714	.6319	.0609	1.2027	.7688
Maize:						
home-produced	.5806	1.6008	1.2131	.5584	2.0057	1.4557
purchased	-.5748	-.9823	-.8274	-.6383	-1.2351	1.0077
total	-.2318	.0224	-.0741	-.2567	.0013	-.1993
Millet:						
home-produced	-.2219	1.5921	.9028	-.2662	1.9831	1.1284
purchased	-1.2019	-1.2086	-1.2045	-1.2567	-1.6497	-1.5004
total	-.9527	.0608	-.3205	-.9542	-.0061	-.3664

*Calculated at the mean of the total annual expenditures.

**Based upon the separate estimates for urban and rural areas.

fish, eggs, milk, cheese, ghee, citrus, dates, and coffee. A curious observation is that all of these products, perhaps with the exception of meat, are not subject to price control. Meat prices are officially fixed. However, these fixed prices are neither enforced by the government nor observed in the market.

The studied commodities can be classified into four general categories:

(1) Commodities that can be labeled "inferior", with negative income elasticity. These include flour, brea, and whey cheese.

(2) Commodities with low positive income elasticity, below .5, which include beans, lentils, oils, butter, onions, tomatoes, sugar, and tea.

(3) Commodities with moderate income elasticity between .5 and .7, which include saturated oils and dates.

(4) Commodities with a relatively high income elasticity, that include rice, macaroni, meat, poultry, fresh fish, eggs, potatoes, milk, white cheese, ghee, citrus, and coffee.

This classification[1] gives a good idea of the general picture, yet it conceals many differences between urban and

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[1] In this classification the coefficients of whole grain wheat, maize, and millet were not included, as they were further discussed in detail by the end of this section.

rural areas. Butter, for instance, has a high elasticity in urban areas, around .9, where refrigeration facilities are available, while in rural areas the elasticity coefficient is at a very low level, other major differences can be noted for rice and potatoes, both have a low elasticity coefficients in urban areas and a very high coefficients in rural areas.

The analysis of wheat, maize, and millet, where data were available on home-produced and purchased consumption, produced some puzzling results. The inputed home-produced consumption expenditures as a percentage of total expenditures for these products are presented in Table 28 for the three grain items. For rural areas, the trend of this percentage in relation to income is generally upward. It is a reasonable generalization to assume that in rural areas where the major activity is agriculture, the higher the farmer's income, the higher the "volume" of the home-produced products. Households with high incomes in the rural areas are likely to be land-owners while low-income households are likely to be part or full time laborers whose products are in terms of wages rather than physical products. The relatively high percentage of "home-produced" items in urban areas was surprising and may be attributed to the existence of many big land owners who prefer to dwell in cities. However, as Stevens noted, "experience in the United States supports an increase in the per capita value

Table 28. Home-produced Wheat, Maize, and Millet as Percent of Total Expenditures for these Products, Related to Household Income Levels

Urban Areas				Rural Areas			
Household Income Level*	Wheat	Maize	Millet	Household Income Level*	Wheat	Maize	Millet
L.E.	percent	percent	percent	L.E.	percent	percent	percent
18.67	0	0	0	20.57	4	1	7
40.57	3	10	5	39.40	6	8	7
62.90	3	9	10	63.14	19	22	16
88.31	3	7	13	88.30	26	26	27
125.88	9	13	14	123.00	38	43	53
173.02	22	25	19	172.66	46	48	47
224.23	21	20	18	221.98	56	60	58
274.20	25	27	46	271.82	64	70	69
344.93	18	36	18	338.68	67	70	70
487.44	43	61	54	475.86	75	78	66
684.53	19	34	60	707.61	78	79	86
871.20	68	51	50	866.50	91	58	100
1547.18	42	58	28	1508.20	92	77	100

*The figures actually indicate average annual total expenditures.

Source: Calculated from U.A.R. Central Statistical Committee, Household Budget Survey in the Egyptian Region, 1958/59, op. cit.

of home-produced food even at high income levels. It was not until after World War II that the farm value of home-produced foods per capita decreased".[1]

Examination of the elasticity coefficients shows that purchased wheat, maize, and millet all have a negative elasticity coefficients in urban and rural areas. Both the home-produced and purchased elasticity is higher in rural areas than in urban areas. In the two regions, the purchased products elasticity is higher for wheat, and is at its lowest level for millet where it becomes negative. $\bar{R}^2$ was high, about .90 for quantities of home-produced wheat and maize in both areas. The coefficient of determination was lower when the imputed values of these products was introduced for no obvious reason except the possibility of underestimating or overestimating these products when estimating its value by the households. This coefficient is lower for purchased wheat, or maize, and much lower (about .7) for millet. The apparent reason for this low coefficient for millet is its unique geographical consumption patterns. It is mainly consumed in upper Egypt and is almost unknown in other parts of the country. The coefficient of determination would have improved significantly had this geographical information been available and included in the model.

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[1]Robert Stevens, Elasticity of Food Consumption Associated with Changes in Income in Developing Countries, op. cit., p. 35.

It was not surprising, however, to have a negative value for B_{3i}, the dummy variable coefficient, for all fittings of wheat, maize or millet. This indicates the obvious fact that, other things equal, consumption of these products is higher per consumption units in rural areas than in urban areas.

Further Considerations of the Results of Wheat and Maize

The most puzzling results in these data are the high positive income elasticity for home-produced wheat and maize, and the negative income elasticity for purchases of these items. In examining these results, it should first be pointed out that for urban areas the percentage of expenditures for whole grain wheat and maize[1] represents only 13 percent of cereals and starches expenditures, and less than one percent of total expenditures. The corresponding percentages for rural areas reach about 66 percent and 27 percent, respectively.[2]

There are at least three possible explanations concerned with data, price relationships, and quality.

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[1]These quantities of whole grain wheat and maize are usually custom-milled at small mills.

[2]See Table 16 (Ch. IV), and Table 29.

Table 29. Percentage Distribution of Expenditures for Cereals and Starches in Urban and Rural Areas

Items	Urban areas	Rural areas	Weighted average
	percent	percent	percent
Wheat:			
home-produced	1.7	16.6	10.9
purchased	5.4	16.7	12.4
total	7.1	33.3	23.3
Maize:			
home-produced	1.6	15.9	10.5
purchased	4.3	16.4	11.8
total	5.9	32.3	22.3
Millet:			
home-produced	.5	5.2	3.4
purchased	1.8	7.5	5.3
total	2.3	12.7	8.7
Rice	9.8	11.2	10.7
Flour	19.8	6.7	11.7
Bread	49.1	2.1	20.0
Macaroni	4.1	.7	1.3
Others	2.0	1.0	1.3
Total cereals and starches	100	100	100

Source: Calculated from: U.A.R. Central Statistical Committee, The Household Budget Survey, op. cit., pp. 210-241.

With regard to the first, a likely explanation is the possibility of data discrepancy that resulted in misclassifying a greater percentage of wheat or maize as home-produced than was actually the case. This could be due to a common Egyptian practice in which a landlord often gets his land rent or a part of it in kind. He may classify this portion of his wheat or maize consumption as "home produced". Urban dwellers who have rural connections and receive quantities of wheat or maize directly from the farms for their domestic consumption may also refer to these quantities as "home-produced", though they were provided to them as a compensation for their share in a common land-ownership, or for other services they rendered.

Another factor that may influence data misclassification relates to the legal requirement for farmers to deliver a percentage of their produced wheat or maize to the government-owned Agricultural and Cooperative Bank. This requirement may encourage clandestine purchases to be reported by buyers as home produced. It is, however, unclear to what extent this would increase the reported home-produced wheat and maize.

The previous line of argument suggests that reported data on home-produced wheat and maize may be unduely high, and offers a partial explanation of the unusual elasticities for home-produced and purchased. Two additional points may throw some light on that complex relationship: (1) The price

relationship. Wheat, for instance, is sold to the government at a fixed price which, in most cases, is lower than the market price. A partial delivery of the product is compulsory in repayment for advanced loans. Large farmers (or high-income households) can afford to repay their loans and keep large quantities of their product for their own consumption. Small farmers, (or low-income households), may find that selling their product to the government and purchasing the government-subsidized flour mix provides more income. (2) Quality differentials. Domestic varieties of wheat are usually regarded as having better baking qualities, and are particularly preferred for their high gloten contents.[1] Imported wheat or wheat flour are usually regarded as being of a lower or of uncertain quality.

The conclusions drawn from the previous discussion and from reviewing elasticity estimates for cereals and starchy products can be summarized as follows:

(1) In urban areas the percentage of home-produced grains of total expenditures for cereals and starches is less than 3 percent, and represents a very negligible portion of total

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[1]Fawzy Refai, "Importance of Testing Grain Varieties and New Lines for Quality", a Lecture presented at the U.A.R. Agricultural Training Center for Afro-Asian Countries, ATC 22, 1965.

income. As income rises, urbanites tend to consume less whole grain wheat and maize, less flour; but more bread,[1] more rice, and more macaroni. However, for that small proportion of whole-grain products consumed in urban areas, the percentage of "home-produced" products increases as income rises. This is due to the fact that the higher the income, the higher the probability of having land-owners who dwell cities included in the sample.

(2) In rural areas, the percentage of home-produced whole-grain consumption to total expenditures for cereals and starches is more than 37 percent. In these areas, as income rises, households tend to consume more of home-produced grains and purchase less flour and less bread.

This extended consideration of whole grains consumption helps explain why flour has a negative income elasticity. This is believed to be a result of aggregating all types of flour in a single item, and due to the fact that the home-produced whole grain wheat is considered a "superior" source of carbo-hydrates in rural areas. Several types of flour are available in the market. The most important is the government-subsized

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[1]The income elasticity for bread in urban areas is positive and equals about .2.

flour mix which is a mixture of wheat, maize, and other products. Certainly if the data were broken down to its components, several elasticities would have been obtained. This belief is supported by the fact that income elasticity for cereals and starches as a group is positive, and amounts to about .3. It would be reasonable to assume a positive income elasticity for wheat flour, and negative income elasticities for other mixed types.

4.3.5 The Effect of Household Size

Tables 30 and 31 show that in both urban and rural areas for certain "basic" commodities, the larger the household size the larger the elasticity coefficient. This applies to cereals and starches, dried legumes, meat, fish, and eggs, milk and dairy products, vegetables and fruit. This applies also to oils and fats, and sugar and sugaries in urban areas. The opposite is true for beverages, tea, coffee, tobacco and other stimulants for the obvious reason that the adults' proportion in small households is greater.

The household size is introduced in the original models to allow for variation in expenditures per consumption unit due to economies of size. The coefficient B_{2i} indicates the

Table 30. Total Expenditures Elasticity Coefficients for Households, Classified by Size, from the Logarithmic and the Log-inverse Models in Urban Areas

Commodity Group	Logarithmic Model			Log-inverse Model		
	Small	Medium	Large	Small	Medium	Large
Cereals & starches	-.0478	.1729	.1849	-.0236	.1375	.1490
Dried legumes	.1838	.2175	.3547	.1517	.1710	.2599
Meat, fish & eggs	.9109	.9586	1.1450	.8191	.7542	.9018
Oils & fats	.3939	.4509	.4939	.3453	.3627	.3459
Milk and dairy products	.9599	.8847	1.1066	.8541	.6989	.8244
Vegetables	.7022	.7030	.8048	.6136	.5546	.6119
Fruit	1.2707	1.2315	1.3722	1.1149	.9710	1.0000
Sugar & sugaries	.6080	.6403	.7461	.5424	.5030	.6017
Beverages	.8698	.7647	.8332	.7469	.6016	.6631
Tea, coffee & other stimulants	1.2190	.8557	.6971	1.0508	.6688	.5810
Other food stuff	.6090	.3783	.4087	.5128	.2917	.3487
Total food	.6907	.6342	.6948	.6016	.4988	.5467

Table 31. Total Expenditures Elasticity Coefficients for Households, Classified by Size, from the Logarithmic and the Log-inverse Models in Rural Areas

Commodity Groups	Logarithmic Model			Log-inverse Model		
	Small	Medium	Large	Small	Medium	Large
Cereals & starches	.4249	.4536	.4467	.5055	.4796	.3910
Dried legumes	.7231	.5744	.7416	.8673	.6316	.6703
Meat, fish & eggs	1.0021	1.0571	1.0150	1.1810	1.0806	.9068
Oils & fats	.6051	.5350	.5382	.7321	.5739	.4617
Milk and dairy products	.9566	1.0572	.9624	1.1996	1.0979	.8837
Vegetables	.5944	.8701	.7586	.6984	.8649	.6878
Fruit	1.4115	1.0361	1.1547	1.6685	1.0749	1.0108
Sugar & sugaries	.9682	.8045	.7000	1.1509	.7959	.6195
Beverages	.9778	.8437	.7736	1.0674	.8405	.6842
Tea, coffe & other stimulants	1.7123	.6148	.9817	2.0471	.6513	.8716
Other food stuff	.7294	.3830	.3528	.6905	.4482	.3255
Total food	.7952	.7608	.7180	.9343	.7771	.6374

extent to which households consume or spend more or less per consumption unit, because other things equal, they contain a larger or smaller number of consumption units.

In urban areas, a positive value for B_{2i} was obtained for dried legumes; meat, fish and eggs; milk and dairy products; vegetables; fruit; sugar and sugaries; beverages; stimulants and total food in general. In rural areas, fewer positive values of B_{2i} were obtained, namely for dried legumes; meat, fish and eggs; milk and dairy products; fruit; beverages; stimulants; and total food. A positive value for that coefficient for a given product indicates that, for a given income per consumption unit, large households spend more per consumption unit than do small ones. Although this coefficient was also obtained for households classified by size in rural and urban areas, its importance appears to be negligible due to two factors: first, the homogeneity of the classified observations, and second, because the commodity groups themselves are broadly defined.

In order to test for the significance of the household size effect, the analysis of variance procedure was applied to the urban sample. The rural sample is not included in the analysis because of the obvious correlation between the household size and its income. The larger the family size, the greater the number of wage-earners, and consequently higher

income. The two-way classification of the sample was according to the income level, as indicated by the total annual expenditures, and the household type as defined earlier in Chapter III. Since the number of reporting households vary greatly from one cell to another as shown in Table 32, the calculation of the analysis of variance was modified to allow for this fact.[1]

The results of the analysis of variance are given in Table 33. The analysis indicates a significant income effect at both .05 and .01 levels of significance, while the household type effect was not statistically significant.

It is possible to pursue this kind of analysis still further and test the hypothesis of additivity of income level and household type, or test the hypothesis of interaction between the two factors. However, it is felt that this problem, though interesting, is outside the major focus of the study.

4.4 Summary

This Chapter presented the analysis of the cross-sectional data drawn from the first household budget survey.

Three models of analysis were utilized, of which the logarithmic and the log-inverse functions provided better fits than did the semi-logarithmic model.

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[1]The analysis of variance model applied here is explained in detail in: Vernon G. Leppitt, Determinants of Consumer Demand for Home Furnishings and Equipment, Harvard University Press, 1959, pp. 19-35.

Table 32. Average Annual Household Expenditures for Food in Urban Areas and the Number of Reporting Households*

Average Total Annual Expenditures	Family Type		
	Large	Medium	Small
40	L.E. 25 (1)	L.E. 34 (7)	L.E. 29 (57)
64	52 (5)	48 (47)	46 (113)
88	69 (21)	65 (119)	61 (111)
125	92 (131)	88 (304)	80 (167)
173	121 (135)	112 (282)	99 (95)
224	146 (130)	134 (171)	122 (55)
274	172 (108)	156 (136)	136 (25)
345	200 (209)	180 (130)	156 (38)
487	261 (175)	219 (104)	191 (28)
684	332 (69)	272 (50)	241 (12)
871	400 (22)	311 (18)	277 (5)
1547	577 (36)	410 (19)	472 (4)

*Figures in parentheses indicate number of reporting households.

Source: UAR Central Statistical Committee, Household Budget Survey in the Egyptian Region, op. cit.

Table 33. Analysis of Variance for Food Expenditures in Urban Areas

Source of variation	Sum of Squares	Degrees of freedom	Mean Squares	Calculated F ratio	F (.05)
Income and household size	26,392,231	13	2,030,172	3.72	2.21
Income (unadjusted)	23,939,030				
Household size (adjusted)	2,453,201	2	1,226,600	2.25	3.44
Household size (unadjusted)	1,102,005				
Income (adjusted)	25,290,226	11	2,299,111	4.21	2.26
Interaction	1,201,219	22	546,009		
Total	27,593,450	35			

Elasticity coefficients based upon expenditures were estimated for commodity groups. The, elasticity coefficients based on both quantity and value were estimated for selected individual items. All of these coefficients were estimated for urban and rural areas, and then, a weighted average was introduced to provide a general view for the entire population.

The examination of the estimated relationships indicates:

(1) That the food consumption patterns differ significantly as between urban and rural areas.

(2) That there are differences between quantity and expenditures elasticity, and that in general, expenditure elasticities are higher than the quantity elasticities.

(3) That although the household size seems to be an important factor in the demand for food, its significance failed to materialize when analyzed after adjusting for income effects. However, when the number of consumption units was included in the regression analysis, the variable produced a coefficient with a value that differs significantly from zero.

The estimated income elasticity coefficients, or more precisely, total expenditures elasticity coefficients have been taken as a fairly reliable indicator of income elasticity of demand. Some investigators in similar studies chose to reduce the total expenditures elasticity by 10 percent so that they

would approximate the income elasticity of demand more closely. This practice is based on several assumptions regarding the relationship between total income and total expenditures. However, it is felt that this practice of arbitrarily scaling down all elasticities by a constant percent would not be a significant improvement where the marginal propensity to save is relatively small.

CHAPTER V

ESTIMATING PRICE PARAMETERS

This chapter is devided into two distinct sections. The first deals with estimating price elasticities for some food items based on analysis of time-series data for prices and consumption, adjusted for income effect, for certain items for which reasonable data were available. The second, attempts to utilize the mathematical relationships between income and price parameters to estimate price elasticities for most commodity groups and individual items dealt with in this study.

5.1 Combined Analysis of Cross-sectional and Time-series Data

5.1.1 Definition of the Variables

The objective of the analysis in this section is to introduce the price factor in the food consumption analysis. This is done by combining the income elasticity coefficients estimated in the previous chapter together with the "price" as a new element in the analysis.[1]

[1] See Appendix A.

Recent price data in Egypt are suspect due to the existence of governmental price controls over a wide range of products, and the use of these prices in published sources as the actual, going prices. However, over the periods used in the analysis we find no reason to seriously question the price data, at least through 1963.

The variables introduced in the analysis include:

(1) Per capita consumption in terms of quantity.

(2) Per capita income.

(3) Income elasticity of demand.

(4) Prices or price indices for different products.

(5) Certain deflators: the cost-of-living index, and the wholesale price index.

Though data about per capita consumption are available over a wide range of commodities and groups of commodities, the price data represented a limiting factor for extending the analysis to include all the commodities that were included in the cross-sectional analysis. Data are either unavailable, or subject to various limitations and not quite comparable. After a thorough investigation of that matter, it was necessary to limit the analysis to few products. However, the elasticity coefficients obtained are utilized in the following section to determine the money flexibility and thus to compute the price elasticities for all the other items.

Six products were included in the analysis. These are: wheat, millet, onions, oils, tomatoes, and total food. The data of annual per capita consumption are the official estimates published by the Egyptian Ministry of Agriculture. They are based on total production, net trade, storage, losses, and use for other purposes. The analysis covers different periods of time for each commodity. From 1945-46 to 1962-63 for wheat, from 1946-47 to 1958-59 for maize and millet, from 1946-47 to 1962-63 for onions, from 1949-50 to 1962-63 for tomatoes, and from 1948-49 to 1962-63 for oils and total food.

Prices used are wholesale prices except for oils and total food where the wholesale price indices were used; there was no specific reason for using the latter except its availability. These prices are deflated by the wholesale price index for all commodities.

Per capita incomes were calculated through the use of the figures on private disposable income and population data. These per capita income figures were deflated by the cost of living index.

The unfortunate limitation of price data was an obstacle in extending the analysis to deal with rural and urban areas, separately. The nature of the price and per capita income

data as overall averages for the whole country necessitated use of an overall income elasticity coefficients. The coefficients used are weighted averages of the urban and rural coefficients.

Because the combined model is a logarithmic model, it was logical and justifiable to use the coefficients derived from the logarithmic model. However, there were not much divergence between the logarithmic model coefficients and those of the log-inverse model. The goodness of fit for both of them was similar and at a satisfactory level.

The use of a single equation model, in other words the inclusion of only one endogeneous variable in the model, is justifiable. Domestic consumption is considered the major single outlet for the items dealt with in the analysis. The share of exports is very small and storage outlet cannot be considered of any major importance. In addition, under price control policies, the world market price for food can hardly be related to local prices or the expenditure decisions in Egypt. Had this not been the case, price would have been regarded as a function of local production and world prices, then consumption would have been made a function of local prices and income. It is believed, therefore, that a single equation model with domestic consumption as the only endogeneous variable can depict the nature of demand for these products.

Table 34. National Disposable Income, Per Capita Income, Cost of Living Index, and the Wholesale Price Index, 1945/46 to 1962/63

Year	National Disposable Income (current price)	Per Capita Income	Cost-of-Living Index 1953-54 = 100	Wholesale Price Index All Commodities (1939 = 100)
	L.E.million	L.E.		
45/46	470	25.5	99	321
46/47	450	23.9	97	304
47/48	499	26.2	94	330
48/49	613	21.4	95	311
49/50	700	35.2	94	344
50/51	770	37.9	99	383
51/52	816	39.1	108	372
52/53	754	35.1	107	355
53/54	801	36.4	100	345
54/55	846	37.5	96	351
55/56	860	37.3	96	389
56/57	924	39.1	98	422
57/58	943	39.0	102	417
58/59	1003	40.5	102	417
59/60	1107	43.7	103	418
60/61	1194	45.9	103	425
61/62	1280	47.9	103	421
62/63	1359	49.6	100	419

Source: Donald Mead, Growth and Structural Change in the Egyptian Economy, (Richard D. Irwin, Inc., Homewood, Ill., 1967), Table VI-F-1, pp. 400-401.

Table 35. Per Capita Consumption and Prices

Years	Wheat		Millet		Onions		Tomatoes		Oils		Total Food		Maize	
	Q	P	Q	P	Q	P	Q	P	Q	P	Q	P	Q	P
1945/46	65.9	2.59												
1946/47	53.6	2.31	19.3	1.7	3.5	1.66							67.60	1.51
1947/48	54.3	2.15	25.0	1.5	5.0	.78							68.02	1.51
1948/49	78.8	2.15	23.6	1.5	4.4	1.29			3.5	97	388.3	86	74.98	1.51
1949/50	67.0	2.15	23.5	1.5	8.2	.76	16.2	1.5	3.6	95	366.2	95	83.58	1.70
1950/51	82.3	2.18	22.7	1.7	6.8	.86	12.9	2.6	3.5	115	371.8	101	56.52	1.91
1951/52	92.2	2.15	22.4	1.6	7.9	1.12	16.8	2.7	3.0	107	370.8	98	62.26	1.86
1952/53	85.3	2.33	16.4	1.7	5.5	1.81	22.3	1.8	3.9	100	376.2	100	61.86	1.71
1953/54	71.7	3.08	22.0	1.7	4.7	1.60	16.9	1.8	3.7	91	406.3	98	74.69	1.77
1954/55	66.3	2.77	20.2	1.9	5.9	.86	19.5	1.7	3.6	91	416.6	101	69.01	2.11
1955/56	78.6	2.51	19.4	2.5	6.7	.80	20.7	2.2	3.9	100	436.0	110	69.23	2.12
1956/57	87.0	2.51	22.1	2.4	4.5	1.13	20.9	1.8	4.3	103	397.1	116	62.29	2.50
1957/58	97.0	2.51	19.8	2.5	8.7	1.00	21.2	1.8	5.0	107	381.9	118	56.71	2.36
1958/59	108.5	2.51	18.4	2.5	7.7	1.36	24.0	1.5	4.8	107	385.0	117	65.31	2.36
1959/60	101.0	2.52			9.0	1.09	25.0	1.4	4.7	107	404.4	115	52.91	2.36
1960/61	90.2	2.52			9.3	1.26	27.3	1.8	5.2	107	405.5	122	58.47	2.36
1961/62	113.3	2.52			8.9	1.79	27.5	1.7	4.3	104	404.2	122	63.11	2.36
1962/63	111.9	2.52			10.3	1.78	30.4	2.4	6.7	107	449.4	120	71.41	2.36

Q: per capita annual consumption, in kilograms.
P: for wheat, millet, onions and maize, wholesale prices piasters/k.g., for oils and total food wholesale price indices (1953/54 = 100), for tomatoes, retail prices, piasters/k.g.

Source: Quantity information: UAR Ministry of Agriculture, The Monthly Bulletin of Agricultural Economics and Statistics, several volumes.

Price information: UAR Department of Statistics and Census, Annuaire Statistique, Several volumes.

5.1.2 Results of the Analysis

It was apparent from the previous discussion that the price data, and to some extent consumption data, represent a restriction on the extension of the analysis to the desired dimensions. It is true enough that the results of any study can be no better than the data used in the analysis. Under such circumstances, we attempted to extend the price analysis as far as possible, bearing in mind all the difficulties involved.

The combined model was applied to nine products. The results were less satisfactory in terms of statistical significance, than hoped for.

Several explanations can be cited for the failure of the time-series analysis to provide significant results:

(1) The reliability of the data. In most cases, data for prices represent the official fixed prices rather than the actual prices. In many instances, these were underestimated indicators of real prices.

(2) The problem of aggregation, as the data represented averages for different types and qualities with a wide range of substitutability, price data were assumed to be a weighted average that reflected the change in price level over the studied period. Yet, the quantities consumed are simple averages that do not show quality differences. The aggregation

problem is of a particular importance when logs are used, as the sum of the logs is not equal to the log of the sum.

(3) The locational differences that have been overlooked in the time-series analysis. While the cross-sectional analysis showed basic differences that exist in the consumption patterns of the two sectors, in terms of income levels, income elasticities, and budget proportions spent on different items. A weighted elasticity coefficient was used to adjust location effect, while price data were not weighted.

Table 36 shows the estimated relationships between per capita consumption adjusted for income and deflated prices for wheat, maize, millet, onions, tomatoes, oil, and total food.

The results show a price elasticity coefficients, which are equal to the estimate $\hat{B}_{1i}$, of -.6 for wheat, -.01 for maize, -.4 for millet, -.25 for onions, -.6 for tomatoes, -.8 for oils, and -.1 for total food. The values of R, R^2 and $\bar{R}^2$ for all the commodities included in the analysis were extremely low with the exception of tomatoes which has a value of R of about .7.

When testing the hypothesis $B_{1i} = 0$ against the alternative hypothesis $B_{1i} \neq 0$, the nul hypothesis was rejected for all the products, which indicate that the estimated values for B_{1i} differ significantly from zero.

Yet the analysis of the overall regression produced significant values of f ratio at a level of significance .05 for only wheat, millet, tomatoes and oils. The overall regression for the other products was not statistically significant at that significance level .05.

It is an obvious conclusion that the results of this analysis was not statistically satisfactory, and should be looked at with caution. However, when discussiong the commodity projection, an assumption was made with regard to the stability of price relationship, and hence the results of the present analysis were not in fact utilized in the projections.

When testing for serial correlation, the results showed values of d' (Durbin Watson statistic) higher than d_U (Durbin-Watson upper limit), which implies acceptance of the hypothesis of random disturbance.

The inclusion of the prices of substitutes, in the case of wheat, maize, and millet did not significantly improve the results.

Table 36. Estimated Relationships from the Model $Z_{it} = B_o + B_{1i} \log P_{jt}/P_t$

Commodities	Estimated Coefficients, Z_i =				Period Covered
	B_o	B_1	R	S	
Wheat	.8100	-.6353	.4734	.0645	1945/46
	.0577	.2956			1962/63
Maize	1.9161	-.0137	.0106	.0471	1945/46
	.0924	.3327			1962/63
Millet	.8533	-.4230	.3919	.0615	1946/47
	.6859	.2994			1958/59
Onions	.0675	-.2527	.2787	.1254	1946/47
	(.5635)	(.2248)			1962/63
Tomatoes	-1.4529	-.5658	.6830	.0613	1949/50
	(.4054)	(.1747)			1962/63
Oils	.0556	-.8340	.3946	.0633	1948/49
	(.0211)	(.5386)			1962/63
Total food	1.5389	-.1016	.0272	.0495	1948/49
	(.0134)	(1.0366)			1962/63

5.2 Estimating Price Parameters from Cross-sectional Information

5.2.1 Assumptions and Techniques

It is usually easier to obtain cross-sectional data on budget proportions and estimates for income elasticity than to obtain estimates for price elasticities. In the present study, reliable price data over a reasonable length of time were either unavailable or unreliable for several items. This shortcoming compelled the use of mathematical relationships among elasticities to avoid the data obstacle.

The model used here,[1] is based upon certain basic mathematical relationships, these are:

(1) The Homogenity Condition, which implies that the demand function is homogeneous of degree zero in money income and absolute prices. It follows that the sum of price elasticity, income elasticity, and cross elasticity is equal to zero, or in mathematical notations:

$$e_{ij} = - E_i \quad \text{for all } i$$

---

[1] Unless otherwise cited, this portion depends heavily upon the work of Lester Manderscheid, "Price and Income Elasticities, Relative Growth rates: Some Implications for Understanding Agriculture's Terms of Trade", a Paper Presented at the Agricultural Development Council Seminar, Stanford University, February 1966.

where:

e_{ij} = price elasticity for good i with respect to the price of good j, all other prices constant. Σe_{ij} indicates that sum of i-th own price elasticity and its cross price elasticity with respect to changes of other goods taken one at a time.

E_i = income elasticity for good i.

(2) The Symetry Condition, which indicates that the cross elasticities of two commodities, each with respect to the change in the price of the other, are approximately equal with the budget proportions spent on them are equal and the income elasticities equal, or:

$$E_i + e_{ij} / w_j = E_j + e_{ji} / w_i$$

where w_i = budget proportion spent on good i. From this relation we can derive:

$$e_{ij} = w_j / w_i \; e_{ji} - w_j (E_i - E_j) \text{ for all i and j.}$$

(3) Total Expenditure Condition, which specifies that the summation of the product of income elasticity and the budget proportion, for all commodities is equal to one, or:

$$\Sigma w_i E_i = 1$$

this relation includes saving as a commodity or excludes it from income.

(4) Cournot Aggregation, which implies that the summation of price elasticities of all goods with respect to changes in the price of one commodity j, is equal to j's proportion of expenditures with sign reversed, or:

$$\Sigma w_i e_{ij} = - w_j \text{ for all } j$$

In addition, to make the model workable we will accept, as a reasonable assumption, Wold and Jureen's argument that the fundamental relations involving income elasticity will not strictly hold unless sector incomes vary proportionately. In addition, the relation is based on the "typical consumer" with a stable preference field and non-decreasing satisfaction associated with increased quantities of each good consumed and continuous derivatives everywhere. This assumes that "the behavior of the market can be described by the behavior of a 'representative individual' in much the same way as Alfred Marshall spoke of a representative firm."[1]

If Frish's notion of "want structure independence" which means that the quantity of good i influences only the marginal utility of good i and no other marginal utility is accepted, all direct and cross elasticities can be calculated from knowledge of income elasticity and the money flexibility.

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[1]Ragnar Frish, "A Complete Scheme for Computing All Direct and Cross Demand Elasticities in a Model with Many Sectors", Econometrica, Vol. 27, April 1959, pp. 177-196.

Though the want independence is a strong assumption, it might be more acceptable if products are aggregated in some broad fashion.

Money flexibility can be defined as:

$$W' = \frac{\partial m}{\partial a} \cdot \frac{a}{m}$$

where:

m = marginal utility of money

a = money income.

The knowledge of money flexibility is a basic assumption in Frisch's formulas for computing direct and cross price elasticities:

$$(1) \quad e_{ik} = - E_i \, W_k \left(1 + \frac{K_k}{W'}\right)$$

$$(2) \quad e_{ii} = -E_i \left[W_i - \frac{(1 - W_i \, E_i)}{W'} \right]$$

where:

e_{ik} = cross price elasticity for good i with respect to k .

e_{ii} = i's own price elasticity .

E_i = i's income elasticity .

W_i = budget proportion spent on i .

W' = money flexibility .

Because W' is not known, it can be estimated from knowledge of the income elasticities and one or more price elasticities

by inserting these estimates in the previous two equations, or,

$$W' = \frac{W_k E_k E_k}{e_{ik} + E_i W_k}$$

$$W' = \frac{E_i (1 - W_i E_i)}{e_{ii} + W_i E_i}$$

W' can be estimated from several sets of elasticities, then an average of these estimates can be used.

6.2 Results of the Analysis

The analysis started with knowledge of few price elasticity coefficients, namely, for wheat, maize, millet, oils, onions, tomatoes, and total food.

The first step in the analysis was to estimate money flexibility, or the relative change in the marginal utility of money associated with change in money income. As indicated before, money flexibility can be estimated indirectly through the knowledge of price elasticity, income elasticity, and the budget proportion of the commodity in question.

It was unfortunate that the few price elasticity coefficients obtained from the combined analysis of section 1, were for the population as a whole, while it was apparent that major differences do exist between the consumption patterns and behavior, and consequently the spending decisions in urban and rural areas.

In estimating money flexibility, several options were open:

(1) To calculate money flexibility through the empirical price elasticity coefficients and using a weighted income elasticity coefficient for the entire population.

(2) To calculate money flexibility in rural and urban areas separately using the estimates of income elasticity for each, and assuming that there was no difference between the two areas with regard to price elasticity.

(3) To use a set of values for money flexibility suggested by Frisch as a useful first approximation until further data and estimates become available.

Frisch's suggested set is:[1]

-10 for an extremely poor and apathetic part of the population;

-4 for the slightly better off but still poor part of the population who want to become better off;

-2 for the median part of the population;

-.7 for the better off part of the population;

-.1 for the rich with ambitions toward conspicuous consumption.

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[1]See, Lester Manderscheid, op. cit., p. 7.

The calculations of money flexibility for the entire population based upon weighted income elasticity coefficients and weighted budget proportions produced an average of -.85 with a wide discrepency between an estimate of -.49 based on price elasticity calculated from oil, and -1.32 derived from the tomatoes elasticity. When urban and rural areas were dealt with simultaneously, two different sets of estimates resulted with a wide margin in between. However, for rural areas money flexibility was higher, in absolute terms, and around -2.5, while it was a little lower in urban areas.

In view of the inaccurate nature of price coefficients and of the assumption of homogeneous price elasticity in both areas, it was decided to use an approximate value of -2 for urban areas, and -4 for rural areas, the two values suggested by Frisch and not far from the calculated averages of money flexibility.

With these values of money flexibility and previous estimates of income elasticity coefficients (based upon total expenditures) available, price elasticity coefficients were calculated for all commodity groups and individual items.

Table 37 shows these derived estimates for commodity groups in urban and rural areas. Similar calculations for individual commodities are shown in Table 38.

It should be kept in mind, however, that although these calculated coefficients are useful as approximations, they

Table 37. Derived Price Elasticity for the Commodity Groups and Their Budget Proportions

Commodity groups	Urban Areas money flexib. = .2		Rural Areas money flexib. = -4	
	budget proportion	derived elasticity	budget proportion	derived elasticity
	percent		percent	
Cereals and starches	13.70	- 1.40	27.78	-10.28
Dried legumes	1.31	- .30	2.80	- 1.53
Meat, fish & eggs	10.65	- 4.81	11.38	- 8.64
Oils and fats	1.89	- .85	1.60	- .50
Milk and dairy	6.09	- 3.70	8.36	- 5.65
Vegetables	3.71	- 2.01	3.43	- 2.22
Fruit	3.18	- 4.09	2.04	- 2.10
Sugar and sugaries	3.24	- 1.72	4.29	- 2.72
Beverages	3.08	- 1.42	3.49	- 2.19
Tea, coffee and others	5.60	- 2.96	6.74	- 6.21
Other food stuff	2.89	- 1.02	1.26	- .73

Source: For budget proportions data, UAR Central Statistical Committee, The Household Budget Survey, op. cit., pp. 344-6.

Table 38. Derived Price Elasticity for Selected Commodities and Their Budget Proportions

Commodities	Urban Areas money flexib. = -2		Rural Areas money flexib. = -4	
	budget proportion %	derived elasticity	budget proportion %	derived elasticity
Rice	1.34	- .63	3.11	- 2.80
Macaroni	.55	- .73	.19	- .83
Beans	.45	- .05	1.02	- .68
Lentils	.50	- .17	.92	- .45
Meat	6.57	- 3.74	7.75	- 4.49
Poultry	1.53	- 1.23	1.78	- 2.25
Fresh fish	1.58	- 1.13	1.08	- 1.17
Eggs	.68	- .94	.52	- .80
Milk	1.93	- .97	3.85	- 3.87
White cheese	.79	- .97	.09	- .58
Butter	.67	- .80	1.14	- .08
Ghee	2.30	- 1.66	2.04	- 1.77
Potatoes	.56	- .52	.63	- .74
Onions	.34	- .19	.60	- .11
Tomatoes	.83	- .60	.82	- .36
Citrus	.75	- .96	.43	- .79
Dates	.34	- .34	.62	- .60
Sugar	2.11	- .87	3.36	- 1.60
Tea	1.68	- .20	2.90	- .96
Coffee	.47	- .94	.32	- .87

Source: For budget proportions data, UAR Central Statistical Committee, The Household Budget Survey, op. cit., pp. 355-6.

are based upon certain unverified assumptions. These assumptions and conditions may fit the commodity groups rather than the individual items. The "want independence" notion may be better applicable to them. For individual items, the want independence notion may seem to be a rather heroic assumption as it is hard to accept the idea that quantity consumed of meat, for instance, does not have any influence on the marginal utility of poultry or fish. Despite these shortcomings, these calculated coefficients are accepted as an approximation until more information is made available.

It is interesting in this context to compare the estimated price elasticity coefficients for onions and tomatoes with the derived coefficients. As can be shown from Table 39, there is not much divergence between the two sets, which might support the usefulness of the derived coefficients.

Table 39. Price Elasticity Coefficients from Derived Mathematical Model and from Empirical Data for Onions and Tomatoes

Commodity	e_{ii} derived from mathematical model			Calculated e_{ii}
	Urban	Rural	Weighted	
Onions	-.1878	-.1056	-.1368	-.2527
Tomatoes	-.5997	-.3633	-.4531	-.5653

CHAPTER VI

PROJECTION OF THE DEMAND FOR FOOD

6.1 Introduction

The elasticities and coefficients presented in the previous chapters represent an intermediate step toward increasing our ability to project the future demand for food products.

Two projections were made. A medium range projection for 1975, and a long range projection for 1985. 1975 was selected for several reasons, by that year the majority of the effects of the Aswan High Dam and other development projects will have been realized. The 1985 projection was designed as a long-term forecast.

The first step in demand projection was to project population, the second, to project income, the third, to proceed to commodity projections.[1] To estimate the increase in potential per capita demand, it is necessary to select the income elasticity coefficients referring to the base year used

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[1]See: L. M. Goreux, "Economic Growth and Commodity Projections", Monthly Bulletin of Agricultural Economics and Statistics, Vol. 10, July/August 1961, p. 1-17.

projection. From the value of the per capita demand estimated for the target year, the level of the total demand can easily be derived by multiplying the per capita demand by the size of the population projected for the target year.

In projecting consumption, several underlying assumptions should be made clear:

(1) that income is the independent variable while consumption is a dependent variable determined by income level, household size, and location. The elasticity coefficients estimated earlier in this study can be used to forecast demand assuming that such coefficients would remain constant over time, and that consumers would behave in the same way, if any of the independent variables change.

(2) that no substantial change in relative prices within the country or in the world market would take place during the projection period.

(3) policitical stability.

(4) no major inflation that involve drastic changes in the purchasing power of money. It would be unrealistic to assume no inflationary pressure which, together with the balance-of-payment difficulties are most typical among "distrubances" that affect underdeveloped countries.[1]

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[1]See: Albert O. Hirschman, The Strategy of Economic Development, Yale University Press, 1964, p. 1956-166.

6.2 Population Projections

Population is the single largest factor which decides the trend of most economic activities. During the process of economic development, changes in population are a cause, an effect, and an indicator of economic change.[1]

As indicated in Chapter II, the Committee of Experts which was formed by the Egyptian Government in 1962 to study the population trends of the country, made five different projections each based on different assumption with regard to the fertility rate:[2]

I. Fertility rates will remain constant from 1960 to 1985 at the actual 1960 level of 190.0 per thousand.

II. Fertility rate will decline by one percent of the 1960 rate each year up to 1985, with a total decline of 25 percent over the period.

III. Fertility rates will remain at the 1960 level for 15 years and decline thereafter by 5 percent each year for 10 years.

IV. Fertility rates will decline by 2 percent of the 1960 rates each year during the projection period, with a total decline of 50 percent.

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[1] J. J. Spengler, "Population: Cause, Effect, Indicator", Economic Development and Cultural Change, April 1961.

[2] Fertility rates are calcultaed in terms of births per thousand females at the age group 15-49 in a given period.

V. Fertility rates will decline by 5 percent of the 1960 rate for 10 years and remain constant thereafter.

Mortality rates up to age 45 are assumed to decline exponentially over the projection period toward certain ultimate values obtained from a study of the minimum relevant mortality rates in various countries. For ages 45 and over, mortality rates were assumed to remain constant at their 1960 level.

Projections based on the first assumption were considered as an upprt limit, while those based on the last assumption were considered as a lower limit.

The projected population was calculated by following the base population at each age group and the expected births according to the relevant fertility rate. The application of the appropriate survivorship probability to each age group, including the new borns, at a certain date would provide an estimate of the population at that date.

Table 40. Projected Population in Egypt, 1970-1985 (in millions)

Years	Fertility rate assumptions*				
	I	II	III	IV	V
1970	34.5	34.0	34.5	33.4	31.7
1975	39.7	38.5	39.7	37.1	33.8
1985	52.2	48.3	48.4	43.6	38.8

*Assumptions I to V as stated in the present section.

Source: UAR Central Statistical Committee, Population Trends in the U.A.R., op. cit., p. 53.

These projections imply a compound annual rate of population growth between 2.8 (for the upper limit) and 1.6 (for the lower limit), over the projection period. Without being pessimistic, it is unlikely that the population growth rate would drop to a rate as low as 1.6 within twenty-five years. The most probable rate would lie between 2.5 and 2.8. Though the population growth rate reached high levels in the past, higher than 2.8, it is believed, based upon examination of consecutive population data that it was a temporary phenomenon attributed to other factors.[1]

For the purpose of this study, the projections under the first and the second assumptions were utilized. It is believed that these assumptions are consistent with the conditions in most less developed nations where the fertility rates remain stable while expectation of life at birth increases. For practical purposes "the influence of likely changes in the age structure on average nutritional requirements can be disregarded in most low income countries, particularly in the case of populations with stable fertility rates".[2]

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[1]See: Bent Hansen and Girgis Marzouk, Development and Economic Policy in the U.A.R., op. cit., pp. 22-45.

[2]L. M. Goreux, op. cit., p. 6.

The impact of population growth on the demand for food is very great and may outrank the effects of income growth. However, it is believed that in a rapidly developing economy with a relatively high income elasticity of demand for food "any decline in the rate of population gorwh may be accompanied in a few decades by an accelerated increase in the demand for food, or at any rate will not be accompanied by a corresponding lower demand for food".[1]

The population projections were made for the population as a whole, and were based on the demographic factors without including other geographic or economic factors. Projection by location was not made by the Committee. But it has been shown from the previous chapters that major distributional and characteristic differences do exist between urban and rural areas to the extent that they should be dealt with separately. Table 42 shows the declining percentage of the rural population to the total due to migration. During the 1950's rural population grew at about 1.9 percent, while growth in urban areas was much greater, about 4.3 percent. This trend is expected to continue and has, in fact, been pushed in that direction by the implementation of the two five-year plans. More than one-third of the planned investment was allocated to projects

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[1]R. P. Sinha, Food in India, Oxford University Press, 1961, pp. 63-64.

Table 41. Projected Population in Egypt by Age Groups in 1975, Based on the Constant Fertility Rate Assumption (in thousands)

Age Groups	1960 census			1975 projection		
	male	female	total	male	female	total
0 - 4	2209	1909	3118	3627	3069	6696
5 - 9	1979	1834	3813	2953	2468	5421
10 - 14	1658	1534	3192	2484	2094	4579
15 - 19	1118	1044	2162	1997	1715	3712
20 - 24	925	878	1805	1925	1800	3725
25 - 29	864	1058	1921	1609	1505	3114
30 - 34	810	847	1657	1079	1020	2099
35 - 39	851	883	1734	884	852	1736
40 - 44	663	617	2180	819	1018	1827
45 - 49	569	575	1144	747	800	1547
50 - 54	496	506	1002	759	824	1563
55 - 59	324	317	641	563	563	1126
60 - 64	322	555	677	884	569	957
65 and over	420	486	906	703	907	1610
Total	13207	12847	26054	20592	19149	39741

Source: UAR Central Statistical Committee, Population Trends in the U.A.R., op. cit.

associated with the Aswan High Dam. Cairo and Alexandria, along with their suburbs were slated to receive more than one-half of the remaining planned investment. Another sizable portion of the investments was allocated to the extractive industries along the Red Sea, far from the settled rural population of the country. With the exception of a few textile and food processing industries, the rural areas and even small cities were to receive little attention as potential sites for industry.[1] This allocation was affected by the lack of transportation facilities and other infrastructure in rural areas. It would be, therefore, a reasonable conclusion to assume that the percentage of rural population will drop to about 57 percent in 1975, and 54 percent in 1985. Accordingly, of the upper limit projected population of 39.7 millions in 1975, about 22.5 millions are rural, and of the 52.5 millions projected for 1985, about 28.3 millions are rural.

6.3 Income Projections

The information on Egypt's national and per capita income are very scanty. However, the available data were reexamined

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[1] Janet L. Abu-Lughod, "Urbanization in Egypt: Present State and Future Prospects", Economic Development and Cultural Change, Vol. 13, No. 3, April 1965.

Table 42. Population of Egypt According to Location, and Percentage of Rural Population in Census Years (in thousands)

Years	Population			Percentage of rural population
	urban	rural	total	
1917	2,640	10,030	12,670	79.1
1927	3,770	10,407	14,178	73.4
1937	4,436	11,485	15,921	72.1
1947	6,262	12,704	18,967	67.0
1957*	8,223	14,773	22,996	64.2
1960	9,864	16,120	25,984	62.0
1975**			45,687	57.0
1985**			52,533	54.0

*Estimates.

**Projections for total population, based on assumption I.

Source: UAR Central Statistical Committee, Population Trends in the U.A.R., op. cit.

and evaluated by Hansen.[1] He estimated that from 1952/53 to 1960/61, the national income of Egypt rose from LE 972 million to LE 1341 million in 1960/61, or at approximately 4.3 percent compound annual rate. Later, he and Marzouk estimated that from 1952/53 to 1962/63 the real gross national income rose at about 5.2 percent compound annual rate, and at about 6 percent during the last six years of the same period.[2]

The principal objective of the general Ten-Year Plan was to double the national income over a period of ten years.[3] This means an average annual rate of growth of 7.2 percent. For the first Five-Year Plan a 40 percent increase was planned, corresponding to a growth rate of 7 percent annuall. This implies an annual growth rate in income per capita of about 4.0 to 4.5 percent.

Recent estimates show that national income has increased to LE 1905 million in 1964/65 in current prices (or LE 1762 million in constant 1959/60 prices).[4] That makes for an annual compound rate of growth around 7 percent.

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[1]Bent Hansen, "The National Income of UAR (Egypt)", Memo No. 355, Institute of National Planning, Cairo, 1963.

[2]Bent Hansen and Girgis Marzouk, op. cit., p. 320.

[3]Recently, and in view of the circumstances of the Middle East conflict, the plan period was extended to 1972 instead of 1970.

[4]See Table 7, Ch. II.

It can be concluded therefore that the national income has increased at a rate near 6.5 percent during the last decade, and is expected to grow at a level near that rate or slightly higher.

The agricultural sector has contributed around 13 percent of the overall increase in the national income during the plan period, while industry contributed more than 31 percent. This reveals the emphasis put on the industry in the investment plans. Over one-third of the total investment in the first Five-Year Plan was directed to industry and electricity, the share of agriculture and irrigation in the investment program was no more than one-fourth and a good part of it was for the construction of the Aswan High Dam.[1] It followed that the agricultural sector grew at a rate around 3 to 3.5 percent during the last decade. This indicates that other sectors of the economy should have grown at a rate from 7 to 8 percent.

All the previous figures on national income refer to gross national product. It is realized that the private disposable gross income may be more relevant when projecting demand is concerned, however, the difference between the two

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[1]National Bank of Egypt, "Egypt's Economic Growth, 1952-1963", Economic Bulletin, Vol. 17, No. 1, 1964, p. 50.

terms is the total public net income, which grew nearly proportionately with the GNP,[1] this means that the previous rates can still be valid for disposable income.

It is not quite true that the rural income coincides with the agricultural income, a part of the income drawn from the agricultural activities goes to non-rural residents and vice versa. Of the estimated labor force of 7.8 millions in 1960, 4.4 millions or about 56 percent were involved in agriculture or related activities. It is thus a reasonable approximation that during the plan years the annual rate of increase in income in rural areas was about 3.5 to 4 percent, while in urban areas was about 7 to 8 percent.

In arriving at consumption projections it was assumed that these rates would be sustained up to 1975, namely about 4 percent for rural areas and 8 percent for urban areas. For 1985 projections a rate of 4.5 percent in rural areas and 8.5 percent in urban areas was used. Considering the trend of the agricultural sector's share in national income over the past, these rates would imply a growth rate of national income of 6.5 percent over the period 1964-1975 and of about 7 percent over the period 1964-1985.

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[1]This is true for a long series of data with the exception of few years in the early sixties, as a result of the major structural changes in the economy. See Chapter II, sec. 2.4.

6.4 Consumption Projections

In projecting consumption, three basic variables are involved: (1) rate of growth in per capita income, (2) the rate of population growth, and (3) income elasticity of demand. The relationships between these variables and food consumption were expressed mathematically by Ohkawa[1] as follows:

$$d = p + gn + pgn$$

where

d = percentage change in national demand for food in a given period

p = percentage change in population

g = percentage change in per capita income

n = income elasticity of demand

Ohkawa dropped in the last term of the formulation Pgn reasoning that it is of small importance.

Using this formula to estimate the percentage change in demand does not require knowledge of the actual per capita income or the actual size of the population either in the base year or in the target year. If the compound rate of growth for each is known, the percentage chan be derived by applying

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[1]As cited by Robert Stevens, Elasticity of Food Consumption Associated with Changes in Income in Developing Countries, op. cit., p. 4.

the compound rate formula

From $Yn = Y_o (1+r)^n$

where Yn is the size of the population or income in the target year, Y_o the size of the population or income in the base year, n the number of years between the two dates, and r the compound rate of growth, it follows that

$$\frac{Yn - Yo}{Yo} = (1 - r)^n - 1$$

In projecting the percentage change in national demand for food products, the study faces a difficult choice:

(1) to estimate the percentage change in demand for the country as a whole using weighted elasticity coefficients for rural and urban areas. In so doing one might question the accuracy of the weighting procedure under the apparent dynamic condition. In declining percentage of rural population has already been discussed and assumed to continue though at a slower rate.

(2) to estimate the percentage change in demand for urban and rural areas separately using the appropriate rates of change in population and per capita income, and thus arrive at the volume of total demand in the target year. This procedure would have been preferred had information been available on the actual consumption

level in both areas in the base year. The figures are available on national level, and any attempt to break them down would at best be some kind of judgment.

None of the two paths is absolutely unerring. However, the problem involved in estimating the national consumption is the expected decline in the percentage of rural population from about 60 percent in the base year to an estimated percentage of about 54 in 1985. The difference, over a period of 21 years would not be of a substantial size that makes for a significant change in the weighted elasticity coefficients, and therefore can be disregarded. This can further be justified that though rural laborers migrate to cities and urban centers, it is doubted that their consumption behavior and decisions would drastically change. It is most probable that they keep their rural consumption patterns under slum living condition at least for an adjustment period.[1]

The percentage change in population was calculated based on population projections under the first two assumptions. These percentages are shown in Table 43.

From the projected compound rates of change in national income, the implied rate of change in per capita income can

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[1]Arthur Lewis, "Unemployment in Developing Country", Lecture to Midwest Research Conference, USA, Oct. 1964.

be calculated based on population projections. Therefore, the percentage change in per capita income can be estimated throughout the projection period.

The estimates of total expenditure elasticity of demand calculated in Chapter IV using the logarithmic model were utilized. Elasticities used in projecting the demand for commodity groups (in money terms based on 1964 prices); are expenditure elasticities, while those used in projecting the demand for selected individual products are quantity elasticities.

In projecting the demand for wheat and maize, the study faces a difficult choice. These two products are demanded by the consumers in several forms: whole grain, flour, and bread. The last two forms are basically mixtures of several products as discussed earlier in Chapter IV.

Three possible alternatives can be explored in order to project the aggregate demand for the two products:

(1) Project the demand for each form of the two products separately, then add them up after being converted to uniform units. This would be valid if the interrelationships between these different forms remain constant over the projection period. These projections, however, require knowledge of the level of consumption of each form separately in the base year and its elasticity coefficient. These data are unfortunately not available.

(2) Convert all forms of consumption of each product to the grain form, and utilize an "adjusted" income elasticity for each product to project its aggregate demand. However, we lack a solid base to adjust the whole grain elasticity for the two products due to the complex relations that exist in the consumption patterns of the two products.

(3) Project the demand for wheat and mazie indirectly. This is done by projecting the increase in demand for cereals and starches as a group. Subtract from it the projected increase in demand in rice and millet for which separate projections could be made. The rest, as was shown earlier in Table 29, is largely wheat and maize in different forms. This procedure was chosen.[1]

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[1]The calculations were performed as follows:

(1) Projections were made for the percentage increased in total expenditures for cereals and starches using the projections of population and income growth together with the estimate for elasticity of demand for the group.

(2) Separate quantity projections were made for rice and millet, which were then multiplied by the base year prices of the two products. These total values were then subtracted from the projected total expenditures for cereals and starches.

(3) Assuming that the proportion of wheat to maize in the diet will change slightly in favor of wheat in the target years. It was assumed that wheat's share will increase from 51 percent in 1964 to 60 percent in 1975 and to 65 percent in 1985.

For commodity groups the highest projected increase in demand was for fruit (about 100 percent increase is projected for 1975 and about 260 percent for 1985). High rates of increase were also projected for meat, fish and eggs; milk and dairy products; tea, coffee and other stimulants. The lowest projected rates were for cereals and starches; dried legumes; and oils and fats. The three groups have a projected percentage of increase of around 55 percent for 1975 and around 130 percent for 1985.

The percentage increase in demand for selected commodities are projected for 1975 and 1985 under the two population hypotheses.[1]

High increases were projected for poultry, eggs, milk, citrus, meat, and to some extent potatoes.[2] The lowest projection was for millet, mainly because of its negative income elasticity of demand. Wheat was projected to increase by about 100 percent by 1975 and 220 percent by 1985. Rice was projected to increase at a slower rate. Other products show reasonable increase between 50-60 percent for 1975 and 100-125 percent for 1985.

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[1]Namely hypothesis I and hypothesis II as were defined in section 6.2.

[2]The high rise in the demand for potatoes is mainly due to the high income elasticity of demand for that product in rural areas.

Table 43. Projected Population in 1975 and 1985 and the Percentage Change from 1964 (Base year)

Year	Assumption*	Population	Percentage Change from Base Year
		million	percent
1964		28.6	
1975	I	39.7	38.8
	II	38.5	34.6
1985	I	52.5	83.6
	II	48.3	68.9

*See Section 6.2

Source: Calculated based on: UAR Central Statistical Committee, op. cit.

Table 44. Projected Annual Rate of Growth in National and Per Capita Income, and Percentage Increase in Per Capita Income, 1964-1975 and 1964-1985 (Base Year: 1964)

	Population Projection Assumption	1964-1975	1964-1985
Compound annual rate of growth in national income		6.5	7.0
Implied annual rate of growth in per capita income	I	3.7	4.2
	II	3.8	4.5
Percentage increase in per capita income	I	48.8	136.4
	II	50.3	151.3

Table 45. Percentage Change in Demand for Commodity Groups from 1964 to 1975 and 1985

Target Year:	1975		1985	
Population assumption:	I	II	I	II
Cereals and starches	53	49	123	113
Dried legumes	60	56	142	133
Meat, fish, and eggs	87	84	219	219
Oils and fats	52	52	131	121
Milk and dairy products	81	78	202	200
Vegetables	67	64	164	158
Fruit	101	98	257	261
Sugar and sugaries	72	69	177	173
Beverages	73	70	180	175
Tea, coffee, and other stimulants	86	84	217	216
Other food stuff	62	58	148	140
Total food	71	68	175	170

Table 46. Consumption Expenditures Projections for Commodity Groups in 1975 and 1985 as Compared to Their 1964 Level

Years	1964/1965		1975		1985	
			Assumption			
Commodity groups	Per capita weighted average	Total	I	II	I	II
	L.E.		--L.E. thousands--			
Cereals and starches	6.78	191,196	292,530	284,882	426,367	407,247
Dried legumes	1.13	31,865	50,986	49,711	77,116	74,248
Meat, fish & eggs	6.97	196,554	367,556	361,659	627,007	627,007
Oils and fats	1.38	38,916	60,709	59,152	89,896	86,004
Milk & dairy prod.	3.24	91,368	165,376	162,635	275,931	274,104
Vegetables	2.70	76,140	127,154	124,870	201,010	196,441
Fruit	1.31	36,942	74,253	73,145	131,883	133,360
Sugar & sugaries	1.77	49,914	85,852	84,355	138,262	163,265
Beverages	2.72	76,704	132,698	130,397	214,771	210,936
Tea, coffee & others	3.23	91.086	169,420	167,598	288,743	287,932
Other food stuff	3.13	88,266	142,991	139,460	218,900	211,838
Total food	34,36	968,952	1,669,525	1,637,864	2,689,886	2,645,282

Source: For 1964/65 figures, calculated from: U.A.R. Administration of Public Mobilization, The Preliminary Results of the Household Budget Survey of 1965, April 1967. (Arabic).

Table 47. Percentage Change in Demand for Selected Commodities from 1964 to 1975 and 1985

Target Year:	1975		1985	
Population assumption:	I	II	I	II
Wheat	111	105	229	217
Maize	42	41	85	78
Millet	23	18	40	20
Rice	67	64	153	156
Beans	58	54	136	127
Lentils	49	45	103	101
Meat	76	73	189	186
Poultry	125	123	324	335
Fresh fish	71	67	173	168
Eggs	99	97	252	256
Oils	47	43	108	96
Saturated oils	72	69	176	171
Milk	106	104	273	279
Potatoes	75	72	185	181
Onions	42	38	94	80
Citrus	102	100	261	266
Dates	59	56	141	133
Sugar	56	52	131	121

Table 48. Consumption Projections of Selected Commodities in 1975 and 1985 as Compared to Their 1964 level (in thousands of metric tons)

Year and population assumption	1964	1975		1985	
		I	II	I	II
Wheat	1880	3968	3862	6201	5958
Maize	1806	2644	2574	3343	3212
Millet	614	755	724	859	737
Rice	889	1485	1458	2338	2275
Beans	162	256	249	382	368
Lentils	22	33	32	47	44
Meat	227	399	393	656	649
Poultry	69	155	154	292	300
Fresh fish	139	238	232	379	372
Eggs	36	72	71	127	128
Oils	167	259	252	366	345
Saturated oils	30	51	51	83	81
Milk	1278	2633	2607	4767	4844
Potatoes	241	422	414	687	677
Onions	366	520	505	710	659
Citrus	274	553	548	989	1003
Dates	239	380	373	576	557
Sugar	402	627	611	929	888

Source: For 1964 consumption figures, UAR Ministry of Agriculture, "Food Balance Sheet, 1964", Monthly Bulletin of Agricultural Economics and Statistics, July 1965.

Table 49. Percentage Distribution of Annual Total Expenditures on Food Products in 1958/59, 1964/65, 1975 Projections and 1985 Projections

Commodity groups	1958/59[2]	1964/65[2]	1975 projections		1985 projections	
			I	II	I	II
Cereals & starches	34.5	21.8	19.5	19.4	17.7	17.3
Dried legumes	3.4	3.6	3.4	3.4	3.2	3.2
Meat, fish & eggs	19.2	22.4	24.5	24.6	26.1	26.6
Oils & fats	3.1	4.4	4.1	4.0	3.7	3.6
Milk & dairy products	12.7	10.4	11.0	11.1	11.5	11.6
Vegetables	6.3	8.7	8.5	8.5	8.5	8.3
Fruit	4.7	4.2	4.9	5.0	5.5	5.7
Sugar & sugaries	6.4	5.7	5.7	5.7	5.8	5.8
Beverages	3.9	8.7	8.8	8.8	8.9	8.9
Other food stuff[1]	6.8	10.1	9.6	9.5	9.1	9.0
Total	100	100	100	100	100	100

[1]Excludes tea, coffee, liquor and other stimulants.

[2]Weighted average for rural and urban areas.

Source: 1958/59 figures: Table 17 Ch. IV.
1964/65, 1975, and 1985: Calculated from Table 49.

Table 50. Projected Per Capita Consumption of Selected Commodities in 1975 and 1985 as Compared to Their 1964 level (in kilograms)

Year and population assumption	1964	1975		1985	
		I	II	I	II
Wheat	66.7	99.9	100.3	118.7	123.3
Maize	64.0	66.6	66.8	64.0	66.5
Millet	21.8	19.0	18.8	16.4	15.2
Rice	31.5	37.4	37.9	44.5	47.1
Beans	5.7	6.4	6.5	7.3	7.6
Lentils	1.1	.9	.8	.9	.9
Meat	8.0	10.0	10.2	12.5	13.4
Poultry	2.4	3.9	4.0	5.5	6.2
Fresh fish	4.9	6.0	6.0	7.2	7.7
Eggs	1.3	1.8	1.8	2.4	2.6
Oils	5.7	6.5	6.5	6.9	7.1
Saturated oils	1.1	1.3	1.3	1.6	1.7
Milk	45.4	66.3	67.7	90.8	100.3
Potatoes	8.5	10.6	10.7	13.1	14.5
Onions	13.0	13.1	13.1	1.35	13.6
Citrus	9.4	13.9	13.2	18.8	20.8
Dates	9.4	13.9	14.2	18.8	20.8
Dates	8.5	9.6	9.7	11.0	11.5
Sugar	14.2	15.8	15.9	17.7	18.4

Source: Calculated from Table 48.

These projections assumed no major changes in relative prices not only for domestically produced products but also for imports and exports as well. These prices, are subject to world supply and demand and also other exogenous factors, and their stability depends to a great extent on the stability and direction of movement of these factors. Aside from these economic factors, the Egyptian market is influenced by political considerations. Under such conditions, the country may decide or be obligated to shift from one course of action to another. These frequent moves might imply a revision of the whole cost structure of the production sector.[1] The main point is that changes in relative prices or other politically inspired changes are likely to occur and their frequency is higher than in other countries with a relatively stable market economy.

6.5 Detailed Results for Food Commodities

The projections made earlier in this study were based on the assumption of stable relative prices. How valid was this assumption and how valid are the projections themselves?

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[1] An example is the drastic change in cost structure as a result of the U.S. Government decision to stop its sales of surplus food products to Egypt under P.L. 480 at mid 1967.

The Egyptian agricultural policy is incorporated in, and is, an integral part of the country's overall plan to double the gross national product within the present decade. The basic aim of this policy is to increase the degree of self-sufficiency. In view of the rapidly growing demand for food, price and production policies of food products and the direction of trade policies need to be re-evaluated.

Without introducing any exogeneous factors, there are certainly factors that would affect the projections from within. This increase in demand has to be fulfilled by a corresponding increase in local production, in imports, or some combination of the two. Unless this is done, excess demand is more likely to put pressure on prices. Whether the government policies would allow the price mechanism to function for all products is yet to be seen.

The present section examines the implications of such structural changes of demand, and discusses the future prospects of the Egyptian food economy.[1]

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[1]Source of information on production levels: U.A.R. Ministry of Agriculture, The Monthly Bulletin of Agricultural Economics and Statistics, Several issues.

6.5.1 Grains

In this group, wheat and rice were projected to have the highest increase in demand. Wheat would increase by some 90 percent of its 1964 level in 1975, and by about 200 percent by 1985. This implies that wheat consumption levels would increase from its 1964 level of 1.9 million tons to some 3.6 and 5.6 million tons in 1975 and 1985, respectively. These figures refer to the demand at the consumers' level. When converted to the farm level, using the same rates of extractions, loss, and other uses, as in 1964, we end up with about 4.1 million tons of wheat in 1975 and 6.8 million tons for 1985.

Average wheat production for 1960-1964 was about 1.5 million tons. If local production continues to grow at the same rate of growth as it was during the last two decades, large imports are required in order to fulfill the projected increase in demand. It has been argued that wheat productivity in Egypt can be increased by as much as 140 percent if a proper "package approach" of techniques, varieties, improved drainage, was applied.[1] However, a more likely path is an

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[1]See: Bushra Abdel-Sayed, "The Potential Use of Fertilizers for Intensification and Development of Agriculture in the United Arab Republic", Ph. D. Thesis, Michigan State University, 1969.

increase in the administered prices by as much as 40-50 percent, which would lower the volume of demand by about 25 to 30 percent. If the local wheat production follow the present trend, it will reach a level between 1.8 and 2.0 million tons by 1975, and this would leave about one to one and half million tons to be imported by that year. Wheat competes with cotton in the crop rotation, and farmers are required, by law, to plant one-third of their total crop acreage to wheat each year. If over the next two or three decades, world cotton prices declined drastically, wheat may be grown instead. If that happens, agricultural and national incomes in Egypt will be affected and the whole demand structure would change.

Demand for maize shows an increase of about 60 and 100 percent in 1975 and 1985, respectively. Taken by itself, local production is capable of fulfilling that demand particularly with the recent trend of increasing productivity. The average yield per feddan of maize has increased from .92 ton in 1954 to 1.17 tons in 1964, or some 25 percent within ten years. Yet, there is a great potential of increasing productivity by introducing hybrids and proper fertilization. It is feasible to double the average yield per feddan in two decades period. If this can be realized it would be of paramount importance for: (1) substituting wheat, to certain

extent, particularly in rural areas, and (2) increasing livestock production.

It should be emphasized here that the projections of both wheat and maize were made indirectly as described earlier in Chapter VI. The ratio of wheat to maize in the national diet in the target years was arbitrarly estimated.

Millet demand was projected to show the lowest increase. The projected demand in 1975 and 1985 can be easily fulfilled.

The demand for rice was projected to increase by about 65 percent in 1975 and by 160 percent in 1985, reaching a volume of about 1.5 and 2.3 million tons, respectively. Local production, with a level of more than two million tons in 1964, is expected to increase after the completion of the Aswan High Dam to a level as high as 3 million tons.[1] However, rice is a major export commodity, and it is the country's policy to give priority to the foreign demand. Rice exports fluctuates around an average of half million ton a year and have a good market potential.

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[1]The Aswan High Dam Reservoir of water would make it possible to expand rice acreage to around 1.2 million feddans. See: M. El-Kateb, "Agriculture Production after the High Dam", in U.A.R. Ministry of Agriculture, The Monthly Bulletin of Agricultural Economics and Statistics, Vol. 16, Dec. 1965, pp. 97-118.

6.5.2 Meat and Poultry

Meat was projected to increase over its 1964 level by about 75 percent in 1975 and by about 187 percent in 1985, reaching about 400 and 650 tons, respectively. Of the 227,000 tons of different types of meat consumed in 1964, 30,000 tons were imported to supplement local production. In recent years, the country has experienced severe shortages in meat to the extent that the government, after a long, unsuccessful experience in controlling meat prices, finally admitted that the price mechanism should function to clear the market. Certain days only were allowed for selling meat in an effort to surpress demand in a country where day-to-day shopping is the common practice.

1964 figures show a total population of livestock of about 1.6 million head of cattle, 1.5 million head of buffaloes, 1.7 million head of sheep, and about one million goats. Camels total about 200,000 and pigs around 19,000. Large numbers of cattle, sheep, and in some years camels are imported mainly for slaughtering purposes from Libya and Sudan.

Forage production in Egypt is a limiting factor in expanding the livestock population. Bersim (Egyptian clover) is the only forage crop grown in the country. However, possible imporvement lies in replacing native cattle which

has no distinct breed by adapted highly productive breeds. If livestock production is to rise, better and well balanced rations must be made available. The problem is that livestock has been always regarded as a by-product, or at least given a second priority after crop production, and this in turn, has resulted in meat shortages in the past few years.

Poultry consumption was projected to show the highest increase of about 125 percent from its 1964 level in 1975, and more than 325 percent in 1985. This increase is mainly attributed to the high income elasticity of demand and implies a projected consumption level of about 150,000 tons for 1975 and about 300,000 tons for 1985. Though large amounts of slaughtered chicken imports were received during the late 1960's from the U.S. under P.L. 480, it is believed that these imports were a by-product of the whole P.L. 480 package. The local production in 1964 made up more than 98 percent of national consumption of poultry. However, it is doubtful that local production can be more than doubled by 1975 and tripled by 1985. More likely, prices would increase by as much as 40-80 percent by 1975, which would reduce demand by as much as 50 to 100 percent from its projected level of 1975, in view of the high price elasticity. If this happens, the demand would be at a more manageable level. For 1985, it is hard to predict a certain path. In such a period, long

enough to give more attention to poultry production and to substantially increase it, it is more likely that production would increase partly in response to higher prices (if left uncontrolled), or that some combination of local production and imports may fulfill consumption requirements.

At any rate, meat and poultry situation is expected to be critical in the future for three reasons:

(1) the high income elasticity of demand for these products;

(2) the present shortages, particularly in meat;

(3) the low level of animal protein in the national diet, and the need to improve its proportion if the diet is to be balanced.

6.5.3 Fish

Consumption of fresh fish is expected to increase by as much as 70 percent in 1975 and around 170 percent in 1985. Yet, this increase is not an alarming one for a country with a long coast of more than 1,500 miles on the Mediterranean to the north and the Red Sea to the east, more than 26,000 miles of the river Nile and its connected network of canals, and the huge lakes of Manzala, Borolus, Mariut, Idko, and Qarun.

Navigation is possible all year round. Fish production which totalled around 155,000 tons in 1963,[1] can be tripled if sufficient investment is directed to provide modern fishing equipment. A great potential lies in this area and its expansion would release some pressure on meat and poultry, and help in balancing present diets.

6.5.4 Milk and Eggs

Milk and eggs are associated with livestock production. Demand for milk is expected to double its 1964 level by 1975 and to triple it by 1985. Unless production and marketing facilities improve significantly, milk is likely to be in short supply. Prices have risen in the past few years and such a trend is likely to continue. Milk yields at the present time are very low, between 1,000 and 3,000 lbs. per year.

Demand for eggs was projected to increase almost 100 percent by 1975 and around 250 percent by 1985. Egg prices have increased and would continue to increase unless poultry production is given prompt attention. The present average egg production is small, between 100-120 eggs per year per hen.

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[1] Ibid., Dec. 1965, p. 95.

With the exception of two native breeds the majority of chickens in the country can scarcely be recognized as a particular breed.

For both milk and eggs, it is difficult to predict future trends. However, few points seem to be in order:

(1) Introduction of improved livestock and poultry breeds are bound to raise productivity to a great extent. Several livestock breeds, mainly the Holstein-Freisian and Herford have been introduced as specialized milk and meat cattle, respectively. Also imported standard chicken breeds are now being raised in massive numbers on experimental farms for breeding and crossing purposes.

(2) Expansion in maize production would increase livestock production substantially, as the availability of year-round forage crops is a major limitation on expanding livestock production.

(3) Pricing policies of the past have had a discouraging effect on production. Indeed, under the unrealistic price controls, farmers lacked the incentive to pay much attention to milk and eggs and other products with unfavorable cost-price relationships.

(4) Particularly for milk and eggs, refrigeration and other improved marketing facilities are of a vital importance.

6.5.5 Potatoes and Onions

These two products have two common characteristics, (1) both are major export products, and, (2) their projected increase in demand seem to be reasonable. Domestic production can certainly fulfill the projected increase in the demand for both of them if the price and cost relationships for each of them remain constant.

The choice, therefore, would be between the export market and the domestic market, and would depend to a great extent on the relative prices between the two markets.

6.5.6 Citrus and Other Fruits

A substantial increase in the demand for citrus and most likely for other fruits seems to be a natural course, in the light of its high income elasticity.

A rapid expansion of about 60 percent in fruit acreage, particularly citrus, was made during the past decade. This expansion made it possible for sizable quantities of citrus to be exported annually. This acreage increase will be reflected in a continued expansion in production in the coming decade as new orchards reach their full production stage.

Citrus production in 1964 was about 475,000 tons, and is expected to reach more than 600,000 tons by 1975. However, it is again the choice between exports or domestic consumption depending on the foreign markets' capacity and prices in relation to local markets, that would determine the future path for fruit consumption.

6.5.7 Oils and Saturated Oils

Oilseed production in Egypt centers mainly around cotton-seed and to some extent peanuts and flax. In the last few years, local production, which is a by-product of cotton industry, fell short of consumption requirements. Increased quantities of either processed oils or cottonseeds were imported. In view of the projected increase in the demand for oils by about 50 percent in 1975 and about 100 percent in 1985, imports must continue at an increasing rate. These projections may underestimate the actual demand as oils and saturated oils may substitute for butter and ghee if their prices rise significantly, which is likely to happen.

CHAPTER VII

SUMMARY AND CONCLUDING REMARKS

This study has focused on estimating parameters determining the demand for food in Egypt. These estimates were used, along with estimates for the annual rate of growth in GNP and the projected rates of population growth, to estimate the aggregate demand for food products in 1975 and 1985. To accomplish this, several types of data, cross-sectional and time-series, were utilized, and more than one model of analysis was introduced. However, it should be emphasized that, in a sense, the study was one-sided as it focused on the demand side of the food problem. Little attempt was made to analyze supply or to project it.

In the cross-sectional analysis, which was based on the published data of the household budget survey of 1958/59, the demand for food was assumed to depend on income, size of the household, and location. Three alternative functional forms were considered: (1) logarithmic, (2) semi-logarithmic, and (3) log-inverse. Of these three functions, the logarithmic relationship seemed to provide the best fit. The results drawn from it were utilized in projecting demand.

Throughout the cross-sectional analysis, estimates for income elasticity of demand for food groups and individual food items were calculated for both urban and rural areas, and a weighted average was introduced to provide an estimate for the entire population.

The results of the cross-sectional analysis has indicated that two-thirds of the total expenditures in rural areas were spent on food and beverages, compared to about one-half in urban areas. Using Lorenz curves, total expenditures and food expenditures were shown to be more equally distributed in rural areas than in urban areas. Two explanations were offered in this connection: First, that qualities and therefore prices paid differ much more in urban areas, and second, that incomes, occupations, social status, and tastes vary greatly in urban areas.

The income elasticity of demand for food in Egypt was not as high as results from other countries' data suggested. The .67 elasticity coefficient for Egypt is intermediate rather than high in comparison with estimates for other countries (Table 51).

The relations between quantity and expenditure elasticity figures were as expected, expenditure elasticities being higher than quantity elasticities.

Table 51. Estimates of the Income Elasticity of Demand for Food in Several Countries[1]

Country	Date of estimate	Income Elasticity
United States[2]	1955	.25
Japan[2]	1955-56	.52
Italy[3]	1952-53	.62
Panama[2]	1952-53	.63
Egypt[4]	1960	.67
Greece[2]	1957-58	.70
Yugoslavia[2]	1955	.72
Brazil[3]	1953	.79
Libya[3]	1950	.80
Puerto Rico[2]	1952	.80
Ghana[2]	1954-55	.81
Ceylon[3]	1953	.81
India, Punjab[3]	1950	.81

[1]All these estimates were derived from budget analysis studies.

[2]Robert Stevens, Elasticity of Food Consumption Associated With Changes in Income in Developing Countries, op. cit., p. 16.

[3]H. S. Houthakker, "An International Comparison of Households' Expenditure Patterns", Econometrica, Vol. 25, Oct. 1957, pp. 532-51.

[4]Weighted average for rural and urban areas, see Ch. IV.

High income elasticities for home-produced wheat, maize, and millet induced a detailed discussion of grain consumption patterns. This, in turn, resulted in the use of an indirect method to project the demand for wheat and maize.

Although household size was expected to be an important factor in the demand for food, its significance failed to materialize when the effect of the household type, based on its size, was tested by the analysis of variance procedure. However, when the number of consumption units was included in the regression analysis, this variable produced a coefficient with a value that differed significantly from zero.

Two methods were used for estimating price parameters. A combined model utilizing cross-sectional and time-series data was applied to six products for which sufficient time-series data were available. For other products, a newer mathematical approach based on several assumptions about the relationship between income elasticities and price elasticities was utilized. The results of the combined model were not very satisfactory in terms of statistical significance. However, the mathematical model produced fairly reasonable results suggesting that further exploration of the technique might prove to be of a considerable value.

Projections of food demand were undertaken in the usual manner. Two population projections were utilized based on different assumptions about fertility rates.[1] Rates of growth in per capita income were estimated.[2] Using these rates, together with the income elasticity coefficients obtained in this study, demand projections were made for 1975 and 1985 for commodity groups and individual food items.

Turning to the estimated percentage increase in total demand for commodity groups, it was shown that the highest projected increases were for fruit (about 100 percent in 1975 and 260 percent in 1985); meat, fish, and eggs (85 and 200 percent); milk and dairy products (80 and 200 percent); and tea, coffee, and other stimulants (85 and 216 percent). The lowest projected increases were for cereals and starches; dried legumes; and oils and fats. The last three groups were projected to increase by about 55 percent in 1975 and about 130 percent in 1985. This, however, still implies a very high increase in the demand for these products.

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[1]The two projections imply a compound annual rate of growth of about 2.8 and 2.5, respectively.

[2]These rates depend on the chosen population projection. They range from 3.7 to 4.5 per year.

When these projections were made on per capita basis, an increase in most items was observed. It should be emphasized, however, that a part of this increase would be absorbed in a shift to higher quality products rather than higher quantities as per capita income rises.

The study has shown that rather large increases in the demand for food products are to be expected. This demand has to be fulfilled through increasing food production, increasing food imports, or some combination of the two. Prospects for increasing productivity seem best for certain crops such as maize, vegetables, fruit, oil crops, sugar cane, and livestock products. There is little doubt that increased productivity can greatly aid in solving the food problem for one generation. Yet, it is hard to see how it could do so for a population that will almost double in about twenty-five years. The only feasible path, given the present state of technology, seems to be a drastic effort to decrease the rate of population growth.

The findings of this study raise questions about the extent to which the nation would be able to provide its food supplies, and also the question of trade policy with regard to food products. It has been often argued that Egypt should stop producing wheat, and concentrate her land and water resources in products for which she has greater comparative

advantage such as cotton, rice, oil crops, as well as sugar and vegetables.[1] This would imply greater dependence on trade, but if imports were matched by exports of other crops with higher value, there should be no cause for concern. However, for sounder decisions to be made in the area of trade policy, more analytical studies are needed particularly for grains for which shortages seem to be alarming.

Finally, it should be mentioned that in several stages of this study, insufficient or unreliable data set a limit on pursuing the analysis in the desired directions. However, it is hoped that in the future, when sufficient data become available, it may be possible to re-evaluate the results of this study, and examine the impact of time trend, economic, social, and institutional factors on food consumption patterns. The present writer, at least, would hope to do so.

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[1]See: W. F. Owen, "Land and Water Use in the Egyptian High Dam Era", Land Economics, Vol. XL, August 1964, pp. 227-93.

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APPENDICES

Appendix A

SOME CONSIDERATIONS IN COMBINING CROSS-SECTIONAL AND TIME-SERIES DATA IN A SINGLE MODEL

In a demand function the two major sets of parameters, namely, the price parameters and the income parameters, can be obtained jointly from a set of time series data. Though it can be argued that there is a tendency to estimate short-run parameters from time-series samples, and long-run parameters from cross-sections, this need not be true in all cases. Nevertheless, there are serious reasons that suggest the pooling of the two types of samples. These reasons include:[1]

(1) multicollinearity.

(2) the effects of income distribution.

(3) the problem of identification.

(4) the least square bias.

Furthermore, it is apparent that the pooling technique will enable us to get in close contact with the decision-making unit, the household, at the microeconomic level through the cross-section sample, and also to look over the aggregates at the macro-economic level through a set of time-series data.

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[1]For an explanation of these mathematical terms, see: Lawrence R. Klein, op. cit., pp. 62-69.

A simple formulation of the standard technique in pooling the two types of data can be presented as follows: An estimate of income elasticity is to be obtained from cross-sectional data, where other variables such as location, size of families, are considered. This estimate is to be substituted directly or after certain adjustments in the time-series model, such as the following single-equation model:

$$\log Q_t = B_o + B_1 \log P_t + B_2 \log Y_t$$

where Q is the quantity consumed, P the price, and Y the income. log Q can be adjusted to the income estimates by taking:

$$\log Q'_t = \log Q_t - B'_2 \log Y_t$$

and thus estimating the relation:

$$\log Q'_t = B_o + B_1 \log P_t$$

The practice of combining the two sets of information has been applied in a number of studies in the last few years. Hildreth[1] emphasized the idea of pooling time-series and cross-sections in his two unpublished papers. Sparks used one of the several statistical models suggested by Hildreth to combine the two types of data in his study to estimate the demand for food from consumer panel data. His combined analysis estimates a

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[1] Clifford Hildreth, "Preliminary Considerations Regarding Time Series and/or Cross Section Studies", Cowles Commission Discussion Paper, No. 333, July 1949. (unpublished). and; "Combining Cross-Section Data and Time-Series Data", Cowles Commission Discussion Paper, No. 347, May 1950, (unpublished).

parameter for each family that is constant over time but varies among families. He viewed these parameters as measuring "the effect of unobservable characteristics that were particular to a family over time". When these family constants were estimated, the coefficient of determination was thirty-five percent greater than the coefficient obtained from the relationship that did not estimate these constants.[1]

Stone[2] used the pooling technique in estimating the demand for a large number of food products in the United Kingdom. He estimated the income elasticity from the Engel curves and substituted it directly in a single equation model. In estimating income elasticity from cross-sectional information, he took the family size (expressed in equivalent adult scale) and social class as separate variables.

Another example of the utilization of the pooling technique can be found in Hoch's estimation of production function parameters,[3] which is based on Hildreth's unpublished papaers. He suggested a pooling procedure by combining a cross-sectional sample, and data of a set of firms over a period of years, and using the analysis of covariance which is a generalized regression procedure utilizing aspects of the analysis of variance.

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[1]Willard R. Sparks, "Estimates of the Demand for Food from Consumer Panel Data", Ph.D. Thesis, Michigan State University, 1961.

[2]Richard Stone (and others), op. cit.

[3]Irving Hoch, "Estimates of Production Function Parameters Combining Time-series, and Cross-Section Data", Econometrica, Vol. 30, January 1962, pp. 34-53.

When combined data are used, it usually allows a wide choice of models available to the investigator. But other problems arise that are not generally encountered when either type of data is used separately. Among these problems is the selection of variables in making cross-sectional estimates of income elasticity. In addition to the family's income and size, region, occupation, education, price expectations, and other variables may be important. The inclusion of such variables usually adds a burden of additional analysis. A second problem is the implied assumption of constant elasticity between households and over time which is hard to substantiate but, nevertheless, should be made. Other problems include the assumptions of homoscedasticity and of serial correlation.

Further, though the equations of a logarithmic model are expressed as linear in logarithms, there is a problem of aggregation involved, as the log of a sum is not equal to the sum of the logs. Most values in the time series part of the pooling are sums. If we assume that prices are the same in a certain time period for all consumers, which is hard to substantiate, income cannot be the same, and certain assumptions have to be made with regard to income distribution in the time series data. Further investigations may encounter other aggregation problems and may eventually lead to improved aggregation theories and procedures.

TABLE B 1.--Annual and per capita incomes and investment, in current prices and in constant 1959/60 prices.

Year	National income		Per capita income		Investment	
	in current prices	in constant prices	in current prices	in constant prices	in current prices	in constant prices
	L. E. million		. . . . L. E.		L. E. million	
1952/53	806	949	37.1	43.7	118.6	139.6
1953/54	847	1026	38.1	46.2	132.4	160.4
1954/55	920	1096	40.1	48.0	146.2	174.1
1955/56	965	1037	41.4	44.5	172.1	184.9
1956/57	1076	1057	44.6	44.2	151.0	149.6
1957/58	1126	1129	46.2	46.3	165.4	165.8
1958/59	1157	1160	46.3	46.4	181.4	181.8
1959/60	1285	1285	50.1	50.1	171.4	174.1
1960/61	1389	1364	52.9	52.1	225.6	221.9
1961/62	1422	1412	52.8	52.5	251.2	249.4
1962/63	1537	1533	55.6	55.4	299.6	298.9
1963/64	1719	1648	61.3	57.9	372.4	357.0
1964/65	1905	1762	64.3	59.5	365.0	337.6

Source: Calculated from: Central Agency of Public Mobilization and Statistics, Statistical Indicators, 1952-1964 (Cairo: 1965), pp. 31-37.

TABLE B 2.--Indices of national income, per capita income and investment in current prices and in constant 1959/60 prices--1959/60 = 100.

Year	National income		Per capita income		Investment	
	in current prices	in constant prices	in current prices	in constant prices	in current prices	in constant prices
1952/53	62.7	73.8	73.9	87.1	69.2	81.5
1953/54	65.9	79.8	75.9	92.0	77.2	93.6
1954/55	71.6	85.3	80.3	95.6	85.3	101.6
1955/56	75.1	80.7	82.5	88.7	100.4	107.9
1956/57	83.0	82.3	88.8	88.1	88.1	87.3
1957/58	87.6	87.9	92.0	92.2	96.5	96.7
1958/59	77.8	90.3	92.2	92.4	105.8	106.1
1959/60	100.0	100.0	100.0	100.0	100.0	100.0
1960/61	108.5	106.1	105.6	104.8	146.6	145.5
1961/62	110.7	109.9	105.4	104.8	146.6	145.5
1962/63	119.6	119.3	111.0	110.6	174.8	174.4
1963/64	133.8	128.2	122.4	115.6	217.3	208.3
1964/65	148.2	137.1	128.4	118.8	213.0	197.0

Source: Calculated from Table B 1.

TABLE B 3.--National income by sectors, 1959/60 to 1964/65 in constant 1959/60 prices.

Sectors	1959/60	1960/61	1961/62	1962/63	1963/64	1964/65
	. . . . . L. E. million					
Agriculture	405	403	373	426	453	470
Manufacture and electricity	266	298	326	348	388	414
Construction	47	44	74	84	96	93
Transport	93	102	117	127	144	152
Housing	73	74	76	78	79	81
Trade and finance	129	145	152	154	148	162
Other services	272	298	294	316	340	390
Total	1285	1364	1412	1533	1648	1762

Source: Central Agency of Public Mobilization and Statistics, Statistical Indicators, 1952-1964 (Cairo: 1965), p. 33.

TABLE B 4.--National income indices by sectors, 1952/53 to 1964-65 (1959/60 = 100).

Sectors	1959/60	1960/61	1961/62	1962/63	1963/64	1964/65
Agriculture	100.0	99.5	92.1	105.2	111.8	116.0
Manufacture and industry	100.0	112.0	122.5	130.8	145.8	155.6
Construction	100.0	93.6	157.5	178.8	204.3	197.9
Transport	100.0	109.7	125.8	136.5	154.8	163.4
Housing	100.0	101.4	104.1	106.9	108.2	111.0
Trade and finance	100.0	112.4	117.8	119.4	114.7	125.6
Other services	100.0	109.5	108.1	116.2	125.0	143.4
Total	100.0	106.1	109.9	119.3	128.2	137.1

Source: Calculated from Table B 3.

TABLE B 5.--Average annual compound growth rates of aggregate output and its components in different periods.

Periods	Agri-culture	Industry and Electri-city	Construc-tion	Trans-port	Hous-ing	Commerce and Finance	Other Ser-vices	Gross National Product	Gross National Income
	%	%	%	%	%	%	%	%	%
1945-1951	0.0	6.4	11.3	13.5	4.5	9.4	6.1	5.0	7.9
1951-1954	0.9	3.4	-2.9	2.8	5.8	-3.5	4.8	1.4	-2.2
1953-54 to 1959-60	3.7	6.9	7.6	8.1	4.5	5.1	1.9	4.5	4.8
1959-60 to 1962-63	1.7	9.4	14.5	11.2	2.2	8.9	5.3	6.2	5.9
1945-1962	1.4	6.6	8.3	9.6	4.2	5.4	4.4	4.3	4.7

Source: Donald Mead, Growth and Structural Change in the Egyptian Economy (Homewood, Ill.: Richard Irwin, Inc., 1967), p. 46.

TABLE B 6.--Index numbers of agricultural output: major commodity groups (1953=100).

Years	Fibers	Cereals	Pulses	Oil grains	Other crops	Vegetables	Fruits	Animal products	Total food production
1935-1939	126.6	88.5	137.0	109.8	69.9	58.8	46.5	84.0	84.0
1948	124.0	94.7	131.5	108.7	88.8	88.8	61.9	105.0	96.6
1949	125.3	90.3	139.7	105.4	83.2	82.3	64.6	105.0	94.1
1950	120.3	86.7	98.6	105.4	82.5	70.6	63.7	107.6	91.6
1951	113.9	83.2	108.2	103.2	83.9	75.9	80.0	110.9	92.4
1952	141.8	77.9	109.6	127.4	88.8	95.3	96.3	102.5	91.6
1953	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1954	108.9	113.3	115.1	106.5	117.5	113.5	98.1	110.1	110.9
1955	105.1	109.7	121.9	105.4	119.6	117.6	105.1	107.6	110.1
1956	102.5	117.7	102.7	105.4	117.5	124.7	88.8	117.6	115.1
1957	127.8	115.0	121.9	121.9	125.9	131.8	106.5	117.6	117.6
1958	143.0	104.4	117.8	132.9	125.9	144.1	112.6	119.3	115.1
1959	145.6	112.4	104.1	134.0	137.1	171.8	107.0	121.8	120.2
1960	154.4	115.9	135.6	140.7	137.8	178.2	113.5	117.6	122.7
1961	109.9	105.3	76.7	95.6	133.6	187.1	103.7	120.2	114.3
1962	151.9	137.2	147.9	141.8	146.9	205.4	131.6	122.7	137.8
1963	145.6	136.3	123.3	144.0	164.3	230.6	139.5	181.5	157.1

Source: Mead, op. cit., p. 319.

TABLE B 7.--Export market value of the U. S. agricultural exports to the United Arab Republic under specified government-financed programs, 1955-1963.

Year ending June 30	P. L. 480					Mutual Security Program	All other	Total Agricultural Exports
	Title I Foreign Currency	Title II Emergency Relief	Title III Donations	Title III Barter	Total			
	thousand dollars							
1955	--	--	15,609	222	15,831	--	11,873	27,704
1956	17,057	--	11,751	7,316	36,124	5,064	14,135	55,323
1957	--	--	423	542	965	--	13,026	13,991
1958	--	--	1,190	496	1,686	--	10,572	12,258
1959	20,901	--	4,986	33	25,920	--	9,700	35,620
1960	76,796	163	6,176	314	83,449	3,935	6,531	93,911
1961	67,493	--	19,026	--	86,519	1,245	14,064	101,828
1962	126,264	16,833	15,161	2,101	160,359	1	949	161,309
1963	108,387	3,915	12,478	52	124,832	-41*	24,658	149,449
Total	416,898	20,911	86,800	11,076	535,685	10,204	104,503	650,397

*Not adjusted from previous periods.

Source: USDA, Economic Research Service, Public Law 480 and Other Economic Assistance to United Arab Republic (Egypt), ERS No. 83, June, 1964.

TABLE B 8.--Net food supply per capita (calories per day) 1948/49 to 1963/64.

Sources	1948/49	1949/50	1950/51	1951/52	1952/53	1953/54	1954/55	1955/56
Cereals	1804	1593	1662	1667	1618	1837	1840	1808
Potatoes and other starchy food	24	21	18	20	17	17	20	16
Sugar and sugaries	158	147	152	167	174	163	174	174
Pulse, seeds and nuts	124	127	102	112	102	102	105	116
Vegetables	37	28	28	29	33	37	39	41
Fruit	54	75	81	111	102	109	129	118
Meat	40	45	53	51	49	47	50	57
Eggs	4	3	3	3	4	4	4	4
Fish	13	15	17	12	13	13	14	25
Milk and dairy products	133	159	145	121	108	105	110	136
Oils and fats	85	86	84	72	75	90	87	95
TOTAL	2476	2299	2345	2365	2315	2524	2572	2590

TABLE B 8.--Continued

Sources	1956/57	1957/58	1958/59	1959/60	1960/61	1961/62	1962/63	1963/64
Cereals	1822	1820	1782	1762	1769	1921	2071	2082
Potatoes and other starchy food	23	22	16	22	27	23	24	30
Sugar and sugaries	172	169	169	172	149	137	168	177
Pulse, seeds and nuts	94	120	103	92	119	76	118	105
Vegetables	41	) 189	153	111	163	171	168	68
Fruit	93							106
Meat	56	59	52	45	47	53	50	54
Eggs	5	5	4	6	5	5	5	6
Fish	20	23	18	16	20	18	18	19
Milk and dairy products	108	106	100	103	103	107	109	109
Oils and fats	102	127	118	106	126	105	163	177
TOTAL	2536	2640	2520	2435	2530	2620	2890	2930

Source: Food and Agricultural Organization of the United Nations, Production Yearbook, several volumes.

TABLE B 9.--Estimated coefficients from the double logarithmic model for the commodity groups in urban areas.

Dependent variable	B_0	B_1	B_2	$\bar{R}^2$	S
X_1	.7878 (.0236)	.1035 (.0143)	-.1035 (.0245)	.9992	.0142
X_2	-.5798 (.1042)	.1752 (.0631)	.1113 (.1095)	.9877	.0626
X_3	-.1767 (0555)	1.0199 (.0336)	.0798 (.0583)	.9979	.0333
X_4	-.7719 (0704)	.4387 (.0426)	.0483 (.0735)	.9947	.0423
X_5	-1.4676 (.0993)	.9409 (.0601)	.2044 (.1049)	.9938	.0596
X_6	-.9985 (.0542)	.6845 (.0328)	.0795 (.0566)	.9974	.0325
X_7	-2.3997 (.1091)	1.2395 (.0660)	.2292 (.1144)	.9940	.0655
X_8	-.8970 (.0762)	.6323 (.0461)	.0464 (.0800)	.9973	.0457
X_9	-1.1226 (.0838)	.7120 (.0507)	.0778 (.0877)	.9940	.0503
X_{10}	-1.4648 (.1200)	.7318 (.0702)	.3787 (.1261)	.9918	.0721
X_{11}	.0200 (0677)	.3545 (.0401)	-.2043 (.0714)	.9916	.0406
X_{12}	.3754 (.0195)	.6331 (.0118)	.0229 (.0200)	.9996	.0117

TABLE B 10.--Estimated coefficients from the double logarithmic model for the commodity groups in rural areas.

Dependent variable	B_0	B_1	B_2	$\bar{R}^2$	S
X_1	.3722 (.0433)	.4081 (.0229)	-.0061 (.0360)	.9979	.0170
X_2	-.9584 (.0725)	.5790 (.0382)	.0304 (.0592)	.9984	.0283
X_3	-.9574 (.0584)	.9745 (.0308)	.0194 (.0480)	.9971	.0228
X_4	-.6570 (.1217)	.2912 (.0642)	-.0205 (.0995)	.9828	.0476
X_5	-1.0159 (.1419)	.8194 (.0749)	.1086 (.1157)	.9843	.0555
X_6	-.5208 (.0704)	.5292 (.0372)	-.1172 (.0574)	.9934	.0275
X_7	-2.3890 (.0750)	1.2900 (.0396)	.1175 (.616)	.9965	.0293
X_8	-.8658 (.0811)	.7206 (.0428)	-.0397 (.0663)	.9931	.0317
X_9	-1.0035 (.1109)	.7005 (.1343)	.0058 (.2078)	.9880	.0434
X_{10}	-2.4433 (.2543)	1.2866 (.1343)	.4309 (.2078)	.9884	.0994
X_{11}	.0552 (.2587)	.5455 (.1365)	-.0808 (.2114)	.9124	.1011
X_{12}	.3155 (.0271)	.6887 (.0143)	.0130 (.0244)	.9993	.0106

TABLE B 11.--Estimated coefficients from the double logarithmic model for individual commodities in urban areas.

Dependent variable	B_0	B_1	B_2	$\bar{R}^2$	S
X_{13}	-2.2146 (.4048)	1.1345 (.2450)	.3543 (.4253)	.9267	.2430
X'_{13}	-2.3834 (.7677)	1.0752 (.4646)	-.3138 (.8066)	.5756	.4610
X_{14}	.8955 (.4951)	-.2776 (.2996)	-.5914 (.5195)	.8183	.2973
X'_{14}	-.6322 (.4660)	-.2725 (.2821)	.4483 (.4898)	.8444	.2798
X_{15}	.4192 (.3818)	.0780 (.2311)	.3885 (.4012)	.8955	.2292
X'_{15}	-1.1055 (.3560)	.0838 (.2155)	.4239 (.3741)	.9239	.2137
X_{16}	-1.0474 (.2788)	.5806 (.1687)	.3602 (.2931)	.9524	.1674
X'_{16}	-1.2485 (.3900)	.5270 (.2360)	.3352 (.4098)	.7432	.2342
X_{17}	1.6871 (.3508)	-.5748 (.2123)	.2412 (.3687)	.8656	.2106
X'_{17}	.3656 (.2931)	-.6228 (.1774)	.1803 (.3080)	.8925	.1759
X_{18}	1.1930 (.3063)	-.2318 (.1854)	.2667 (.3209)	.9071	.1839
X'_{18}	-.1640 (.2599)	-.2519 (.1573)	.1958 (.3731)	.9229	.1561
X_{19}	.2006 (.3694)	-.2219 (.2236)	.2179 (.3873)	.8600	.2218
X'_{19}	-.0403 (.3500)	-.2443 (.2118)	-.5026 (.3674)	.4719	.2101

TABLE B 11.--Continued

Dependent variable	B_0	B_1	B_2	$\bar{R}^2$	S
X_{20}	3.7380 (.3433)	-1.2109 (.2078)	-.5087 (.3605)	.7349	.2061
X'_{20}	2.0969 (.3539)	-1.1512 (.2142)	-.5163 (.3715)	.7021	.2125
X_{21}	3.3379 (.2284)	-.9427 (.1382)	-.4733 (.2402)	.8202	.1371
X'_{21}	1.7029 (.2405)	-.8900 (.1455)	-.4687 (.2527)	.7907	.1444
X_{22}	-2.2686 (.3651)	-.6661 (.1535)	.2786 (.2362)	.8693	.1519
X'_{22}	.5541 (.3306)	-.5201 (.1390)	.3053 (.2139)	.8872	.1375
X_{23}	1.4243 (.0643)	.1961 (.0270)	.0699 (.0416)	.9913	.0268
X'_{23}	.4243 (.0643)	.1961 (.0270)	.0699 (.0416)	.9913	.0268
X_{24}	.6162 (.1125)	.3308 (.0473)	.1137 (.0728)	.9827	.0468
X'_{24}	-.0811 (.1232)	.4042 (.0518)	.0911 (.0797)	.9797	.0513
X_{25}	1.4020 (.1923)	.8457 (.0808)	.3443 (.1244)	.9747	.0800
X'_{25}	-2.9501 (.1943)	.9101 (.0817)	.4433 (.1257)	.9775	.0808
X_{26}	1.0841 (.1706)	-.1526 (.0717)	-.0382 (.1104)	.9379	.0809
X'_{26}	-.5303 (.1765)	-.0205 (.0742)	.0140 (.1142)	.9410	.0734
X_{27}	1.0403 (.0891)	-.1181 (.0539)	.1013 (.0766)	.9837	.0535

TABLE B 11.--Continued

Dependent variable	B_0	B_1	B_2	$\bar{R}^2$	S
X'_{27}	-.2690 (.1086)	-.0716 (.0457)	-.0511 (.0703)	.9735	.0422
X_{28}	.2085 (.0396)	.8160 (.0166)	-.0656 (.0256)	.9982	.0165
X'_{28}	1.0276 (.0585)	.9358 (.0246)	-.0296 (.0378)	.9968	.0243
X_{29}	-2.8737 (.2475)	1.6439 (.1041)	.2201 (.1602)	.9754	.1030
X'_{29}	-3.7352 (.1359)	1.7301 (.0571)	.2552 (.0879)	.9772	.1035
X'_{30}	-1.7505 (.1525)	.7636 (.0641)	.1956 (.0987)	.9800	.0634
X_{31}	.5359 (.1352)	1.1415 (.0568)	.1118 (.0874)	.9879	.0562
X'_{31}	-2.9861 (.1452)	1.2351 (.0610)	.1873 (.0939)	.9878	.0604
X_{32}	.3944 (.1025)	.2081 (.0621)	.0490 (.0881)	.9869	.0616
X'_{32}	-.7355 (.1155)	.2888 (.0485)	.0004 (.0747)	.9773	.0480
X_{33}	-.9022 (.1116)	.5361 (.0469)	.1038 (.0722)	.9835	.0464
X'_{33}	1.6296 (.1771)	.5876 (.0745)	.0756 (.1146)	.9638	.0737
X_{34}	-.5075 (.1070)	.8357 (.0450)	.1973 (.0692)	.9907	.0445
X'_{34}	-2.8620 (.2838)	.9897 (.9897)	.6218 (.6322)	.9692	.1704
X_{35}	-2.3143 (.2003)	1.1327 (.0842)	.3074 (.1296)	.9773	.0833
X'_{35}	-3.1358 (.1998)	1.1884 (.0840)	.3431 (.1293)	.9789	.0831

TABLE B 11.--Continued

Dependent variable	B_0	B_1	B_2	$\bar{R}^2$	S
X_{36}	2.3692 (.2694)	-.6336 (.1133)	-.3965 (.1743)	.8153	.1121
X'_{36}	.8636 (.2847)	-.5368 (.1197)	-.3597 (.1842)	.7801	.1184
X_{37}	-1.1710 (.2492)	.8104 (.1048)	-.1444 (.1612)	.9276	.1037
X'_{37}	-1.9578 (.1922)	.9268 (.0808)	.0679 (.1244)	.9643	.0800
X_{38}	-1.5050 (.1402)	.9573 (.0589)	.1254 (.0904)	.9846	.0583
X'_{38}	-1.9735 (.1424)	1.0141 (.0598)	.1434 (.0921)	.9852	.0592
X_{39}	.0247 (.1048)	.4852 (.0441)	.1202 (.0678)	.9867	.0436
X'_{39}	-1.7126 (.1075)	.5768 (.0452)	.1272 (.0695)	.9870	.0447
X_{40}	1.1082 (.1151)	.1506 (.0484)	-.1549 (.0745)	.9662	.0479
X'_{40}	-.7773 (.1227)	.2348 (.0516)	.1660 (.0794)	.9634	.0511
X_{41}	.7886 (.0560)	.3734 (.0234)	-.0461 (.0362)	.9945	.0233
X'_{41}	-1.1826 (.0474)	.5452 (.0199)	-.0376 (.0307)	.9874	.0547
X_{42}	-1.0111 (.1314)	1.0176 (.0553)	.1427 (.0850)	.9874	.0547
X'_{42}	-2.8143 (.1528)	1.2162 (.0642)	.1348 (.0989)	.9857	.0636
X_{43}	.2808 (.0991)	.3024 (.0417)	-.0405 (.0641)	.9822	.0412
X'_{43}	-1.5177 (.0933)	.4492 (.0392)	.0275 (.0604)	.9875	.0388

TABLE B 11.--Continued

Dependent variable	B_0	B_1	B_2	$\bar{R}^2$	S
X_{44}	.8065 (.1184)	.2412 (.0498)	-.0149 (.0766)	.9747	.0493
X'_{44}	.4304 (.0638)	.3963 (.0268)	-.0763 (.0413)	.9927	.0266
X_{45}	.1779 (.0889)	.0248 (.0374)	-.1226 (.0575)	.9706	.0370
X'_{45}	.0303 (.0847)	.0973 (.0356)	-.0894 (.0549)	.9834	.0352
X_{46}	-3.8690 (.2713)	1.6002 (.1141)	.2289 (.1756)	.9698	.1129
X'_{46}	-3.8486 (.2433)	1.5889 (.1023)	.1841 (.1574)	.9747	.1012

TABLE B 12.--Estimated coefficients from the double logarithmic model for individual commodities in rural areas.

Dependent variable	B_0	B_1	B_2	$\bar{R}^2$	S
X_{13}	-3.7228 (.3537)	2.4705 (.1866)	.7705 (.2893)	.9735	.1382
X'_{13}	-5.4697 (.4125)	2.5538 (.2177)	.8489 (.3377)	.9668	.1612
X_{14}	2.4274 (.3637)	-.6318 (.1919)	.1169 (.2974)	.8939	.1422
X'_{14}	.5972 (.3263)	-.5076 (.1722)	.2152 (.2668)	.9228	.1275
X_{15}	.2954 (.0651)	.9714 (.0344)	.0811 (.0529)	.9967	.1275
X'_{15}	-1.4665 (.0689)	1.0387 (.0363)	.1881 (.0566)	.9969	.0269
X_{16}	-3.0482 (.2519)	1.6008 (.1329)	1.1856 (.2059)	.9872	.0984
X'_{16}	-4.7490 (.2963)	1.6401 (.1564)	1.2545 (.2425)	.9833	.1158
X_{17}	3.5509 (.1474)	-.9823 (.0778)	-.1754 (.1204)	.9743	.0576
X'_{17}	1.8802 (.1451)	-.9274 (.0766)	-.1314 (.1187)	.9760	.0567
X_{18}	1.9301 (.1608)	.0224 (.0849)	.0287 (.1315)	.9716	.0629
X'_{18}	.3853 (.1606)	.0226 (.0895)	.0845 (.1386)	.9714	.0663
X_{19}	-1.8419 (.4316)	1.5921 (.2277)	.8278 (.3535)	.9245	.1687
X'_{19}	-3.4361 (.4193)	1.6440 (.2213)	.2915 (.3434)	.9276	.1639
X_{20}	3.8400 (.4637)	-1.2087 (.2447)	-.3280 (.3807)	.7771	.1812

TABLE B 12.--Continued

Dependent variable	B_0	B_1	B_2	$\bar{R}^2$	S
X'_{20}	2.0489 (.4588)	-1.1174 (.2421)	-.2780 (.3753)	.7797	.1793
X_{21}	2.0489 (.3028)	.0608 (.1598)	-.2621 (.2476)	.8285	.1183
X'_{21}	.2981 (.3091)	.1303 (.1631)	-.2216 (.2527)	.8394	.1208
X_{22}	3.2859 (.6711)	-2.3752 (.2373)	.8796 (.2757)	.9598	.1534
X'_{22}	1.7871 (.7018)	-2.3883 (.2482)	.9357 (.2884)	.9574	.1605
X_{23}	3.0114 (1.0658)	-1.2429 (.3769)	-.3882 (.4379)	.6315	.2437
X'_{23}	2.0114 (1.0658)	-1.2429 (.3769)	-.3882 (.3479)	.6315	.2437
X_{24}	-.6701 (.2946)	.7311 (.1042)	.5449 (.1210)	.9776	.0674
X'_{24}	-2.5937 (.3256)	1.1297 (1.1297)	.4633 (.3337)	.9498	.0744
X_{25}	-5.0560 (.5415)	2.3588 (.1915)	1.7077 (.2225)	.9456	.1238
X'_{25}	-7.3296 (.5724)	2.6782 (.2024)	.9926 (.2352)	.9532	.1309
X_{26}	-.3368 (.3548)	.5275 (.1255)	.2126 (.1458)	.8993	.0811
X'_{26}	-1.7410 (.1660)	.6150 (.6150)	.1821 (.1825)	.9759	.0380
X_{27}	.6104 (.1257)	.2722 (.0445)	-.2112 (.0517)	.9838	.0287
X'_{27}	-1.0794 (.0654)	.4196 (.0231)	-.0290 (.0269)	.9942	.0149

TABLE B 12.--Continued

Dependent variable	B_0	B_1	B_2	$\bar{R}^2$	S
X_{28}	-.0925 (.0734)	.7464 (.0259)	-.0315 (.0301)	.9940	.0168
X'_{28}	-.6684 (.0671)	.7574 (.0354)	-.0386 (.0419)	.9954	.0262
X_{29}	-3.5039 (.02636)	1.8360 9.0932)	.5593 (.1083)	.9802	.0603
X'_{29}	-4.2374 (.2068)	1.9251 (.0731)	.5137 (.0850)	.9883	.0473
X_{30}	-1.3979 (.2274)	.8128 (.0804)	.3782 (.0934)	.9681	.0520
X'_{30}	-3.0084 (.2642	1.1527 (.0934)	.4271 (.1086)	.0656	.0604
X_{31}	-.4255 (.0982)	1.2966 (.0347)	-.0605 (.0403)	.9938	.0224
X'_{31}	-2.8609 (.0912)	1.3298 (.0323)	-.0173 (.0375)	.9951	.0208
X_{32}	.2103 (.1255)	.1633 (.0444)	-.0551 (.0516)	.9822	.0287
X'_{32}	-.9500 (.0950)	.3532 (.0336)	0.9418 (.0390)	.9874	.0217
X_{33}	-1.7284 (.4182)	.7643 (.1479)	-.0298 (.1718)	.8364	.0956
X'_{33}	-2.3409 (.3544)	.7245 (.1253)	-.0123 (.1456)	.8739	.0810
X_{34}	-3.6501 (.4239)	1.7240 (.1499)	-1.2917 (.1742)	.9643	.0969
X'_{34}	-5.1805 (.4670)	1.7463 (.1652)	1.3478 (.1919)	.9587	.1068
X_{35}	-3.7268 (.6848	1.6163 (.2422)	.3077 (.2814)	.8414	.1566

TABLE B 12.--Continued

Dependent variable	B_0	B_1	B_2	$\bar{R}^2$	S
X'_{35}	-4.5824 (.4557)	1.9283 (.1612)	.0154 (.1873)	.9361	.1042
X_{36}	2.0800 (.1846)	-.7274 (.0653)	-.0070 (.0758)	.9810	.0422
X'_{36}	.5264 (.2011)	-.5381 (.0711)	-.0970 (.0826)	.9687	.0460
X_{37}	.3965 (.6403)	-.0644 (.2265)	-.1008 (.2631)	.6170	.1464
X'_{37}	-.2864 (.6239)	.0591 (.2206)	-.1109 (.2564)	.5993	.1427
X_{38}	-1.2497 (.1592)	.9479 (.0563)	-.0023 (.0063)	.9776	.0364
X'_{38}	-1.6580 (.1655)	.9882 (.0585)	-.0176 (.0680)	.9765	.0378
X_{39}	-.9102 (.2270)	.8988 (.0803)	.2430 (.0933)	.9644	.0519
X'_{39}	-2.6580 (.1882)	1.0234 (.0665)	.2148 (.0773)	.9766	.0431
X_{40}	1.2772 (.0709)	.0298 (.0251)	-.1387 (.0291)	.9921	.0162
X'_{40}	-.4917 (.0923)	.1263 (.0326)	-.1997 (.0379)	.9836	.0211
X_{41}	.8070 (.1233)	.2183 (.0436)	.0015 (.0506)	.9810	.0282
X'_{41}	-1.1046 (.1290)	-.3633 (.0456)	.0050 (.0530)	.9791	.0295
X_{42}	-1.9499 (.1492)	1.4752 (.0528)	.1641 (.0613)	.9896	.0341
X'_{42}	-3.5721 (.1552)	1.5420 (.0549)	.1715 (.0638)	.9894	.0355
X_{43}	-.0064 (.2043)	.4950 (.0722)	.0411 (.0839)	.9531	.0467

TABLE B 12.--Continued

Dependent variable	B_0	B_1	B_2	$\bar{R}^2$	S
X'_{43}	-2.0658 (.1731)	.7327 (.0612)	.1458 (.0711)	.9740	.0396
X_{44}	.8917 (.2129)	.4079 (.0753)	-.2130 (.0875)	.9152	.0487
X'_{44}	-.3242 (.2305)	.5012 (.0815)	-.3030 (.0947)	.9088	.0527
X_{45}	-.2385 (.2796)	.2864 (.0989)	-.1313 (.1149)	.8788	.0639
X'_{45}	-.3083 (.2412)	.3286 (.0853)	-.1028 (.0991)	.9130	.0551
X_{46}	-4.0971 (.4385)	2.0423 (.1551)	-.0206 (.1809)	.9459	.1003
X'_{46}	-4.6442 (.4786)	2.1692 (.1693)	.1250 (.1967)	.9437	.1094

TABLE B 13.--Annual consumption per household of major food products as related to income level (expressed in total expenditures) in urban areas--1958/59 (in kilograms).

Commodities \ Total Annual Expenditures Groups (L.E.)	Less than 25	25 to less than 50	50 to less than 75	75 to less than 100	100 to less than 150	150 to less than 200	200 to less than 250	250 to less than 300	300 to less than 400	400 to less than 600	600 to less than 800	800 to less than 1000	1000 and over
Wheat: home-produced	..	.6	1.3	1.4	5.1	14.3	16.4	22.6	21.0	45.9	17.0	25.3	96.2
purchased	2.0	24.2	40.1	42.4	49.8	50.6	59.5	63.2	66.3	63.8	72.1	11.1	135.4
Maize: home-produced	..	4.1	5.2	4.8	8.3	19.9	15.0	22.0	34.7	45.1	24.2	32.4	51.4
purchased	3.8	34.3	44.0	63.9	50.6	58.5	54.8	60.7	47.9	30.3	45.7	26.4	45.7
Millet: home-produced	..	2.5	5.5	7.1	4.6	5.9	3.2	11.2	5.7	8.3	8.6	9.3	4.5
purchased	48.7	44.0	52.1	43.1	27.9	23.4	13.0	12.6	24.5	7.2	5.8	8.3	11.5
Flour	52.9	55.9	62.4	110.1	176.4	200.7	265.7	273.2	242.2	166.9	109.1	105.0	58.5
Bread	27.5	52.3	89.3	115.6	140.1	157.9	166.2	177.6	217.7	256.2	279.3	325.3	357.2
Rice	7.8	21.9	34.9	51.5	75.2	99.0	112.5	123.2	151.2	162.7	172.1	208.1	205.5
Macaroni	..	2.1	4.7	6.3	12.1	17.5	24.9	30.1	37.6	46.0	61.2	61.7	71.6
Beans	2.0	8.4	13.8	16.0	19.2	21.1	22.6	27.5	29.0	28.5	24.8	18.4	34.9
Lentils	5.3	8.3	11.4	13.7	16.9	18.3	19.9	19.7	21.2	21.2	19.0	19.9	27.0
Meat	3.3	11.7	16.4	20.5	29.8	39.7	50.0	61.8	74.7	102.1	134.0	168.0	254.2
Poultry	.5	1.0	1.4	1.8	4.0	7.3	12.3	16.7	23.0	37.6	52.6	74.8	120.5
Fresh fish	2.0	6.1	9.1	14.0	23.5	29.3	35.6	37.6	45.5	48.0	54.7	64.2	66.8
Eggs (in numbers)	11.5	27.4	83.6	59.9	90.8	136.5	200.7	256.3	317.8	483.9	730.0	821.0	1194.6
Oils	3.5	7.8	12.8	17.3	22.7	27.2	31.3	24.0	37.1	32.6	43.9	50.9	54.7
Saturated oils	.5	1.3	2.1	3.8	4.6	5.5	7.0	7.0	9.6	13.5	15.3	17.1	18.6
Milk	.5	11.8	20.6	31.8	51.5	74.3	94.0	83.6	141.5	183.1	244.1	236.9	375.3
White cheese	..	.6	1.5	2.2	3.7	5.4	7.5	6.4	13.4	19.2	27.9	30.8	37.5
Whey cheese	5.5	12.3	15.1	16.2	14.4	15.8	12.9	9.8	12.9	11.6	8.6	8.9	14.3
Butter	.5	1.2	1.3	1.4	1.8	3.5	4.5	5.1	6.5	9.8	11.8	12.0	17.6
Ghee	..	1.6	2.4	3.2	6.0	8.7	11.9	10.5	17.9	24.2	29.2	35.5	54.5
Potatoes	1.0	9.1	17.3	25.5	38.5	46.0	55.4	45.5	72.5	83.8	106.5	111.7	142.8
Onions	7.1	18.6	26.9	32.4	40.1	45.9	52.6	41.0	62.3	67.7	73.5	84.3	105.8
Tomatoes	10.5	26.1	36.3	49.3	64.5	79.9	95.0	109.1	121.4	148.2	172.2	196.3	224.7
Citrus	2.1	6.3	9.5	14.3	22.6	33.3	48.0	62.1	73.2	109.0	128.0	170.0	235.9
Dates	3.1	6.9	8.7	11.5	15.7	19.4	22.5	27.4	31.0	34.1	39.4	35.5	53.3
Sugar	7.0	18.9	25.9	36.3	44.9	75.0	66.5	72.3	79.5	93.7	101.3	105.8	144.3
Tea	.5	1.6	2.0	2.6	3.2	3.9	4.4	4.8	4.7	5.0	5.2	6.3	6.2
Coffee	..	.1	.1	.2	.4	.6	1.0	1.1	2.0	3.9	5.0	6.5	9.2
Information about the sample													
Average total annual expenditures (L.E.)	18.67	40.57	62.90	88.31	125.88	173.02	224.23	274.20	344.93	487.44	684.53	871.20	1547.18
Average number of consumption units/household	.83	1.21	2.09	2.78	3.43	3.78	4.15	4.46	4.90	5.28	5.37	5.29	5.98
Number of households	6	65	165	251	602	512	356	269	377	307	131	45	59

Source: Calculated from: UAR Central Statistical Committee, Household Budget Survey in the Egyptian Region, Cairo, April 1961 (Arabic)

TABLE B 14.--Annual consumption per household of major food products as related to income level (expressed in total expenditures) in rural areas, 1958/59 (in kilograms).

Total Annual Expenditures Groups (L.E.) / Commodities	Less than 25	25 to less than 50	50 to less than 75	75 to less than 100	100 to less than 150	150 to less than 200	200 to less than 250	250 to less than 300	300 to less than 400	400 to less than 600	600 to less than 800	800 to less than 1000	1000 and over
Wheat: home-produced	1.8	6.4	28.8	58.2	129.8	217.8	336.3	467.4	618.9	812.3	1323.6	1793.7	3052.4
purchased	42.8	82.8	114.1	155.0	199.0	244.7	258.3	250.9	296.4	282.5	261.1	165.5	240.0
Maize: home-produced	.8	12.4	50.0	78.2	167.3	244.5	378.7	511.9	567.7	758.8	871.3	636.0	882.2
purchased	91.1	133.0	172.3	212.1	212.2	254.5	247.5	219.4	251.4	209.4	224.5	443.5	233.4
Millet: home-produced	3.0	7.6	24.9	56.7	70.2	89.9	115.5	136.6	195.2	167.4	513.5	954.0	940.6
purchased	53.3	91.3	128.8	138.4	129.2	96.8	80.4	56.8	79.5	83.9	79.7	..	..
Flour	27.4	35.8	57.1	67.7	71.7	87.8	88.2	63.1	74.3	89.9	15.9	131.0	2.6
Bread	8.5	11.4	10.0	6.1	7.0	6.9	6.4	9.0	14.8	28.3	17.8	20.0	4.0
Rice	13.9	22.9	41.8	69.6	115.8	169.2	257.1	234.8	263.4	331.0	427.5	443.7	442.0
Macaroni	.1	.3	.6	1.5	2.2	5.0	7.7	10.2	16.8	21.0	44.7	38.0	70.2
Beans	3.6	8.9	12.4	18.2	27.2	35.7	68.9	49.2	61.8	75.3	109.7	142.5	121.6
Lentils	4.6	7.4	11.4	12.9	15.7	19.8	24.9	25.8	32.6	37.4	54.9	70.7	95.8
Meat	7.8	12.7	19.5	26.8	35.8	48.8	58.8	73.2	89.3	118.6	186.8	181.0	304.6
Poultry	.4	1.1	2.7	4.7	8.0	13.9	21.1	25.4	31.2	45.9	80.9	90.7	147.8
Fresh fish	1.0	3.1	5.9	8.2	13.3	19.7	25.2	30.2	37.0	43.1	62.2	75.0	70.6
Eggs (in numbers)	17.1	30.4	49.2	74.1	98.7	141.2	198.9	253.1	291.5	439.8	711.6	929.0	2103.6
Oils	3.4	5.3	7.8	9.6	12.7	16.6	20.5	22.8	28.1	31.5	40.2	54.2	43.6
Saturated oils	.2	.4	.4	.8	1.2	1.3	1.6	1.6	2.6	3.8	3.3	5.0	10.2
Milk	2.2	5.8	24.8	53.0	117.2	174.4	207.0	270.9	368.4	561.0	683.8	1259.0	559.6
White cheese	.1	.1	.5	.6	.4	1.3	1.8	2.2	2.6	4.3	6.2	..	14.8
Whey cheese	9.9	18.2	25.3	30.8	36.5	36.3	44.0	48.5	49.0	46.2	58.9	53.2	34.4
Butter	1.3	2.4	3.2	4.6	5.3	5.5	8.1	7.4	9.0	10.2	5.6	9.7	23.6
Ghee	.9	1.7	3.1	4.6	5.8	8.2	9.6	12.3	15.9	18.4	33.9	13.0	67.0
Potatoes	4.5	8.5	12.5	20.3	31.7	45.7	57.0	68.7	79.8	112.7	170.2	179.0	212.2
Onions	14.7	21.3	29.1	34.9	43.3	53.2	64.9	69.8	78.4	93.6	126.6	163.7	158.6
Tomatoes	14.5	21.8	30.3	37.7	51.5	68.7	84.3	93.7	108.1	121.1	167.0	190.7	203.4
Citrus	1.4	3.6	6.0	9.4	14.9	22.5	29.5	38.2	52.3	74.6	131.9	103.0	262.0
Dates	3.8	8.3	14.4	20.2	22.9	31.5	43.6	46.3	57.5	68.1	115.9	142.2	127.6
Sugar	11.6	21.8	32.5	40.7	50.5	64.2	74.6	84.9	100.2	120.9	162.3	241.2	288.8
Tea	.6	1.5	2.1	2.9	3.7	4.5	4.8	5.3	6.9	8.3	8.8	14.2	21.5
Coffee	..	.1	.1	.2	.3	.5	.8	1.6	1.3	2.6	5.6	3.7	14.4
Information about the sample													
Average total annual expenditures (L.E.)	20.57	39.40	63.14	88.30	123.00	172.66	221.98	271.82	338.68	475.86	707.61	866.50	1508.20
Average number of consumption units per households	.81	1.57	2.49	3.09	3.76	4.64	5.46	6.07	7.16	8.09	9.55	14.00	11.40
Number of households	42	279	460	442	748	443	246	134	127	89	18	4	5

Source: See Table B 13.