AN ANALYSIS OF CONSUMPTION PATTERNS OF MAJOR FOOD ITEMS IN MOROGORO DISTRICT

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SOKOINE UNIVERSITY OF AGRICULTURE

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ABSTRACT

Response studies relating changes in food consumption patterns to relative changes in income and prices, and as influenced by sociodemographic factors are lacking in Tanzania. Food demand projections and the evaluation of the impact of alternative food policies on consumers and producers' welfare, and the cost for complementing them require parameter estimates based on food demand studies.

The study examines food consumption patterns of major food items, in Morogoro district for the year 1983. The influence of income, sociodemographic factors and government policies on food consumption patterns are considered. Budget shares, income elasticities, and marginal propensities to consume by income groups are determined. In addition to the analyses based on individual food items, an investigation based on aggregated classes is also conducted the aggregation being based on the nutritional value of the food items. The nutritional classes considered are (i) Energy (maize, rice, sorghum, wheat flour, cassava, bananas and sugar), (ii) Proteins (Milk, meat, beans and fish), (iii) Vegetables and (iv) Fats.

The data was gathered from both primary sources (through a questionnaire administered to a sample of 120 households randomly selected from both the urban and rural areas), and secondary sources (Government reports, Population Census). The data was analyzed by regression and tabula analyses. The model used in the regression analysis evolved from the static theory of consumer behaviour. For per capita expenditure, on food income and education level, nature of

employment and residential area are the factors considered. Four functional forms (i.e. linear, quadratic, semilog and double log) were identified for the analysis. The linear form was selected for subsequent analysis as most of its coefficients conformed to a priori expectation, it had the highest $\bar{R}^2$, and relatively lower standard errors than the other functional forms.

The study has established that lower income households have higher budget shares on food than the higher income households (84 per cent and 50 per cent respectively), whereas rural households and farmers have higher budget shares than urban households and non farmers (79 and 89 percent respectively, and 55 and 54 per cent respectively). This is because of lower incomes of the rural and farming households compared to the urban and non farming households. The lower income group spend a higher budget share on energy items (58 per cent), whereas the higher income groups spend a higher budget share on proteins (23 per cent). Households with 0-3 years of education spend 75 per cent of their incomes on food with 52 per cent being spent on energy items, whereas those with 15 - 25 years of education spend only 44 per cent on food and 20 per cent on protein. The study also shows that the total mean expenditure on food increases with an increase in the household size. Mean expenditure on food, increases with an increase in the age of head of household up to the age of 45 years and then declines thereafter.

Qualitative analysis shows that the urban households prefer maize, rice, wheat flour, cassava and bananas,while the rural households prefer maize, rice, sorghum and cassava. Falling real

income and cronic food shortages have resulted in below the required calorie and protein intake for all income strata, and has increased expenditure on cassava and bananas by the urban residents.

Engel curve results indicate that per capita income was the only factor affecting per capita total food expenditure significantly, it affected two food catagories (energy and protein) and three selected individual food items (maize, rice and meat) significantly. The level of education of the head of household affected significantly the vegetables category only, whereas area of residence was found to affect significantly the protein category (mainly meat) and sorghum. The nature of employment factor had no significant effect on the consumption expenditure of any of the food classes considered.

Marginal propensities to consume (MPCs) and income elasticities decline with an increase in income level. The MPCs for the most preferred food items (maize, rice and meat) are higher than for the less preferred food items (sorghum, banana, and beans) Those MPCs for protein and energy food categories are higher than those for fats and vegetables.

Income elasticities for maize, rice, meat and beans are generally higher than for sorghum and bananas, and those for energy and protein categories are higher than for vegetables and fats. This indicates that a one per cent increase in income will increase the expenditure on the more preferred food items by a higher percentage than the increase in the less preferred items. Maize, rice, meat and beans are luxury commodities for 20 per cent of the sampled households while meat is a luxury commodity for 80 per cent of the sampled households.

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NMC	-	National Milling Corporation
RTC	-	Regional Trading Corporation
NDB	-	Marketing Development Bureau
UDSM	-	University of Dar es Salaam
IRDP	-	Institute of Rural Development Planning
TFNS	-	Tanzania Food and Nutritional Strategy
TFNC	-	Tanzania Food and Nutritional Centre
IBRD	-	International Bank for Reconstruction and Development
GAPEX	-	General Agriculture Products for Export.
NDL	-	National Distributors Limited

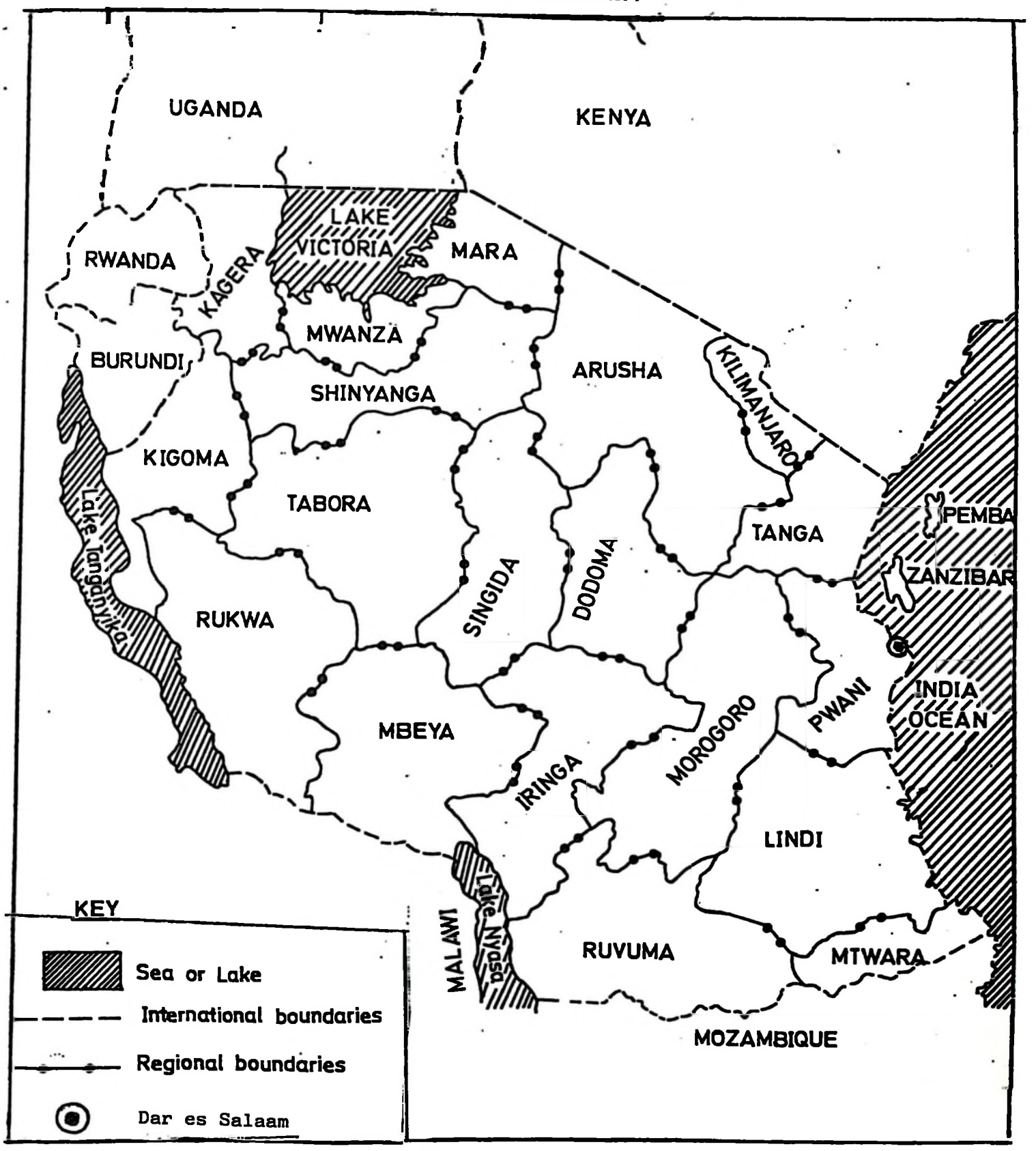
CHAPTER 1. INTRODUCTION

Tanzania has a total area of about 945,000 km^2 and it is divided into 25 administrative regions as shown in figure 1. The country's population is estimated at 19.9 million and it is increasing at an annual rate of 3.2 percent. About 85 percent of the population live in the rural areas with 75 percent of these being subsistance farmers using hand tools in agricultural production (Daily News Jan 19th 1984). With an exception of a few private and parastatal estates the country is generally characterized by small scale peasant farming. The population's real income therefore depend not only on the level and structure of agricultural production but also on the terms of trade facing them.

Agriculture accounts for about 54 percent of the country's GDP and over 80 percent of total foreign exchange earnings (IBRD 1981). It is therefore obvious that the performance of the agricultural sector has a great influence on the incomes of the majority of Tanzanians as well as their food consumption patterns. It also determines the ability of the Nation to meet its food needs.

Farmers will always attempt to produce enough to meet their subsistance needs. The urban population that constitutes about 12 percent of the total population and is growing at an annual rate of 8.5 percent, depends for its food requirements largely on factors influencing production of marketed surplus, its procurement and distribution, prices of the food and their real incomes. The majority of urban households have very low incomes (Keeler et al 1982).

Fig.1. MAP SHOWING THE REGIONS OF TANZANIA



This chapter presents a brief review of policies that influence food production and consumption, followed by the presentation of the problem and the main objectives of the study. The chapter ends with a presentation of the organisation of the remainder of the dissertation.

1.1 Policy elements that influence food production and consumption

1.1.1 Introduction

One of the country's important development goals is food self sufficiency. Recent studies on the performance of the agricultural sector have indicated that in the last two decades agricultural productivity has been declining.(Shayo, 1981; Keeler et al 1982, and UDSM 1982). Production growth rate has fallen from 4.9 percent in the period 1969/1974 to the current rate of 2.4 percent (Shayo Op.cit). The large food imports for the last 15 years suggest that in fact the food self sufficiency goal is far from being achieved. While part of the decline is caused by bad weather, the country's domestic and external trade policies have contributed directly or indirectly to the present situation. This section will specifically review pricing and marketing policies.

1.1.2 Agricultural pricing policy

Government intervention in agriculture can take place at the stages of production, marketing, consumption and trade. Pricing Policy either takes the form of a subsidy or a tax. Examples of subsidies include support of farm prices, input, transportation

subsidies and subsidies of main staples. Taxation includes export taxes, compulsory procurement of staples at low prices by government monopolies such as the National Milling Corporation (NMC), and less favourable foreign exchange rates.

The pricing policy adopted is intended to meet targets deemed desirable by policy makers. In general pricing policies can be used to bring about desired income distribution, provide incentive to farmers to increase production and can act as an instrument of stabilization. Tanzania's experiences in agricultural pricing policies for the last two decades are briefly reviewed below.

Producer price

Although in Tanzania there is a marked interrelationship between cash crops and food crops on one hand and between different food crops on the other, price policies of these are formulated independently (Helleiner 1968, Livingstone 1971, Temu 1971, Tessua 1982). This has often led to the promotion of one crop at the expense of the other (s).

In the middle seventies the terms of trade between cash and food crops was changed in favour of cash crops. The objective was to encourage increased production of export crops in order to increase foreign exchange earnings that was badly needed for the expansion of the industrial sector. This resulted in the shifting of resources to cash crop production and a fall in food production. In the second half of the seventies the reverse was the case. Shortages of food led to relative increases in prices of preferred staple food items. This caused a fall in cash crop production of

24.5 percent and an increase in preferred cereals production of 13.3 percent (Keeler et al 1982). A fall in the cash crop production has led to a fall in the investment in imported capital goods needed in both the industrial and agricultural sectors.

Table 1. Relationship between producer prices[1] for food and export crops

Production Year	Food crops Average price	Cash crops Average price	Ratio of Export to food crop price
	Cts/Kg	Cts/Kg	
1971/72	n.a	n.a	n.a
1972/73	171	919	5.4
1973/74	157	875	5.6
1974/75	163	698	4.3
1975/76	200	955	4.8
1976/77	237	1331	5.6
1977/78	289	880	3.0
1978/79	260	839	3.2
1979/80	223	779	3.5
1980/81	177	695	3.9

Source: Mlay et al (1982)

[1]The prices are deflated according to the Tanzanian National Consummer Price Index (1980/81 = 100), and are weighted according to the value of official purchases 1977/78 to 1979/80 inclusive.

While the main goal now is to increase food production because of the increasing food shortages real food and cash crop prices are declining as shown in Table 1. This has acted as a disincentive to produce surplus food and more cash crop for the market. The domestic cash crop producer prices are lower than those in the world market. In 1979/80 period when most world market prices doubled the domestic real producer prices remained constant (Keeler et al 1982). These lower prices discouraged farmers from growing for the market and this led to a fall in real incomes for the majority of the rural population. In 1974/75 period Panterritorial prices were introduced for all crops. At the same time the less preferred grains (sorghum, millets and cassava) were introduced into the official market after the 1973/74 drought. The prices of these grains were also increased substantially especially for finger millets between the 1974/75 and 1977/78 periods as shown in table 2 below. Farmers acted positively to this increase in prices and the presence of a guaranteed market by expanding production of these grains more rapidly.

Table 2. Producer prices for major staples in Tanzania

Cts/kg

Marketing Year	Food Items						
						Millets	
	Maize*	Paddy*	Wheat*	Sorghum	Cassava	Bullrush	Finger
1970/71	26	60	57	n.a	n.a	n.a	n.a
1971/72	24	55	57	"	"	"	"
1972/73	26	56	57	30	25	"	"
1973/74	33	57	77	50	31	"	"
1974/75	50	65	100	55	36	55	55
1975/76	75	100	120	75	40	75	85
1976/77	80	100	125	90	50	90	95
1977/78	85	120	125	100	60	100	200
1978/79	85	120	135	100	65	100	200
1979/80	100	150	n.a	100	65	100	200
1980/81	n.a	n.a	n.a	n.a	90	100	n.a

Source: Marketing Development Bureau 1979, 1981

*Preferred staples.

Pan territorial prices involved the setting of same producer prices at regional godowns for marketed crops but producer prices within each region varied depending on transport costs. The main objectives of these were:

1. To minimize differences in returns to farmers having different locational advantages with respect to the final market

2. To provide a transport subsidy to farmers serviced by poor infrastructure

3. To impose a direct tax on farmers with better access to markets or infrastructure

4. To increase national food output by stimulating production in remote rural areas.

The policy failed to equalize incomes of farmers in different regions because different regions have different productivity capability due to differences in resource endowment. It managed to make farmers respond positively by increasing food production in remote areas especially in Rukwa and Ruvuma regions (Keeler et al 1982). The uniform producer prices implied high transport costs to NMC since prices paid to producers did not reflect distance differentials from the markets.

Likewise the expansion of the less preferred crops increased storage problems in NMC godowns especially for more

preferred crops like maize. It also increased storage costs. Since the domestic market for these grains was limited, NMC had to export the grains at a loss.

The introduction of Pan territorial pricing policy coupled with the introduction of the less preferred food items led to a competition for resources between the less preferred crops and cash crops on the one hand and between the less preferred crops and preferred food crops on the other hand. This led to a fall in the marketed output of preferred grans of 21.2 per cent (Ellis 1980). Pan territorial pricing policy led NMC to suffer great losses in procurement and storage of these less preferred crops and maize from remote areas. Due to great expenses in this exercise delays in procurement of the food surplus was experienced and storage problems at both the village and national levels were experienced. The policy was abandoned in 1981 and regional pricing was introduced where higher prices were offered to premium regions and lower ones to non-premium regions. This policy was formulated inorder to increase food production by attempting to stimulate production of a given crop where it has the highest potential and discourage production in marginal areas.

Pricing of Livestock products

Producer prices of animal protein have affected consumption of meat. Due to low controlled official prices for live animals at the auction markets the supply of animals has either remained constant or has declined with an increase in demand for meat Prices of meat have continued to rise and since majority of the population have low income, consumption of meat for these people is low..

Pulses have become the source of protein for most of these people.

As a whole although Tanzania pricing policies were formulated in most cases to ensure equitable income distribution and to increase food production, most have ended up acting as disincentives to farmers to produce for the market. In some cases these have resulted in significant losses to the government and reduced incomes to farmers.

Export taxes and foreign exchange rates

Export tax policy was introduced to raise revenue for the government. The crops covered included coffee, cotton, tea and cashew nuts. In 1979 to 1980 period export taxes levied against producers increased by 464 per cent from an implicit tax due to overvaluation of the currency. Coupled with other factors these taxes acted as a disincentive to the production of these crops. The serious foreign exchange shortages facing the country has led to the reexamination of export taxes and their abolition in 1982 for most export crops.

The overvaluation of the Tanzanian shillings has acted as a tax to farmer and hence a disincentive towards increased production of export crops. Since the devaluation of 1979 the rate of inflation in Tanzania has risen to reach the level of 227 per cent in 1981 (Keeler et al 1982). Although the official rate remained steady the overvaluation of the shilling is seen in the fall of its value in the parallel exchange market as shown in Table 3.

This has led to further disincentives to farmers to invest in the agricultural sector. The import restrictions resulting from low foreign exchange earnings and overvaluation of the shilling have impeded investment in agricultural sector. Lack of incentives to farmers and non availability of durable and non durable goods have made farmers to reduce production for the market.

Table 3. Inflation and Exchange rates

Year	CPI 1975 = 100	International Index of inflation	Official exchange rate	Parallel market rate
	%	%	Shs/Kg	Shs/Kg
1962	40	44	7.14	n.a
1963	39	45	7.14	"
1964	40	45	7.14	"
1965	42	46	7.14	"
1966	44	77	7.14	8.64
1967	47	47	7.14	8.82
1968	47	47	7.14	8.25
1969	48	48	7.14	9.10
1970	50	52	7.14	10.45
1971	51	55	7.14	15.45
1972	56	60	7.14	15.00
1973	61	72	6.90	15.45
1974	79	89	7.14	13.45
1975	100	100	8.26	14.00
1976	107	101	8.32	25.00
1977	119	109	7.96	20.40
1978	133	124	7.42	15.05
1979	151	142	8.22	11.75
1980	197	159	8.18	13.50

Source: Table 1 Keeler *et al* 1982

CPI - Consumer Price Index

Food subsidies

While crop producers have benefited from an input subsidy (mainly in the form of fertilizers and chemicals to cash crop growers and to some extent maize producers), consumers have benefited from a retail price subsidy for the major staple foods (maize flour, rice, and wheat flour). The subsidy has now been removed. The objective of the input subsidy was to encourage farmers to increase their productivity. This has mainly resulted in shifts of resources towards production of cash crops. The subsidy has mainly benefited cash crop growers. The objective of the retail price subsidy on consumer goods was to protect the lower income population residing in urban areas. The prices of these food items are shown in table 4. The impact of consumer

Table 4. Retail price of maize flour, rice and wheat flour in Dar es Salaam

Marketing Year	Maize Flour	Rice	Wheat Flour
		Shs/Kg	
1973 - March 1974	0.80	1.65	1.65
April 1974 - June 1974	1.25	2.00	2.40
July 1974 - Oct. 1974	1.25	2.00	2.40
Nov. 1974 - June 1975	1.75	5.00	4.55
July 1975 - June 1976	1.75	4.00	3.75
June 1976 - June 1978	1.75	3.50	3.75
Jan. 1980 - Jan. 1981	1.25	5.35	5.65
June 1981 - early 1983	2.50	5.35	5.65

Source: Marketing Development Bureau 1979, 1980.

price subsidy has been to increase the demand for these items especially in urban areas. This increased demand cannot be satisfied because the marketed surplus is declining due to reasons discussed in the previous section. This has led to hoarding and parallel food markets for the major food items. However most of these subsidies have now been removed.

Since majority of the urban population cannot afford to pay high parallel market prices they have either reduced their food consumption or have now turned to less preferred food items. The impact of artificially low consumer and producer prices is a high demand for preferred staples and low supply of these. This has led to the country becoming an importer of preferred grains for the last 15 years (MDB 1979, UDSM 1982). Table 5 shows imports of grain for the last 6 years.

Table 5. NMC Purchases and imports of preferred staples 1975/76 - 1980/81 in 000' tonnes

Marketing Year	NMC Purchases	Imports (exports)
1975/76	134.0	181.9
1976/77	177.0	112.0
1977/78	302.4	140.1
1978/79	301.5	96.8
1979/80	233.4	104.0
1980/81	151.5	389.7

Source: Adopted from MDB 1979 and Table 15 Keeler et al 1982.

1.1.3 Marketing and procurement

These involve food procurement, transportation storage and distribution policies. In Tanzania marketing policies overlap other policies like the pricing policy. There is also a considerable amount of government intervention in marketing of food (Helleiner 1968).

Compulsory s·ale of almost all grains to the only official body, NMC, is a major marketing policy (Keeler et al 1982). This was formulated to protect farmers from profit making middle men. This has led NMC to become a monopsony as far as farmers are concerned and a monopoly in the case of consumers. Due to lack of competition in the marketing system inefficiencies have resulted in NMC leading to poor services to both farmers and consumers (Helleiner 1968, Temu 1971, IRDP 1980). As a consequence parallel food markets have emerged. Although NMC was formed as a commercial concern it has on many occasions been called upon to serve as government instrument of income distribution and has incurred high overhead costs and enomous losses (UDSM, 1982).

Procurement policy

The main official bodies marketing food have been GAPEX National Cold Chain Organisation, NMC and RTCs. NMC is the sole official body marketing food grains whole sale to RTCs and in Dar es Salaam to NDL. From RTC the grains are then distributed to cooperative shops for distribution to consumers on retail basis. NMC is required to procure all surplus food grains from villages. However NMC has transport problems. It does not only lack adequate transport facilities but it lacks

adequate planning in the transport itself. The current foreign exchange problems have hit NMC transport fleet badly due to lack of spare parts and fuel. Consequently undue delays in procurement of food grains from villages occur. This has led to loss of faith in NMC by farmers who instead sell their produce to private buyers. It is estimated that the country looses 25 per cent of its harvest through pests and weather hazards every year while awaiting collection (Helleiner 1968). Delays in procurement and poor storage facilities both at the village and national level have contributed significantly to this loss.

Shortage of storage facilities is an acute problem in urban areas especially Dar es Salaam and Tanga (see Appendix 2). In villages NMC is sometimes forced to store grain under taurpalin, in open space causing significant grain damage during wet seasons.

The procurement policy also requires NMC to buy almost all the grains being offered for sale anywhere in the country at the fixed official price. NMC has to sell this grain in urban areas at low retail price. In most cases these undertaking are not viable without subsidy and to some extent these have exacerbated the inefficiencies and other economic problems in NMC (Temu 1971).

The official producer prices NMC pays farmers cannot compete with those offered by the parallel market, as shown in Table 6. Farmers prefer to sell in the parallel markets where they get higher incomes comparatively. This reduces tha marketed surplus bought by NMC resulting in reduced supply to urban population which depends on NMC for their supply.

Marketing policies

The retail food prices paid to NMC for processed food are too low to cover the cost of procurement, storage and processing. This is evident from the heavy borrowing NMC is forced into, to cover its losses.

Table 6. Comparison of official NMC prices and parallel market prices for the period 1979/80 - 1980/81

Food Item	Marketing Year 1979/80		1980/81	
	Parallel Prices	NMC Prices	Parallel Prices	NMC Prices
	Shs/Kg		Shs/Kg	
Maize	3.08	1.00	4.98	1.00
Paddy	2.31	1.50	4.23	1.75
Cassava(dry)	1.99	0.65	2.98	0.65
Sorghum	2.96	1.00	4.68	1.00
Millet	4.73	2.00	6.95	1.50

Source: Table 23 Keeler et al 1982

To date it has an accumulated overdraft of Shs. 2826 million which is 5 times the value of its annual domestic purchases (MDB 1979, TFNC 1981). Excessive costs mainly brought about by marketing policies have inhibited the ability of NMC to offer other important services like grading of produce. It does not even offer different prices for different varieties of the / grains even when there is a marked /same difference in consumer preference (TFNS 1981). In most cases NMC

sells the allocated grains for the regions, in regional and district headquarters because the RTCs that are responsible for distribution of these allocated grains do not receive payment for transport to these areas.

It is evident that NMC faces a lot of problems as a marketing agncy. Fardmers now prefer to sell their produc in the paralles markets where prices are high and procurement is prompt. Consumers have to turn to these markets for their food because NMC does not provide them these grains at the right time, in the right from and in the right place. This has had an adverse effect on food consumption of the majority of people whose incomes are too low to meet their own food requirements given high parallel market price.

1.2 The Problem

The lack of adequate and reliable quantitative data and information for policy analysis, has contributed to the formulation of policy without a good base (Helleiner 1968, Livingstone 1971, Temu 1971, IRDP 1960, Tessua 1982). Sometimes the policies adopted are inconsistent with the goals set. A coherent agricultural policy in relation to goals set will have to be based on sound analysis, utilizing reliable data. Quantitative information on production and supply response and demand relationship will contribute partially to the input needed in policy analysis. That is an assessment of alternative policies in achieving the set goals and costs associated with their implementation. In Tanzania such information is either lacking, unreliable or covers a few agricultural commodities.

As has been shown in the previous section pricing, marketing and procurement policies have acted as disincentives to the expansion of the production of marketed food surplus. In addition the food subsidy has led to the increase in demand of the preferred food commodities in urban areas where the availability of these through the official channel is declining.

There is a need to emphasize the development of reliable data bank. The data also should be in the form useful for policy analysis. While it is important to focus on both supply and demand relationships, the study will be limited to the demand side.

Limited work has been done in Tanzania to assess the changes in food consumption patterns in response to relative prices or income. Quantitative information on the impact of socio-demographic factors on food consumption patterns, or how these factors interact with income to influence food consumption patterns is lacking. These response studies are important in providing income and price elasticities needed for food demand projections, in the assessment of alternative food policies in attaining the set goals, and in determining public costs in implementing these policies. The Household Budget studies of 1969 and 1976 - 77 would have contributed significantly in such analyses. However to date there has not been adequate analysis based on these budget studies.

This study will attempt to contribute the desired data and information by examining food consumption patterns in Morogoro District as they are influenced by income and socio-demographic factors. Since most studies on the subject have been conducted in

developed countries the study will also be used to assess alternative recommended models/functions to determine whether these models/ functions are applicable under Tanzanian conditions. Lack of time series data makes it impossible to assess temporal effects of income and relative prices on consumption. The study will therefore be based on cross section data and the impact of relative price changes on consumption pattern will not be investigated.

The choice of Morogoro District as the area of study is justified by:

(i) The financial and time constraint

(ii) Since in Tanzania, plans are an aggregation of regional plans, the information resulting from this study can contribute positively to the planning exercise in Morogoro region.

1.3 Objectives

The main objective of this study is to examine the effects of income differences across households on food consumption patterns in Morogoro district and how these effects are modified by socio-demographic factors. The study will be based on total expenditure on food, expenditure on individual major staples, and expenditure by four food classes,protein, energy, vegetables and fats.
In order to meet the main objectives the following will be done:

(1) determine budget shares by income groups using the above classification,

(2) determine income elasticities and marginal propensities to consume by income groups,

(3) study the effects of socio-demographic characteristics (household size, area of residence, level of education, age of head of household and employment) on food expenditure.

(4) Qualitative evaluation of the effects of public policies on food consumption patterns.

1.4 Description of area of study

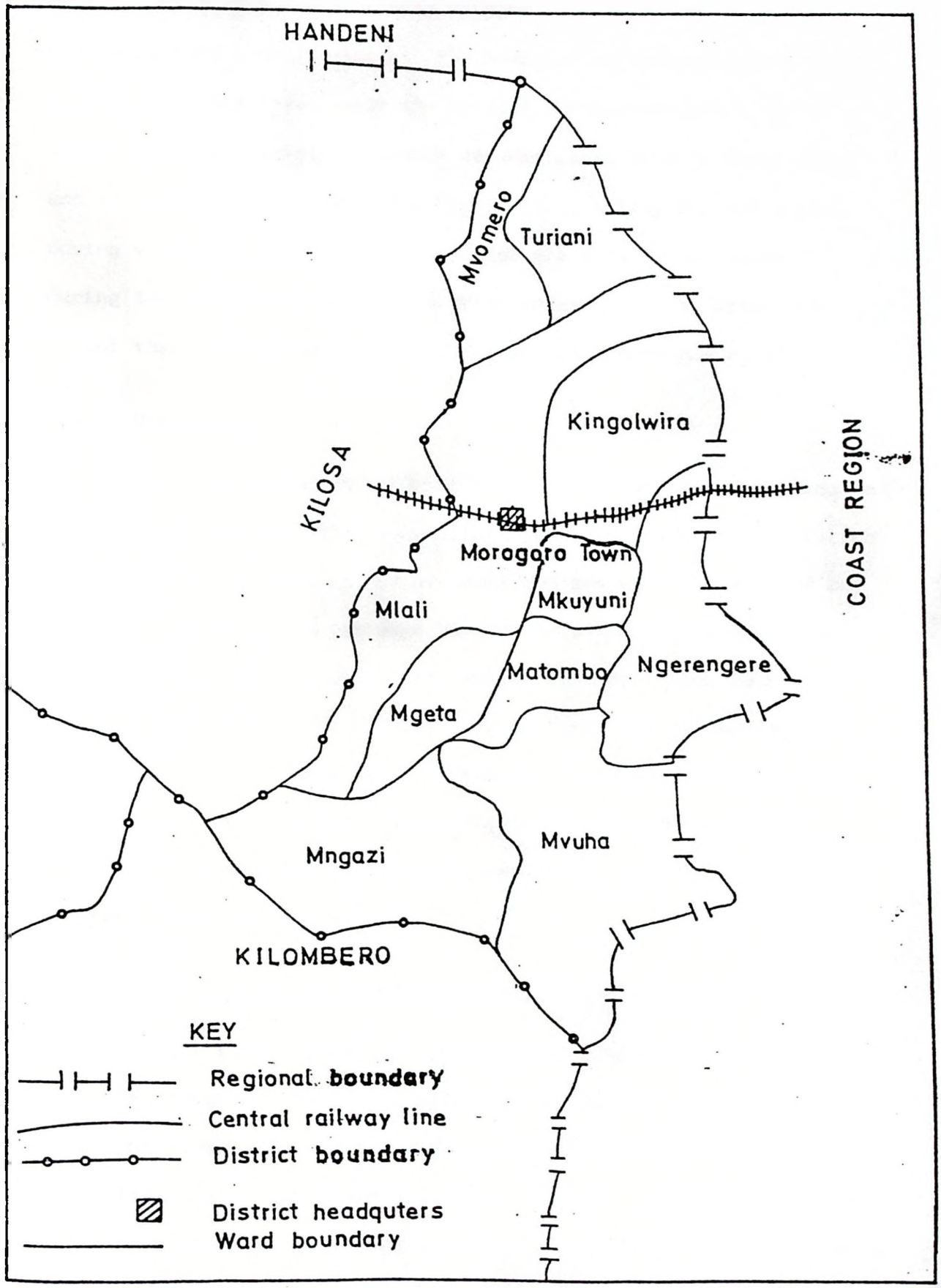
Morogoro district covers 19296 km^2 of which 19230 km^2 is in Morogoro rural and the rest in Morogoro urban (IRDP 1980). The district is divided into 10 wards; Mvomero, Turiani, Mgeta, Mlali, Kingolwira, Mbuyuni, Ngerengere, Matombo, Mvuha and Mngazi, as shown in Figure 2. Morogoro rural can be divided into 3 relief zones,

1. The Highlands - Uluguru, Nguu and Mgeta mountains
2. Lowlands - Ngerengere, Mlali and Matombo
3. The Valleys - these lie between the highlands and lowlands. These are Wami, Ruvu and Ngerengere Valleys.

1.4.1 Climate

The highlands which lie between 1,400 - 2,033 metres above sea level get a rainfall of between 1000 - 1800 mm. per annum. The

Fig.2 THE MAP OF MOROGORO DISTRICT SHOWING WARDS



rainfall is reliable and farming is done throughout the year. The highlands have a cool climate. The lowlands lie between 400 - 900 metres above sea level while the valleys lie between 180 - 400 metres above sea level. Rainfall is unreliable in both these areas and it varies between 800-1000 mm. It falls mainly for six months during which all the farming activities are done. Unemployment during the dry season is acute in these areas. The two areas are warmer than the highlands (IRDP 1980, Anandajayasekeram et al 1981)

1.4.2 Population

Total population in 1980 was estimated to be 445,089 living in 215 villages and one urban area (IRDP 1980). In 1978 the population in Morogoro rural rose by 3.1 per cent per annum, while that of the urban area rose by 8.5 per cent per annum (1978 population census). Out of this total population only 49 per cent were able people who have to support the rest. Fourty six per cent out of the total population were children below 15 years of age (1978 Population Census, IRDP 1980) showing that the population in Morogoro is composed of more young people whose demand for food will continue to increase in the next decade.

1.4.3 Food output, percapita income and consumer prices

The major foods grown are maize, paddy, bananas, cassava, yams, beans and sorghum. The maize and beans are grown in all 3 relief zones while bananas,yams and cassava are grown in the highlands. Paddy is grown in the lowlands and the valleys. Differences in crops grown have resulted in differing income levels between households in different relief zones (IRDP 1980, Anandajayasekeran et al 1981).

Gross Domestic Product (GDP) and per capita income for both the rural and urban areas are unknown because no computations have been made. GDP for the region rose from shs 750 million in 1977/78 period to shs 859.2 million in 1979/80 period. Per capita income rose from shs 849 in the 1978/79 period to shs 891 in 1979/80 (at constant prices using 1966 as base year). Price Index in 1978 had risen to 250 per cent (IRDP 1980)

1.4.4 The food distribution institutions

The two major official food distribution Institutions of cereals are RTC and NMC. While NMC is a wholesaler dealer RTC handles processed grain and flour which it sells to cooperative shops for distribution to consumers. Although these were set to ensure equitable distribution of essential food items, this is not so due to inefficiencies, corruption, shortages, poor infrastructures and lack of capital in the villages to buy these commodities, (IRDP 1980, MDB 1979-80). The effect of such is the non availability of food items and the establishment of parallel markets.

1.5 Organisation of remainder of the thesis

The remainder of the thesis is organized in four chapters. Chapter two presents the literature review. Chapter three presents the Methodology while Results and Discussion are presented in Chapter four. Chapter five concludes the thesis by presenting the summary and proposals on direction for future research.

CHAPTER II. LITERATURE REVIEW

2.1 Introduction

The importance of food consumption pattern studies has been recognized for a very long time in the developed countries. It is only in recent years that interest in such studies has filtered into the developing countries. The need for food security by these coutries has made it important to have reliable projections of food, in order to take appropriate measures/programs to ensure adequate supplies. To day food is a political weapon, hence the need for self sufficiency in food itself. In the long run, food demand projections will enable development of food strategies to meet the anticipated growth in demand. The other aspect that makes such studies important has to do with growing concern of nutritional deficiencies existing in some communities in a country and which cannot be detected from aggregate national figure (Pinstrup et al 1978, FAO 1974, 1978). Adoption of blanket programs which are likely to be costly can therefore be avoided by directing the programs to the effected groups. Identification of these groups and the degree of responsiveness of their food consumption patterns to changes in some controllable factors is therefore necessary, if effective instruments in addressing the problem are to be found (Salathe 1979). Another reason that justifies consumption pattern studies is the need for accurate and appropriate food policy analysis (Timmer 1979, Pinstrup 1979), and also in assessing alternative public programs, with respect to consumer and producer welfare and the costs of

carrying out these programs. Some of the parameter estimates needed for such analyses are income and price elasticities of demand.

This chapter reviews relevant studies dealing with food consumption patterns, paying particular attention to (1) methodological issues, (2) estimation techniques, and (3) types of results obtained in such studies.

2.2 Methodological Issues

Empirical analysis is done to test restrictions implied by theory, to study structural relationships and to obtain parameter estimates for use in policy analysis and in projections. The basis for studies on food consumption patterns is the theory of consumer behaviour. Depending on the objectives of the study the models to be empirically specified are either based on static or dynamic theory of consumer behaviour.

2.2.1 Theoretical issues

The basic theory of consumer behaviour postulates that the quantity of a commodity demanded is dependant on the price of the commodity, prices of related commodities, income, tastes and preferences. Many empirical studies on demand assume that in the short run tastes and preferences are given. However several studies have shown that even in the short run tastes and preferences have a marked effect on food consumption patterns across households (Staehle 1939, Purcell 1967, Burk 1967, Thurow 1969, Ostby 1968, Lazaer 1970, Serow 1972 and Salathe 1979). In order to explain temporal consumption decisions, the static theory has been

extended to : incorperate expectation formation and dynamic elements. (Salathe 1978, Pollack 1978 and Howe 1979)

Economic theory of consumer behaviour is generally used to guide in developing models for empirical specification. A number of problems are usually encountered in attempting to quantitatively specify the variables/factors in the theoretical models, and in the choice of appropriate functional form for the relationships. Problems are also encountered as to how to include all the stated variables, and the choice of the best way to show the interrelationship between the various commodities in the consumer's basket. Some of the methodological problems are caused by the non quantifiable factors implied by theory. For example some of the tastes and preferences factors implied by the theory can not be quantified. This leads to the use of proxies to represent them, (George et al 1971, Howe 1977). Tastes and preferences are revealed by factors like household size, its composition and distribution, age, education level and employment of head of household and area of residence, (Staehle 1939, Purcell 1967, Burk 1967).

The problem of the choice of the best functional form when theory does not specify the actual relationship between the various variables/factors in the theoretical model faces most researchers (Sinha 1966, Sulathe 1978, Blaylock 1980). Statistical methods have therefore evolved to try to solve this problem. Such are the use of criteria like the coefficient of determination (R^2) error sums of squares and the resulting economic interpretation of each functional form (Sinha 1966, Lee et al 1971, Salathe 1978). Some have tried

to let the data determine the best functional form, like in the case of using Box-Cox Transformation (Blaylock 1980).

Researchers have found it difficult to include all the stated variables/factors in the empirical models. This is either due to the nonavailability of data or the problem of not having enough observations (Agarwal 1974, Saxaur 1979). Such a problems results in specification problems.

The other methodological problem facing researchers is the incorporation in the empirical model of the interrelationship between commodities in a consumer's basket. This interrelationship is not fully incorporated in single equation models, as a result researchers now try to use simultaneous equation systems like the Linear Expenditure Systems (LES) the Extended Linear Expenditure Systems (ELES) and the Quadratic Expenditure Systems (QES) to cope with this problem. (George et al 1971, Tryfos et al 1973, Howe 1977, Pollack 1978).

2.2.2 Types of data used

The data used by various studies is mainly determined by (1) its availability (2) the purpose of the study (3) the advantages offered by each type of data. In developed countries both cross section and time series data are used. However in developing countries where relevant recorded time series data is in most cases non existant, cross section data is used. In some cases studies done in developed countries pooled both the time series and cross section data in order to overcome the disadvantages found in each.

Cross section data is used for the estimation of class specific elasticities and other parameters. George et al 1971 argued that this data is used because it is easy to obtain and it takes a short time to collect. The price and income is not highly correlated in cross section data as it is in time series. However this data has its own disadvantages and limitations. It fails when there is no homogeneity in incomes among families being surveyed (Burk 1969). It becomes difficult to quantify the relationship between income and food consumption for analytical use in the long run. Quantifying such a relationship involves shifting from the static situation described by cross section data to a dynamic situation. Price that are taken as fixed in cross section analysis do affect food expenditure through time. These reflect change in food marketing costs and changes in food supply and demand (Nerlove 1958, George et al 1971, Thraen et al 1978).

Haavelmo (1947) and Brown (1954) argued that studies based on cross section data have no meaning because there is a marked difference in results due to aggregation of data, especially for parameters like income and household size elasticities. The studies also pointed out that any comparison of income and expenditures between different individuals is inappropriate because this is not the same as comparing successive changes of these variables for the same household. Due to this limitation other studies have questioned the usefulness of coefficients estimated from cross section data in extrapolation over time or outside the sample used (Ferber et al 1962, Timmer et al 1967, Burk 1967).

However George et al (1971) justified the validity of the results obtained from cross section data. They argued that even though the static analysis used in cross section data implies that any change in income and prices bring an instanteneous change in consumption, there is a time factor involved. A lag exists in consumption adjustments since most people have formed consumption habits that take time to change. Also for the majority of consumers the income level is fairly stable. This means that the consumers have adapted themselves to income level at which they have been recorded. The data therefore reflects demand patterns in the long run changes.

The choice of time series data for the estimation of demand for food depends on its ability to capture the effect of time element. Time factor results in changes in several factors affecting consumption such as prices, incomes, tastes and preferences. This data enables the use of dynamic models (Agarwal et al 1977). It enables the estimation of price and cross elasticities.

According to George et al (1971) time series data has been used for both single and simultaneous models. The single equation models are limiting because they do not take into account the interrelationship between various food commodities. The simultaneous equation models on the other hand are used to show interrelationship between food items.

Although the interrelationship between food commodities is taken into account in these systems the problems of multicollinearity,

heteroskedasticity and autocorrelation usually prohibit the inclusion of all commodity prices and incomes (George et al 1971).

Other limiting factors with time series data as Agarwal (1974) and Saxauer (1979) have pointed out are (1) that the data provides only samples from limited range (2) that there is usually the problem of discontinuity in the data.

Such disadvantages of both the cross section and time series data have led many researchers to use pooled data. This involve the use of some specific elements from cross section data that are desirable to be pocled with those from time series data that are desirable (George et al 1971). This enables one to observe food consumption patterns in space and over time.

2.2.3 Functional forms used

Functional forms used for the consumer theory models by various studies depend on their predictive performance, economic interpretations, the robustness of their parameters in policy making and projections and whether they fitted the data better.

The most widely used functional forms are the "classical" ones. These include the linear, quadratic, semilog, double log, inverse, log-log inverse and log inverse functional forms (Brown 1954, Sinha 1966, George et al 1971, Salathe 1978, Pollack et al 1978, Blaylock 1980). Different functional forms give different results, and Salathe (1978) has shown that each functional form possesses some desirable characteristics but none has been found wholly acceptable to economists.

In India, Sinha (1966) found that the log-log inverse, the double log, semilog and log-inverse functional forms were the best for the rural and urban data. He found the linear functional form unsuitable. Salathe (1978) on the other hand found the linear functional form good in estimating parameters for inferior goods in the United States but resulted in low coefficient of determination (R^2) The quadratic form according to Salathe (1978) proved useful because it allowed for the Marginal Propensity to consume (MPC) and income elasticities to vary with the level of income. This makes it ideal for analysing expenditure on commodities regarded as necessities. However Brown (1954), George et al (1971), Lee et al (1971) and Salathe (1978) found the double log and semilog function forms the best because they had the lowest mean square errors and highest correlation coefficient. Ostby (1968) used the linear functional form for the Dar es Salaam study and found the age and education coefficients unreliable for most of the commodities.

Other types of functional forms used for simultaneous systems are the Linear Expenditure System (LES) the Extended Linear Expenditure System (ELES) and the Quadratic Expenditure Systems (QES) (Howe 1978, Pollack et al 1978). These were used to show the interrelationship, between different food items in a consumer's basket, because 'classical' forms could not show this relationship.

2.2.4 The estimation techniques

The Ordinary Least Squares (OLS) is used in most cases to estimate parameters (Sinha 1966, Ostby 1968, Singh 1973, Tryfos

et al 1973, Thraen et al 1978, Salathe 1978 and Timmer et al 1979). When simultaneity in food items was taken into account the parameters were obtained from single equation techniques or systems techniques (George et al 1971, Tryfos et al 1973, Agarwal et at 1977, Girshick et al 1947).

The single equation techniques include the Two Stage Least Squares (2SLS), Limited Information Maximum Likelihood and the Indirect Least Squares. The systems techniques include the Three Stage Least Squares (3SLS) and the Full Information Maximum Likehood Techniques (George et al 1971, Lee et al 1971). While the systems techniques are more efficient than single equation methods they are more expensive and difficult to use.

2.3 Types of results obtained from similar studies

The results obtained in most casses differed when different techniques and functional forms were used (Salathe 1978). In a study done in Tanzania by Keeler et al (1982), the budget shares shown in Table 7 were obtained. Income elasticities for specific income groups obtained by the studies done in Colombia (Pinstrup et al 1978) are also presented in Table 8. Other results obtained include the effects of the various socio-demographic characteristics. The age and education of the head of house hold also have significant effects on food consumption patterns. Mellor (1968) has shown that the expenditure on food for most products increase until the head of household reaches the age of 44 years.

Table 7. Budget shares for cereal grains and food in Tanzania, 1969

Region	Total Food (% of income)	Cereals (% of income)
Rural		
Arusha, Kilimanjaro Tanga	53	12
Mtwara, Ruvuma	51	21
Mara, Mwanza Shinyanga, Kagera	49	13
Iringa, Mbeya	58	23
Kigoma, Tabora, Singida	63	26
Coast, Dodoma Morogoro	55	23
Dar es Salaam non-central	31	9
Dar es Salaam central	21	5
Other urban	37	11

Source: Keeler et al (1982) table 33.

It then declines thereafter, because the children have grown up and are independent by then.

Mellor (1968) pointed out that as the size of household increases total food expenditure increases but the per capita expenditure on food declines. Ferber (1962) showed that different

Table 8. Income elasticities for defferent food items and food groups in Colombia 1978

Food Items	Income groups				
	Low	Low Medium	High Medium	High	Average
Meat	1.52	0.99	0.67	0.47	0.84
Rice	0.42	0.39	0.26	0.19	0.34
Maize	0.63	0.44	-0.26	-0.43	0.39
Beans	0.80	0.64	0.45	0.25	0.60
Vage-tables	1.12	0.87	0.37	0.20	0.68
Bananas	0.52	0.39	-0.31	-0.29	0.32
Fats and oils	0.83	0.57	0.30	0.14	0.50

Source: Pinstrup et al 1978

areas of residence have different food habits which point to different attitudes towards buying by consumers in different parts of a country. In Tanzania for example it has been noted that urban population prefer wheat flour, rice and maize while rural population prefer maize, sorghum and rice (Ostby 1968, MDB 1979, Livingstone 1971).

CHAPTER III. METHODOLOGY

3.1 Introduction

The analytical models to be presented are based on the static theory of consumer behavior. The chapter begins by a brief presentation of the theoretical model. This is then followed by specification of the variables. The limitations of the models specified and analytical procedures will end the chapter.

3.2 Theoretical Model

From the static theory of consumer behaviour, the demand for the i^{th} commodity by the h^{th} household is given as in equation 3.1

$$Q_{ih} = f(\underset{\sim}{P}_i, P_h, Y_h, T_h) \qquad 3.1$$

Where Q_{ih} = Quantity of the i^{th} commodity ($i = 1,2 \text{ ------ } I$) demand by the h^{th} household ($h = 1,2 \text{ ------ } H$) per unit of time

P_i = the price per unit of time of the i^{th} commodity

$\underset{\sim}{P}$ = a column vector of prices of commodities closely related to the i^{th} commodity

Y_h = disposable income per unit of time of h^{th} household

T_h = Tastes and preferences for the h^{th} household.

Prices are taken as given, because these are determined by the market mechanism and any one individual cannot effect any change in prices. The income (Y_h) facing household h is fixed at any given time. This therefore limits the amount of goods household h can buy.

If interest is in looking at the variation in quantity demanded of commodity i at a given time across households then model 3.1 needs to be modified. At a given time P_i and $\underset{\sim}{P}$ are constant. While tastes and preferences of a particular household at a given time are also constant they are likely to vary across households. These variations across households may be caused by such factors as education level, family size, employment, cultural and religious differences, and area of residence that may influence the availability of certain commodities. When this modification is incorporated, model 3.1 is reduced to

$$Q_{ih} = f(Y_h, T_h) \qquad 3.2$$

Since tastes and preferences are not directly quantifi able, their changes across households will be proxied by education level of the head of the household, family size, area of residence and nature of employment. Incorporating the variables and factors indicated above leads to equation 3.3 below.

$$Q_{ih} = (Y_h, E_h, AR_h, FS_h, EMP_h) \qquad 3.3$$

Where: E_h = Education level of the head of household h,

AR_h = Area of residence for household h

FS_h = Family size for the household-h

EMP_n = Nature of employment of the head of household h.

Model (3.3) is the basic model for subsequent empirical specification in this study.

3.3 Specification of an econometric model

Since economic theory does not specify functional forms to be used several functional forms will be empirically specified. However since all the functional forms to be tried can be logarithmically transformed into linear form, only a single model is presented in equation 3.4

$$Q_{ih} = B_0 + B_1 Y_h + B_2 E_h + B_3 AR_h + B_4 FS_h + B_5\ EMP_h + U_h,$$

$$U_H \sim N(0, \Omega) \qquad 3.4$$

If the distrbances are spherical, Ω is reduced into an identity matrix. Since the study will be based on cross section data the disturbances are likely to be heteroskedastic in which case Ω will be a diagonal matrix with unequal diagonal elements. This being the case an equation can be estimated for each income group alternatively, through the use of dummy variables one equation can be estimated for all income groups, but allowing for variation in slopes and intercepts across the income groups. This is the procedure to be used in this study.

In this study rather than using quantities consumed, expenditure on a commodity or a class of commodities is used. This procedure is preferred since it allows for the aggregation of the

food items. When this modification is introduced into equation 3.4, equation 3.5 below is obtained.

$$P_iQ_{ih} = e_{ih} = B_0 + B_1Y_h + B_2E_h + B_3AR_h + B_4 \quad (3.5)$$

$$FS_h + B_5EMP_h + U_h$$

Where P_iQ_{ih} = expenditure of the h^{th} household on the i^{th} commodity

Equation 3.5 will form the basis for empirical analysis of structural relationships and the estimation of income elasticities. It should be noted that the effect of family size on consumption can be accounted for by expressing expenditure and income on per capita basis.

3.3.1 Specification of variables included in the model

The variables included in the model are household income, expenditure, education level, employment household size and area of residence. A brief description of these variables as they are used in this study is presented below.

Household income is defined here as the sum of the annual earmings (in monetary equilavents) of all household members under the same roof and sharing meals. In the same context the number of years of formal education were used to represent education level. In the case of area of residence and nature of employment two groups were identified for each factor. The two groups identified for area of residence are (1) rural households (2) urban households, those for nature of employment are

(1) farming households (2) non farming households. Zero one dummies were used to represent these groups.

3.4 Data Needs and Sources

The data needed for analysis was collected from both the primary and secondary sources. Data from primary source was collected from single visit interviews, in both the rural and the urban areas. The secondary sources used were the MDB reports of 1979, 1980 and 1981, the Household Budget Study of 1969, and TFNC reports of 1981 and 1982.

3.4.1 Questionaire design

The questionnaire was designed to capture both the qualitative and quantitative data. The questionaire contained three sections. The first section was designed to obtain information on socio-demographic characteristics of the households. The second section was designed to capture the expenditure of a household for specific commodities consumed and income received. The last section contained questions on qualitative data needed for the study. The questionaire designed is in Appendix I.

3.4.2 Sampling design

A sample of 120 households was decided upon. It was obtained through a multistage sampling technique. Four stages were involved. In the first stage it was decided to choose 60 households from the rural areas and 60 from the urban area. The second stage involved

(a) identification of two classes of households in the urban areas (i) those living in the low income residential areas from where 40 households are selected (this area has more people) (ii) those living in the higher income residential areas from where 20 households are selected. The lower income residential area selected subjectively was Mbuyuni ward and the higher income residential area selected was Boma ward.

(b) Identification of three areas in the rural areas corresponding to the 3 relief zones. These areas were assumed to have different incomes due to differences in resource endownment. From each of these 3 areas a village was selected subjectively. This was justified by the cost, time and transport constraints. From each village 20 households were selected.

The third stage involved the selection of representative areas within the two selected urban areas. Since each ward is subdivided into smaller areas a list of these subdivisions were obtained from the Mbuyuni and Boma wards' Chama Cha Mapinduzi (CCM) offices from which three areas were each selected randomly. In the Mbuyuni ward, the Magadu, Kilimo Mkoa and Chuo Kikuu areas were selected. Those chosen from Boma ward were the Field Force Unit (FFU), Magorofani, and the Regional Development Director areas.

The fourth stage involved the actual selection of the individual households from the selected areas through random sampling method.

In the urban areas the list of households constructed from ten cell leaders in the selected areas formed the sampling frame. From this 40, and 20 households were selected from the low and high income areas respectively. In the rural areas the lists of households obtained from village chairmen in each village formed the sampling frames from which 20 households were separately selected.

3.4..3 Data collection

Before data was collcted preliminary preparations were done. First letters of introduction to the various areas to be visited were obtained from the District Development Director. These letters desribed the type of research to be carried out and the reasons for carrying out such a study. A pilot study was conducted by interviewing six people, from which adjustments were made to the questionaire.

Both quantitative and qualitative data needed for the study were collected. The quantitative data was for the variables stated in section 3.2.1. The main food items considered in the study were maize, rice, sorghum, cooking bananas, sugar, wheat flour, meat, fish, beans, milk, vegetables, cooking fat and cassava.

3.5 Problems encountered during data collection

The data collection exercise was planned to be completed in July but could not be finished until September due to the following problems:

(a) Transport was not always available when needed.

(b) The approach thought to be the best in establishing rapport was to have village and CCM leaders accompanying

the researcher to the field at this stage in order to explain to the respondents the purpose for conducting the research. Often these people could not be found despite making prior arrangements.

(c) Respondents were not always available although arrangements for the interviews were made ahead of time.

(d) Suspicion in relaying information especially on income for fear that it will be used for taxation purpose.

(e) Communication problems with some of the respondents especially in the rural areas due to low literacy. In some case it was necessary to drop a respondent and have the sampling exercise repeated to find a replacement.

3.6 Data modification

In order for some of the raw data to be used in estimation some transformation had to be made to the data

(1) Expenditure for each commodity was calculated from the product of the price and quantity of each particular commodity. Since it was collected on a monthly basis it was then converted into the yearly expenditures.

(2) income for each household that had been collected on a monthly basis was aggregated and converted into an annual income.

(3) The income data was later post stratified into 4 income classes based on major salary and income categories in Tanzania

(a) Income between shs 0 - 11999

(b) Income between shs 12000 - 47999

(c) Income between 24000 - 47999

(d) Income between shs 48000 and above

(4) The household size was converted into equivalent household adult units by counting each member of a household above 16 years of age as 1 unit and those below 16 years of age as ½ a unit.

(5) Food expenditure for each household were grouped into 4 food categories (energy, protein, vegetables, and fats categories) based on nutritional value.

(6) Using food value scales each food item was converted into its calorie and protein contents, Calorie and protein values for each household were aggregated and converted into per capita calorie and protein consumption values using household units.

3.7 Data analysis

Regression analysis was used to estimate factors affecting food consumption patterns for the 4 food categories, total expenditure and for some of the selected items in each food group. Effects of factors not considered in the expenditure equation were examined through the use of tabular analysis.

CHAPTER IV. RESULTS AND DISCUSSION

4.1 Introduction

This chapter is divided into three sections. The first section discusses food preferences and expenditure characteristics for the sample. The nutritional situation of each income group is also analyzed. Section two contains the discussion on Engel curves as specified in the model presented in chapter 3. Lastly the chapter ends with a summary of the main findings.

4.2 Food preferences and expenditure characteristics

Income is among the factors determining food expenditure patterns. Empirical results from similar studies (Burk 1967, Janvry et al 1972, Pinstrup et al 1979, Timmer et al 1979) have confirmed this. However Institutional arrangements and socio demographic factors can modify the effect of income on food expenditure patterns. This section therefore contains a discussion of food preferences, budget shares for the various food categories and selected food items across four income groups. The section ends with a discussion of the nutritional situation in the district.

4.2.1 Preferred food

As shown in table 9, maize, rice, cassava, bananas and wheat flour are the main preferred staples in the urban area while maize, rice, cassava, banana and sorghum form the main diet in the rural areas. Scarcity of maize rice and wheat flour in the urban areas has

Table 9. Major preferred food items in urban and rural areas

(in percent)

Food item	Area of Residence		Sample Percentage
	Rural	Urban	
Rice	42	58	79
Maize	58	42	69
Cassava	75	25	54
Sorghum	92	8	22
Wheat flour	35	65	22
Bananas	33	67	15

Source: Survey Data.

resulted in increased consumption of cassava and bananas in the urban area. As discussed in Chapter I government subsidy on cereals like maize, rice and wheat flour has resulted in preference for these food items. The analysis of the 1969 Budget study showed that the percentages of households that consumed rice, maize and wheat flour in urban area were 23.2, 48.4 and 6.0 percent respectively (Keeler et al 1982). Those percentages for the rural areas for rice, maize and sorghum for the 1969 study were 12.6, 65.1 and 13.8 respectively.

4.2.2 Relationship between household income and area of residence

Table 10 shows the percentage distribution of households in each income category by area of residence. Chisquare test results show that there is a significant relationship between income and area of residence. These results show that among the sampled households falling in the lowest income class, 36 percent reside in the urban and 64 percent in the rural areas. All the sampled households in the highest income class reside in the urban area. The results suggest that on the average rural residents have lower incomes than urban residents.

4.2.3 Budget shares

The budget shares for each food category and for each income group are presented in Table 11. Those for the two employment categories and area of residence are presented in Table 12 and 13 respectively while those for selected food items are presented in Table 14.

Table 10. Relationship between household income and area of residence[1]

Income Categories	Area of Residence				Total samples	
	Urban Frequencies	%	Rural Frequencies	%	Frequencies	%
0-11999	9	36	16	64	25	21
12000-23999	11	26	31	74	42	35
24000-47999	16	55	13	45	29	24
48000 and over	24	100	0	0	24	20
TOTAL	60		60		120	100

Source: Survey Data

1 Chisquare test based on the above contingency table was found to be statistically significant at .05 probability level.

The results presented in table 11 show that the proportion of income spent on food declines as the level of income increases across households. While the low income bracket household spend 84 percent of their incomes on food, the higher income brackets household spent only 50 percent of their incomes on food. The results indicate that across all income groups with an exception of the highest income households energy foods receive the largest share of the portion of income spent on food, followed by protein foods, vegetables and fats in that order. In all the four food categories, budget shares decline as the level of income increases across the sampled households. While the lowest income class households spent 58 percent and 20 percent of their income on energy and protein foods respectively the highest income class households spent 20% and 30% on energy and protein food respectively. These results are in line with those obtained from similar studies done in some developing countries (Sinha, Pinstrup et al 1979). Higher income bracket households usually have lower budget shares for food because they spend some of their income on more durable goods and they have higher marginal propensity to save than low income households.

Table 13 shows that rural residents have higher budget shares for total food (79 percent) and energy food category (54 percent) than do urban residents whose budget shares for total food and energy food category are 55 percent and 27 percent respectively.

Table 12 indicates that with respect to the nature of occupation, farmers have higher budget shares for total food and energy food class (89 and 59 percent respectively) than do non farming households whose budget shares for total food and energy food category are 54 and 28 percent respectively. It has already been shown in section 4.2.2 that the majority of rural households have lower incomes than urban households. The same factor is emphasized by table 13 which shows that the mean income of a rural resident is lower than that of the urban resident. In the same manner table 12 shows that the mean incomes of a farming household is lower than that of a non farming household. Due to these low incomes both rural and farming households are expected by theory to spend a bigger proportion of their incomes on food than would the higher income urban and non farming households.

The budget shares calculated from the 1969 Budget Survey for total food for Morogoro urban and rural areas were presented in Table 7. In that year budget share for total food was 55 percent while that for cereals was 23 percent. Thirteen years later the rural budget share for total food had risen to 79 percent and that for cereals had risen to 54 percent. In the same manner those for the urban areas had risen from 37 percent for total food and 11 percent for cereals in 1969 to 55 percent for total food and 27 percent for cereals in 1983. These budget shares in 1983 are higher because the cost of living has risen substantially in recent years making most households to spend a bigger proportion of their income now than before in order to attain the same level of food consumption. The higher budget share for cereals in 1983 study was also due to the inclusion of cassava and bananas in the energy food group.

Table 11. Budget shares for each food group by income group.

Food Group	Income classes			
	0-11999	12000-23999	24000-47999	48000 and over
Energy	0.5805	0.53	0.4367	0.2089
Protein	0.2044	0.2038	0.2786	0.2333
Vegetables	0.0618	0.0587	0.0499	0.0331
Fats	0	0.0092	0.0178	0.0308
Total Expenditure	0.8467	0.8017	0.783	0.5061

Source: Survey Data

Table 12. Mean expenditure on each food group by nature of occupation

Employment Category	Mean Income	Food Groups				
		Energy	Protein	Vegetables	Fats	Total Expenditure
Farmers	16406	9616	3716	1241	28	14601
Non-Farmers	42304	11794	10805	1380	968	22947
		Proportion of Expenditure to Income				
Farmers		0.59	0.23	0.076	0.002	0.89
Non-Farmers		0.28	0.26	0.03	0.02	0.54

Source: Survey Data.

Table 13. Mean expenditure on each food group for urban and rural households in shs.

Area of Residence	Mean Income	Food Groups				
		Energy	Protein	Vegetables	Fats	Total Expenditure
Rural	17778	9547	3506	1035	40	14087
Urban	44385	12154	9695	1605	959	24541
		Proportion of Expenditure to Income				
Rural		0.54	0.197	0.06	0.002	0.79
Urban		0.27	0.22	0.04	0.02	0.55

Source: Survey Data.

Table 14. Mean expenditure and Budget shares for individual food items.

Food Item	income Groups in Shs.			
	0-11999	12000-23999	24000-47999	48000 and over
Maize	2724	4460	5458	3960.7
Paddy	1005.6	1525.6	3203.6	4704.3
Meat	707.4	1182.8	4189.7	11085
	Proportion of expenditure of each food item to income			
Maize	0.28	0.23	0.17	0.05
Paddy	0.10	0.08	0.10	0.06
Meat	0.07	0.06	0.13	0.15

Source: Survey Data

The budget shares for maize, paddy and meat for the four different income classes presented in Table 14 show that the two lower income groups spend a higher proportion of their incomes on the preferred cereals (maize and rice) as expected and less on meat. The higher income bracket households spend a higher proportion of their incomes on meat than on maize. These results conforms with results obtained from similar studies done in India, Indonesia and Colombia (Sinha 1966, Pinstrup 1976, Timmer et al 1979). Similar studies showed that households tend to shift their incomes towards the purchasing of higher value food as income rises (Burk 1967, Modigliani et al 1979, Pinstrup et al 1979).

The budget shares for each food catagory with the exception of protein and fat foods decline as the level of education of the head of the household increases (table 15). The observed trend is explained by the high positive correlation between the level of income and number of years of formal education. For this study, the correlation was found to be .78.

In the case of protein foods and fats their budget shares are observed to rise with the level of education of head of household. Knowledge on the nutritional value of different food items is likely to be influenced by the level of education of a consumer. In the study it was observed that high protein foods are more expensive than the preferred cereals. The high correlation between education level and household income plus a high concern of nutritional value of diets by the educated consuming units explain the observed relationship between budget shares allocated to these

foods and the level of education.

It has also been observed that in general mean expenditure on each food item increases with an increase in the age of head of household up to the age of 45, it then declines thereafter as shown in Table 16. This is explained by the positive relationship that exists between the age of the head of the household and household size. Family size decreases as the children grow up and become independent. The observation in the case of education and age of households conforms with results obtained in similar studies (Mellor 1968 and Salathe 1978).

Household size is found to have a positive effect on the consumption of food. Appendix 2 shows that for any particular income group, an increase in household size increases the mean expenditure for most food catagories. Mean protein expenditure seems to decrease with an increase in household size for the two lower income groups. This could have been caused by the high prices of both meat and pulses, a fact that has made most households purchase less protein food items and more energy food items.

The survey results indicate that mean expenditure on each of the four food classes (energy, protein vegetables and fats) increases with the level of income for a given family size (Appendix 2). This suggest that differences in levels of income partly explain the observed differences in consumptions patterns between households of the same size. As expected for a given level of household income, per capita expenditure on food declines as family size increases (Appendix 3)

Table 15. Budget share for different education levels

Education Level in number of years	Energy	Protein	Vegetables	Fats	Total Expenditure
0- 3	0.522	0.17	0.039	0.003	0.753
4- 9	.399	0.195	0.043	0.005	0.659
10-14	0.354	0.17	0.036	0.02	0.570
15-25	0.180	0.208	0.032	0.027	0.448

Source: Survey Data

Table 16. Mean expenditure for each food group in shillings by age of head of household

Age of Head of Household In Years	Energy	Protein	Vegetables	Fats	Total[a1], Expenditure
25-35	10590.82	8506	1567	1046.28	21710.1
36-45	12766.97	12770.58	1893.57	1011.63	28442.75
46-60	11149.28	6158.21	1172	238.64	18718.13
61 and Over	8408	3595.7	660.35	144	12808.05

Source: Survey Data

[a]1 Shows total mean expenditure for each food group

With the exception of some minor discrepancies, for a given family size per capita expenditure on food increases with level of household income (Appendix 3). These results are in line with those obtained in similar studies (Ferber 1962, Mellor 1968).

4.2.4 Nutritional situation

The nutritional status of a population depends on several factors. Some of these factors are (1) the supply of food from the agricultural sector (2) Institutional arrangements of making the food available to the consumers and (3) real purchasing power of consumers. The widening gap between domestic food supply and demand coupled with rapidly rising cost of living have likely affected negatively the level and quality of food consumption in Tanzania.

Table 17 shows that 79 percent of the sampled farmers thought that the producer prices for their crops are low. Most of these feel they cannot produce more than their subsistance because prices they get do not cover production costs. This has resulted in reduced supply of marketed surplus. The same table also shows that the majority of consumers (61 percent) thought that the official retail prices of preferred food items are fair. However these official prices are considered unrealistic and useless since the commodities are never available at these prices.

From the survey it was learnt that there is a problem in the distribution of processed food and mainly scarce food items because

(1) There are limited shops especially in the villages

where one shop is required to serve more than 100 households scattered over a wide areas.

(2) The supply of food items to these shops by RTC is erratic and inadequate due to scarcity of these items at the national level and inefficiencies in RTC's distribution system.

(3) Sometimes lack of transport and ready cash by shops have either delayed collection of allocated food items from RTC headquarters godowns, or they have resulted in complete forgoing of allocated food items.

Shop keepers and respondents claim that food allocated to any shop does not take into account the number of households served by the shop nor does the distribution of food to households take into account the size of households. Usually a fixed amount of food is given to each household who comes for food.

Although there are several markets in the urban area most of them are small. These are open seven days a week. There is one major market in the urban centre. However prices of most food items in these markets are higher than the official prices because these are determined by the forces of demand and supply. In villages markets are open once a week. However respondents claim that these no longer serve the rural population because farmers refuse to sell to individuals on retail basis, they only sell to business men who pay higher prices and buy wholesale.

Meat is also very scarce in rural areas. There are no butcheries in most of the villages and meat is sold sometimes only

once a forthnight. In the urban areas meat is also scarce due to the reasons discussed in Chapter I. The butcheries are concentrated in the urban centre. Meat is never available in the bucheries after 8 O'clock in the morning. This indicates the low supply of meat. It also means that those farthest from the butcheries do not usually get meat. Most have now turned to pulses and fish as a source of protein.

The low food production, poor distribution of food to shops and markets and increased demand resulting from low subsidized consumer prices have resulted in the establishment of parallel markets which charge much higher prices for these food items. Most low income households can not afford these exorbitant price. These have therefore reduced their consumption by either reducing the number of meals eaten per day or by turning to the consumption of less attractive and low quality food items. Examples of these items are cassava flour and maize flour distributed by NMC.

The food scarcity coupled with high prices have resulted in low calorie and protein intake for majority of the Morogoro population. Table 18 presents the actual calorie and protein intake across income groups for households covered in the sample. The calculation of per capita values was done by the use of household units instead of household size, in order to reduce the effect of household size where there are more children in a family. As shown in the table 18 only the lower income group attains the minimum required per capita calorie intake for an average adult Tanzanian man (3200 KCal/capital/day). However none of these groups attains the minimum required protein intake of 60 g/capita/day recommended (Pinstrup et al. 1976)

Table 17. Frequency table showing respondent's opinion on producer and consumer retail prices

Opinion	Producer Prices		Consumer Retail Prices	
	Frequencies of Farmers	Percentage	Frequencies of Respondents	Percentage
High	0	0	12	10.0
Low	42	79.3	25	20.8
Fair	4	7.5	74	61.7
Do not know	7	13.2	9	7.5
Total	53[a],	100	120	100

Source: Survey Data

a, The total number of farmers in the sample

Table 18. Calorie and protein intake in Morogoro District

Food type	Units	Income Groups in Shs.			
		0-11999	12000-23959	24000-47999	48000 and over
Calorie	kCal/Cap/day[a,]	3278	2569.42	1543	2986
Protein	g/Cap/day[b,]	10.3	8.26	18.0	32.45

Source: Survey Data

a, = kCal/capita/day

b, = g/capita/day

It happens that the majority of the lowest income group are farmers who under any circumstances will always maintain their calorie consumption because they have enough for their subsistance. The urban population that makes up the last two income groups have to depend on NMC for their calorie intake. So far NMC has not been able in the recent years to satisfy this demand. The high costs of food items rich in protein could have resulted in low protein intake for all the four income groups.

4.3 Structural relationships

The general model specified in Chapter III expresses expenditure on a given food item per unit of time as a function of income, family size, area of residence, education level and nature of employment. In order to account for possible differences resulting from nature of employment and area of residence dummy variables are included in the model.

The households included in the sample was divided into four homogeneous income groups. Structural stability tests were conducted to determine whether significant differences in expenditure behavior exist among the four income groups. The tests results were statistically significant at .05 probability level, indicating that a separate equation needs to be estimated for each income group. In order to conserve degrees of freedom and increase efficiency, a single equation combining all income groups, but allowing intercepts and slopes to vary was estimated.

4.3.1 Choice of functional forms

Since there is no a priori basis for determining functional form to use in this study, several functional forms are tried. The functional forms satisfying a set of predetermined criteria is selected for subsequent analyses.

The criteria used for evaluating alternative functional forms include the conformity of signs to a priori expectations, explanatory power ($\bar{R}^2$) and the standard error of the estimated equation. More general and powerful approaches for selecting functional forms based on Box-Cox Transformation and Langrangean Multiplier Test could have been used, but limitation imposed by available data processing facilities made this impossible. The functional forms being evaluated are the linear, quadratic in income, semilog and double log forms.

The criteria mentioned above were separately applied to 3 classes of food expenditure types. The classes are (1) total food expenditure (2) the 4 food categories based on nutritional values (3) selected food items. In each of these cases the functional form satisfying most of the criteria is selected. From the comparison of the 4 functional forms mentioned above the linear functional form was found the best for all the 3 cases because it met most of the criteria set. Results based on the other functional forms are presented in Appendices, 4 to 9.

4.3.2 Total expenditure results

The food items considered in determining total expenditure are maize, rice, wheat flour, cassava, meat, fish, banana, beans,

vegetables, milk and sugar. These are the most common food items in Morogoro District and account for the largst share of consumers expenditure on food. The estimated equation is presented in Table 19.

The results indicate that the variables included in the model account for 81 percent of the observed variation in per capita expenditure on food. However income is the only variable with a significant effect on per capita expenditure on food. The high explanatory power of the equation and the low t - values suggest the presence of multicollinearity. This is certainly the case for education and income variables since they have been shown to be highly correlated.

For a given income level, rural households spend less in per capita food than urban households while farmers spend more on food than non farmers. The area of residence results obtained do not conform to those obtained from budget shares in section 4.2.3. This could be explained by the big extended families most of the higher income (higher educated) heads of households have to take care of.

Marginal propensity to consume (MPC) and income elasticity coefficients have been computed for the four income groups and these are presented in Table 19. Both coefficients show a declining trend as one moves into higher income brackets. For the income group 0-11999 a shilling increase in income will cause total expenditure of food to increase by 80 cents while in the case of the highest income group expenditure increases by 55 cents ceteris paribus. This suggests that any income transfer policies favouring the low income

Table 19. Engel Curve for Total Expenditure[1]

Variables	Coefficients	t-value	$\bar{R}^2$	Standard Error	Summary of Coefficients and Income Elasticities			
					0-1199	12000-23999	24000-47999	48000 and over
Intercept	- 420.154							
PINC	0.552	8.358[a],						
D_1	611.667	0.220						
D_2	961.639	1.216						
D_3	1199.26	1.432						
D_1PINC	0.253	2.197[a],	81.4	933.90	0.805	0.649	0.523	0.552
D_2PINC	0.097	1.20						
D_3PINC	- 0.029	0.270			(0.998)	(0.804)	(0.648)	(0.684)
RES	- 236.26	1.006						
EDUC	18.275	0.245						
EMPL	88.168	0.389						

Source: Regression results based on survey data

[1]PINC = Per capita Income, RES = Residential Area, EDUC = Education, EMPL = Employment

D_1, D_2, D_3 are dummy variables representing the 3 income groups

Zero - one dummies were also used for the area of residence and nature of employment variables where

1. For employment 1 was assigned if households are farmers and zero if they are non farmers.
2. For area of residence 1 was assigned if a household was residing in rural areas and 0 if the household resides in urban areas.

Figures in parenthesis are income elasticities.

a, = values that had significant t = value at 5% probability level

$\bar{R}^2$ = coefficient of determination adjusted for degrees of freedom.

groups will result in an increase in food consumption and little savings and investments which are necessary for economic growth. If the intention of the policies is to increase food consumption for the low income households such policiy is worth considering.

Elasticity figures suggest that expenditure on food is income inelastic. although in the case of the lowest income group the elasticity is close to unity. This suggests that income manipulation may not be a costly method to effectively influence households' expenditure on food in Morogoro District.

4.3.3 Results on expenditure for selected individual food items

The individual food items being considered are maize, rice, sorghum, bananas, meat and beans. The results for the estimated equations are presented in Table 20. These food items have been selected from 3 groups, which are grains, bananas and protein groups.

Grain Staples

The grains considered are maize, rice and sorghum. Income seems to influence the consumption of rice and maize positively and that of sorghum negatively. Although education, and employment do not affect any of the three grains significantly, education has a positive influence on maize and rice but a negative affect on sorghum, (sorghum being an"inferior"grain). As discussed before, education was found to be highly correlated with income. Except for sorghum the rural households tend to spend less on selected grains than urban households. However except for the difference in expenditure on sorghum these differences in consumption patterns between the two area of residence are not statistically significant.

All three grains staples as shown in Table 21 have the marginal propensity to consume coefficients (MPC) less than unity, and with the exception of minor discrepancies, the MPCs decline as per capita income increases across the households. The high income bracket households allocate a smaller share of a shilling increase in their income to these staples than lower income bracket households. When the MPCs are compared across the three grains staples, the results indicate that on average maize has the largest MPCs followed by rice and lastly sorghum across all the four income groups. This suggests that as income increases more of the increase allocated to food will be spent on maize purchases and less on sorghum. The increase in maize purchases will be higher for the lowest income bracket households. Generally the increase in purchase of these staples when income increases are low. For example a shilling increase in income leads lower income bracket households to increase expenditure on maize, rice and sorghum by 18 cents, 13 cents and 3 cents respectively while that of the highest income bracket households for the same grains are 2 cents, almost one cent, and no cent respectively, ceteris paribus.

Income elasticity figures indicate that, expenditure on the 3 grains for the first income group households are income elastic. Maize and sorghum are luxury[1] grains for 21 per cent of the sampled households rice is a luxury good for 56 percent of the sampled households. In a similar study done in Indonesia (Timmer et al. 1979) rice was found to be a luxury[1] good for the bottom 30 - 40 percent of the Indonesians. These percentage were obtained by taking number of respondents in particular income class whose income elasticity for a particular food is greater than one against the number of sampled households.

[1] Luxury goods according to theory are those whose income elasticity are greater than unity. In some text such a commodity is referred to as a superior good.

Table 20. Engel curves for individual selected food items[1]

Food Items	Coefficients											$\bar{R}^2$
	Inter-cept	PINC	D_1	D_2	D_3	D_1XPINC	D_2XPINC	D_3XPINC	EDUC.	EMPL.	RES.	
Maize	224.98	.03	121.99	-85.03	585.76	.16	.18	-.05	1.78	94.46	-82.37	
	(.25)	(.30)	(28)	(1.46)	(2.93)[a]	(4.70)[a]	(1.03)	(.15)	(.86)	(.73)		51
Rice	507.02	.01	-543.82	-467.44	-457.25	.13	.07	.09	4.89	-72.81	8.81	
		(.19)	(2.02)	(1.92)	(1.80)	(3.61)[a]	(2.91)[a]	(2.76)[a]	(.67)	(1.05)	(.12)	40
Sorghum	-144.51	-.01	-193.41	-166.51	-155.07	.04	.02	.02	-5.51	120.44	154.98	
		(.17)	(.72)	(.61)	(1.00)	(.85)	(.52)	(.76)	(.76)	(1.73)	(2.15)[a]	13
Bananas	372.41	.05	-112.63	-162.77	-45.01	0.03	.01	-.03	-9.47	-47.11	-44.29	
		(2.24)	(.42)	(.67)	(.18)	(.921)	(.16)	(.76)	(1.31)	(.68)	(.62)	28
Meat	-388.39	.16	-156.90	174.86	148.43	.08	-.01	.02	15.92	25.92	-217.35	
		(6.27)[a]	(.46)	(.57)	(.46)	(1.78)	(.37)	(.40)	(1.17)	(.29)	(2.38)[a]	77
Beans	+ 87.83	.02	-341.60	-22.11	40.62	.113	.02	.11	-6.62	64.95	-31.95	
		(1.62)	(1.76)	(.13)	(.25)	(4.4)	(1.03)	(.46)	(1.27)	(1.21)	(.64)	34.8

Source: Computed from Regression results and survey data

[1]PINC = Per capita income, EDUC = Education, EMPL = Employment, RES = Residential area

$\bar{R}^2$ = Coefficient of determination adjusted for degrees of freedom,

Figures in parenthesis are t - values

a_1 = Values with significant t - values at 5% probability level

D_1, D_2, D_3 are dummies representing the first three income groups

Dummies were used for residence and employment variables

Where Employment - assigned a value of one if head of household is a farmer and zero if non farmer

Residence - assigned value of one if household resides in rural area and zero if in the urban area

Table 21. Marginal propensities to consume and income elasticities for selected individual food items[a],

Food Items	Income groups			
	0-11999	12000-23999	24000-47999	48000 & Over
Maize	-.189 (1.515)	-.208 (.893)	-.029 (.124)	.025 (.158)
Paddy	.133 (2.781)	.075 (1.219)	.096 (.769)	.004 (.21)
Sorghum	.033 (1.279)	.018 (.576)	.171 (.507)	-.003 (-9.32)
Bananas	.077 (.391)	.049 (.725)	.020 (1.603)	.045 (.309)
Meat	.241 (3.548)	.151 (1.965)	.178 (1.556)	.170 (.997)
Beans	.137 (1.737)	.042 (.553)	.035 (.357)	.024 (.743)

Source: Computed from regression results and survey data

a, the figures in parenthesis are income elasticities and those without parantheses are marginal propensities to consume

Cooking bananas

Engel curve results are presented in Table 20. Income and education signs conform to a priori expectation. Although there is a positive relationship between income and per capita on bananas expenditure the relationship is not significant nor is the negative relationship between education level of head of household and per capita expenditure on bananas is significant. Bananas have now become one of the major food items in the urban areas as discussed in section 4.2.1. This is reflected in the Engel curve results which show that rural residents spend less on banana than urban residents. None of the factors included in the equation had any significant influence on household expenditure on bananas.

Marginal propensity to consume and income elasticity figures as presented in Table 21 show a declining trend as income level increases. The MPCs show that a shilling increase in income will result in an increase in per capita banana expenditure of 7 cents for the lower income brackets households and a 4 cents increase for the higher bracket households ceteris paribus. This increase for the higher income group is higher than that allocated to the three grain staples already discussed. This indicates that banana which is more easily available now than either maize or rice is becoming a substitute for these preferred grains for majority of the urban population.

Income elasticities do not show any consistent trend. The income elasticities for the two middle income classes indicate that their expenditure on bananas are more responsive to income increases than are the other two groups.

Meat and Banana

Engel curve results presented in table 20 show that all coefficient signs except area of residence in the case of beans conform to a priori expenditure. Income has a significant positive influence on per capita expenditures on meat and beans. Since beans are regarded as inferior/substitute to meat an increase in the level of both per capita income and education level of the head of household are expected to reduce the per capita expenditure on beans and increase that of meat. Area of residence has significant effect on per capita expenditure on meat. Low income in the rural areas and scarcities of meat as discussed in Chapter I and in section 4.2.1 could have resulted in lower per capita expenditure on meat in the rural areas.

The marginal propensity to consume and income elasticity results as presented in Table 21 for beans and meat decline across income groups. While lower income bracket households spend 24 cents of a shilling increase of their incomes on meat and 14 cents on beans, the higher income bracket households spend 17 cents of a shilling increase of their incomes on meat and 2 cents on beans. On the whole the MPCs for meat are the highest followed by those for maize. This indicates that any proportion of a shilling increase in income allocated to food the largest share will be spent on meat followed by maize, rice, beans, bananas and sorghum in that order. This shows the importance of each food item to the Morogoro population. Any food production policies should take into account these preferences.

4.3.4 Results on expenditure by nutritional classes

The four nutritional classes are energy, protein, vegetables and fats. The Engel curves for these four classes are presented in Table 22 and their marginal propensities to consume and income elasticities are presented in Table 23.

Energy class

The food items considered in this class are maize, rice, sorghum, sugar, cooking bananas, wheat flour and cassava. Results shown in Table 22 indicate that per capita income is the only factor influencing energy class significantly. Education and nature of employment factors have the expected signs. These results conform to the budget share results in section 4.2.3. The area of residence coefficient has a wrong sign. Logically the rural residents whose incomes, as discussed in section 4.2.3. are lower than those of urban residents, are expected to spend a higher proportion of an income on energy foods than urban residents.

Except for a discrepancy in the second income group MPCs and income elasticities presented in Table 23 for the four income groups decline with an increase in the level of income. Although the income elasticities are high they are generally less than unity and do not differ much from those obtained from the Colombia study. These results are presented in Table 8.

Protein class

This class contains the following food items, meat, fish, milk and dry beans. Results in Table 22 show that per capita expenditure

Table 22. Engel curves for four food categories[1]

Food Categories	Coefficients											R^2
	Inter-cept	PINC	D_1	D_2	D_3	D_1XPINC	D_2XPINC	D_3XPINC	EDUC.	EMPL.	RES.	
Energy	1153.4	.12 (3.37)[a,]	-536.9 (1.15)	-593.3 (1.41)	-322.63 (.23)	.275 (4.45)[a,]	.323 (5.39)[a,]	.10 (1.74)	-16.15 (1.28)	123.632 (1.03)	-1.92 (.001)	72
Protein	-501.4	.25 (7.62)[a,]	-111.39 (.25)	486.3 (1.04)	460.06 (1.59)	.15 (2.59)	-.01 (.23)	.01 (.11)	20.54 (1.72)	50.46 (.44)	331.9 (2.91)[a,]	81
Vegetables	-87.87	.02 (1.87)	212.49 (1.24)	38.85 (.25)	40.58 (.25)	-.02 (.92)	.02 (1.09)	.01 (.37)	10.94 (3.866)[a]	38.27 (1.17)	53.91 (2.37)[a,]	26
Fats	1068.8	.013 (1.78)	-92.75 (.98)	-147.24 (1.70)	-156.08 (1.72)	-.01 (.95)	.10 (1.18)	-.01 (.08)	4.60 (1.80)	-7.61 (.31)	-29.29 (1.15)	62

Source: Regression results based on survey data

[1]PINC = Per capita income, EDUC. = Education, EMPL. = Employment RES = Residence

$\bar{R}^2$ = Coefficients of determination adjusted for degrees of freedom

Figures in parenthesis are t - vaues

a, = Values with significant t - Values at 5% probability level of significance

D_1, D_2, D_3, are dummies representing the first 3 income groups

Dummies were used to represent residential area, if head of household resides in rural area and zero if reside in urban

Employment - assigned a value of one if head of household is a farmer and zero if head of household is a non farmer.

Table 23: Marginal propensities to consume and income elasticities for the four food categories by income group[a],

Food Categories	Income groups			
	0-11999	12000-23999	24000-47999	48000 & Over
Energy	.393 (.885)	.35 (.788)	.567 (1.277)	.118 (.266)
Protein	.405 (1.935)	.244 (1.166)	.259 (1.238)	.253 (1.209)
Vegetables	.003 (.06)	.041 (.821)	.032 (.640)	.024 (.481)
Fats	.001 ( )	.113 (1.276)	.005 (.666)	.013 (.721)

Source: Computations from regression results and survey data

a, Figures in parenthesis are income elasticities those without parantheses are marginal propensities to consume

on protein foods is influenced significantly by per capita income and area of residence. All signs except that for nature of employment conform to a priori expectation. According to the results and evidence from similar studies (Sinha 1966, Timmer 1979) an increase in income and level of education result in an increase in expenditure on protein foods, and a decrease in expenditure on energy class. As explained in section 4.2.3 farmers, generally have lower incomes than non farmers they were therefore expected to have low expenditures on protein. However since beans, a major source of protein for farmers formed a bigger proportion of the protein class, it is possible to find that farmers spend more on protein than non farmers.

Marginal propensity and income elasticity figures shown in Table 23 show a declining trend as income level increases. These are higher than those obtained for the energy class. The table shows that while 41 cents of a shilling increase in income will be spent on protein and energy classes respectively by the lower income bracket household, only 25 cents and 11 cents respectively will be spent on these food classes by the higher income bracket households. This indicates that nutritional standards of the low income groups can be improved through implementing policies that will raise incomes.

Income elasticities for all the income strata are greater than unity. This indicates that protein is a luxury food for all income strata. This could have resulted from the low real income for majority of the population coupled with constant scarcities of meat, beans and milk in general.

Vegetables class

Results in Table 22 indicate that there is a positive relationships between per capita income and per capita expenditure on vegetables. However it is only education level that has a significant influence on per capita expenditure on vegetables. All signs conform to a priori expectation. Higher educated heads of households have the knowledge of the value of various vegetables. These households will therefore tend to purchase high value vegetables like carrots, tomatoes, peas etc which generally cost more than the normal green vegetables purchased by low income households. Since education is highly correlated with income as discussed in section 4.2.3 these higher educated heads of households can afford these.

With an exception of a minor discrepancy both the MPCs and income clasticities follow the normal trend: as shown in Table 23. The MPCs are much lower than for either the energy and protein classes. This shows that a smaller share of an income increase is allocated to vegetables as compared to the other two food classes.

Income elasticities are generally high, however they do not compare well with those presented in Table 8, which were obtained from the Colombia study. The Morogoro elasticities are less than unity, as expected because vegetables form only a small proportion of the budget for majority of the population.

Fats class

Engel curve results presented in Table 22 show that all signs conform to a priori expectation. None of the factors included in the equation affected per capita fat expenditure significantly. This

could be due to severe scarcity of this commodity in both the urban and the rural areas.

Marginal propensity to consume fats are generally lower than those for vegetables, while income elasticities across income groups are higher than those for vegetables or energy classes. As discussed above due to severe scarcity of the commodity,per capita expenditures on fat for the two lower income brackets were very low.

4.4 Chapter Summary

Results obtained from this study were similar in most cases to those obtained in similar studies done in other developing countries. In general they also behave as expected by theory. Per capita income was found to have a positive effect on the per capita expenditure on all food categories and selected food items except sorghum. It affected the following food items significantly, maize, rice and meat, and the following food categories, energy and protein classes. Structural stability tests for the various food categories and individual food items showed that there was a significant difference in food consumption patterns across income groups. Same results were obtained from budget shares. This shows that when prices are held constant, income is the main factor explaining the observed variation in food consumption patterns across households.

An increase in the level of education of head of household results in increases in purchases of total food as a whole, and increases in purchase of protein, vegetables and fats food categories

and increases in purchase of individual food items like rice, meat and maize. This increase in education level however results in lower purchases of sorghum and bananas, the less preferred food items. However education was found to influence only the expenditure on vegetables significantly. This could be due to the close correlation between education and income.

Households residing in the urban and the rural areas were found to have different consumption habits. Engel curves results show that rural households generally spend less than urban households on the following, all selected food items, except sorghum, and on the following food categories energy, and fats. Their expenditure on sorghum is greater than that for urban households. The non availability of certain food items in any of these areas of residence has also modified the effect of area of residence on food expenditure. It was also established that area of residence and nature of employment are correlated with the level of income of a household. It is therefore possible that these sociodemographic factors modify the effect income has on expenditures on food.

Age of the head of household was found to affect expenditure on all food categories positively up to the age of 45, then negatively after that age. Younger heads of households tend to spend a greater absolute mean income on food than do older heads of households. Household size also has a positive effect on food expenditure. An increase in household size increases the absolute mean expenditure on food but per capita expenditure declines.

Marginal propensities to consume and elasticities across different income groups behave as expected. They decline with an increase in the level of income for most commodities and food categories. They are high for the most preferred food categories and food commodities especially energy and protein food groups. They are high for some commodities within these categories like maize and paddy in the energy food category and for meat in the protein food group. Rice and meat were found to be luxury items for majority of households.

Qualitative results show that production of food is low due to low producer prices, and marketing of food is poor as a whole. Parallel markets have evolved due to food scarcity. These factors have led to low calorie and protein intake in all income strata in Morogoro.

The MPC and income elasticity results can help to predict the outcome of some set of food policies. When an effort is made to redistribute or increase the level of income of the lower income households such a policy will give different results depending on the objective of the policy. If the objective is to increase the level of food consumption of this community, then the policy is to be recommended. A one per cent increase in income will result in an increase in food expenditure specially on proteins of a greater than one percent. Since it has been shown that this community suffers from low calorie and protein intake such a policy coupled with the food campaigns through mass media, and the availability of food could save the government costly food blanket policies like food subsidies. If the objective is to stimulate economic growth through saving and

investment then either the objective will fail to be realized or it will be realized at a very high cost to the government because this community has a very low marginal propensity to save (MPS).

It also shows any policy to expand the production of the less preferred food items will only result in an increased accumulated stock of these, costly disposal of these and constant importation of the more preferred food items. From the results one can see that a proportion allocated to food of any one percent increase in income will first be allocated to the more preferred food items.

CHAPTER V. SUMMARY AND CONCLUSIONS

As stated in section 1.3 the main objective of this study is to examine the effects of income differences across households on food consumption patterns in Morogoro district, and how these effects are modified by sociodemographic factors. The sociodemographic factors considered are education level, nature of employment of head of household, and area of residence. The study therefore did the following:

a) determine budget shares by income groups for the four food categories, individual selected food items and total food expenditure.

b) determine marginal propensity to consume and income elasticities by income group.

c) study the effects of sociodemographic characteristics on food expenditure through the use of budget shares and Engel Curves.

d) qualitative evaluation of the effect of some public policies on food consumption patterns.

5.1 Summary of analysis used and results obtained

The model used for the regression analysis was based on the static theory of consumer behaviour. The variables included are per capita expenditure and income, education level, and the other factors considered are the nature of employment and area of residence. Per capita expenditure and per capita income are used, in order to

take into account the effect of household size. Allowance is also made for variation in intercepts and slopes across the four income groups. Four classical functional forms are used to empirically specify expenditure income relationship. These are the linear, quadratic in income, semilog and double log forms. The linear form was eventually used for the analysis in all the 3 food classes because it met most of the criteria set.

Tabular analysis is used to analyze the effects of socio-demographic characteristics on food consumption patterns. This analysis included budget shares by income groups for all the 3 food classes, and also budget shares by the stated sociodemographic characteristics. From these budget shares results it was revealed that budget shares for higher income brackets households are lower for total food expenditure, and all food categories, except protein. The budget shares for total food expenditure ranged from 50 percent for the highest income bracket households to 80 percent for the lowest income bracket households. In the same manner the rural residents and farming households who are found to have lower incomes than urban and non farming household, have higher budget shares for total food expenditure (79 percent and 89 percent respectively) and for all food categories except fats and protein.

Tabular analysis has also showed that the households with heads of households in the 25 - 35 and 36 - 45 age groups spend a bigger absolute mean income on all food categories than do households with a head of household of over 46 years of age. Budget shares for the higher educated heads of household were lower than those for lower educated heads of households.

The budget shares for a head of household with up to 3 years of education for energy and fats are 52 percent and 3 percent respectively, while those for a head of household with up to 15 years of education are 18 percent and 27 percent for the two food categories.

Coefficients obtained from Engel curves for most of the food categories and selected individual items had the expected signs. The percentage of coefficients with the expected signs were as follows protein, vegetables, and sorghum 100 percent, total expenditure and energy food expenditure, maize, paddy, beans and meat 80 percent.

Income has been found to be a significant influencing factor in the consumption of protein and energy food groups, and in the consumption of meat, maize and rice food items. Although it had a positive influence on the consumption of fats and vegetable food categories, and in the consumption of bananas and beans, its effect was not significant. It had a negative effect on expenditure on sorghum. Other factors included in the model did not seem to influence food consumption patterns significantly. For all food categories and food items analyzed, income coefficients had a significant t value 63 percent of the equations while education coefficient was significant only 9 percent of the equations. Area of residence had significant t values 27 percent of the equations. Employment coefficient was not found to influence any of the food expenditures significantly. It is possible that the presence of multicollinearity resulted in wrong signs and wrong inferences.

Rural residents were found to consume more rice, sorghum and vegetables than urban residents, and less meat, maize, banana and beans items, fats and energy food classes as a whole. Most of these results are consistent with the budget shares, obtained for major food categories.

Farmers were found to spend more on energy food, protein, and vegetable food categories than do non farmer. In the case of selected individual food items they spend more on meat, beans, sorghum and maize than non farmers. All equations for food items conform to a prior expectation with the exception of those which included meat as a component. The consumption of these is mainly determined by their incomes which are generally low.

Household size also affects food expenditure positively. Household with a larger household size spent a bigger mean income on food than those with a smaller household size. For example a low income bracket household with one member spends shs.4018 on energy food category and shs.2172 on protein category while that with 5 members spend shs. 7115 on energy food class and shs.2537 on protein. For the 24000-43999 income group a household with 3 members spends shs.7968 on energy food category and shs.6960 on protein while that with 5 members spends shs. 10485 on energy category and shs. 7605 on protein.

Marginal propensity to consume and income elasticities calculated from Engel curvesdecline as one moves to higher income levels. In the case of individual selected items meat has the highest

MPCs followed by maize, rice, bananas, beans and lastly sorghum. This indicates that a shilling increase in income will be allocated to these items in terms of priority. In the case of the 4 food categories the protein category has the highest MPCs followed by energy, vegetables and lastly fats categories. These range from .253 for protein and .118 for energy for the highest income group to .405 for protein and .393 for energy for the lowest income group.

Income elasticities are generally greater than unity for the 0-11999 income group for all food items and for protein and fats food categories. In general meat is a luxury item for 80 percent of the population and rice is a luxury item for 56 percent of the population. Protein expenditure is very responsive to income increases for all income strata. These income elasticities range from 1.935 for the 0-11999 income group to 1.209 for the highest income group. Although those for the energy category are less than unity they are generally high. They range from .885 for the lowest income group to .266 for the highest income group. This indicates that any income transfers will result in an increase in the consumption of food for the lower income households whose food expenditures are very responsive to income, but would reduce economic growth through low investments made by higher income households. Since it is mainly the lowest income households that have higher food MPC and income elasticities any blanket programs to improve food consumption would be very costly because the government will have to spend a larger amount of money to achieve a targeted consumption level.

Qualitative results indicate that both producer and retail prices are low. This has led to low production of food by farmers and an increased demand for these food items, as a result food scarcities are experienced leading to the rise and entrenchment of parallel markets. These scarcities are aggrevated by the poor and unequal distribution of the available food. Consumers find some of the substitutes for maize and rice like cassava flour and sembe, distributed by NMC are of poor quality. These scarcities and poor quality food have resulted in reduced food consumption for majority of the population in Morogoro whose income cannot allow them to buy food at parallel market prices. This has led to below minimum calorie and protein intake for all strata. Calorie intake for Morogoro ranges from 1543 Kcal/Capita/day for the 24000 - 47999 income group to 3278 KCal/Capita/day for the 0-11999 income. It is only the first income group that has attained the minimum required calorie intake for an adult Tanzanian of 3200 KCal/Capita/day (UDSM 1982). Protein intake for all income strata are below the 60 g/capital/day recommended (Pinstrup et al.1976). These range from 8.26 g/cap/day for the 12000 23999 income group to 32.45 g/cap/day for the highest income group.

5.2 Conclusion and implications of results

Sample results in general have shown that there are differences in food consumption patterns between the rural and urban residents, lower educated and higher educated, farmers and non farmers and across income groups. However it is only income that has proved to have any significant effect on food consumption. This could have been due the poor economic situation in the country where income

now plays a major role in determining whether a household can buy in the parallel markets or not. As discussed in Chapter one and as shown in section 4.2.2 and 4.2.3, incomes for the majority of the population are low. Real income are now low and continue to fall due to rising inflation. It so happens that the effects of these other factor included in model are now insignificant.

The qualitative, tabular and regression analyses have indicated that there are clear food preferences in both the urban and rural areas. Marginal propensities to consume and income elasticities for most preferred food items and food categories are higher than for the less preferred food. Percentages of households consuming preferred food items or food categories and budget shares for these are also high. This therefore indicates that any food production and distribution policies should take into account these preferences in particular residential areas and for particular sections of the community.

5.3 Limitation of the study and direction for future research

The main purpose of the study is to give information needed for policy formulation and future projection. This study was conducted during a critical economic situation when food scarcities were acute. It was therefore difficult to get accurate data for some of the food items like sugar, wheat flour and cooking fat that are more scarce than others. It is possible that data for some of these food items are unreliable and so are the results obtained from such data. It is also possible that the presence of multicollinearity among the

variables used and also the over powering effect of income has led to low t values and wrong signs for some of the variables included in the model used.

The study looked at the effect of the stated variables on individual food items and on individual food categories separately across households. It did not look at the interrelationship in consumption between these food items or food categories. Also since cross section data was used for the analysis it was not possible to get the effect of changes in prices or the effect of time on food expenditure patterns. It would be of interest to revist the same households for several years and build information for studying their consumption behaviour over time.

The study did not evaluate whether there is any significant differences between marginal propensities to consume obtained. It is of interest therefore for any future work to establish this.

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APPENDIX I

QUESTIONNAIRE FOR THE RESEARCH ON CONSUMPTION OF MAJOR FOOD ITEMS IN MOROGORO DISTRICT

Part 1: Background Information on the Area of Residence of Household

1. Name of area of residence village/town .....

   .....

   .....

2. Accessability to good road .....Yes ..... /___/

   No ..... /___/

3. Numbers of shop(s) if any .....

   .....

4. Food items available in the shop(s)

   .....

   .....

   .....

5. Number of markets if any .....

6. Food items available in the market(s) .....

   .....

   .....

   .....

   .....

7. How many days a week is/are the markets open ..... days

Part 2: Background Information about the Household

8. Name of Head of Household.....

.....

9. Tribe: .....

.....

10. Age: .....

.....

11. Education level (enter the number of years of formal education. If none enter zero).

.....[ ] Years

12. Occupation: .....

13. Position: .....

14. Family background

Number of members .....[ ]

AGE IN YEARS

SEX	0 - 4	5 - 10	11 - 16	17 - 25	26 - 39	40 - 59	Over 60	Total
Males								
Females								
Total								

15. Income per month

16. Does the income differ from month to month .....

.....

..... Yes .....☐

No .....☐

17. In which months does it differ: .....

.....

.....

.....

18. By how much .....

.....

.....

.....

19. Part 3: Family Expenditure on Food Items

Food Item	Amount	Price in Shs	Total Expenditure in Shs.
Maize			
Rice			
Sorghum			
Millet			
Wheat Flour			
Bananas			
Meat			
Fish			
Vegetables			
Beans			
Sugar			
Milk			
Cooking Fat			
Cassava			
Total Expenditure			

20. What other food items do you consume .....

.....

.....

.....

21. Which food items do you grow yourself .....

.....

.....

.....

22. How much of each food items you grow do you consume yourself? .....

.....

.....

23. Which food items do you prefer to eat .....

.....

.....

.....

24. Is each of these preferable food items easily available:

Yes ..... /—/

No ..... /—/

25. If not, what are the reasons for non availability: .....

.....

.....

.....

26. How often are these food items distributed .....

.....

.....

.....

27. How are they distributed .....

.....

.....

.....

28. Are these food items sold at the official prices? .....

.....

Yes ..... ☐

No ..... ☐

29. If no, at what price is each commodity sold.

Food Item	Unofficial Price

30. Which food items do you consume which you do not like

.....

.....

.....

31. Why do you still consume them .....

.....

.....

.....

32. Do you think the distributive system is efficient?

Yes ..... ☐

No ..... ☐

33. If no what are your reasons: .....

.....

.....

34. Will the proposed distributive system where each cooperative shop will be responsible for a certain number of people be better than the present one .....

Yes ..... ☐

No ..... ☐

35. If no, why .....
.....
.....
.....

36. Do you think the system could be improved? .....
Yes/No.

37. If Yes, What improvements: .....
.....

38. If the price of food remained as stated by the Government would you want to buy more of each food item?
Yes/No.

39. Do you think the retail prices are fair.
.....
.....
.....

40. Do you think the price to farmers are fair? .....
.....
.....
.....

Appendix 2. NMC milling corporation storage capacity

	1000 tons						
	Usable capacity of flat storage 1976			Storate capacity 1976			Peak storage Demand 1980
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Owned	Hired	Total	Convention	Silos	Total	
Dodoma	14.7	-	14.7	24.0	-	24.0	24.6
Arusha	14.6	15.2	29.8	20.0	28.0	48.0	46.3
Kilimanjaro	10.2	6.6	16.8	14.5	-	14.5	9.9
Tanga	1.5	1.4	3.2	-	-	-	14.5
Morogoro	3.3	1.4	4.7	2.0	-	2.0	14.3
Coast Dar es Salaam	41.2	27.3	68.5	74.1	18.5	92.6	56.7
Lindi	7.0	-	7.0	-	-	-	13.9
Ruvuma	-	0.1	0.1	-	-	-	8.8
Iringa	15.2	-	15.2	18.3	13.5	31.8	19.4
Mbeya	5.4	0.8	6.2	-	-	-	15.4
Singida	5.0	-	5.0	9.0	-	9.0	1.9
Tabora	7.8	-	7.8	15.0	-	15.0	20.0
Rukwa	3.0	-	3.0	5.5	-	5.5	4.6
Kigoma	3.8	-	3.8	15.0	-	15.0	3.4
Shinyanga	4.4	-	4.4	-	-	-	19.6
Ziwa Magharibi	-	0.5	0.5	-	-	-	3.4
Mwanza	5.5	-	5.5	4.5	-	4.5	16.5
Mara	6.7	-	6.7	4.5	-	4.5	10.8
Tanzania	149.3	53.3	239.7	206	60	266	304

Source: 1 - 3 from Coopers & Lybrand (11), 4 - 5 from FAO (12).

Appendix 3 Household size: mean expenditure for each food group and for each income group

Household Size	Food Categories	Income Group in Shs. 0-11999	12000-23999	24000-43999	48000 and over
1	Energy	4018	-	-	-
	Protein	2172	-	-	-
	Vegetables	325	-	-	-
	Fats	0	-	-	-
2	Energy	6327	7200	-	-
	Protein	2184	4156	-	-
	Vegetables	368	1056	-	-
	Fats	0	208	-	-
3	Energy	5667	6608	7968	-
	Protein	1536	4422	6960	-
	Vegetables	752	672	528	-
	Fats	0	0	0	-
4	Energy	7673	8380	10053	9648
	Protein	1632	3868	7260	19768
	Vegetables	752	638	672	2880
	Fats	0	170	0	1560
5	Energy	7115	10314	10485	10788
	Protein	2537	3504	7605	18000
	Vegetables	888	1056	2136	996
	Fats	0	0	0	2100
6[a,]	Energy	-	14800	15300	16322
	Protein	-	5311	9327	16845
	Vegetables	-	1745	1653	2558
	Fats	-	720	252	2493

Source: Survey Data

- Indicates that there was no household in that particular income group with that household size

a_1 The values were calculated using the mean value of 8 members

Appendix 4. Household size: per capita expenditure for each food and income group

Household Size	Food Categories	Income Groups in Shs. 0-11999	12000-23999	24000-47999	48000 and Over
1	Energy	4018	-	-	-
	Protein	2172	-	-	-
	Vegetable	327	-	-	-
	Fats	0	-	-	-
2	Energy	3163.5	3600	-	-
	Protein	1092	2088	-	-
	Vegetables	184	528	-	-
	Fats	0	104	-	-
3	Energy	1889	2203.6	2656	-
	Protein	512	1474	2320	-
	Vegetable	250.6	224	176	-
	Fats	0	0	0	-
4	Energy	1791.7	2095	2513.95	2412
	Protein	408.0	967	1815	4942
	Vegetable	138.0	159.2	168	720
	Fats	0	42	0	390
4	Energy	1791.7	2095	2513.95	2412
	Protein	408.0	967	1815	4942
	Vegetable	138.0	159.2	168	720
	Fats	0	42.	0	390
5	Energy	1423	2062.8	2097	2157.6
	Protein	507	700.8	1521	3600
	Vegetable	777.6	211.2	534	199.2
	Fats	0	0	0	420
6[a],	Energy	-	1850	1915.87	2040.25
	Protein	-	663.87	1165.87	2105.62
	Vegetable	-	218.13	206.6	319.75
	Fats	-	90	31.5	311.62

Source: Calculated from Appendix 2

a, The values were calculated using mean household of 8

- Shows that there was no household of this size in the particular income group

Appendix 5. Results for total food expenditure when four classical functional forms are used[1]

Equation	$\bar{R}^2$	Inter-cept	Sign of Coefficient											
			PINC	$PINC^2$	LPINC	D_1	D_2	D_3	D_1 PINC[b],	D_2 PINC[b],	D_3 PINC[b],	EMPL	EDUC.	RES.
Linear	81	-	+ (.38)	na na	na na	+ (.22)	+ (1.21)	+ (1.44)	+ (2.20)	+ (1.2)	- (.27)	+ (.39)	+ (.24)	- (1.0)
Quadratic	81	+	- (2.42)	- (1.22)	na na	+ (0)	+ (.69)	+ (.57)	+ (2.50)	+ (1.17)	+ (.47)	+ (.11)	+ (.74)	- ((.86)
Semilog	71	-	na na	na na	+ (11.74)	+ (.89)	+ (4.0)[a],	+ (3.2)[a],	+ (1.48)	OM OM	- (3:02)[a],	+ (1.25)	+ (.23)	- (.89)
Double log	86	+	na na	na na	+ (16.47)[a],	- (.22)	+ (4.0)[a],	+ (1.93)	+ (.73)	OM OM	- (1.43)	+ (.21)	+ (1.09)	- (1.70)

Source: Computer printout

[1] PINC = Per capita income, EDUC. = Education, EMPL. = Employment, RES. = Area of Residence, LPINC = Log income

Figures in parenthesis are t value

a, = Values with significant t values at 5% probability level

OM = Ommitted

na = Not applicable

D_1, D_2, D_3 are dummies representing the first 3 income classes. Dummies where used to represent area of residence and nature of employment. Area of residence was assigned one if rural resident and zero if urban resident

Nature of employment was assigned one if farmer and zero if non farmer.

b, = for the semilog and double log the cross terms are D_1 LPINC

+ = Positive, - = Negative

Appendix 6. Marginal propensities to consume and income elastioities for total food expenditure[a],

Equation	Income groups			
	0-11999	12000-23999	24000-43999	48000 & Over
Linear	.805 (.990)	.649 (.804)	.523 (.648)	.552 (.684)
Quadratic	.342 (.424)	.103 (.128)	.069 (.128)	.183 (.227)
Semilog	.158 (.196)	OM OM	.099 .099	.173 (.214)
Double log	.740 (.917)	OM OM	.569 (.705)	.682 (.845)

Source: Computations from regression results and survey data

OM = Ommitted

Figures in parenthesis are income elasticities and those without parantheses are marginal propensities to consume

Appendix 7. Engel curves for selected individual food items when four classic functional forms are used

Food Items	Equation	Intercept	Signs of Coefficients[b], PINC	$PINC^2$	D_1	D_2	D_3	D_1 PINC	D_2 PINC	D_3 PINC	EMPL.	EDUC.	RES.	$\bar{R}^2$
Maize	Linear	+	+	na	+	−	+	+	+	−	+	+	−	
			(.25)	na	(.30)	(.22)	(1.46)	(2.93)[a],	(4.70)	(1.03)	(.86)	(.15)	(.73)	51
	Quadratic	+	−	+	−	−	−	+	+	+	+	+	−	
			(2.24)	(2.88)[a],	(1.09)	(1.21)	(.21)	(4.0)[a],	(4.82)[a],	(.70)	(.29)	(.09)	(.46)	54
Rice	Linear	+	+	na	−	−	−	+	+	+	−	+	+	
			(.19)	na	(2.01)	(1.92)	(1.79)	(3.69)[a],	(2.91)[a],	(2.76)[a],	(1.05)	(.67)	(.12)	40
	Quadratic	+	−	+	−	−	−	+	+	+	−	+	+	
			(.62)	(.78)	(2.14)	(2.07)	(1.94)	(3.54)[a],	(2.89)[a],	(2.73)[a],	(1.18)	(.65	(.20)	39
Sorghum	Linear	−	−	na	−	−	−	+	+	+	+	−	+	
			(.17)	na	(.72)	(.61)	(1.0)	(.83)	(.52)	(.76)	(1.73)	(.76)	(2.15)[a],	13
	Quadratic	−	+	−	+	+	+	−	+	−	+	−	+	
			(2.61)[a],	(2.98)[a],	(.76)	(.38)	(1.02)	(.51)	(.92)	(1.19)[a],	(2.36)	(.72)	(1.92)	18
Meat	Linear	−	+	na	−	+	+	+	−	+	+	+	−	
			(6.27)[a],	na	(.45)	(.57)	(.46)	(1.78)	(.37)	(.40)	(.29)	(1.73)	(2.38)[a],	77
	Quadratic	+	−	+	−	−	+	+	−	+	−	+	−	
			(.58)	(3.85)[a],	(2.25)[a]	(.78)	(1.59)	(3.49)[a],	(.432)	(2.47)[a],	(.47)	(1.75)	(2.14)[a],	79
Beans	Linear	+	+	na	−	−	+	+	+	+	+	−	−	
			(1.62)	na	(1.76)	(.12)	(.25)	(4.4)[a],	(1.03)	(.45)	(1.21)	(1.27)	(.64)	34
	Quadratic	+	+	−	−	−	+	+	+	+	+	−	−	
			(.98)	(.31)	(1.39)	(0)	(.35)	(3.71)[a],	(1.03)	(.21)	(1.3)	(1.26)	(.63)	34

Appendix 7 (Contd.)

Food Items	Equation	Intercept	Signs of Coefficients[b]: PINC	PINC^2	D_1	D_2	D_3	D_1 PINC	D_2 PINC	D_3 PINC	EMPL.	EDUC.	RES.	$\bar{R}^2$
Bananas	Linear	+	+	na	−	−	−	−	+	−	−	−	−	
			(2.24)	na	(.42)	(.67)	(.18)	(.92)	(.16)	(.76)	(.68)	(1.31)	(.62)	28
	Quadratic	−	+	−	+	+	+	−	+	−	+	−	−	
			(4.19)[a]	(3.52)	(1.28)	(.57)	(1.68)	(.53)	(.21)	(2.61)	(0)	(1.31)	(.99)	35

Source: Computer print out

[1] PINC = Per capita income, EDUC. = Education, EMPL. = Employment, RES. = Area of residence

D_1, D_2, D_3 are dummy variables representing the first 3 income groups

$\bar{R}^2$ = Coefficient of determination adjusted for degrees of freedom

Figures in parenthesis are t values

a, = are values with significant t value - at 5% probability level

Dummy variables were used to represent area of residence and nature of employment

Employment - was assigned 1 if farmer and zero if non farmer

Area of Residences - was assigned 1 if the head of household resides in the rural areas and zero if the head of household lives in urban area

+ = Positive, − = Negative.

Appendix 8. Marginal propensities to consume and income elasticities for individual selected food items [a,]

Food Item	Functional Form	Income group			
		0-11999	12000-23999	24000-47999	48000 & Over
Maize	Linear	.189	.208	-.029	.025
		(1.515)	(.0893)	(.124)	(.158)
	Quadratic	.504	.436	.398	.255
		(5.193)	(1.872)	(1.709)	(1.608)
Paddy	Linear	.133	.075	.096	.004
		(2.781)	(1.219)	(.769	(.021)
	Quadratic	.207	.134	1.72	.071
		(4.328)	(2.178)	(1.378)	(.379)
Sorghum	Linear	.033	.018	.171	-.003
		(1.279)	(.576)	(.507)	(-9.32)
	Quadratic	-.275	-.243	-.202	-.255
		(-10.658)	(-7.778)	(-5.990)	(-792.59)
Meat	Linear	.241	.149	.178	.161
		(3.548)	(1.965)	(1.556)	(.997)
	Quadratic	.554	.371	.50	.383
		(31.67)	(13.25)	(4.267)	(1.478)
Beans	Linear	.137	.042	.035	.024
		(1.739)	(.553)	(.357)	(.743)
	Quadratic	.209	.118	.106	.100
		(6.091)	(1.891)	(.849)	(1.068)
Bananas	Linear	.013	.049	.20	.045
		(.391)	(.725)	(1.603)	(.309)
	Quadratic	-.235	-.143	-.236	-.138
		(-7.661)	(-2.116)	(1.891)	(.948)

Source: Computed from regression results and survey data

a, = Figures in parenthesis are income elasticities those without are marginal propensities to consume

Appendix 9. Engel curves for four food categories when four classical functional forms are used[1]

Food Category	Equation	$\bar{R}^2$	Sign of Coefficient												
			Intercept	PINC	$PINC^2$	LPINC	D_1	D_2	D_3	D_1 PINC[b],	D_2 PINC[b],	D_3 PINC[b],	EMPL.	EDUC.	RES.
Energy	Linear	72	+	+	na	na	-	-	-	+	+	+	+	-	-
				(3.37)[a],	na	na	(1.14)	(1.41)	(.23)	(4.45)	(5.40)[a],	(1.74)	(1.03)	(1.28)	(0)
	Quadratic	72	+	+	-	na	-	-	+	+	+	+	+	-	-
				(2.56)	(1.26)	na	(.39)	(.86)	(.05)	(3.27)[a],	(5.45)[a],	(.73)	(1.28)	(1.25)	(.16)
	Semilog	67	-	na	na	+	-	-	+	+	+	-	+	-	-
				na	na	(3.12)[a],	(1.22)	(1.89)	(.16)	(1.57)	(2.37)	(.14)	(.13)	(1.04)	(1.82)
	Double log	63	+	na	na	+	-	-	-	+	+	+	+	-	+
						(2.7)	(1.10)	(1.67)	(.36)	(1.36)	(1.97)	(.14)	(1.41)	(1.70)	(.29)
Protein	Linear	81	-	+	na	na	-	+	+	+	-	+	+	+	-
				(7.62)[a],	na	na	(.25)	(1.04)	(2.59)	(2.50)	(.23)	(.11)	(.44)	(1.72)	(2.80)[a],
	Quadratic	82	+	+	+	na	-	+	-	+	-	+	-	+	-
				(1.23)	(2.18)	na	(1.29)	(.37)	(.21)	(3.37)[a],	(.31)	(1.32)	(.03)	(1.69)	(1.29)
	Semilog	73	-	na	na	+	+	+	+	-	-	-	+	+	-
				na	na	(6.05)[a],	(1.48)	(2.44)	(2.79)	(1.28)	(2.30)	(2.72)[a],	(.92)	(.29)	(2.70)[a],
	Double log	50	+	na	na	+	-	+	+	+	OM	-	+	+	-
				na	na	(4.83)[a],	(.28)	(1.07)	(.18)	(.95)	OM	(.5)	(.28)	(.34)	(3.67)[a],
Vegetables	Linear	26	-	+	na	na	+	+	+	-	+	+	+	+	+
				(1.24)	na	na	(1.24)	(.25)	(.25)	(.92)	(1.09)	(.37)	(.87)	(2.37)	(1.17)
	Quadratic	24	+	+	-	na	+	+	+	-	+	+	+	+	+
				(1.05)	(.3)	na	(1.22)	(.34)	(.37)	(.95)	(.06)	(.14)	(.91)	(2.37)	(1.13)

Appendix 9 (Contd.)

Food Category	Equation	$\bar{R}^2$	Sign of Coefficient												
			Intercept	PINC	$PINC^2$	LPINC	D_1	D_2	D_3	D_1 X PINC[b],	D_2 X PINC[b],	D_3 X PINC[b],	EMPL.	EDUC.	RES.
Vegetables	Semilog	23	-	na na	na na	+ (1.66)	+ (1.17)	- (.07)	+ (.54)	- (.13)	+ (.24)	- (.48)	+ (.10)	+ (1.10)	+ (1.0)
	Double log	18	+	na na	na na	+ (.53)	- (.43)	- (.75)	- (.53)	+ (.47)	+ (.85)	+ (.57)	+ (2.16)	+ (2.56)	+ (1.71)
Fats	Linear	62	+	+ (1.78)	na na	na na	- (.98)	- (1.7)	- (1.72)	- (.96)	+ (1.18)	- (.08)	- (.31)	+ (1:8)	- (1.15)
Quadratic	Quadratic	63	+	+ (1.54)	+ (2.54)	na na	- (2.12)	- (2:56)	- (2.84)	+ (.12)	+ (1.13)	+ (1.37)	- (.86)	+ (.78)	- (.88)
	Semilog	58	-	na na	na na	+ (1.61)	+ (1.05)	+ (:07)	+ (.59)	- (1.26)	- (.16)	- (.82)	- (.32)	+ (1.94)	- (1.0
	Double log	53	+	na na	na na	+ (.48)	- (.34)	- (4.24)[a]	- (1.12)	- (.19)	OM OM	+ (.54)	- (.28)	+ (1.9)	- (1.4

Source: Regression results

[1] PINC = Per capita Income, EDUC. = Education, EMPL. = Employment, RES. = Residence

na = not applicable, b, for semilog and double log the cross terms are D_1 X log PINC

D_1, D_2, D_3 are dummy variables representing the first 3 income classes

Figures in parenthesis are t values

Dummies were used to represent area of residence and nature of employment

Area of residence assigned one if rural resident and zero if urban resident,

Nature of employment assigned one if farmer and zero if non farmer

+ = Positive, - = Negative

a, are values with significant t - values at 5% probability level

Appendix 10. Marginal propensity to consume and income elasticities to consume for the four food categories[a],

Food Category	Equation	Income groups			
		0-11999	12000-23999	24000-47999	48000 & Over
Energy	Linear	.393 (.885)	.35 (.788)	.567 (.177)	.118 (.266)
	Quadratic	.215 (.484)	.217 (.489)	.051 (.115)	-.017 (-.038)
	Semilog	.082 (.184)	.092 (.208)	.042 (.095)	.05 (.113)
	Double log	.206 (.773)	.230 (.863)	.152 (.527)	.127 (.479)
Protein	Linear	.405 (1.935)	.244 (1.166)	.259 (1.238)	.553 (1.209)
	Quadratic	.540 (2.609)	.211 (.008)	.408 (1.950)	.535 (2.556)
	Semilog	.075 (.173)	.059 (.072)	.049 (.038)	.102 (0.035)
	Double log	.075 (.359)	OM OM	.049 (.233)	.102 (.485)
Vegetables	Linear	.003 (.06)	.041 (.821)	.032 (.64)	.024 (.481)
	Quadratic	-.01 (-.20)	.032 (.041)	.19 (.381)	(.301)
	Semilog	.002 (.031)	.011 (.212)	.006 (.120)	.009 (.183)
	Double log	.681 (.026)	.9 (.054)	.732 (.035)	.327 (.012)

Appendix 10 (Contd.)

Food Category	Equation	Income groups			
		0-11999	12000-23999	24000-47999	48000 and Over
Fats	Linear	.001	.023	.012	.013
		(.055)	(1.276)	(.666)	(.721)
	Quadratic	.045	-.088	.058	.037
		(2.385)	(4.88)	(3.217)	(2.032)
	Semilog	.0002	.004	.002	.005
		(∞)	(.588)	(.199)	(.047)
	Double log		OM	.006	.002
		(.046)	OM	(.588)	.205

Source: Compution from Regression results and survey data

OM = Ommited

a, = Figures in parenthesis are income elasticities and those without parantheses are marginal propensities to consume