62

PN AAQ025

ISN-34660

EXAMPLES OF SIMPLE METHODS FOR CONSUMPTION ANALYSIS USING TANZANIAN DATA

Jerry B. Leonard

May 1983

FILE

EXAMPLES OF SIMPLE METHODS FOR CONSUMPTION ANALYSIS USING TANZANIAN DATA

by
Jerry B. Leonard

May 1983

The methods illustrated in this case study were used for analyzing consumption data in a recent study, "The Potential Effects of Alternative Structures and Pricing Policies in the Markets for Maize in Tanzania," Sigma One Corporation, February 1983

Training materials prepared for the
United States Department of Agriculture
Office of International Cooperation and Development
Technical Assistance Division
Nutrition Economics Group
RSSA BST-1171-R-AG-3125-01

TABLE OF CONTENTS

Section		Page
1	INTRODUCTION.	1
2	CONSUMPTION DATA.	5
	2.1 Food Balance Sheets.	7
	2.2 Food Consumption Tables.	10
	2.3 Nutrition Standards.	13
3	EXPENDITURE DATA.	19
	3.1 Published Household Budget Surveys	19
	3.2 Regional Comparisons of Expenditure Data .	23
	3.3 Arc Elasticities from Expenditure Data . .	27
	3.4 Subsamples of the 1976/77 Household Budget Survey.	31
	3.5 Income and Own-Price Elasticities.	38
	BIBLIOGRAPHY.	45

LIST OF TABLES

Table		Page
1	National Food Balance Sheet for Tanzania 1978/79 ('000 MT)	9
2	Nutritional Value of Food Items	11
3	Official Retail Prices for Major Staple Food Products in Tanzania	14
4	Minimum Urban Wage Levels and Their Purchasing Power in Terms of Sembe, Rice and Wheat Flour 1973 to Date	14
5	Recommended Intake Levels for Energy (Calories/Day)	15
6	Total Expenditures by Subgroup and Expenditure Group for Tanzania Mainland ('000 Shillings), 1969 Household Budget Survey	20
7	Budget Shares for Tanzania Mainland, 1969 Household Budget Survey	21
8	Contribution of Maize, Rice and Sorghum to Daily Calorie Needs of Tanzanians 1969	25
9	Regional and Urban Average Annual Population Growth Rates	28
10	Annual Consumption (Incl. Non-Consumption) in Private Households 1969	29
11	Contribution of Cereals and Cassava to Daily Calorie Intake of Tanzanians (FAO Sample 1976/77 HBS)	33
12	Contribution of Cereals and Cassava to the Daily Calorie Requirements of Tanzanians (1976/77 HBS Data)	35
13	Estimated Quantities of Maize Consumed in 1979/80, 1981/82 and 1982/83	39
14	Income and Own-Price Demand Elasticities for Basic Staples in Urban Areas (1976/77 HBS Data)	41
15	Producer Prices for Maize, Rice and Wheat 1971/72 to Date	43

1.0 Introduction

Food consumption analysis is directed toward understanding and measuring changes in the levels of food consumption by different population groups in response to changes in costs of food, which are caused or brought about by inflation, trade policies, innovations and new technologies, price controls, subsidies and other interventions in the markets for foodstuffs. A major reason or motivation for consumption analysis is concern about the nutritional status of low income populations. The so-called cheap food policies of many developing countries are usually directed toward maintaining incomes or reducing increases in the cost of living; sometimes they are directed toward improving the nutrition of populations at risk of being malnourished. Governments of developing countries often intervene in the markets for food and use their resources and public policies to transfer food and public services among members of the population. Because of this, development planners and economists make decisions and policy recommendations which have implications for the nutritional status of low income populations, even when the object of planning is not directly related to nutrition.

The purpose of this report is to assist development planners in understanding the information that can be developed regarding the food and nutrition situation in a country. Specifically, this report illustrates--through examples and exercises--the use of various types of food consumption data which may be available in a developing country and the use of relatively simple methods

for analyzing food consumption data. The examples are based on data from Tanzania and were compiled for studies of the consumption effects of Tanzania's agricultural policies.

The central issues in assessing the food consumption situation in a developing country relate to identifying the factors underlying the existing situation and of predicting the probable change which could result from changes in economic or agricultural variables. These issues relate to how the size and composition of household food acquisitions (through purchasing, producing and/or transfers) are determined in response to price and income changes under different socio-economic conditions. At aggregate levels, the nutritional situation of a population is affected by both aggregate food supplies and their geographic and economic distribution, as well as the distribution of effective demand among the members of the population. A determination of whether a significant percentage of the population is affected by nutritional problems and the identification of the causes and consequences of those problems are objectives for the assessment of the food and nutrition situation in a country.

Aggregate national food production, import, and food aid data can provide insight in several areas. First, is there an adequate supply of calories available for the entire population? If the supply is ample, questions of distribution take precedence. Second, what sorts of year to year variations in supply have historically been experienced due to uncontrollable phenomena such as weather uncertainties or international price

fluctuations? Such phenomena can help explain populations which exhibit high incidence of current acute malnutrition with relatively low incidence of chronic malnutrition.

The nature and magnitude of food subsidies and taxes should also be carefully analyzed. If imports are subsidized relative to domestic supply, it is possible that the nutrition of the urban classes is being improved at the cost of decreased nutrition to rural agricultural producers. The procurement policies of parastatals may create disincentives to food production and thus exacerbate urban and rural malnutrition. To the extent that malnutrition is a consequence of inadequate food supply, it is essential to understand the effects of the whole range of government agricultural policies on the decisions of food producers. Are producer prices set by the government? Do they vary from region to region? Do price policies, intentionally or unintentionally, provide incentives to shift to or away from food production? Have price policies helped create black markets? The understanding of the interactions between various price settings, subsidies, and risk-reducing policies and the farmers also gives insight into the prospects of future food supply adequacy.

It is typical to look at household food supplies or other measures of per capita food availabiity relative to some reference requirement level to determine whether the availability is inadequate at the aggregate level. Sometimes the food availability at the aggregate level may appear to be adequate,

yet distribution of the food supplies may lead to some segments of the population receiving inadequate supplies of food.

2.0 Consumption Data

Because nutritional problems are associated with food intake, most solutions seek to increase the amount of food available to the affected population. Agriculture is likely to be the most important sector in the economies of most developing countries. In this regard two types of basic data are frequently available:

(1) national food balance sheets which present the principal foodstuffs converted to nutrient equivalents per capita, and

(2) national product accounts with functional income distribution (particularly the sectoral wage bills).

These data can be used to determine whether or not there is likely to be a significant distributional problem and therefore significant proportions of households consuming food below generally accepted recommendations. Where the country's statistical systems support the effort, it may be possible to assess inter-regional and inter-temporal flows of food commodities in order to locate particular regions or particular seasons of the year at which food deficits occur more frequently.

In the absence of these latter statistics, micro-economic data regarding food production and consumption may be available from surveys, such as those used to monitor rural development or agricultural extension projects. The following statistics could be obtained from such surveys:

- household quantities of principal foodstuffs that are consumed regularly on a daily or weekly basis,

- share of total income allocated to food expenditure,
- share of food expenditure for the principal 5 or 10 sources of calories and proteins,
- share of food expenditure obtained from home produced sources (the "subsistence share"), and
- for the principal foodstuffs, their share in the calorie and protein budget.

If such statistics were available, even from small samples and for a few locations, it would be possible to develop scenarios regarding the possible extent of food intake deficits and the possible food consumption effects of changes in agricultural and other economic policies. For example, households with a large share (more than half) of income devoted to food are likely to be at some nutritional risk. If the surveys reveal many such households, intake deficits are very likely to occur. By identifying the principal sources of nutrients or the foodstuffs with the highest budget shares, it is possible to identify probable nutritional consequences related to the availability of these foodstuffs in households at risk.

Estimates of income and price elasticities of food demand would be required to ascertain any impacts from changing market conditions. Such estimates are not likely to be available; thus, in the absence of such elasticities, scenarios which simulate high and low elasticities could allow the estimation of possible impacts from changes in food availability. The changes which could be analyzed could be many, including supply curtail-

ments due to droughts or rising prices for imported commodities, and/or demand shifts from changes in personal income, the cost of living, etc. The possible impacts of agricultural programs could also be assessed in this manner. In general, these statistics and judgments on the probable impacts of changing incomes and prices affect the decisions of whether the food consumption situation among low income persons warrants further analysis or whether a proposed policy or program is likely to have important nutritional consequences.

The examples of analyses which are presented in the next sections include a food balance sheet, published household budget survey, and raw data from a recent household budget survey; these sources of data were used to develop insight into the food and nutrition situation of Tanzania. In addition, population data milling extraction rates, food composition tables and calorie recommendations are used to develop consumption patterns in terms of calorie and budget shares, and to estimate quantities consumed, subsistence consumption, and income and price elasticities for the major cereals and cassava.

2.1 Food Balance Sheets

Meaningful consumption analysis can be done with various sources of data. It is not necessary to have extensive consumption surveys to begin calculating general statistics regarding consumption levels. Information that is readily available for most developing countries--such as food balance sheets, population estimates or census data, and the energy and nutrient content of the major foods consumed can be used to

calculate average per capita consumption of specific foods and the contribution of these foods to calorie and nutrient consumption. An example of a food balance sheet, Table 1, compiled by the Tanzania Food and Nutrition Centre demonstrates this process. These data were developed from production, import, export and inventory data and from estimates of nonfood use and waste and losses. As such, food balance sheets depend on the accuracy of the production and trade data and the estimates of nonfood use and waste and losses. In the case of wheat, production plus imports equals 113,000 metric tons, of which some is waste and seed, and the rest is manufactured, i.e. ground into flour. The grinding process produces 81,500 metric tons of wheat flour from 108,700 metric tons of wheat grain, which implies an extraction rate of 0.75. The 81,500 metric tons of flour represent the amount available for consumption. Dividing the 81,500 metric tons by the total population in 1978/79 yields the average per capita wheat flour available, 4.7 kg/year. An average daily per capita calorie availability of wheat of 46.9 calories is obtained by dividing 4.7 kg/year by 365 days and multiplying the result by the energy content of wheat flour (3,640 calories/kg).

Table 1: National Food Balance Sheet for Tanzania 1978/79 ('000. MT)

Commodity	Production (000 ton) Input	Production (000 ton) Output	Changes in Stock	Gross Import	Supply	Gross Export	Total	Feed	Seed	Manf.	Waste	Food	Kg. Per Year	Gms. Per Day	Kcal Per Day	Gr Pr Pe Da
CEREALS																
Wheat	-	53	-	60.0	113	-	113	-	2	108.7	2.3	-	-	-	-	-
Wheat Flour	108.7	81.5	-	-	81.5	-	81.5	-	-	-	-	81.5	4.7	12.8		
Paddy	-	449	-	-	449	-	449	-	3	441.5	4.5	-	-	-	-	-
Rice	441.5	287	-	36.8	323.8	-	323.8	-	-	-	-	323.8	18.5	50.7		
Maize	-	1882	-	-	1882	-	1882	-	38	1750	94	-	-	-	-	-
Maize Meal	1715	1544	-	-	1544	-	1544	-	-	-	-	1544	88.2	241.6		
Maize Beer	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Millet & Sorghum	-	1282.7	-	-	1282.7	-	1282.7	64.1	26	1064.3	128.3	-	-	-	-	-
Flour	351.3	808.7	-	-	808.7	-	808.7	-	-	-	-	808.7	46.2	126.6		
Beer	213.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cereal Preparations	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SUB TOTAL																

Source: Data Report on the Food and Nutrition Situation in Tanzania 1974/75-1979/80, Tanzania Food and Nutrition Centre, April 1982.

2.2 Food Consumption Tables

Table 2 presents the calorie, protein and fat content of the major cereals in Tanzania. More complete sources on the nutrient content of foods would include carbohydrate, calcium, vitamins A and C and other vitamins and minerals, as well as calories, protein and fat. Table 2 is used for this analysis because it was developed specifically for foods consumed in Tanzania. Using Table 2 and the quantities from the food balance sheet, calculations of average daily per capita calorie and protein availabilities of wheat flour, maize flour, rice and millet and sorghum flour can be done using the methods described above. The final two columns of the food balance sheet are left for the reader to complete.

Exercise 1

Given the following consumption of various cereals in Tanzania per year and the calorie and protein content of each cereal in Table 2, complete the following table.

Cereal	Kg. Per Person Per Year	Kcal Per Person Per Year	Grams of Protein Per Person Per Day
Wheat Flour	4.7	_____	_____
Rice	18.5	_____	_____
Maize Flour	88.2	_____	_____
Sorghum/Millet Flour	46.2	_____	_____
	Totals	_____	_____

Table 2: NUTRITIONAL VALUE OF FOOD ITEMS

Item	Units	Calories (kcal)	Protein (grams)	Fat (grams)
Paddy	kg.	2360	46	3
Rice, husked	kg.	3630	70	5
Maize, grain	kg.	3630	96	51
Maize, flour	kg.	3510	83	20
Millet, grain	kg.	3400	97	30
Millet, flour	kg.	3350	89	26
Sorghum, grain	kg.	3430	98	41
Sorghum, flour	kg.	3450	107	32
Wheat, grain	kg.	3430	118	18
Wheat, flour	kg.	3640	110	13
Barley, and other	kg.	3460	90	14

Source: Ortolo, B. and J. Rook, (mimeo), Tanzania National Food Strategy Project

Averages such as those presented in the previous example, however, do not reveal nutritional problems which may exist if the population on average appears to satisfy recommended levels of nutrient intake. Income and other social and economic differences frequently lead to maldistribution of the available food and thus some segments of the population may have nutritional problems.

Nutritional problems are most prevalent in lower income households. An estimate of the total cost of purchasing the average available quantities of the major foods is calculated by multiplying the prevailing retail price or official price of each food available by the quantity of that food and summing all foods. This estimated cost, when compared with basic income distribution data, can provide an estimate of the percentage of the population with incomes insufficient to purchase the average available quantities of the major foods. If incomes are greater than two or three times the food costs, there is little likelihood of having appreciable food intake deficits. If, on the other hand, incomes are below or only slightly higher than food costs, then there is a high probability that significant nutritional problems exist and that further nutrition-specific analysis is warranted.

Exercise 2

Using the official retail price data for maize flour (sembe), rice and wheat flour from Table 3, calculate the monthly cost of purchasing the average available quantities of these three commodities from the food balance sheet for a family of five.

Cereal	Official Retail Price (Sh/kg)	Kg per Person Per Year	Monthly Cost Per Person	Monthly Cost For Family of Five
Wheat Flour	3.75	4.7	_____	_____
Maize Flour	1.75	88.2	_____	_____
Rice	3.50	18.5	_____	_____

How does this cost compare with the minimum monthly urban wage for 1978/79 from Table 4?

These exercises and similar calculations for the other major foods can be compared to average basic nutritional recommendations to help develop insight regarding the overall nutritional status of the population.

2.3 Nutrition Standards

Table 5 presents recommended intake levels for energy according to various sources. More commonly, nutrient analysis of dietary data is done in a two-staged process. First, the nutrient content of the foods identified from the dietary

Table 3: Official Retail Prices for Major Staple Food Products in Tanzania 1973 to date

(Sh/kg; loose; in July of each year)

	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
(a) Current Prices										
Sembe	0.80	1.25	1.25	1.75	1.75	1.75	1.75	1.25	2.50	2.50
Rice	1.65	2.00	4.00	4.00	3.50	3.50	3.50	5.35	5.35	5.35
Wheat Flour	1.65	2.40	3.75	3.75	3.75	3.75	3.75	5.65	5.65	5.65
(b) Constant 1982 Prices (using Tanzania CPI as a deflator)										
Sembe	3.70	4.90	3.90	5.10	4.50	4.10	3.60	2.00	3.10	2.50
Rice	7.70	7.80	12.40	11.60	9.10	8.10	7.20	8.40	6.70	5.30
Wheat Flour	7.70	9.40	11.60	10.90	9.70	8.70	7.70	8.90	7.10	5.70

Table 4: Minimum Urban Wage Levels and Their Purchasing Power in Terms of Sembe, Rice and Wheat Flour 1973 to date

	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Minimum Urban Wage (Sh/month)										
Nominal terms	240	340	380	380	380	380	380	480	600	600
Constant 1982 terms	1120	1330	1180	1100	990	880	780	760	760	600
Purchasing Power of Minimum Urban Wage (kg staple/day's wage)										
Sembe	10.0	9.1	10.1	7.2	7.2	7.2	7.2	12.8	8.0	8.0
Rice	4.8	5.7	3.2	3.2	3.6	3.6	3.6	3.0	3.7	3.7
Wheat Flour	4.8	4.7	3.4	3.4	3.4	3.4	3.4	2.8	3.5	3.5

Source: Marketing Development Bureau

Table 5: Recommended Intake Levels for Energy (Calories/Day)

Age	NAS RDA[a]	FAO/WHO[b]	INCAP[c]
6-11 mos		820	1000
1-3 yrs	1300	1360	1350
4-6 yrs	1700	1830	1750
7-9 yrs	2400	2190	2050
Males:			
10-12 yrs (11-14)[d]	2700	2600	2500
13-15 yrs		2900	2850
16-19 yrs (15-18)[d]	2800	2070	3100
Adults	2700	3000	2900
Females:			
10-12 yrs (11-14)[d]	2200	2350	2250
13-15		2490	2450
16-19 yrs (15-18)[d]	2100	2310	2300
Adults	2000	2200	2050
Pregnant	+300	+300	+300
Lactating	+500	+500	+500

[a]National Academy of Sciences. Recommended Dietary Allowances. Washington, DC. 1980.

[b]World Health Organization. Energy and Protein Requirements. Report of a Joint FAO/WHO Expert Group, FAO, Rome. 1972.

[c]INCAP. Recommendaciones Dietéticas Diarias. 1973.

[d]Numbers in parentheses indicate the age group used by the National Academy of Sciences when different from the other sources.

assessment must be calculated using tables similar to Table 2.* After the nutrient content for each food item has been calculated, these values are combined to produce an estimate of the person's total nutrient intake. Intake then can be compared to an accepted standard. The Food and Nutrition Board of the National Academy of Sciences publishes Recommended Dietary Allowances (RDA's) that can be used to evaluate dietary data. The RDA's are the daily amounts of intake recommended so that a large proportion (enerally 95 percent) of healthy persons achieve adequate ,els of nutrient intake.

Some caution must be used in comparing an individual's nutrient consumption to the RDA's. Except for calories, which is a median value, the RDA's are set at levels high enough to cover the nutrient needs of most individuals in the population. Therefore, an intake below a particular RDA does not necessarily signify a deficiency. For example, most women do not achieve the RDA for iron, yet most women are not anemic. RDA's are to be used as indicators with the assumption that the farther below a specified RDA an individual's nutrient intake falls, the higher is the probability of a specific nutrient deficiency.

---

*The most complete sources of information on the nutrient content of foods are handbooks number 8, Agricultural Research Service, Composition of Foods, Agriculture Handbook #8, Washington, D.C., USDA, 1975, and number 456, Adams, C. F., Nutritive Value of American Foods in Common Units (Agricultural Handbook #456), developed by the U.S. Department of Agriculture. Nutrient analyses including food energy, protein, fat, carbohydrate, calcium, phosphorous, iron, sodium, potassium, vitamins A and C, thiamine, riboflavin and niacin, are provided for approximately 4,500 foods.

Furthermore, diets low in calories may frequently also be low in other nutrients.

Because of the margin of safety built into nutrient RDA's, some researchers have suggested that nutrient intake be considered adequate if it meets at least two-thirds of a specified RDA. Hegsted points out that even when the two-thirds cut-off is used, there may still be some individuals who need more than this amount. The intake of an individual in relation to the RDA's is not by itself an indication of adequacy. It is known that individual requirements present large variations due to differences in metabolism, level of physical activity, and presence or absence of infections and diseases. Thus, an intake that is adequate for one individual may not be adequate for another, and may not even be adequate for the same individual at all times.

An average daily per capita calorie requirement of 2,320 calories has been estimated for Tanzania by the FAO. This estimation employed both the FAO recommendations from Table 3 and data on the age and sex distribution of the overall Tanzania population. To facilitate the understanding of how this estimation was developed, complete the following exercise.

Exercise 3

Determine the average daily calorie needs within a family of five, consisting of an adult male and female, and their three daughters, aged 8, 11 and 13 using the FAO recommendations from Table 3.

Exercise 4

Using the consumption data in Exercise 1, what percentage of the average daily per capita calorie requirement is represented by these three food commodities? If this family of five satisfied the remainder of their daily calorie needs from foods more expensive than these, how would monthly food costs compare with the minimum urban monthly wage?

3.0 Expenditure Data

In addition to consumption data alone, analyses of food consumption in a developing country must also incorporate expenditure data based on household budget surveys and sub-samples of household budget surveys.

3.1 Published Household Budget Surveys

The analysis of aggregate statistics based on food balance sheets is only a first step in identifying priorities for consumption analysis. Additional analyses are necessary for the formulation of appropriate food policies; for this purpose, household budget surveys provide the major source of information. These surveys record household expenditures during a specific period of time along with general household characteristics and often record information concerning household income and production.

Aggregate statistics from the 1969 Household Budget Survey for Tanzania consists of three published volumes, which detail income and consumption, housing conditions, and year-mean retail prices for several important consumption items. Total expenditures on different consumption items (presented in Table 6), and the food budget shares (Table 7), and year-mean retail prices for most major foods are included in the consumption data results.

The budget shares in Table 7 are presented by expenditure groups. The food budget share in the total budget can be seen to vary from 67 percent in the lowest expenditure group to 18 percent in the highest expenditure group. It is likely that

Table 6: Total Expenditures by Subgroup and Expenditure Group for Tanzania Mainland ('000 Shillings), 1969 Household Budget Survey

TANZANIA
MAINLAND

Consumption Subgroup page 1 of 2	EXPENDITURE GROUPS								
	0 - 999	1000-1999	2000-3999	4000-5999	6000-7999	8000-9999	10,000 - 24,999	24,999 >	Total
TOTAL	591143	1544500	1491098	672354	384684	155025	375676	227624	5442104
Food and drink	393488	950195	751298	303748	146079	39655	95951	41440	2721855
Processing of foodstuffs	4705	10886	7849	2359	765	117	290	106	27077
Cereals	137338	323280	226116	73418	27458	12702	25281	7537	833130
Cereal Products	1744	5437	10214	6716	5483	1869	4601	2510	38574
Starchy roots and starches	52212	102951	57305	18310	3999	2062	2762	622	240223
Sugar and sweets	9576	26497	28466	14401	6345	2065	4704	2462	96516
Pulses, dry	25092	42475	33163	10418	3288	1088	2260	1395	119178
Nuts	11390	29318	19579	8251	3305	2038	2100	830	76812
Seeds	437	1154	500	287	42	19	12	2	2447
Vegetables	33452	58767	36916	10625	6582	2185	5982	2672	157182
Fruits	26126	79496	60357	21370	6725	1004	3247	1152	199476
Meat and meat products, poultry and insects	27963	85492	89264	49273	44247	3836	14770	7371	322216
Eggs	348	107.	1139	715	734	173	1041	616	5837
Fish and shell-fish	17863	49482	33569	11793	4581	1718	2756	818	122579
Milk and dairy products (excl. butter)	7409	29253	45054	34957	8840	2274	7169	3453	138410
Oils and fats	4374	17111	21499	8739	5742	1195	4405	2903	65968
Spices and other foodstuffs	7573	15926	11420	3849	1818	814	2022	728	44145
Raw material for drinks	1782	5474	6629	3150	2164	608	1736	732	22274
Non-alcoholic drinks	65	507	1598	1195	1524	356	1364	737	7346
Alcoholic drinks consumed at home	11706	27171	20595	9303	3427	717	4459	1389	78768
Meals and drinks consumed at home	12349	36436	40067	14624	9009	2816	4992	3405	123698
Housing	59905	148373	116808	51750	28987	11533	37244	20213	474813
Rents and water costs	357	1615	11441	11603	8708	5221	20276	8007	67226
Fuel and light	48655	106281	68633	23757	9987	4096	9848	3668	274925
Furniture	881	5712	4580	2169	1756	460	723	2012	18293
Linen and bedclothes	6614	23204	21332	9917	5900	910	3020	843	71740
Household durables	265	646	684	898	1414	68	2075	5442	11491
Other household equipment	3133	10916	10139	3406	1220	778	1302	240	31138

Source: 1969 Household Budget Survey

Table 7: Budget Shares for Tanzania Mainland, 1969 Household Budget Survey

TABLE T0110 V3
TANZANIA MAINLAND
PAGE 1 OF 10
Appendix 16. 1 : 1

CONSUMPTION ITEM	EXPENDITURE GROUP, SHS/HH/YEAR 0-999		1000-1999		2000-3999		4000-5999		6000-7999		8000-9999		10000-24999		>24999		TOTAL STATED	
TOTAL STATED	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
FOOD AND DRINK	67	67	62	62	58	58	45	45	38	38	26	26	26	26	18	18	50	50
PROCESSING OF FOODSTUFFS	1	1	1	1	1	1	1		1								1	
COST OF GRINDING CEREALS	100	1	100	1	100	1	100		100		100		92		106		100	
PROCESSING OTHER FOODSTUFFS													8					
CEREALS	35	23	54	21	38	15	24	11	19	7	32	8	26	7	18	3	31	15
PADDY	5	1	4	1	3		2				6				1		3	1
RICE, HUSKED	9	2	12	3	15	2	20	2	35	3	39	3	42	3	46	2	15	2
MAIZE, GRAIN	32	7	32	7	31	5	29	3	22	2	21	2	13	1	16	1	30	5
MAIZE FLOUR	28	7	32	7	34	5	35	4	28	2	24	2	38	3	27	1	32	5
MILLET GRAIN	4	1	2						2								2	
MILLET FLOUR	3	1	2		2										1		2	
SORGHUM GRAIN	8	2	7	1	7	1	8	1	4		4		1				7	1
SORGHUM FLOUR	5	1	6	1	3		2		2		1		1		1		4	1
WHEAT GRAIN	2		1		1		1				1		1		1		1	
WHEAT FLOUR			1		1		2		6		3		5		8		1	
BARLEY AND OTHER CEREALS	5	1	2		1						1						2	
CEREAL PRODUCTS			1		1	1	2	1	4	1	5	1	5	1	6	1	1	1
BREAD	38		51		63		78	1	77	1	76	1	75	1	82	1	67	
BISCUITS	1		2		2		2		3		5		8		2		3	
BUNS, CAKES, SMALL BREAD	43		35		30		23		19		15		14		11		25	
MACARONI, SPAGHETTI, ETC.			1		1		2		1		3		3		4		2	
CORN FLAKES, OTHER PRODUCTS	18		11		3		3		1								4	
STARCHY ROOTS AND STARCHES	13	9	11	7	8	6	6	3	3	1	5	1	3	1	1		9	4
CASSAVA	68	6	64	4	60	2	43	1	38		54	1	45		15		62	3
SWEET POTATOES	21	2	24	2	28	1	43	1	36		31		19		11		26	1
YAM, COCOYAM	2		3		2		3		1				3		1		2	
IRISH POTATOES	4		5		6		10		25		15		31		68		7	
OTHER STARCHY ROOTS	1		1										1		6		1	
STARCHES, PURE, DRY	4		3		2		1						2				3	
SUGAR AND SWEETS	2	2	3	2	4	2	5	2	4	2	5	1	5	1	6	1	4	2
SUGAR	88	1	85	2	89	2	85	2	94	2	95	1	94	1	96	1	88	2
HONEY	12		15		18		15		5		2		1				11	
SYRUP, JAM, MARMALADE, JELLIES									1		2		5		3		1	
CHOCOLATE AND OTHER SWEETS											1				1			
PULSES, DRY	6	4	4	3	4	2	3	2	2	1	3	1	2	1	3	1	4	2
PEAS, DRY	3		6		4		7		4		18		5		2		5	
BEANS, DRY	79	3	81	2	82	2	81	1	86	1	68		69		92	1	81	2
LENTILS AND OTHER PULSES	17	1	12		13		12		11		22		26		6		14	
NUTS	3	2	3	2	3	1	3	1	2	1	5	1	2	1	2		3	1
GROUNDNUTS, IN SHELL	29	1	31	1	27		25		14		6		5		2		27	
GROUNDNUTS, SHELLED	23		30	1	38		46	1	27		11		23		9		32	
GROUNDNUTS, SALTED, [illegible]STEP	2		3		3		1				1		1		1		2	
COCONUTS, MATURE	38	1	29	1	30		27		56		65	1	66		85		33	
COCONUTS, IMMATURE	2		1		1				2		1		2		1		1	
CASHEWNUTS	14		5		1						15				1		5	
ALMOND AND OTHER NUTS					1						1		2		1		1	
SEEDS																		
SESAME SEEDS	99		92		80		100		53		33		64		100		91	
SUNFLOWER AND OTHER SEEDS	1		8		20				48		67		36				9	

Source: 1969 Household Budget Survey

Best Available Document

certain individuals or households in the lower expenditure groups are at risk of malnutrition. The survey data also include information concerning household and socio-economic characteristics; these characteristics can be used to identify groups at risk of malnutrition.

The data are presented at the national level by rural-urban classification, and are also divided into nine regional zones. These data can be used to determine the expenditures and consumed quantities of any of the major foods at various levels of aggregation. For example, the budget share of total expenditure of the principal staple, maize flour (sembe), is obtained by multiplying maize flour expenditure as a share of total cereals expenditure (0.32) by the share of cereals expenditure in total household expenditure (0.31). This computation indicates that 9.9 percent of total household expenditures go toward the purchase of maize flour. In other words, the commodity-specific budget shares given in Table 7 are used to compute maize flour shares as a share of total expenditure by employing the following algebraic equation:

$$\frac{\text{maize flour expenditure}}{\text{total cereal expenditure}}$$

$$\times$$

$$\frac{\text{total cereal expenditure}}{\text{total expenditure}}$$

equals

$$\frac{\text{maize flour expenditure}}{\text{total expenditure}}$$

The simplest computation of quantities consumed for a commodity is:

$$\frac{\text{total expenditures for commodity per year}}{\text{year-mean retail price of the commodity}}$$

equals

quantity consumed of the commodity per year

These quantities can then be converted into kilogram or metric ton equivalents. Another computation of quantities consumed is:

$$\frac{\text{maize flour budget share among cereals x total expend. on cereals}}{\text{year-mean retail price of maize flour}}$$

equals

total quantity consumed of maize flour

These calculations could be done for any of the foods at the national level, at the rural-urban level, and for each of the regional zones.

3.2 Regional Comparisons of Expenditure Data

Patterns of food consumptions based on the daily share of calories which each food contributes to the total daily calorie needs are determined by integrating information regarding the calculated quantities consumed, national and regional population totals, and the energy value of each food. The quantities consumed must first be converted to a daily per capita basis in the following way. The quantity of a specific food consumed annually would first be divided by the total population of the area for which the consumption pattern is being determined. This result is then divided by 365 days to convert the consumption to a daily

per capita basis. As seen in Exercise 2, in the case of maize flour, the total quantity consumed (kg) is multiplied by 3,510 calories per kg. Similar calculations were done for the major cereals and cassava, yielding daily calories per person from each food for each of the regional zones. The determination of the share of total daily calorie needs obtained by each food commodity is obtained by dividing the daily calories per capita of each food by the average daily calorie requirement per person (which has been estimated by the FAO to be 2,320 calories for Tanzania). In the case of maize flour, the result of this calculation represents the percentage of daily per capita calorie needs derived from maize flour for the particular area or region being considered. Algebraically, the share of daily calorie needs is written:

$$\frac{Q_M/\text{year}}{\text{total population}}$$

equals

Q_M per person per day,

and

$$\frac{Q_M \times 3510 \text{ cal per kg}}{2320}$$

equals

% of daily per capita calorie needs from maize flour
where Q_M = total quantity of maize flour consumed (in kg)

Calculating similar percentages for other foods or groups of foods establishes a consumption pattern for an area based on calorie shares. Table 8 presents the calorie shares for maize,

Table 8: Contribution of Maize, Rice and Sorghum to Daily Calorie Needs of Tanzanians 1969

Zone	Calorie Share of Maize in Diets 1969
Ar, Kj, Tg	.345
Coast, Mo, Do	.213
Ma, Mw, Sh, WL	.245
Kg, Si, Tb, Rk	.288
Ir, Mb	.314
Mt, Rv, Li	.202
DSM	.216
Weighted Average	.265

Zone	Calorie Share of Rice in Diets 1969
Ar, Kj, Tg	.024
Coast, Mo, Do	.060
Ma, Mw, Sh, WL	.029
Kg, Si, Tb, Rk	.022
Ir, Mb	.026
Mt, Rv, Li	.066
DSM	.246
Weighted Average	.031

Zone	Calorie Share of Sorghum in Diets 1969
Ar, Kj, Tg	.015
Coast, Mo, Do	.077
Ma, Mw, Sh, WL	.055
Kg, Si, Tb, Rk	.077
Ir, Mb	.006
Mt, Rv, Li	.067
DSM	.0006
Weighted Average	.049

Source: 1969 Household Budget Survey

rice and sorghum for the regional zones of the survey.

Since rice and maize flour for human consumption must first be milled from the raw commodity, it is necessary to adjust the consumption quantities to reflect the losses due to milling (milling extraction rates). In Tanzania, milling extraction rates of 0.65 for paddy to rice, and 0.85 for maize grain to maize flour imply that 1 kg paddy rice = 0.65 kg husked and polished rice, and 1 kg maize grain = 0.85 kg maize flour. This means that the quantity of maize flour consumed should be multiplied by 1.18 (i.e. 1/0.85) to determine the amount of maize grain that would be necessary for that required level of consumption. Similar calculations would be necessary to convert polished rice consumption to the quantities of paddy rice which must be produced to meet the consumption requirement.

Exercise 5

Given the following estimates of rice consumption and population data for these regions, calculate the percentage of daily calorie needs (2,320) from rice for each region.

Region	Estimated Rice Consumption ('000 MT grain equivalents)	Population (thousands)	Calorie Share
Arusha	11.0	928	_____
Morogoro	55.3	939	_____
Ruvuma	22.4	564	_____
Kigoma	2.7	649	_____
Shinyanga	10.1	1323	_____

Under the assumption that consumption patterns would remain

close to the same for several years, estimates of consumption requirements for each food can be calculated for preceding or succeeding years by multiplying by the annual average population growth rate of the particular area or region being considered. For example,

$$\text{total quantity of maize flour consumed} \times (1 + \text{poprate})^n$$

equals

total quantity of maize flour consumed n years later

where n = number of years, and
poprate = the annual rate of growth of the population (in decimal form)

Estimated quantities of what might have been or what may be consumed can be compared with production estimates to determine the surplus or deficit status for each food in an area, region, or for the nation. This provides a means of determining whether estimated consumption could have been maintained at the same absolute level in years following the survey year.

3.3 Arc Elasticities from Expenditure Data

Consumption data in the 1969 survey are also separated by expenditure group in order that analyses similar to the above could be conducted for each expenditure group, i.e. a consumption pattern based on calorie shares could be determined within each group. Differences in the consumption patterns of expenditure groups are then observable.

Expenditures (expressed as shillings per household) for cereals are separated by expenditure groups in Table 10. An estimate of the average quantities of cereals consumed per

Table 9: REGIONAL AND URBAN AVERAGE ANNUAL POPULATION GROWTH RATES (%) 1/

	REGION	REGIONAL GROWTH RATE	URBAN CENTRE	URBAN GROWTH RATE
1.	Arusha	3.6	Arusha	10
2.	Coast	1.6)	Dar es Salaam 2/	9.5
3.	Dar es Salaam	7.6)		
4.	Dodoma	2.7	Dodoma	6.2
5.	Iringa	2.5	Iringa	9.2
6.	Kagera	3.7	Bukoba	7.0
7.	Kigoma	2.7	Kigoma	8.0
8.	Kilimanjaro	2.8	Moshi	6.2
9.	Lindi	1.9	Lindi	6.5
10.	Mara	2.4	Musoma	7.0
11.	Mbeya	3.0	Mbeya	11.0
12.	Morogoro	2.7	Morogoro	8.5
13.	Mtwara	1.8	Mtwara	8.2
14.	Mwanza	2.7	Mwanza	11.0
15.	Rukwa	4.2	Sumbawanga	10.5
16.	Ruvuma	3.0	Songea	11.0
17.	Shinyanga	3.3	Shinyanga	10.0
18.	Singida	2.5	Singida	10.7
19.	Tabora	4.2	Tabora	11.0
20.	Tanga	2.5	Tanga	5.0
	MAINLAND 3/	3.3		8.8

1/ All growth rates rounded to one decimal point

2/ Dar es Salaam has been assumed to be the dominant urban centre for Dar es Salaam and Coast Regions. The growth rates of Dar es Salaam is assumed to decline to 8.0 after 1990.

3/ Derived average annual rate of growth 1978 - 2000.

Source: Ortolo, B. and J. Rook, (mimeo), Tanzania National Food Strategy Project

Table 10: ANNUAL CONSUMPTION (INCL. NON-CONSUMPTION) IN PRIVATE HOUSEHOLDS 1969. £ PER HOUSEHOLD BY SUBGROUP AND BY EXPENDITURE GROUP. TANZANIA MAINLAND

Consumption Subgroup Page 1 of 2	EXPENDITURE GROUPS								
	0 - 999	1000-1999	2000-3999	4000-5999	6000-7999	8000-9999	10,000 - 24,999	> 24,999	Total
TOTAL	696	1387	2619	4505	6984	8095	11933	25450	1947
Food and drink	464	853	1320	2035	2652	2071	3048	4633	974
Processing of foodstuffs	6	10	14	16	14	6	9	12	10
Cereals	162	290	397	492	498	663	803	843	296
Cereal products	2	5	18	45	100	98	146	281	14
Starcy roots and starches	62	92	101	123	73	108	88	69	86
Sugar and sweets	11	26	50	96	115	108	149	275	35
Pulses, dry	30	38	58	70	60	57	72	156	43
Nuts	13	26	34	55	60	106	67	93	27
Seeds	-	1	1	2	1	1	-	-	1
Vegetables	39	53	65	71	120	114	190	299	56
Fruits	31	71	106	143	122	52	103	129	71
Meat and meat products, poultry and insects	33	77	157	330	803	200	469	824	115
Eggs	-	1	2	5	13	9	33	69	2
Fish and shellfish	21	44	59	79	83	90	88	91	44
Milk and dairy products (excl. butter)	9	26	79	234	160	119	228	386	50
Oils and fats	5	15	38	59	104	62	140	325	24
Spices and other foodstuffs	9	14	20	26	33	42	64	81	16
Raw material for drinks	2	5	12	21	39	32	55	82	8
Non-alcoholic drinks	-	-	3	8	28	19	43	82	3
Alcoholic drinks consumed at home	14	24	36	62	62	37	142	155	28
Alcoholic drinks consumed outside home	15	33	70	98	164	147	159	381	44
Housing	71	133	205	347	526	602	1183	2260	170
Rents and water costs	-	1	20	78	158	273	644	895	24
Fuel and light	57	95	121	159	181	214	313	410	96
Furniture	1	5	8	15	32	24	23	225	6
Linen and bedclothes	8	21	37	66	107	48	95	94	27
Household durables	-	1	1	6	27	3	66	608	4
Other household equipment	4	10	19	23	22	41	41	27	11

Source: 1969 Household Budget Survey

household for each expenditure group is obtained by dividing these expenditures per household by the average retail price for cereals. These quantities and the expenditure groups can be used to approximate income elasticities of demand for cereals among the expenditure groups. Income elasticities of demand measure changes in the consumption of a particular commodity caused by changes in real income. The following formula is used to compute arc elasticities for cereals between expenditure groups:

$$\frac{(Q_G - Q_L)/[(Q_G + Q_L)/2]}{(Y_G - Y_L)/[(Y_G + Y_L)/2]}$$

equals

arc income elasticity

where Q_G = avg. quantity consumed by group with greater expenditure

Q_L = avg. quantity consumed by group with smaller expenditure

Y_G = median expenditure for group with greater expenditure

Y_L = median expenditure for group with lower expenditure

The calculations for the first two expenditure groups are as follows:

$$\frac{(290 - 162)/[(290 + 162)/2]}{(1,500 - 500)/[(1,500 + 500)/2]}$$

equals

0.57

The arc income elasticity for cereals is 0.57 between the first two expenditure groups. Arc elasticities can be computed between

the eight different expenditure groups. The average of these elasticities is 0.43, which indicates that on average a 10 percent increase in income will result in a 4.3 percent increase in the consumption of cereals.

Exercise 6

Compute the arc income elasticity for food between the two highest expenditure groups.

Income elasticities for a particular cereal can be computed in a similar manner. Average expenditures per household for a particular cereal (by expenditure group) are calculated by multiplying the budget shares (Table 7) for that cereal by the average expenditures per household (Table 10). The average expenditures are then divided by the retail price of the cereal to determine the average quantities consumed of the cereal for each expenditure group. The determination of an elasticity for a particular cereal would then use the same formula presented above.

3.4 Subsamples of the 1976/77 Household Budget Survey

Consumption analysis for the National Food Strategy Project analyzed a subsample from the 1976/77 Household Budget Survey. This analysis calculated daily average calories consumed per person for each food or food group and total daily average calories per person in each region in the country. The average percentage each food contributes to total average calories is calculated by dividing the averages for each food by the total

average. Regional consumption patterns are defined by calculating this average for each region. Table 11 presents the calorie shares for the major staples based on this subsample of data. Consumption patterns could also be defined using the estimate of total daily average calorie needs per person, 2,320, as the basis rather than the estimate of total daily average consumption. Changes in diets can be estimated by comparing the consumption patterns of the 1969 survey and this subsample of the 1976/77 survey.

Another subsample of the 1976/77 Household Budget Survey included information concerning household characteristics, production and costs of production, consumption, and a summary of household expenditures and sources of income. Figure 1 presents the actual data recording sheet used for extraction in the field. The consumption data for major cereals, cereal products and starches include quantities consumed and total value and expenditures of various food commodities. Analyses of these data by Sigma One Corporation primarily for the Consumption Effects of Agricultural Policies study concentrated on the major cereals and cassava.

Average calorie shares for the major cereals and cassava were computed in order to study the consumption patterns for Dar es Salaam and for urban and rural areas within each region, assuming an average daily requirement of 2,320 calories per person per day (Table 12). Regional calorie consumption averages from the FAO subsample closely approximate this requirement of

Table 11: Contribution of Cereals and Cassava to Daily Calorie Intake[1] of Tanzanians (%)
(FAO Sample 1976/77 HBS)

	Dar es Salaam	Other Urban	Rural
Total[2]	64.2	66.7	63.7
Maize/Sembe	33.3	42.3	44.2
Rice	22.1	13.1	7.2
Wheat	8.1	8.2	1.0
Sorghum/Millet	0.0	2.3	9.6
Cassava	0.7	0.8	1.7

[1]Average daily calorie consumption is 2,586 for Dar es Salaam, 2,070 for other urban areas, and 2,521 for rural areas.

[2]Includes cassava, excludes other cereals.

Source: Tanzanian National Food Strategy, Ministry of Agriculture, National Food Strategy Project

Figure 1

Partial Data Sheet Used for Data Extraction of the 1976/77 Household Budget Survey

FROM PAGES 10 - 13

FOOD AND DRINK CONSUMPTION

Code	Item	Consumption Type	Quantity: local units amount	local units unit	standard units amount	standard units unit	Total value in Shs.	Payment since last interview in Shs.
10101	Paddy							
10102	Rice, husked	1	–	–	51	Kg	207	207
10103	Maize, grain	4	–	–	23	"	18	–
10104	Maize, flour	4	–	–	11	"	28	–
10105	Millet, grain							
10106	Millet, flour	1	–	–	45	Kg	135	–
10107	Sorghum, grain							
10108	Sorghum, flour	1	–	–	42	Kg	126	–

Table 12: Contribution of Cereals and Cassava to the Daily Calorie Requirements[1] of Tanzanians (%) (1976/77 HBS Data)

	Dar es Salaam	Other Urban	Rural
Total (Cereals and Cassava)[2]	75.5	46.9	48.0
Maize/Sembe	36.7	29.3	33.3
Rice	28.3	9.3	5.8
Wheat	9.8	1.3	0.5
Sorghum/Millet	0.1	5.7	6.7
Cassava	0.6	1.3	1.7

[1]FAO average requirement for Tanzania is 2,320 calories per person per day.

[2]Includes cassava and excludes other cereals not listed in the table.

Source: Sigma One Corporation

2,320 calories. The food consumption patterns presented in both Tables 11 and 12 are in general agreement. These calorie shares are computed in a similar manner as discussed in Section 3.2: quantities of foods consumed are in kilograms per household per survey period (two months for households subsiding outside of Dar es Salaam and ten days for households in Dar es Salaam). These quantities are then converted to kilograms per person per day by dividing the given quantities by the number of days in the survey period times the number of people in each household. The number of calories per person per day per food commodity is then obtained by applying the appropriate energy value (calories) per kilogram of the particular food to the quantities per person per day. The proportion of total daily calories derived from each particular food is calculated by division of these quantities by the 2,320 calories per day requirement. For example,

$$\frac{\text{quantity maize flour consumed by household/days in period}}{\text{number in household}}$$

x

energy value of 3,510 calories per kg

divided by

2,320 calories per day

equals

proportion of total daily calorie needs met by maize flour per household

By then averaging the proportions of each food within each region or area, we obtain average calorie shares of each food for an area or region, which are used to form consumption patterns for

urban and rural areas within regions.

Exercise 7

Using the data in Figure 1 (which represents a rural Tanzanian household consisting of eight people), calculate the proportion of daily calorie needs (assumed to average 2,320 per person per day) met by each cereal group for the entire household.

Using the consumption patterns derived from the Household Budget Survey and demographic data from the 1978 Population Census, estimates of the quantities consumed of the major cereals are obtained by region. An average per capita daily consumption (kg) must first be calculated for the area or region being considered. The average per capita daily consumption (kg) of a cereal is multiplied by the rural or urban population within the region to determine the total daily consumption (kg) for the rural and urban areas of the region. This value multiplied by 365 days yields an estimate of total annual consumption (kg) for each cereal. This annual consumption equation is:

average per capita daily consumption of maize flour for area

x

area population

x

365 days

equals

total annual consumption of maize flour for the area

As previously mentioned in Section 3.2, when appropriate, milling extraction rates must be applied to these quantities to accurately reflect actual consumed quantities. In the case of maize flour (sembe), an extraction rate of 0.85 was used for urban areas and a rate of 0.75 for rural areas. This requires multiplying quantities of sembe by 1.18 in urban areas and 1.33 in rural areas to account for actual quantities of maize grain necessary to produce required maize flour. The conversion of the regional quantities of each cereal to metric tons is done by dividing the quantities (kg) by 1,000. These consumption estimates can be used to estimate future consumption assuming calorie shares have remained unchanged since the 1976/77 survey, and that consumption of each cereal in each region will increase relative to the population growth in each region. By applying the annual population growth rates to the quantities (MT) of each cereal, estimates of consumption in subsequent years can be calculated. Table 13 presents estimates of projected maize consumption for several years.

3.5 Income and Own-Price Elasticities

As consumption analysis seeks to determine the impact of food price changes on consumption levels and nutrition status, obtaining a general measure of how consumption changes relative to price and income changes will enhance the analysis. Income is an important determinant of consumption, and reliable data concerning total income or the ability to generate a reasonable proxy for total income are needed to generate income elasticities. The usual case is that income data are scanty and/or

Table 13: Estimated Quantities of Maize Consumed in 1979/80, 1981/82 and 1982/83 ('000 MT grain equivalents)

Region	1979/80	1981/82	1982/83
Dodoma	25.7	27.0	27.7
Arusha	86.5	92.7	96.0
Kilimanjaro	42.7	44.8	45.9
Tanga	129.7	135.8	139.0
Morogoro	134.2	141.4	145.2
Coast	28.5	29.5	30.0
Lindi	34.7	35.7	36.3
Mtwara	28.9	29.7	30.1
Ruvuma	77.5	82.5	85.1
Iringa	209.6	218.9	223.8
Mbeya	131.8	137.6	140.6
Singida	88.0	91.1	92.7
Tabora	130.4	138.3	142.5
Rukwa	105.6	115.9	121.6
Kigoma	49.2	53.5	55.8
Shinyanga	102.2	109.5	113.4
West Lake	35.1	37.7	39.0
Mwanza	97.2	104.7	108.9
Mara	9.6	10.7	11.2
Dar es Salaam	105.6	126.6	138.6
Tanzania	1652.7	1763.6	1823.4

Source: 1976/77 Household Budget Survey Subsample and Sigma One Corporation calculations

unreliable. Total expenditures are a reasonable and useful proxy for total income. In the subsample of the 1976/77 survey, income data for urban households appear reasonable, but that of rural, mostly agricultural households is less acceptable. The value of consumption out of own production is not included in either total income or expenditures. Thus, an estimate of the value of on-farm consumption must be calculated from the data and added to total expenditures to serve as proxy for total income for rural households.

The data extracted from the subsample of the 1976/77 survey included information on whether a particular food was purchased in the market or homegrown (under the heading "consumption type"). A measure of the proportion of the value of food consumed that was purchased in the market is obtained by summing the quantities of market-purchased foods and dividing by the total quantity of food consumed. An estimate of the value of on-farm consumption is simply one minus this proportion multiplied by the total value of food consumed. Summing the value of on-farm consumption and total expenditures yields a reasonable estimate of total income for the rural household.

Income and own-price elasticities represent the proportional changes in consumption of a particular food caused by changes in income and changes in the price of the food, respectively. Consumption demand analysis utilizes various techniques to derive these elasticities. Table 14 presents these elasticities for Dar es Salaam and other urban areas in Tanzania. These figures will allow planners and analysts to predict changes in

Table 14: Income and Own-Price Demand Elasticities for Basic Staples in Urban Areas (1976/77 HBS Data)

Commodity	Income Elasticity	Own Price Elasticity	Expenditure Share
Dar es Salaam			
Maize, Sembe	.090	-.100	.129
Rice	.486	-.536	.201
Wheat, Bread	.257	-.273	.084
Urban (Non-Dar es Salaam)			
Maize, Sembe	.478	-.530	.210
Rice	.275	-.290	.080
Wheat, Bread	.697	-.710	.060

Source: Sigma One Corporation

consumption demand of a particular food caused by changes in the price of the food and by changes in income, which may result from policy implementations, market interventions, or other factors in the markets for foodstuffs. Using the elasticities to predict probable changes in consumption can lead to an examination of the nutritional consequences of those changes.

Exercise 8

Price data from Table 4 show that the real price of maize flour (sembe) has declined from 1977 to 1982. Using these data and the own-price elasticity for sembe in Dar es Salaam from Table 14, by how much would sembe consumption have changed during this period assuming all other factors affecting sembe consumption remained the same?

Wage level data from Table 5 show that in real terms the minimum urban wage has declined from 1977 to 1982. Using these data and the income elasticity for sembe in Dar es Salaam from Table 14, by how much would sembe consumption have changed during this period assuming all other factors affecting sembe consumption remained the same?

Using the data on rice and wheat flour from Tables 4 and 5 and data for Dar es Salaam in Table 14, by how much would consumption of each have changed assuming that all other factors affecting each remained the same? What observations would you make concerning consumption changes in these three cereals based on the above calculations? What other information could you use to help explain consumption changes?

A comparison of the calorie and budget shares of maize flour from the 1969 survey and those calculated from the subsample of the 1976/77 survey, reveals that the share of maize flour in total expenditures and total calorie needs increased between the two periods for most regions in the country. The price and income data of Tables 4, 5 and 15 help to provide a partial explanation for this behavior. Because sembe

Table 15: Producer Prices for Maize, Rice and Wheat 1971/72 to date

Sh/kg

	Maize		Paddy		Wheat	
	Money Price	Constant 1/ 1982/83 Price	Money Price	Constant 1/ 1982/83 Price	Money Price	Constant 1/ 1982/83 Price
1971/72	0.24	1.47	0.52	3.19	0.57	3.50
1972/73	0.26	1.47	0.56	3.16	0.57	3.22
1973/74	0.33	1.62	0.57	2.79	0.57	2.79
1974/57	0.55	1.98	0.65	2.58	0.77	3.06
1975/76	0.80	2.75	1.00	3.44	1.00	3.44
1976/77	0.80	2.52	1.00	3.14	1.20	3.77
1977/78	0.85	2.39	1.20	3.37	1.25	3.51
1978/79	0.85	2.12	1.20	2.99	1.25	3.12
1979/80	1.00	2.04	1.50	3.07	1.35	2.76
1980/81	1.00	1.60	1.75	2.80	1.65	2.64
1981/82	1.50	1.92	2.30	2.94	2.20	2.81
1982/83	1.75 2/	1.75	3.00 2/	3.00	2.50	2.50

Notes: 1/ Using National Consumer Price Index as a deflator.

2/ Premium region prices (at which most purchases are likely to be made).

Source: Marketing Development Bureau

is subsidized, its real consumer price has declined in recent years. Since sembe is a preferred staple, the demand for it increases with a decrease in its price. With real incomes declining and the price of sembe lower than the other preferred staples, the share of sembe in total expenditures increases. Among other factors to be considered are total production, level of imports, subsidies, inflation and the official and unofficial markets. After examining the factors or policies which have led to consumption changes, a determination of the nutritional consequences of those changes should follow.

Bibliography

Frisch, R., "A Complete Schema for Computing All Direct and Cross-Demand Elasticities in a Model of Many Sectors," Econometrica 27, 1959.

Keeler, Andrew G., Grant M. Scobie, Mitchell A. Renkow and David L. Franklin, The Consumption Effects of Agricultural Policies in Tanzania, Sigma One Corporation, Raleigh, N.C., January 1982.

Ortolo, B. and J. Rook, An Assessment of the Present Pattern of Consumption and Projections of Future Food Requirements Using a Sample From the 1976/77 Household Budget Survey, Tanzania National Food Strategy Project, (mimeo), 1982.

Renkow, Mitchell A., Jerry B. Leonard and David L. Franklin, The Potential Effects of Alternative Structures and Pricing Policies in the Markets for Maize in Tanzania, Sigma One Corporation, Raleigh, N.C., February 1983.

Tanzania Food and Nutrition Centre, Data Report on the Food and Nutrition Situation in Tanzania 1974/75-1979/80, Dar es Salaam, Tanzania, April 1982.

United Republic of Tanzania, 1969 Household Budget Survey, Vol. 1-3, Bureau of Statistics, Dar es Salaam, Tanzania, 1972.

United Republic of Tanzania, 1978 Population Census Preliminary Report, Bureau of Statistics, Dar es Salaam, Tanzania.

United Republic of Tanzania, Price Policy Recommendations for the July 1982 Agricultural Price Review, Annex 1, Maize, Rice, and Wheat, Marketing Development Bureau, Dar es Salaam, Tanzania, 1982.

United Republic of Tanzania, Tanzania National Food Strategy Main Report, Ministry of Agriculture, National Food Strategy Project, Dar es Salaam, Tanzania, 1982.

Exercise Solutions

Exercise 1

Cereal	Kcal Per Person Per Year	Grams of Protein Per Person Per Day
Wheat Flour	17,108	1.4
Rice	67,155	3.5
Maize Flour	309,582	20.1
Sorghum/Millet Flour	157,080	12.4
Totals	550,925	37.4

Exercise 2

Cereal	Monthly Cost Per Person	Monthly Cost For Family of Five
Wheat Flour	1.47	7.34
Maize Flour	12.86	64.31
Rice	5.40	26.98

Monthly cost = 26% of minimum wage

Exercise 3

2,578 calories/day

Exercise 4

(a) 41.86 percent of the RDA is represented by the three foods.

(b) They would spend all or nearly all of their income on food.

Exercise 5

Region	Calorie Share
Arusha	0.03
Morogoro	0.16
Ruvuma	0.11
Kigoma	0.01
Shinyanga	0.02

Exercise 6

0.14
N.B. This is computed assuming that $Y_G = 25,000$.

Exercise 7

Cereal	Proportion of RDA Met
Rice, husked	16.6%
Maize Grain	7.5%
Maize Flour	3.5%
Millet Flour	13.5%
Sorghum Flour	13.0%
Total	54.1%

Exercise 8

(a) Maize consumption increased by 4.44%.

(b) Maize consumption decreased by 3.54%.

(c) For rice, price changes would have caused consumption to increase by 22.38 percent; income changes would have caused consumption to decrease by 19.15 percent. For wheat, price changes would have caused consumption to increase by 11.26 percent; income changes would have caused consumption to decline by 10.12 percent.

(d) Conclusions

Over the period 1977-1982, consumption of these cereals probably increased, as the substitution effects of real price changes counterbalanced the effects of declining real incomes. Other important information explaining consumption changes includes the amount of these foods available within the country (e.g., imports and domestic production) and information on the distribution of these staples (i.e. did people in Dar es Salaam have access to these foods at the prices found in Table 3).