KENYAN AGRICULTURE: TOWARD 2000

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FOREWORD

Since its inception in 1977, the central purpose of the IIASA Food and Agriculture Program has been to further understanding of the nature and dimensions of the world's food problem. In addition, IIASA is proposing and analyzing various policy options aimed at ameliorating the food problem.

Clearly this work has to be based on a detailed understanding of food and agriculture in various specific contexts. To this end, this report provides an extensive analysis of food and agriculture in Kenya from now until the year 2000. Much of its analysis has also been used as an input to the global study *Agriculture 2000* sponsored by the UN Food and Agriculture Organization. Its value arises not only from the light it sheds on the situation in Kenya but also from the fact that Kenya has many problems in common with other developing countries: a rapidly rising population, increasing urbanization, and a deteriorating balance of payments.

In this report we study the Kenyan economy somewhat generally. However, we place particular emphasis on the agricultural sector, analyzing the production structure and demand patterns, the latter by income class. After discussing current policies and making predictions for the year 2000, a number of solution strategies are considered, for problems both envisaged by the authors and anticipated by others.

IIASA's publication of this report is one step in the effort of its Food and Agriculture Program to integrate its work with that of other world institutions seeking as an ultimate goal to alleviate food shortages and to eradicate hunger throughout the world.

KIRIT S. PARIKH
Leader
Food and Agriculture Program

PREFACE

In recent years there have been a number of studies aimed at understanding world food and nutrition. In particular, the UN Food and Agriculture Organization (FAO) is seeking to assess world agriculture in the year 2000. This work entails widespread activity, including a number of case studies at country level. This report describes the work of one of these studies, termed the Kenya Case Study (KCS).

The major part of the work was completed by January 1979, while one author (McCarthy) was food and nutrition planning adviser to the Kenyan Ministry of Economic Planning and Community Affairs; his work was sponsored and supported by the Nutrition Division of the FAO in Rome. A preliminary draft of the study's findings was widely circulated for comments by policy makers, planners, and scholars. It benefited particularly from the comments of J.O. Otieno, Senior Planning Officer in the Ministry of Economic Planning and Community Affairs in Kenya. The final version of the report, which was completed at IIASA as a contribution to its Food and Agriculture Program, made important use of all these comments.

Many people contributed to the work by providing useful insights and making their work and data sources available; they included the following.

Ministry of Economic Planning and Community Affairs in Kenya: H. Mule (Permanent Secretary), J.O. Otieno (Senior Planning Officer), M. Ouma (Macro Planning Unit), A. Vukovich (UN Fund for Population Activities), Richard Myers, Judy Geist (Rural Planning Unit), and A. Rasmussen.

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FAO in Rome: Nural Islam, N. Alexandratos, J.P. Hrabovszky, J. Mason, Bruce Johnston (Stanford University), and Per Pinstrip Andersen (International Food Policy Research Institute, Washington).

The work depended heavily on sources from the Ministry of Agriculture (T. Aldington) and on the Integrated Rural Survey and Urban Food Purchasing data bases from the Central Bureau of Statistics. The work of previous analysts of these data was extremely useful, particularly that of M. Shah, L.D. Smith, D. Casley, and T. Marchant.

The final version of this report has benefited from extensive reviews by T. Aldington and J. Sharpley.

Finally, we should like to express our thanks to Mary Kariuki and Rosemary Muriithi for their excellent work in preparing the manuscript.

F.D. McCARTHY
W.M. MWANGI

GLOSSARY

Weights

1 long ton = 2240 lb = 1.016 metric tons (tonnes)
1 metric ton (tonne) = 1000 kg = 2205 lb

Area and Volume

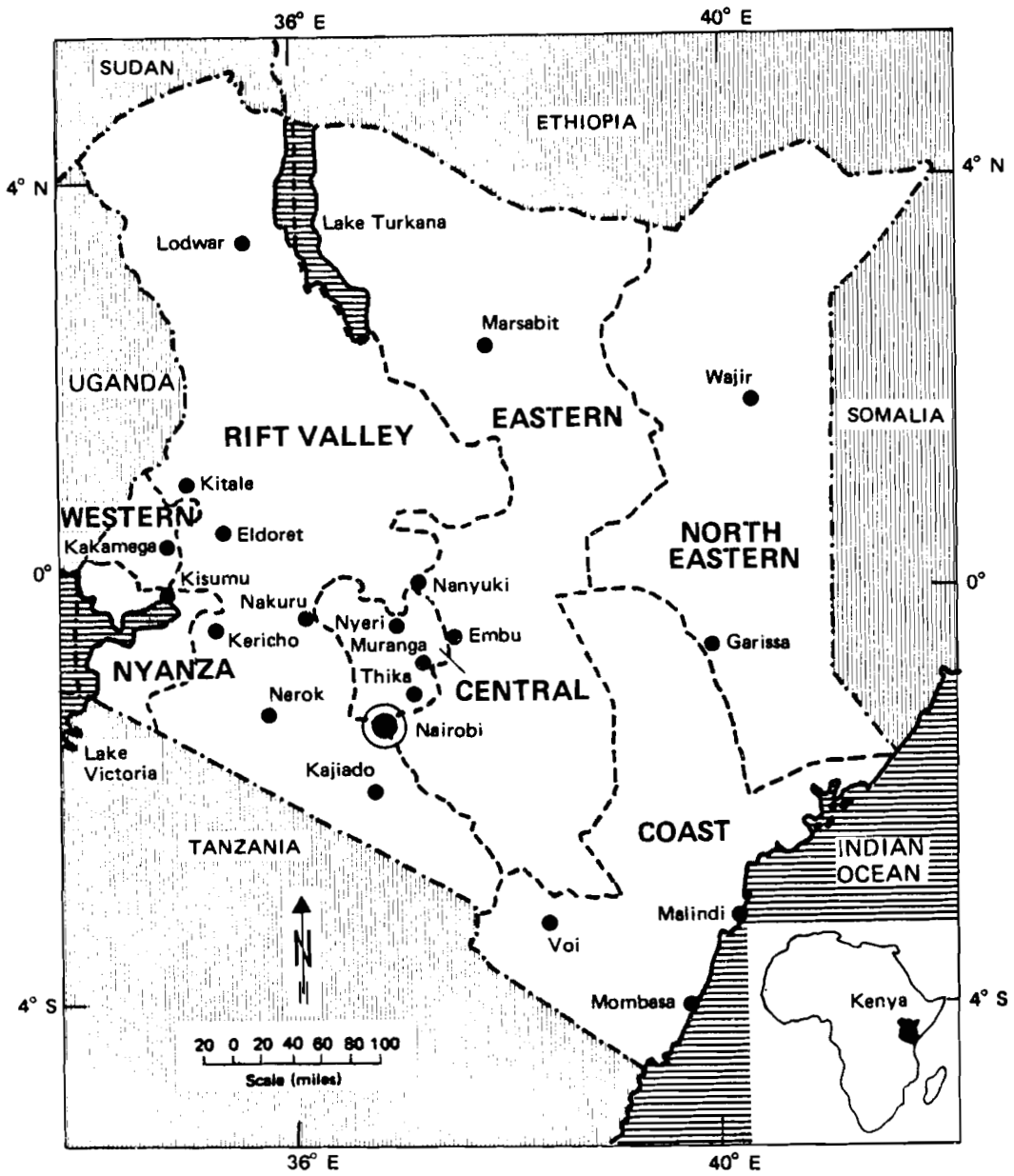
1 hectare = 2.4711 acres
1 acre = 4840 square yards = 0.4047 hectares
1 square mile = 2.59 square kilometers
1 cubic meter = 35.315 cubic feet

Length

1 yard = 36 inches = 0.914 meters
1 mile = 1760 yards = 1,609 kilometers
1 kilometer = 0.6214 miles

Currency (December 1981)

20 Kenya shillings (KSh) = 1 Kenya pound (K£)
1 Kenya pound = 2.65 US dollars
1 US dollar = 7.54 KSh = K£0.38



The Republic of Kenya. (Source: The World Bank, 1980.)

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SUMMARY

OVERVIEW

By the year 2000 the population of Kenya is expected to double to about 30 million. However, even then the population will remain predominantly rural, 73% being the current estimate. The majority of the rural population today consists of smallholders, and this is expected to continue to be the case.

By conventional measures the national income is heavily skewed. For Kenya as a whole the Gini coefficient (see Appendix) is 0.61. A closer examination indicates that, while there is a small number of urban poor in absolute terms, most of the population live in rural households; here the income distribution is more egalitarian, the Gini coefficient being 0.49.

Production Structure

The production structure is vastly different for smallholders and large farms, in terms of both the technology used and the crops grown. Most smallholders grow maize largely for home consumption. This is the principal staple in the country except for some areas in the west where cassava is common. The smallholders typically intercrop, usually with beans or pulses, and use virtually no modern inputs; they are also significant producers of millet and sorghum. Large farms tend to place emphasis on the production of wheat and export crops, such as coffee, tea, and sisal; they also produce a significant share of the marketed maize.

Demand

Maize can be expected to remain the principal crop up until 2000, but substantial increases in demand are anticipated for wheat, rice, sugar, meat, and oils. The higher demand levels are expected primarily owing to the doubling of the population and a per capita income increase of about 27%, while changes in the composition of demand will be much influenced by increasing urbanization.

Production

Higher acreages, greater yields, and improved technology are expected to increase domestic production levels to meet this demand. Most of the gains are expected from higher yields, which will entail substantial increases in inputs. The analysis suggests that

all these expectations will be within the realm of technical feasibility, but that institutional factors may be limiting.

Nutritional Status

One of the measures of success of agricultural development is its ability to satisfy the population's nutritional needs. Presently it is estimated that 16% of the population (2.2 million people) are below the datum of 1.2 times the calorie intake for the basal metabolism rate. If present planning objectives are achieved and continue being until 2000, there will be more people below this datum by then (3 million), but they will represent a smaller proportion of the population (10%). Thus, while expenditure growth alone – even the substantial growth postulated of 27% – will alleviate much of the mild-to-moderate malnutrition, it will not eliminate the more severe category. For this group of 10% of the population more direct intervention will be needed.

Consumption–Production Balance

This study suggests that supplies will be adequate to meet domestic demands for maize, millet, sorghum, potatoes, fruit, and vegetables. There are possible shortfalls for wheat, rice, meat, and oils. The wheat supply can be augmented by a modest shift in policy, while meat will most likely require significantly higher producer and consumer prices. Barring a major policy shift, Kenya will need to import rice (about 60 tons per year) and oils. Kenya will still have significant surpluses of its traditional export crops, coffee and tea, and, with a continuation of present policies, a similar surplus for sugar.

This overall consumption–production balance should be achievable with some increases in investment, particularly for improved marketing and distribution facilities, together with land improvement, together with incentives to encourage the move toward higher yields and improved technology. The burden on the balance of payments will not be disproportionately large.

Policy

Policies to achieve this require higher farmgate prices, which should be so designed as to moderate the impact on consumer prices. Since Kenya does not favor consumer subsidies and at the same time seeks to avoid an increased fiscal burden, it faces a dilemma. The analysis suggests some possibilities for trimming the overhead costs of marketing boards and tilting transport tariffs to favor smallholder crops. Similarly, policies directed toward these crops (maize, beans, and pulses) would be self-focusing in that they would favor positive redistribution. These could also be accompanied by noneconomic incentives, such as improved water supply.

For redistribution a number of possibilities are indicated: some land redistribution and reorienting of extension services toward smallholder crops and smallholder technology. Kenya has demonstrated the ability to mount an effective smallholder extension service

for some crops, with positive results. It remains to be seen whether this can be extended further to the great majority of smallholders who produce largely for subsistence. It is these rather ephemeral issues of management and institutional structure that pose the biggest problems. There seem to be few problems outside the feasible range of current technical possibilities.

Ironically, the present low yields and the lack of modern inputs offer great potential for improvement, but the social issues are more intractable. The increasing population pressure, with its concomitant increasing food demand, land fragmentation, and employment needs, poses major challenges.

For answers one may seek outside the immediate realm of agriculture. While the whole psychological structure in Kenya is largely pronatalist, the overall educational milieu, strongly influenced by the colonial period, supports a value system in which agricultural employment is ranked rather low.

However, the achievements in the short time since independence suggest that Kenyans can adapt to face a challenge. The rhetoric of the present plan certainly holds promise. It remains to be seen whether the reality will match the promise.

SOME SUPPORTING DETAILS

There are a number of the details that support the summary overview and are of general interest. The purpose of this section of the summary is to set them forth.

Production Targets for 2000

The production target for maize in the FAO study for the year 2000 is 4559 thousand tonnes (metric tons, MT); this estimate arises from the postulate that 1857 thousand hectares (ha) of land will have an average yield of 2.46 MT/ha.

Most of the maize in Kenya is presently produced by smallholders (see Table 32). Their yields vary significantly from less than 0.5 MT/ha for local varieties using virtually no modern inputs to levels close to 4 MT/ha for the most advanced smallholders using hybrid seeds and fertilizer. The area under hybrid maize has increased at a rate of about 60,000–70,000 ha/year since this was introduced around 1970. Present policies, which the current plan is strengthening, should support this trend.

The maize target is feasible if this trend is maintained, as is envisaged in current policies.

Another major question mark is the FAO coffee and tea estimates. In this report we suggest that the additional areas they assume are probably too high. Most area expansion will benefit smallholders, but most informed estimates do not support the FAO area estimates.

Wheat, which is produced by large farms, will need higher producer prices to achieve a 100% yield increase. Meat prices should also rise at the producer and consumer levels. Except for rice, therefore, the principal FAO production targets can be achieved without any major new policy initiatives to favor the smallholders. However, the situation of the smallholders could be improved by accelerating the present trends.

Implications for Crop Yields

Smallholder and large-farm crops differ in many ways (see Table 30). Of the large-farm contribution to the agricultural gross domestic product, 80% comes from the plantations, primarily growing coffee, tea, and sisal. For smallholders the important crops are maize, millet and sorghum.

- For maize, the smallholders' average yield should double, while the additional contribution from large-scale farmers should not be critical.
- For tea and coffee, smallholder yields are presently much lower than those of large-scale farmers, primarily because the large-scale farmers occupy more productive land. However, for tea many of the smallholder yields have been improving rapidly under current policy measures geared toward extension and input availability.
- Wheat will need a doubling of yield. Since this is a large-farm crop, policy makers will have to consider the distributional impact of higher producer prices.
- FAO livestock production targets should be exceeded. However, it is unlikely that Kenya will allow imports to rise to the FAO estimate of 387 MT. The policy will most likely be a combination of higher producer and consumer prices.

Income Distribution and Poverty Effects

The large-farm areas will gain in absolute terms because of higher producer prices for wheat and meat. However, the main source of income will be determined by world market prices for coffee, tea, and sisal.

The smallholders will gain because of higher maize production and higher meat prices. However, most of these gains will be offset by the 4% population growth rate.

The pastoralists will benefit from higher meat prices.

The policies to meet the production goals will therefore make little change in the present income distribution. The improved infrastructure should modestly ease poverty.

Equity

If the aim is to increase equity, it may be desirable to consider the possibility of making land available to the low income groups. According to the estimates of land distribution given in Table 30, the smallholder farms with 10–11 million people have sizes of up to about 10 ha but average a little over 2 ha. They typically grow maize and beans for subsistence. The smaller ones (less than 2 ha) have a few animals; the larger ones produce some surplus maize and tend to have more livestock.

A group of farms not covered in the usual surveys, the so-called "gap farms", are believed to be about 20–50 ha in size. These are understood to be similar to the larger of the smallholder farms, but the land is generally not as good, and there is consequently a lower population density. They tend to have more animals.

The large farms consist of mixed farms, plantations, and ranches. The ranch land is generally of low potential. Plantations primarily grow cash crops such as coffee, tea, and

sisal. The mixed farms have high and medium potential land. About 62% of this area has been bought by groups and has been informally and often illegally subdivided without government control. However, this subdivision has now been legalized.

Available Land

There are only about 300,000 ha of suitable land in the large-mixed-farm category that might be used for redistribution. Other lands that might be available include the Narok Agricultural Development Project, where there are an estimated 250,000 ha of high potential land. Additional land may become available in the medium to long term through drainage and irrigation; however, as this analysis indicates, the costs are prohibitive at the moment, and little can be expected from this source. The redistribution of 200,000 ha from large plantations could also be considered, but the political and institutional factors would be major obstacles.

In summary, in the near to short term at most 500,000 ha could be distributed to the low income groups if the political and institutional difficulties could be overcome.

A Land Distribution Experiment

Land holding is a major determinant of total income for smallholders, though activities outside the holding contribute about 50% of income. Let us consider an experiment whereby the 500,000 ha are distributed to the pastoralists, the landless, squatters (1.3 million), and the poorest smallholders (3.5 million) – that is, the bottom 40% in the rural area, about 680,000 households. On average they would receive 0.74 ha per household. This in turn suggests that each household would have an additional annual income of about 1900 Kenya shillings (KSh), or about 270 KSh per capita. This would produce a major improvement in nutrition similar to the effect of the major redistribution scenario (236 KSh) discussed in this report. The proportion of malnourished would fall from 33% to 15%, while those below the datum of 1.2 times the basal metabolism rate would fall from 17% to 6.5%.

Thus a land distribution of this magnitude could have a major impact on the low income groups. Political feasibility, however, is the key question.

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1 INTRODUCTION

1.1 Background

Currently Kenya is at an extremely interesting juncture in its history. For the fifteen years following independence in 1963 Kenya had one President, Jomo Kenyatta. In this period the total output of goods and services more than tripled. Many landless families were settled, while colonial prohibitions on Africans from engaging in various forms of economic activity were removed. It was a period of rapid growth, with an increase in real per capita consumption of more than 60%. While the concomitant structural change benefited most of the population, inevitably some groups prospered more than others.

1.2 The Current Plan

In preparing the current plan (1979–83) the government sought ways of rectifying some of these problems by placing greater emphasis on equity and distributional issues. This thrust was given greater emphasis when President Moi assumed office. In his first few months he proposed innovative policies whose implications cannot be fully gauged at this stage. These included a mandated 10% increase in employment by 1979, making everybody literate by 1983, and making free milk available to all schoolchildren*. At this time of change it seems particularly appropriate to take a critical look at agriculture and the policies that mold it. First the overall economy is considered briefly.

1.3 General Economic Considerations – 1976

In 1976 the population of Kenya was estimated at 13.75 million of whom 86.7% lived in rural areas. The gross domestic product was K£1263 million** or K£91.8 per

*Owing to severe shortages in 1980 this program had to be severely curtailed.
**K£1 equals approximately US$2.65 (May 1979).

capita, of which 38% was contributed by agriculture. Kenya has a land area of 57 million hectares, of which 6.84 million hectares, or about 12% of the total area, are classified as high potential agricultural land. This implies that at present Kenya has about 0.49 hectares per capita of high potential land equivalents. If the present high population growth rate of about 3.5% per year* continues then at the turn of the century the per capita high potential land equivalents will fall to 0.2–0.3 ha per capita. However, there are many variations in endowment between different parts of the country and in the purchasing powers of various groups. One of the more obvious differences is that between urban and rural dwellers, for whom there are marked differences in both production and consumption patterns. Similarly, the institutional and behavioral patterns vary greatly between different ethnic groups, from the coast Moslem to the Masai pastoralist. In a short report such as this it is not feasible to disaggregate all the significant variations.

The report, referred to by us as the Kenya Case Study (KCS), has five sections in addition to this Introduction.

In Section 2 we discuss the current economic situation by analyzing the composition of the national product and suggesting what structural changes may be expected by the year 2000. These changes will be strongly influenced by population growth and increasing urbanization.

Section 3 is devoted to the analysis of food demand. The base year (1976) estimates of a number of sources are reviewed. The demand for the year 2000 is then estimated. This is done for a number of scenarios and for various assumptions about population and income growth rates.

In Section 4 the resource base for agriculture is discussed, together with some of the options for increasing output.

Section 5 deals with production estimates for most agricultural commodities. Each group is discussed and estimates are made for the year 2000. Sources of growth are identified and some of the relevant policy measures are discussed.

Section 6 seeks a synthesis. Production and consumption estimates are compared. Some of the implications for income distribution and nutritional status are considered. Finally, some suggestions on possible policy directions are offered.

2 THE ECONOMIC SITUATION

The current economic situation and some of its underlying dynamics are briefly discussed before we focus on agriculture and on food in particular. The gross domestic product by industrial origin, together with that projected for 1983, is given in Table 1 for 1976. Note the large contribution, 38%, from agriculture. This is expected to fall to 34.1% by 1983, primarily because of the relatively low growth rate projected for the semimonetary sector. The manufacturing, building, and construction sectors are expected to increase their shares to 15.8% and 4.4% respectively. More than 80% of the productive work force is located in rural areas, agriculture providing a major share of the opportunities to generate purchasing power. Because of the lower-than-average value added contributed by the workers in agriculture, this sector has a much larger share of the labor force than it does in the total national product.

*While the official rate is 3.5%, the Economic Survey (1979) suggested that the growth rate may be as high as 3.9%.

TABLE 1 Gross domestic product by industrial origin: actual 1976; projected 1983[a].

	K£ million in 1976 prices		Annual growth (%)		Share of total (%)	
			Actual	Target		
	1976	1983	1972–76	1976–83	1976	1983
Enterprises and nonprofit institutions						
Agriculture	219.64	341.30	1.5	6.5	17.4	17.6
Forestry	6.33	10.70	5.9	7.8	0.5	0.6
Fishing	2.36	3.20	0.2	4.5	0.2	0.2
Mining and quarrying	4.15	7.10	11.2	8.0	0.3	0.4
Manufacturing	167.41	306.20	9.4	9.0	13.3	15.8
Electricity and water	14.20	24.30	10.1	8.0	1.1	1.3
Building and construction	46.20	84.50	−4.7	9.0	3.7	4.4
Wholesale, retail trade, etc.	144.46	211.50	2.0	5.6	11.4	10.9
Transport, storage and communications	69.15	109.60	4.1	6.8	5.5	5.7
Finance, insurance, real estate, etc.	68.03	114.30	9.9	7.7	5.4	5.9
Ownership of dwellings	46.13	69.40	2.4	6.0	3.7	3.6
Other services	24.84	38.10	5.1	6.3	2.0	2.0
TOTAL ENTERPRISES	812.90	1320.20	4.2	7.2	64.4	68.3
Private household (domestic services)	10.93	21.30	13.6	10.0	0.9	1.1
Producers of government services	178.91	281.20	6.7	6.7	14.2	14.5
TOTAL MONETARY SECTOR	1002.74	1622.70	4.8	7.1	79.4	83.9
Semimonetary sector	260.11	311.30	0.8	2.6	20.6	16.1
TOTAL GDP AT FACTOR COST	1262.85	1934.00	4.0	6.3	100.0	100.0
Add (+) indirect business taxes	167.00	268.20	−4.1	7.0	13.2	13.8
Less (−) subsidies	−0.77	−8.50	–	–	–	−0.4
GDP AT MARKET PRICES	1429.08	2193.70	2.9	6.3	113.2	113.4

[a]SOURCE: Kenya Development Plan, 1979–83.

2.1 Changes in Structure

Since independence the most notable changes in the composition of the gross domestic product (GDP) have resulted from the steady decline in the combined agriculture and semimonetary share, particularly in the semimonetary component. These changes are summarized in Table 2. If the historic trend continues, then by the year 2000 the share of agriculture should fall to around 27.6% even then including a 10.7% share from the semimonetary economy. It is estimated that the manufacturing, building, and construction sectors will show a dramatic rise to 26.7%. The shares for other enterprises and for government are expected to maintain roughly the same levels. However, the composition will reflect a number of changes. Evidence cited by Kuznets (1966) strongly suggests that those services associated with the production of commodities (power and communications) will steadily grow in importance and that the degree of processing for various foodstuffs will increase.

TABLE 2 Gross domestic product at factor cost – sector shares.

Industry sector	Sector share in GDP (%) by year			
	1964[a]	1976[b]	1983[c]	2000[d]
Semimonetary economy	27.0	20.6	16.5	10.7
Enterprises				
Agriculture	16.1	17.4	17.6	16.9
Manufacturing, building, and construction	12.4	17.0	20.2	26.7
Other enterprises[e]	31.6	30.8	31.6	31.6
Government	12.9	14.2	14.1	14.1
TOTAL	100.0	100.0	100.0	100.0

[a]In 1964 prices: Economic Survey, 1975.
[b]1976, 1983, and 2000 figures are in 1976 prices.
[c]1983 official targets: Kenya Development Plan, 1976–83.
[d]The year 2000 figures are estimates based on historical trends from 1964.
[e]Figures include private households.

2.2 Income Distribution

There have been a number of studies of income distribution in Kenya: the International Labour Organization (1972), Ng'ethe (1976), Bigsten (1977), Lijoodi and Ruthenberg (1978), Hazlewood (1978), Crawford and Thorbecke (1978), and Kaplinsky (forthcoming). In view of the wide variations in sociocultural conditions, it is not clear that an aggregate measure of distribution at the national level is very meaningful. At the very least it seems that urban and rural areas should be examined separately. Nevertheless, the ramifications of income redistribution at the national level are considered in Section 5.

Population estimates are given in Table 3. We note that in 1976, of a total population of 13.75 million, the urban population was estimated at 1.83 million, or 13.3% of

TABLE 3 Estimated rural and urban populations, in millions[a].

	Population in millions, by year					
	1969[b]	1976	1983	2000 (low)	2000 (high)	2000 (medium)
Rural	9.83	11.92	14.47	21.05	24.42	22.73
Urban	1.11	1.83	3.00	7.13	9.70	8.42
TOTAL	10.94	13.75	17.47	28.18	34.12	31.15

[a]Source: the urban estimates are given in Ministry of Finance and Planning (October 1974), Population Projections During 1969–2000. The total estimates are from the Central Bureau of Statistics – high projections assume a constant fertility rate of 7.6, while the lower estimate assumes a reduction in fertility of 40% from 1981 onwards.
[b]1969 was census year.

the total. The total population is expected to increase to at least 28 million by the year 2000. In recent years Kenya has been experiencing rapid population growth, at a rate in the neighborhood of 3.5% per year*. If socioeconomic conditions continue to improve this rate may fall a little, but estimates indicate that unless some major catastrophe occurs there will be a population of around 30 million by the year 2000. It is estimated that the urban population will increase to more than 25% of the total by that time. This will result from a number of factors. The structural change in the economy together with current investment policy indicates that more job opportunities will be available in urban areas. A number of towns will also reach the size at which they will be reclassified into the urban category.

2.3 Urban–Rural Differences

In view of the large differences between urban and rural populations, total GDP was divided between the two and then scaled down to the official gross income level. This gave K£478 million and K£556 million for urban and rural categories respectively**. The rural component was then further disaggregated.

It should be noted (see Table 4) that the vast majority of the rural dwellers are smallholders with modest incomes. Their economic characteristics are discussed in more detail

TABLE 4 Rural income in 1976[a].

Occupation group	Population (millions)	Income (K£ million)	Average per capita income (K£ per annum)
Smallholders	10.11	341	33.7
Pastoralists, landless and squatters	1.29	21	16.3
Large and gap farms, professional, and government service	0.52	194	373.1
TOTAL	11.92	556	46.64

[a]Estimates based on Integrated Rural Survey 1 (IRS1), 1974–75. This survey underestimated the Rift Valley and did not include the North Eastern province.

in the sectors on demand and production. However, it is evident that nonfarm income plays a major role for the "wealthier" smallholders. This component tends to be masked by the average per capita income figure of K£33.7 per annum. There are also noticeable regional differences, those in the Rift Valley and Central provinces being more affluent (Lijoodi and Ruthenberg, 1978). In the production section it is indicated that production by smallholders is considerably different in type of crop and technology from that of

*Recent estimates suggest that the figure could be as high as 3.9% (Economic Survey, 1979). See also Central Bureau of Statistics (November 1979).

**These estimates were obtained with the assistance of the National Accounts Section of the Central Bureau of Statistics.

large farms. These distinctive features offer some possibilities for directing policy to favor the smallholders. The smallholder data is that given in IRS1, adjusted for inflation. The estimate for the remaining category is based on assuming that their incomes are about the same as those of the lower 40% of the smallholder class. An estimate of the coarse distribution is then obtained. The lowest 40% of the rural population are estimated to receive 14% of rural income, while the upper 20% receive 54%. This type of estimate tends to mask the fact that the top 5% receive more than 30% of the income. However, the approach adopted is to be used for demand estimates and provides a reasonable degree of disaggregation for this purpose. The estimated income distribution is given in Tables 5 and 6. The distribution of expenditure is not so skewed because of tax and transfer effects together with the saving pattern – negative at the lower end and strongly positive at the upper end.

TABLE 5 Rural income distribution in 1976[a].

Income group (%)	Income (K£ million)	Per capita income (K£ per annum)	Share of population	Share of income
0–40 (lowest)	78	16.4	0.4	0.14
40–80 (middle group)	179	37.5	0.4	0.32
80–100 (upper group)	299	125.4	0.2	0.54
TOTAL	556	46.6	1.0	1.00

[a]The lowest 40% of incomes are obtained by combining those of the 1.29 million pastoralists and others with the 3.48 million lowest smallholder incomes given in the Integrated Rural Survey 1 (IRS1). The middle 40% are also obtained from the IRS1 data, the upper 20% then being given as residual.

TABLE 6 Urban income distribution in 1976[a].

Income group	Income (K£ million)	Per capita income (K£ per annum)	Share of population	Share of income
0–40	51	69	0.4	0.11
40–80	177	242	0.4	0.37
80–100	250	683	0.2	0.52
TOTAL	478	261	1.0	1.00

[a]Based on data from the Urban Food Purchasing Survey (1977).

2.4 Income Distribution – Urban

An estimate of the income distribution for urban areas is based on a recent Urban Food Purchasing Survey (Casley and Marchant, 1977). This study primarily dealt with households with incomes below K£125 per month. It also excluded single-member households. If this omission is adjusted for, it is estimated that the lowest 75% of the urban population have a total annual income of about K£180 million, which suggests that K£298 million goes to the upper 25%. On using the data from the urban survey, a log–log

Pareto-type plot suggests a distribution of the form shown in Table 6. This distribution indicates that the share of total urban income accruing to the urban poor is lower than that of rural income going to the rural poor. However, urban incomes are on average five times greater than those in rural areas.

Thus as migration from rural to urban areas continues it will exert a strong influence on the overall national income distribution. Since the lower end of the national income spectrum predominantly represents rural dwellers, and also because per capita incomes are growing faster in the urban sector, the overall impact of this increasing urbanization will be an increased disparity in income distribution. This is discussed in more detail in Section 5.

2.5 Conclusions

If the analysis is restricted to purely economic considerations, then recent historical trends suggest broad patterns that are likely to evolve by the year 2000.

- The structure of the economy will reflect a significant change in the composition of the GDP. This will result from the semimonetary sector declining from the 1976 share of 20.6% to 10.7% while the total share of agriculture falls from 38% to 27.6%. Countervailing this will be an increase in the manufacturing, building, and construction sector from 17% in 1976 to an estimated 26.7% by 2000. Within each sector, the composition will change. For example, for the food sector there will be a larger component of value added, owing to greater processing.
- There will be an increase in population from the 1976 figure of 13.75 million to about 30 million, the urban population increasing from less than 2 million in 1976 to about 8 million.
- There will be an increased disparity in income distribution if present policies continue, owing to the relatively greater increase in urban population. However, even by the year 2000 the vast majority of the population will still live in rural areas and will still predominantly be smallholders.

These patterns are suggested primarily by the current economic situation and the trends since independence in 1963. In making these deductions we do not countenance any major shift in the sociopolitical milieu. The patterns can be moderated by active policy measures. Before proceeding to consider various policy options, in particular those that relate to food production and food intake, the demand structure is considered in detail.

3 DEMAND PATTERNS

3.1 Introduction

In Kenya demand patterns differ between ecological zones and provinces, besides exhibiting the striking differences one might expect between urban and rural areas. This

is to be expected in view of the large subsistence or near-subsistence population and the large intersectoral variations. Average incomes of urban dwellers are typically five times as high as those in rural areas. Another major factor is that rural consumption patterns include a large component of home production. The urban population will be considered here, and then the rural population. These will then be combined to produce a national estimate of demand.

General Trends in Consumption

During the course of development, demand patterns in most countries tend to show a number of broadly similar characteristics. In the early stages, when much of the economy may be subsistence, the food share tends to be as high as 70% of total expenditure. This tends to fall over time with rising per capita expenditure. Within the food share the portion accruing to primary agriculture shows an even sharper drop. The other share of demand that seems to show a systematic decline is expenditure for household (domestic) services. Most other components of demand tend to increase their share, even more so their absolute values, over time. Clothing and housing items tend to increase rather slowly, except in certain urban locations, but the greatest increase tends to be in the so-called service sector*. In particular, those services related to improved infrastructure, energy, water, transportation, and distribution increase in relative importance. The thrust of urbanization and the rate at which the urban–rural duality is reduced plays a significant role in shaping future demand patterns.

3.2 Urban Consumption Patterns

The urban analysis is based on a sample of 459 households with a total of 2614 members. The Urban Food Purchasing Survey (Casley and Marchant, 1977) was primarily focused on expenditure patterns of those households with monthly incomes below K£125. The survey also excluded single-member households. It is estimated that at the time of the survey (1977) about 75–80% of all urban households fall into this category. The income level for the various households was also estimated. This allows the approximation of an expenditure function for this group.

Expenditure function – poverty level

A plot of expenditure *versus* income exhibits the conventional pattern: dissaving at the low income end and savings gradually becoming positive with increasing income. The data were first aggregated into income classes and then a linear regression was estimated to approximate the expenditure–income relation. This gives

$$E = 39.21 + 0.75Y \qquad R^2 = 0.97$$

where E is the per capita expenditure per annum and Y is the per capita income per annum, both in Kenya pounds (1977), and R^2 is the coefficient of determination. From this it

*This sector may be considered as the residual after allowing for food, clothing, and housing.

can be estimated that expenditure and income are just equal at a level of K£157 per capita per annum.

This relation allows the estimation of income elasticities from expenditure elasticities. Notice that above K£157 expenditure is less than income, primarily owing to a positive saving propensity, so that income elasticities will be lower than expenditure elasticities. At the lower income levels, at which there is considerable dissaving, the converse is the case.

Expenditure by Income Group

The expenditure shares of three income groups are given in Table 7. The share of food declines from about 50% for low incomes to 24% for high incomes. The trend is even more pronounced if both extremes of the income distribution are examined. Even though the shares fall with income, the actual expenditure on each food item listed increases across income groups. Note in particular the sharp fall in the share spent on the staple maize, and the somewhat less pronounced fall for other grains and for bread.

TABLE 7 Urban per capita expenditure shares in 1977.

Commodity group	Low[a] income	Middle[a] income	High[a] income
1 Dairy produce	8.1	7.6	4.2
2 Maize	8.1	4.7	1.9
3 Other grains (rice)	1.8	2.2	0.6
4 Bread	3.1	2.3	1.4
5 Meat	8.9	7.8	4.0
6 Fats	2.8	2.0	1.0
7 Sugar	4.9	2.3	1.2
8 Vegetables	2.8	3.6	2.4
9 Fruit and nuts	0.5	1.0	0.9
10 Drinks	0.5	1.1	0.8
11 Roots	0.3	1.0	0.8
12 Other foods	0.4	0.5	0.4
Total food	44.6	37.3	20.7
Food outside home	4.9	4.6	3.3
Other expenditure	50.5	58.1	76.0
TOTAL	100.0	100.0	100.0

[a]The categories chosen have per capita annual incomes of K£63, K£160, and K£376 respectively in K£ (1977).
SOURCE: Computed from data collected by Casley and Marchant (1977) for the Urban Food Purchasing Survey.

Quantities Consumed

Price and quantity information was not collected in this survey but some measures may be inferred by imputing prevailing Nairobi prices. The estimates are given in Table 8. These categories are aggregated and the price estimated should probably be slightly lower for the low income group and somewhat higher for the upper end to reflect the shift in both the quality and the composition with income.

TABLE 8 Urban per capita consumption in 1977.

Commodity group	Price[a] (Kenya shillings per kilo)	Per capita annual consumption (kg), by income group			
		Low	Medium	High	Average
1 Dairy produce[b]	2.6 (per liter milk)	57.3	99.8	146.1	92.0
2 Maize	1.6 (maize, meal, and flour)	93.4	100.8	108.2	99.5
3 Other grains	3.4 (rice)	9.9	16.0	16.0	13.6
4 Bread	3.0	18.8	25.3	41.7	25.6
5 Meat	7.0 (beef, goat, and fish)	23.1	38.2	51.0	34.7
6 Fats	11.0 (average per liter)	4.6	6.1	8.3	6.7
7 Sugar[c]	4.5	19.7	20.2	24.7	20.9
8 Pulses	2.25 (beans, peas)	10.5	12.9	24.2	14.2
9 Vegetables	3.0	17.0	41.1	71.8	37.6
10 Potatoes	2.0	7.9	15.2	29.9	15.2
11 Cassava	1.0	2.0	3.5	4.5	3.1

[a]These prices are estimates from gazetted prices and prevailing Nairobi retail prices in late 1977. The aim is to reflect the composition of each of the categories. Shah (1978) has examined some of the price effects: in particular, the manner in which the price per unit quantity varies from low to high income consumers.
[b]In milk equivalent: probably about 60% is consumed as whole milk.
[c]In sugar equivalent.

Elasticity Estimate – Urban

A number of authors have estimated elasticities for Kenya. Shah (1978) tried a number of different functional forms and also a disaggregation by different urban locations. Massel and Heyer (1969) made an earlier study based on a sample of 324 middle income urban households. The estimates in this study were based on the data made available in the Urban Food Purchasing Survey (Casley and Marchant, 1977). An aggregate estimate was computed for each of 27 expenditure groups. These are given in Table 9. The lower household size at the upper end may be used to give some indication of variation by income class. These expenditure elasticities differ significantly from income elasticity estimates. Income elasticity values would be somewhat less at the upper income levels, but greater at the lower end where there is considerable dissaving. All groups are aggregated and estimates are obtained by log–log regressions of the form

$$\log E_i = a_i + b_i \log X + c_i \log H$$

where E_i is the annual expenditure per capita on commodity i,
X is the total annual expenditure per capita, and
H is the household size.

This yielded estimates for expenditure and household elasticity for each commodity. The expenditure elasticity value for food, 0.74, is a little higher than would be expected from similar studies in other countries, while the household value, 0.10, suggests that per

TABLE 9 Urban expenditure and household size elasticities (double log)[a] (the figures in parentheses are the standard errors of the estimates).

Expenditure group	Expenditure elasticity[b]	Household size elasticity[b]
1 Loans and gifts	4.22 (0.87)	7.40 (2.23)
2 Rent	0.85 (0.31)	−1.50 (0.80)
3 Fees/licenses	2.72 (0.48)	4.34 (1.24)
4 Services	1.44 (0.26)	−0.93 (0.67)
5 Total regular expenses	1.60 (0.09)	0.58 (0.22)
6 Cleaning materials	0.85 (0.25)	0.43 (0.68)
7 Regular nonfood items	1.14 (0.15)	0.06 (0.37)
8 Food etc. consumed out of house	0.31 (0.54)	−1.69 (1.38)
9 Total regular purchases	0.74 (0.12)	−0.35 (0.31)
10 Meat and fish	0.93 (0.15)	0.72 (0.38)
11 Dairy produce	0.98 (0.14)	−0.07 (0.36)
12 Edible fats	0.64 (0.27)	0.41 (0.70)
13 Sugar and sweets	0.32 (0.14)	0.36 (0.36)
14 Bread	0.97 (0.16)	0.10 (0.41)
15 Maize	0.70 (0.15)	1.12 (0.39)
16 Other grains	1.18 (0.42)	1.03 (1.08)
17 Pulses	0.70 (0.36)	0.51 (0.92)
18 Vegetables	0.43 (0.21)	−1.70 (0.53)
19 Fruit and nuts	0.66 (0.67)	−1.31 (1.72)
20 Roots	0.31 (0.27)	−1.62 (0.67)
21 Drinks and beverages	1.34 (0.21)	−0.15 (0.54)
22 Other foods	0.73 (0.47)	−1.25 (1.21)
23 Total food	0.74 (0.06)	0.09 (0.16)
24 Furniture	1.68 (0.50)	1.31 (1.27)
25 Clothing	1.96 (0.30)	1.63 (0.77)
26 Other major expenses	−0.21 (0.71)	−3.92 (1.82)
27 Total major expenses	1.24 (0.16)	−0.12 (0.41)

[a]Data used in the regressions were from the Urban Food Purchasing Survey (Casley and Marchant, 1977).
[b]For the sample, we sought to exclude those with a household income greater than K£125 per month, and also households with only one member.

capita food expenditure tends to increase slightly with household size. Clothing, at 1.96, is a luxury. Rent follows an expected pattern where per capita costs fall with household size, while furniture, at 1.68, falls in the luxury category.

Within the food group the pattern is somewhat surprising. Meat, at 0.93, is above the total food figure, and given its large share the consumption should rise significantly. The dairy products elasticity, at 0.98, suggests that per capita consumption can be expected to rise steadily with income. Maize and particularly roots are below the total food figure, with household elasticity positive for the former. On the other hand, it is noted that other grains (rice) and bread are more elastic. This suggests that as per capita income rises the share of expenditure on wheat and rice increases in relation to that on maize and roots. The expenditure elasticity for sugar, at 0.32, is lower than might be expected, and lower than would be expected from estimates for other countries. Some of this may be attributed to demand being suppressed owing to lack of availability in certain locations. Shah's (1978) estimate is higher. There are strong negative household size elasticities for

vegetables and for fruit and nuts, suggesting that higher per capita consumption of these items is associated with a smaller household size.

The rural sector is considered next, and then both sets of estimates are used to predict future demands.

3.3 Rural Consumption Patterns

Rural consumption patterns in Kenya in recent years have been discussed by a number of authors (Shah 1978, Smith 1978). In both instances they relied to a large extent on the IRS1 1974–75 data. This survey included more than 1600 households from the rural smallholder category, which comprises about 73% of the total population. The survey did not seek to cover those living in the Northeastern Province, and there is some evidence that the Rift Valley Province may not have been adequately represented. There is also some feeling that at the time of the survey expenditure levels may have been slightly inflated owing to the particularly good economic performance for agriculture that year. Subject to these qualifications, it does represent the best source of information currently available on consumption patterns in rural Kenya. This is supplemented by data from the Integrated Rural Survey, 1977, and from the Market Information Survey, 1977, reported in Casley and Marchant 1978.

Rural Expenditure Function – Poverty Level

There was an attempt to include income data in this survey, but as usual in surveys of this type they presented many problems. Nevertheless, an expenditure function was estimated by regressing expenditure on income. This produced the conventional S-type pattern – dissaving at the lower end, with expenditure (normalized by income) rising slowly at first then increasing fairly rapidly over an intermediate range and tapering off toward the higher income groups. Smith (1978) carried out a similar analysis and obtained results of a similar nature. A linear regression for various groups gives

$$X = 13.3 + 0.41Y \quad \text{(all smallholders)}$$

$$X = 12.6 + 0.42Y \quad \text{(smallholders with } Y \text{ less than K£30)}$$

$$X = 19.9 + 0.31Y \quad \text{(smallholders with } Y \text{ greater than K£30)}$$

where X is the annual per capita expenditure in K£ (1974–75) and Y is the annual per capita income in K£ (1974–75).

Consumption Shares

The general pattern of expenditure by income group is shown in Table 10. Rural Kenyans produce a large proportion of their own consumption, so that the overall composition bears little resemblance to urban patterns in other countries or even within Kenya. Expenditure seems to fall into three approximately equal categories: namely, own produced items, food purchases, and nonfood purchases together with miscellaneous expenses.

TABLE 10 Average value per holding of household consumption, by household income group[a].

Commodity group	Under 0 KSh	0–999 KSh	1000–1999 KSh	2000–2999 KSh	3000–3999 KSh	4000–5999 KSh	6000–7999 KSh	8000– KSh and over	Total, all groups
Own-produced items									
Maize	309	147	213	327	317	418	546	980	386
Finger millet	24	8	15	13	16	20	45	13	17
Sorghum	26	37	39	31	35	70	28	65	43
Beans	94	56	94	125	157	196	320	353	164
English potatoes	85	13	22	92	148	129	363	221	115
Other crops	106	75	122	108	135	151	246	309	152
Beef	24	27	31	13	8	24	19	46	25
Other meat and poultry	68	38	74	83	92	109	161	161	95
Milk	222	59	141	177	285	369	534	798	300
TOTAL CONSUMPTION OF OWN-PRODUCED ITEMS	959	458	751	968	1193	1487	2262	2946	1297
Purchased items									
Dairy produce and eggs	55	26	32	46	60	49	46	66	46
Grains, flours, and root crops	618	335	385	452	610	491	757	580	498
Meat and fish	234	158	177	202	239	267	312	379	236
Fats and oils	121	28	52	60	84	94	135	154	83
Sugar and sweets	219	83	115	154	184	203	230	276	172
Fruit and vegetables	67	48	71	78	122	108	130	98	88
Drinks and beverages	146	86	95	122	139	141	199	252	140
Salt and other flavorings	37	22	29	36	41	33	45	43	35
TOTAL FOOD PURCHASES	1498	786	956	1151	1478	1385	1853	1848	1297
Clothing	494	142	191	249	213	350	482	714	324
Appliances and utensils	31	8	16	14	17	38	33	58	25
Furnishings	69	26	14	35	22	47	59	92	40
Miscellaneous purchases	152	81	113	138	157	178	211	286	158
TOTAL NONFOOD PURCHASES	746	256	334	437	410	613	784	1151	547
Miscellaneous expenses	488	110	125	165	283	406	719	560	309
TOTAL CASH CONSUMPTION	2732	1153	1414	1753	2171	2405	3356	3559	2153
TOTAL CONSUMPTION	**3691**	**1611**	**2165**	**2721**	**3364**	**3892**	**5618**	**6505**	**3450**
NUMBER OF HOLDINGS	98,982	175,057	332,813	204,972	174,002	200,501	117,919	179,176	1,483,422

[a]Incomes are in Kenya shillings (1974–75) per household per annum.
SOURCE: Integrated Rural Survey, 1974–75.

Expenditure on schooling* or on imputed house rental costs is not included. This latter item is not very large for most rural smallholders. However, the net effect is that the food share is somewhat overstated.

Most smallholders typically produce maize for home consumption. The principal exception to this is in parts of Nyanza, where sorghum dominates – see Table 11. Many sell a portion of their produce to generate cash income; many also have some source of employment. In the low income brackets, the food sold can hardly be termed a surplus in the sense that domestic needs have first been satisfied. This is evident from the steady rise with increasing income of the proportion of food consumption that is domestically produced. Note in particular the low income levels shown in Table 12. From a policy point of view this indicates the need for generating some source of cash income for these groups; otherwise, they are driven to selling much needed food for cash, often at unfavorable prices. The share of total expenditure devoted to food purchases does not increase as rapidly as the other two principal categories, which suggests the perceived necessity for these items.

Rural Consumption – Elasticities

The estimated annual per capita consumption levels are given in Table 13 for rural areas. Maize consumption is estimated to be about 126 kg, of which two thirds is home produced and only one third purchased. It is clearly the principal source of calories and also of protein. Similarly, for milk we find that only 7% is purchased. The principal food items purchased are wheat, fats, and sugar.

Expenditure elasticity estimates for three income groups are given in Tables 14–16, for low, medium, and high income groups. On moving up the income scale, the elasticity for food purchases falls from 0.97 to 0.89 to 0.79. This is in line with the pattern in most countries on moving from subsistence toward some degree of "affluence". Within the food group it is further noted that the elasticities for meat and sugar also fall.

Elasticities for virtually all the own-produced foods fall with income. Typically, the elasticity for milk declines from 1.95 at low income levels to 0.57 at high income levels, suggesting that the poor perceive milk as a luxury.

3.4 Rural–Urban Estimates Combined

From the foregoing analysis we can now produce national estimates of current demand and postulate future demand. The demand for 1976 is first estimated by combining the rural estimates for 1974–75 with the urban estimates based on 1977. For both cases income and population levels are adjusted to 1976 levels.

The data are summarized in Table 17. The differences in the average rural and urban patterns are particularly noticeable. Urban dwellers consume about 20% less maize and virtually no millet or sorghum. However, the urban dweller consumes much more wheat, primarily in the form of bread, and also rice. He also consumes more sugar, fat (mostly cooking oil), and meat. He can enjoy this consumption pattern partly owing to the higher income level he enjoys, but also because of the marketing in urban areas. The rural dweller

*In December 1978 President Moi announced that primary school fees for Standard VI would be abolished; schooling for Standards I–V was already free.

TABLE 11 Percentage distribution of household food consumption by type of food and province[a].

Commodity group	Central	Coast	Eastern	Nyanza	Rift Valley	Western	TOTAL
Own-produced items							
Maize	11.74	12.55	10.76	20.60	24.49	17.55	14.88
Finger millet	0.00	0.00	0.29	0.98	2.22	1.80	0.66
Sorghum	0.00	0.00	0.20	7.01	0.00	1.14	1.66
Beans	7.70	1.26	12.45	1.18	0.23	3.32	6.32
English potatoes	8.60	0.00	7.59	0.00	0.08	0.00	4.43
Other crops	5.97	3.25	8.15	5.05	0.51	5.22	5.86
Beef	0.19	1.76	0.68	0.88	3.20	1.80	0.96
Other meat and poultry	3.01	4.02	3.19	4.07	3.12	5.27	3.66
Milk	11.87	2.76	11.02	11.57	31.90	6.36	11.57
TOTAL CONSUMPTION OF OWN PRODUCE	49.07	25.64	54.34	51.35	65.76	42.50	50.00
Purchased items							
Dairy produce and eggs	2.02	2.79	1.37	1.18	1.09	2.80	1.77
Grains, flour, and root crops	19.56	44.55	23.66	11.23	9.36	16.79	19.20
Meat and fish	4.71	9.11	3.75	19.27	6.59	14.52	9.10
Fats and oils	5.23	2.41	2.97	2.31	0.78	2.47	3.20
Sugar and sweets	8.15	6.85	4.20	5.89	7.53	9.25	6.63
Fruit and vegetables	4.04	3.02	3.49	3.29	1.25	3.13	3.39
Drinks and beverages	6.29	4.59	4.37	4.12	6.71	7.21	5.40
Salt and other flavorings	0.93	1.03	1.79	1.42	0.94	1.28	1.35
TOTAL FOOD PURCHASES	50.93	74.36	45.66	48.65	34.24	57.50	50.00
TOTAL FOOD CONSUMPTION	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
TOTAL VALUE OF FOOD CONSUMPTION (KSh)	**3118**	**2613**	3068	**2039**	**2564**	2108	2594

[a] Excludes pastoral and large farm areas.

SOURCE: Integrated Rural Survey, 1974–75.

TABLE 12 Percentage distribution of household food consumption by type of food and household income group.

Commodity group	Under 0 KSh	0–999 KSh	1000–1999 KSh	2000–2999 KSh	3000–3999 KSh	4000–5999 KSh	6000–7999 KSh	8000 KSh and over	TOTAL
Own-produced items									
Maize	12.58	11.82	12.48	15.43	11.87	14.55	13.27	20.44	14.85
Finger millet	0.98	0.64	0.80	0.61	0.60	0.70	1.09	0.27	0.66
Sorghum	1.06	2.97	2.28	1.46	1.31	2.44	0.68	1.36	1.66
Beans	3.83	4.50	5.51	5.90	5.88	6.82	7.78	7.36	6.32
English potatoes	3.46	1.05	1.24	4.34	5.54	4.49	8.82	4.61	4.43
Other crops	4.31	6.03	7.15	5.10	5.05	5.26	5.98	6.45	5.86
Beef	0.98	2.17	1.82	0.61	0.30	0.84	0.46	0.96	0.96
Other meat and poultry	2.77	3.05	4.34	3.92	3.44	3.80	3.91	3.36	3.66
Milk	9.04	4.74	8.26	8.35	10.67	12.85	12.98	16.65	11.57
TOTAL CONSUMPTION OF OWN PRODUCE	39.03	36.82	44.00	45.68	44.66	51.78	54.97	61.45	50.00
Purchased items									
Dairy produce and eggs	2.24	2.09	1.87	2.17	2.25	1.71	1.12	1.38	1.77
Grains, flour, and root crops	25.15	26.93	22.55	21.33	22.84	17.10	18.40	12.10	19.20
Meat and fish	9.52	12.70	10.37	9.53	8.95	9.30	7.58	7.91	9.10
Fats and oils	4.92	2.25	3.05	2.83	3.14	3.27	3.28	3.21	3.20
Sugar and sweets	8.91	6.67	6.74	7.27	6.89	7.07	5.59	5.76	6.63
Fruit and vegetables	2.73	3.86	4.16	3.68	4.57	3.76	3.16	2.04	3.39
Drinks and beverages	5.94	6.91	5.57	5.76	5.20	4.91	4.84	5.26	5.40
Salt and other flavorings	1.51	1.77	1.70	1.70	1.54	1.15	1.09	0.90	1.35
TOTAL FOOD PURCHASES	60.97	63.18	56.00	54.32	55.34	48.22	45.03	33.55	50.00
TOTAL FOOD CONSUMPTION	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
TOTAL VALUE OF CONSUMPTION (KSh)	2457	1244	1707	2119	2671	2872	4115	4794	2594

SOURCE: Integrated Rural Survey, 1974–75.

TABLE 13 Rural consumption levels, 1974–75, by income group.

Commodity group	Price (KSh per kg)	Consumption per capita per annum in kg[a]			
		Low	Medium	High[b]	Average
Own-produced items					
Maize	0.66	43.8	91.2	145.6	83.1
Millet, sorghum	0.5	16.8	25.4	14.4	19.8
Beans	2.1	6.4	15.8	25.8	14.0
Potatoes	0.8	6.8	18.3	78.4	25.7
Meat	3.2	2.7	3.9	10.6	4.7
Milk	0.93	16.7	76.8	125.0	65.7
Vegetables	0.60	7.0	14.8	20.3	12.8
Cassava and other roots[c]	0.40	17.8	33.3	50.3	30.5
Purchased items					
Dairy produce	1.5	3.1	4.5	10.2	5.0
Maize[d]	0.8	60.5	39.5	9.7	41.9
Wheat	2.5	1.1	11.5	23.6	9.8
Other cereals (mostly rice)	2.5		1.1	4.7	1.4
Meat	3.6	7.0	7.9	19.0	9.8
Fat	9.0	0.8	1.5	3.3	1.6
Sugar	2.7	6.2	8.0	22.4	10.2
Vegetables[e]	0.8	6.0	6.9	10.7	7.3

[a]The income groups chosen have average annual per capita incomes of 12.5, 37.5, and 120.0 approximately, in K£ (1974–75).
[b]Some of the quantity levels listed for this group seem high; this may be due to assuming too low a price, or else in some instances the imputed home consumption does not all go to the household members. The figure for own-consumed maize is that for the K£100 per annum income group.
[c]The "other crops" category is assumed to include 50% roots – the remainder being vegetables (30%) and fruit (20%).
[d]Purchased roots and grains are disaggregated as follows: for low incomes, 90% maize, 5% wheat, 5% sorghum; for high incomes, 10% maize, 75% wheat, 15% rice; and for medium incomes, 55%, 40%, and 5%.
[e]These are estimated as 50% of the fruit and vegetable aggregate category.

consumes more potatoes and considerably more cassava. He adjusts to his lower income level by obtaining a large share of his calories through the cheaper sources: millets, sorghum, and cassava.

3.5 National Estimates

An estimate of total national demand for 1976 is also given in Table 17. It is of interest to compare other estimates, in particular those prepared by Aldington (1979) as a food balance sheet for the current government plan. These are given in Table 18, while those developed by the FAO are reproduced in Tables 19 and 20. One should exercise caution in comparing the estimates as the categories do not match exactly; also, the FAO estimate is for 1975. This difference in base year would account for a difference of about 4–6%, depending on whether the commodity in question has a low or high elasticity. Even allowing for this margin there are some differences.

TABLE 14 Expenditure and household size elasticities (double log)[a] for the rural low income[b] group.

Commodity group	Expenditure elasticity[c]	Household size elasticity[c]
Purchased items		
1 Dairy produce	1.18 (0.17)	0.07 (0.19)
2 Grains	1.08 (0.12)	−0.19 (0.13)
3 Meat	1.41 (0.12)	0.33 (0.13)
4 Fats	2.03 (0.16)	0.55 (0.17)
5 Sugar	1.54 (0.12)	0.52 (0.13)
6 Fruit and vegetables	1.16 (0.13)	−0.08 (0.14)
7 Drinks	1.55 (0.10)	0.55 (0.11)
8 Flavoring	1.11 (0.10)	0.10 (0.11)
14 TOTAL FOOD PURCHASES	0.97 (0.03)	−0.09 (0.03)
9 Clothing	2.96 (0.19)	1.68 (0.21)
10 Appliances	1.33 (0.14)	1.02 (0.15)
11 Furnishings	0.98 (0.15)	0.52 (0.16)
12 Fuel	1.17 (0.10)	0.44 (0.11)
13 Miscellaneous	1.05 (0.06)	0.10 (0.07)
15 NONFOOD PURCHASES	1.45 (0.04)	0.20 (0.04)
16 *Own-produced items*	1.00 (0.06)	0.18 (0.07)
17 Livestock	1.30 (0.15)	1.36 (0.17)
18 Milk	1.95 (0.21)	2.65 (0.22)
19 Local maize	0.36 (0.21)	−1.06 (0.23)
20 Hybrid maize	0.62 (0.21)	1.34 (0.23)
21 Millets	0.04 (0.14)	0.33 (0.16)
22 Sorghum	−0.23 (0.15)	−1.07 (0.17)
23 Beans	1.85 (0.20)	0.45 (0.22)
24 Potatoes	0.92 (0.14)	0.23 (0.15)

[a]The computations used data collected for the Intergrated Rural Survey 1, 1974–75. The sample size was 940.
[b]Annual per capita income 0 to 30 in K£ (1974–75).
[c]The figures in parentheses are standard errors for the estimates.

TABLE 15 Expenditure and household size elasticities (double log)[a] for the rural middle income[b] group.

Commodity group	Expenditure elasticity	Household size elasticity
Purchased items		
1 Dairy produce	0.96 (0.23)	−0.60 (0.22)
2 Grains	0.86 (0.13)	−0.10 (0.12)
3 Meat	0.91 (0.13)	0.08 (0.13)
4 Fats	2.14 (0.19)	0.51 (0.18)
5 Sugar	1.06 (0.11)	−0.14 (0.10)
6 Fruit and vegetables	0.92 (0.17)	0.14 (0.17)
7 Drinks	1.20 (0.09)	−0.04 (0.11)
8 Flavoring	0.77 (0.12)	−0.30 (0.11)
14 TOTAL FOOD PURCHASES	0.89 (0.04)	−0.22 (0.04)
9 Clothing	2.42 (0.23)	1.33 (0.23)
10 Appliances	1.56 (0.21)	1.08 (0.20)

TABLE 15 *Continued.*

Commodity group	Expenditure elasticity	Household size elasticity
11 Furnishings	0.51 (0.22)	0.86 (0.21)
12 Fuel	0.96 (0.12)	0.24 (0.12)
13 Miscellaneous	1.08 (0.07)	−0.08 (0.07)
13 NONFOOD PURCHASES	1.58 (0.05)	0.34 (0.53)
16 *Own-produced items*	1.05 (0.07)	0.20 (0.07)
17 Livestock	1.16 (0.20)	0.99 (0.19)
18 Milk	1.23 (0.26)	2.74 (0.25)
19 Local maize	1.15 (0.14)	0.20 (0.14)
20 Hybrid maize	0.59 (0.29)	0.74 (0.28)
21 Millets	−0.28 (0.18)	0.19 (0.17)
22 Sorghum	−0.38 (−0.10)	−0.33 (−0.09)
23 Beans	2.31 (0.26)	0.54 (0.25)
24 Potatoes	1.65 (0.24)	0.87 (0.24)

[a]The computations used data collected for the Integrated Rural Survey 1, 1974–75. The sample size was 588.
[b]Annual per capita income 30 to 100, in K£ (1974–75).
[c]Figures in parentheses are standard errors for the estimates.

Cereals. Wheat, millet and sorghum seem to be in reasonable agreement. The FAO rice paddy figure (which does not allow for about 20% milling loss) should be closer to 40,000 rather than 31,000 tonnes. The principal discrepancy appears for maize. The Kenya Case Study and the Ministry of Agriculture put the figure at about 1.7 million tonnes. The FAO estimate (after adjustment to 1976 values) seems a little low at 1.3 million tonnes.

Potatoes and cassava. The Kenya Case Study and the Ministry of Agriculture estimate potato production at around 350,000 tonnes, while the FAO estimate less than half this. On the other hand, the FAO gives a figure of 800,000 tonnes for sweet potatoes and cassava. The Ministry of Agriculture gives 1.2 million tonnes, while the current study suggests only 370,000 tonnes. Cassava is notoriously difficult to estimate correctly, so it is difficult to see how these differences might be resolved without further field work.

Sugar. The FAO estimate, at 248,000 tonnes (1975), seems too high, but the current study estimate (164,000 tonnes) may have underestimated some sources of sugar consumption, particularly in rural areas. The Ministry of Agriculture estimate of around 200,000 tonnes in 1976 is perhaps about right.

Pulses. The Kenya Case Study omits a number of pulses and obtains a total estimate of 194,000 tonnes. Again, the Ministry of Agriculture estimate, at around 250,000 tonnes, strikes a balance.

Milk. In the light of recent studies (Kenya Ministry of Economic Planning and Community Affairs 1978; Mbaja and de Graaff 1978), the Kenya Case Study estimate of about 1 million tonnes is perhaps nearer the mark. The other two sources possibly underestimate home consumption in rural areas.

Meat and fish. The FAO estimates 236,000 tonnes, of which about 44% is beef and veal, while the Ministry of Agriculture estimates 270,000 tonnes with 47% beef. The Kenya

TABLE 16 Expenditure elasticities[a] for the rural high income group.

Commodity group	Expenditure elasticity
Purchased items	
1 Dairy produce	1.30
2 Grains	1.06
3 Meat	0.47
4 Fats	0.97
5 Sugar	0.65
6 Fruit and vegetables	0.76
7 Drinks	0.69
8 Flavoring	0.53
9 Clothing	1.14
10 Appliances	1.64
11 Furnishings	0.54
12 Fuel	1.52
13 Miscellaneous	1.05
14 TOTAL FOOD PURCHASES	0.79
15 NONFOOD PURCHASES	2.26
16 *Own-produced items*	0.72
17 Livestock	0.77
18 Milk	0.57
19 Local maize	
20 Hybrid maize	0.42
21 Millets	−0.24
22 Sorghum	−0.25
23 Beans	0.94
24 Potatoes	1.03

[a]The computation is based on the regression ($E_i = a + b \log X + c \log H$) for those smallholders with a per capita income greater than K£30 per annum. The elasticity was then computed from $D_{ij} = b_i/E_i$, where E_i is the per capita expenditure by those in the K£75–125 income group. Money values are in K£ (1974–75).

TABLE 17 Food consumption estimates for 1976.

Commodity group	Per capita consumption (kg per annum)			Total national demand (thousand tonnes)
	Rural	Urban	National	
1 Maize	125.6	97.1	121.9	1676
2 Millet, sorghum	19.8	–	17.2	236
3 Wheat	10.0	24.7	11.9	164
4 Other cereals (rice)	1.4	13.1	2.9	40
5 Potatoes	26.2	14.8	24.7	340
6 Cassava and other roots	30.5	3	26	369
7 Sugar	10.4	20.6	11.7	161
8 Pulses	14.2	13.8	14.1	194
9 Milk	72.1	88.6	74.2	1021
10 Meat	15.1	33.6	17.5	241
11 Fat	1.7	6.5	2.4	32
12 Vegetables	20.4	36.9	22.5	310

SOURCE: Urban estimates are based on the Urban Food Purchasing Survey (Casley and Marchant, 1977) while rural estimates are based on Integrated Rural Survey 1 (1974–75) data. Both estimates are adjusted to 1976 values.

TABLE 18 Food balance sheet, 1976 and 1983 (populations: 1976, 13,850,000; 1983, 17,648,000).

Commodity group	Consumable supplies (thousand tonnes)		Consumption per capita per annum		Percent utilized as human food	Grams per head per day		Calories per head per day		Protein, grams per head per day	
	1976	1983	1976	1983		1976	1983	1976	1983	1976	1983
Maize	1634.0	2124.0	118.0	120.0	80	259	263	917	921	23.3	23.7
Other coarse grains	277.0	383.0	20.0	21.6	80	44	47	154	165	3.9	4.2
Wheat flour	140.0	204.0	10.1	11.5	100	28	32	98	112	2.8	3.2
Rice	34.6	47.6	2.5	2.7	100	7	7	25	25	0.5	0.5
Barley	41.6	112.0	–	–	–	–	–	–	–	–	–
Malt	26.6	71.5	–	–	–	–	–	–	–	–	–
Beer	163.0	439.0	11.8	24.8	100	32	68	13	28	–	–
Beans	150.0	213.0	11.0	12.0	93	27	31	80	102	5.3	6.0
Other pulses	98.0	137.0	7.0	7.7	93	13	20	59	65	3.6	4.0
Potatoes	376.0	485.0	25.0	27.4	85	58	64	44	48	1.2	1.3
Other starchy roots	1191.0	1534.0	86.0	86.7	60	142	143	234	236	1.4	1.4
Sugar	195.0	317.0	14.1	17.9	100	39	49	156	196	–	–
Bananas and plantains	209.0	300.0	15.1	16.9	85	35	39	36	40	0.5	0.6
Oilseeds and nuts	35.0	71.0	2.5	4.0	85	6	9	9	13	0.1	0.1
Fruit and vegetables	203.0	280.0	14.7	15.8	80	32	35	15	16	0.2	0.2
Milk and milk products in whole milk equivalent	652.0	928.0	47.1	52.4	100	129	144	83	92	4.1	4.6
Eggs	20.8	29.5	1.5	1.7	88	3.5	4	6	6	0.5	0.5
Beef	128.0	159.0	9.2	9.0	80	20	20	40	40	3.8	3.8
Mutton and goat meat	65.0	82.0	4.7	4.6	74	10	9	15	14	1.6	1.5
Pork	2.7	3.9	0.2	0.2	80	0.8	1	2	2	0.1	0.1
Poultry meat	27.8	38.5	2.0	2.2	80	3	5	6	10	0.6	1.0
Fish	42.4	59.8	3.1	3.4	70	6	7	9	10	1.2	1.3
Oil and fat including butter	44.3	74.0	3.2	4.2	100	9	12	81	100	–	–
TOTAL	–	–	–	–	–	–	–	2082	2241	54.6	58

SOURCE: Kenya Development Plan (1979–83).

TABLE 19 Kenya – projected demand for food: crops (in thousand tonnes) (FAO estimates).

	High hypothesis				Low hypothesis			
Commodity group	1975	1985	1990	2000	1975	1985	1990	2000
Total cereals	1764	2608	3081	4054	1764	2532	3047	4342
Wheat	186	323	440	819	186	280	352	557
Rice paddy	31	52	69	124	31	46	57	89
Barley	–	–	–	–	–	–	–	–
Maize	1290	1889	2173	2551	1290	1862	2239	3137
Oats	2	3	3	5	2	3	3	5
Millet and sorghum	254	340	394	553	254	340	394	553
Other cereals	1	1	2	2	1	1	2	2
Total roots and tubers	943	1392	1705	2541	943	1347	1622	2338
Potatoes	129	211	273	447	129	191	237	359
Sweet potatoes	337	511	636	977	337	486	389	862
Cassava	477	670	796	1117	477	670	796	1117
Total sugar	248	394	563	1066	248	312	410	690
Pulses, nuts, and seeds	298	437	536	798	298	418	500	712
Vegetables	274	456	598	997	274	408	508	780
Fruits (and plantain)	418	704	945	1728	418	623	778	1210
Spices	4	6	8	13	4	5	7	10
Tea	7	12	17	29	7	11	14	21
Coffee	2	3	5	9	2	3	4	6
Vegetable oils	22	39	54	104	22	33	42	67

All data are estimates (March 1978).
Assumptions used in the food demand projections:

	1975	1985	1990	2000
Population (thousands) (UN medium)	13,251	18,605	22,102	31,020
Growth rate	3.5	3.5	3.4	
Total private consumption expenditure				
Low alternative	4.4	5.0	5.0	
High alternative	6.2	7.2	7.2	

TABLE 20 Kenya – projected domestic demand for food: livestock products (in thousand tonnes).

	High hypothesis				Low hypothesis			
Commodity group	1975	1985	1990	2000	1975	1985	1990	2000
Beef and veal	105	192	271	542	105	161	205	234
Mutton and lamb	23	40	56	108	23	34	44	74
Pig meat	5	8	11	19	5	7	9	13
Poultry meat	21	41	60	127	21	33	43	71
Other meat	12	19	24	40	12	17	21	32
Offal	35	55	70	113	35	51	62	93
Eggs	12	23	35	77	12	13	24	41
Whole milk	592	964	1248	2044	592	875	1082	1642
Skim milk	41	100	146	229	41	93	133	196
Animal fats and oils[a]	5	10	16	33	5	9	12	20
Finfish, fresh	20	31	40	64	20	29	35	53
Finfish, processed	15	24	32	55	15	22	27	41

[a]Including butter.
All data are preliminary (March 1978). SOURCE: FAO, Rome.

Case Study gives an aggregate rural consumption, but in urban areas beef accounts for about 54%, fish 24%, and poultry about 8%, the remainder being other meats, principally sheep and goat. In rural areas there is some evidence that the beef share is about 40%, while other meats have a somewhat larger share. This would then yield a national estimate for beef consumption of 105,000 tonnes. If in addition we estimate that in rural areas 10% by weight of this category is fish, then a national estimate for fish of around 33,000 tonnes is obtained.

Fats and oils. The FAO estimate of around 38,000 tonnes (vegetable and animal origin) checks with the Kenya Case Study estimate of 32,000 tonnes. The Ministry of Agriculture estimate of 44,300 tonnes includes butter, and so these figures are reasonably consistent.

Vegetables. Vegetable consumption is particularly difficult to estimate accurately, but the Kenya Case Study estimate of 310,000 tonnes ties in reasonably well with the FAO's 281,000 tonnes (after adjustment) and with the Ministry of Agriculture figures.

In summary, most estimates are in reasonable agreement. However, the FAO maize estimate is perhaps 300,000 tonnes too low. The Kenya Case Study estimate for cassava is probably too low by as much as 50%, while the pulse estimates should probably also be increased by about 25%, as the Integrated Rural Survey data used for the estimate primarily related to beans.

3.6 Future Demand

The estimation of future demand for an economy undergoing change as rapidly as Kenya's is today presents a number of difficulties. The structural changes mentioned earlier are both the result and the cause of variations in economic performance. Invariably, many major transitions do not lend themselves to meticulous forecasting, as in the case of the OPEC oil price increase or the depreciation of the US dollar.

In the specific Kenyan context, one could envisage a major improvement for certain resources; for example, new mineral or oil discoveries, or breakthroughs in veterinary medicine permitting significant increases in livestock production. However, the reality of assessing demand for the year 2000 invariably means being faced with the issues of population, income, and price structure.

Population. In Section 2 it was indicated that the population will be around 30 million by the year 2000. This alone will necessitate a substantial increase in food production, even just to maintain current intake levels. There are those, however, who argue that the consequences of high population growth rates are not all negative. Besides the benefits perceived at the family level, in certain circumstances there may be some positive features at the national level. The cost per capita for a number of services should fall (in real terms); for electric power, better load factors should be achieved; roads and infrastructure should be used more efficiently, while a population of 30 million should provide a large enough domestic market to enable producers to take advantage of economies of scale. This should also cushion the effects of external market fluctuations. However, specifically in Kenya the population is currently increasing extremely rapidly. This is because of a modest increase in fertility in recent years and a precipitous fall in mortality due to improved living conditions. The recent Kenya Fertility Survey (1980) suggests that the crude birth

rate may be as high as 54.6 while the crude death rate is 14.2, giving a net population growth rate of 4%. Recent practice in other developing countries (see Johnston 1977 for example) suggests that the fertility rate should be reduced to bring the rates into a more manageable balance. In Kenya this is in line with present government policy, as stated in the Development Plan 1979–83. However, if the policy is to be effective, it will require certain innovations, together with a major effort to change deep-rooted attitudes. Such a change requires a major commitment at all levels of leadership. The Kenya Fertility Survey (1980) says "In spite of a national policy to promote family planning, there is at present little contraceptive practice in Kenya" (Section 7.10, page 142).

Income. In recent years there have been significant gains in per capita income. The government has opted for substantial investment in human capital, which should produce results by 2000. How big an increase can be expected? Few countries have achieved per capita growth rates of more than 2% per annum over an extended period and rarely is the agricultural sector growth rate more than 1% above the population growth rate.

Price structure. Price changes can also play a major role in shaping demand. These changes will depend to some extent on the role of the government. Until recently, government policy in Kenya has avoided consumption subsidies except in cases of severe hardship: in famines caused by inclement weather, or for groups particularly vulnerable for limited periods such as pastoralists being helped to adapt to a more settled lifestyle. The decision by President Moi to embark on a broad national feeding program for schoolchildren signals a major departure from previous approaches. However, the program has run into many difficulties. The normal administrative problems for a program of this magnitude were compounded by a disastrous harvest due to inclement weather. This has resulted in the program's being severely curtailed. Policies of this form can have major repercussions on demand without evident changes in nominal income levels; that is, the recipients' purchasing power increases. However, in order to be effective, such policies have to be well planned and executed. They should also be weighed against other options such as alternative foods or a program to improve health.

Finally, the issue of changes in taste is important. Again, this is difficult to predict. Urban dwellers in particular are likely to be more affected by various promotion campaigns. This is presently evident in the increased consumption of cooking fat, drinks, and beverages; on the other hand, much of the increase in bread consumption may be due to its convenience.

Scenarios for Year 2000

Possible changes in many variables should be considered in estimating demand patterns for the year 2000. Even then the estimates must be hedged because of the many unforeseeable events, both domestic and abroad, that may exert a critical influence. To reduce the task to manageable proportions requires that the most important factors be identified.

At the individual level, where in most societies purchasing power dominates the economic milieu, income (in its broadest sense) and the price structure are critical. For aggregate and especially national estimates, population growth plays an important role. In many developing countries, and especially in Kenya, the degree of urbanization exerts a strong influence, both on incomes and on changes in expenditure patterns. From the

plethora of possibilities, five scenarios are chosen in this report. These are summarized in Table 21. Two other scenarios (6 and 7) are discussed in Section 5. These correspond to the FAO low and high alternatives. The properties of each are discussed briefly now and compared with those for the base year, 1976. For this we combined the urban and rural distributions. However, it would be more useful for many issues to discuss these sectors separately.

TABLE 21 Income distribution scenarios.

	Share of income					
Share of population (%)	Base year 1976	Scenarios for the year 2000				
		1	2	3	4	5
0–40	0.092	0.092	0.071	0.069	0.070	0.153
40–60	0.093	0.093	0.090	0.087	0.088	0.123
60–80	0.181	0.181	0.175	0.176	0.176	0.181
80–90	0.177	0.177	0.192	0.188	0.190	0.177
90–100	0.457	0.457	0.472	0.480	0.476	0.366
TOTAL	1.000	1.000	1.000	1.000	1.000	1.000
Per capita annual income in K£ (1976)	75.20	75.20	101.00	107.60	132.70	75.20
Population in millions	13.75	31.15	28.18	34.12	31.15	31.15
GROSS INCOME (billion K£ (1976))	1.03	2.34	2.85	3.67	4.13	2.34

Scenario 1. The distribution of income remains the same as in the base year, the average annual national per capita income is unchanged, while the medium population growth rate is assumed. This scenario might be viewed as a norm for comparing others in the year 2000.

Scenario 2. The distribution of income within urban and rural sectors remains unchanged and within each of these the average annual per capita incomes remain the same. However, because of the relatively higher population growth rate in the urban sector the outcome is a higher national average annual per capita income. The low estimate is assumed for the national population growth rate.

Scenario 3. The same assumptions as in Scenario 2 are made about the urban and rural sectors. However, the high estimate is assumed for the national population growth rate.

Scenario 4. The distribution of income within urban and rural sectors remains unchanged. Within each sector annual per capita income is assumed to grow at 1% per year from 1976 to 2000. The medium estimate is used for the national population growth rate. This scenario probably comes closest to recent trends in urbanization and population growth rate, while the income growth rates are close to current plan targets. This scenario projects an annual growth rate in gross income of 5.9% with a 3.5% population growth rate.

Scenario 6. This is the FAO low alternative. Its assumptions include a population growth remains at the 1976 level, with the medium population growth rate. A redistribution of income is postulated. It is assumed that the share of the upper 10% of the population is reduced by 20% from 0.457 to 0.366. The income derived from this is then redistributed on an equal per capita basis to the 60% of the population with the lowest incomes. A change in distribution of this order would require considerable political support and is included primarily to study the implications for nutritional status. Under any reasonable assumptions about the evolution of the present political system, it is extremely unlikely that a redistribution of this magnitude could be achieved.

Scenario 6. This is the FAO low alternative. Its assumptions include a population growth rate of 3.5% until 1990 and then a slight fall to 3.4% for the next decade, while expenditure on private consumption would increase by 4.4% until 1985 and by 5% thereafter.

Scenario 7. The FAO high alternative assumed a similar population growth rate, but the growth rate of expenditure on private consumption is assumed to be 6.2% until 1985 and 7.2% thereafter.

The possible implications of income redistribution are considered in Section 5 using Scenarios 1, 4, and 5. In this section Scenarios 2, 3, and 4 are considered, primarily in terms of the impact on national demand. In view of the recent experience with urbanization and population growth, these scenarios would appear to be within the realm of possibility.

Note that in Scenarios 2 and 3 the average national income increases because of the relatively higher population growth rate in urban areas. Scenario 4 suggests a strong performance by the economy, as it implies that the rural sector should grow at about 3.9% per annum while the urban sector is postulated to achieve a growth rate of 7.6% per annum. This is required because of the population growth rates of 2.9% and 6.6% in the rural and urban areas respectively.

Of these three, Scenario 4 is perhaps the most interesting. It assumes that the economy progresses steadily; growth rates for population and income are in line with those envisaged in the present plan (1979–83), while the underlying assumptions are reasonably close to those in the FAO low alternative. The major difference is in the treatment of elasticities. The FAO incorporates changes in elasticities over time while the current study uses a *de facto* change in elasticities by treating urban and rural patterns separately. This is deemed necessary because of both the large average income difference (five to one) and the rather different consumption patterns.

3.7 Kenya Case Study and FAO Demand Estimates Compared

Kenya Case Study (KCS) estimates of food demand for the year 2000 are given in Tables 22, 23, and 24 for Scenarios 2, 3, and 4 respectively. For purposes of comparison the FAO "low" alternative is given alongside Scenario 2 while the "high" alternative is given alongside Scenarios 3 and 4.

In the FAO low alternative, total expenditure on private consumption grows at 4.4% until 1985 and at 5% thereafter, while for their high alternative the figures are 6.2% until 1985 and 7.2% thereafter.

TABLE 22 Estimated food consumption in the year 2000: Scenario 2[a], population 28.18 million

Commodity group	Per Capita consumption (kg per annum)			Total demand (thousand tonnes)	
	Rural	Urban	National	Scenario 2	FAO[b]
1 Maize	125.6	97.1	117.9	3324	3137
2 Millet, sorghum	19.8	–	14.8	417	553
3 Wheat	10.0	24.7	13.7	387	557
4 Other cereals (rice)	1.4	13.1	4.4	123	89
5 Potatoes	26.2	14.8	23.3	657	359
6 Cassava	30.5	3.0	23.5	663	1117
7 Sugar	10.4	20.6	12.9	365	690
8 Pulses	14.2	13.8	14.0	396	712
9 Milk	72.1	88.6	76.0	2141	1838
10 Meat and fish	15.1	33.6	19.7	556	513
11 Fats and oils	1.7	6.5	2.9	82	87
12 Vegetables	20.4	36.9	24.5	690	780

[a]Scenario 2 is with average annual per capita incomes in urban and rural sectors unchanged and a low population growth estimate.
[b]The FAO low alternative is included for comparison: see Table 20 for details.

TABLE 23 Estimated food consumption in the year 2000: Scenario 3[a], population 34.12 million.

Commodity group	Per capita consumption (kg per annum)			Total demand (thousand tonnes)	
	Rural	Urban	National	Scenario 3	FAO[b]
1 Maize	125.6	97.1	117.5	4009	2551
2 Millet, sorghum	19.0	–	14.2	484	553
3 Wheat	10.0	24.7	14.2	484	819
4 Other cereals (rice)	1.4	18.1	4.7	161	124
5 Potatoes	26.2	14.8	23.0	783	447
6 Cassava	30.5	3.0	22.7	774	1117
7 Sugar	10.4	20.6	13.3	454	1066
8 Pulses	14.2	18.8	14.1	481	798
9 Milk	72.1	88.6	76.8	2620	2273
10 Meat and fish	15.1	33.6	20.4	694	947
11 Fats and oils	1.7	6.5	3.1	105	137
12 Vegetables	20.4	36.9	25.1	856	997

[a]Scenario 3 is with average annual per capita incomes in urban and rural sectors unchanged and a high population growth estimate.
[b]The FAO high alternative is given for comparison: see Table 20 for details.

The various scenarios have significantly different outcomes, so comparisons cannot readily be made. However observations on some of the principal groups may be useful.

Maize. The Kenya Case Study estimates of demand for maize, in millions of tons, are 3.3 (low population), 4.0 (high population), and 4.2 (medium population with a 1% per capita income growth in both urban and rural sectors), while the FAO puts the figure at 3.1 for its low (income) alternative and 2.6 for its high alternative. The latter figure is lower because the FAO postulates negative income elasticity at the upper level. This is not

TABLE 24 Estimated food consumption in the year 2000: Scenario 4[a], population 31.16 million.

Commodity group	Per capita consumption (kg per annum)			Total demand (thousand tonnes)	
	Rural	Urban	National	Scenario 4	FAO[b]
1 Maize	140.9	115.5	134.1	4178	2551
2 Millets, sorghum	18.2	–	13.3	414	553
3 Wheat	12.6	31.2	17.6	550	819
4 Other cereals (rice)	1.9	17.3	6.1	189	124
5 Potatoes	34.0	16.0	29.1	908	447
6 Cassava	30.5	3.0	23.1	720	1117
7 Sugar	13.5	22.4	15.9	496	1066
8 Pulses	21.1	16.4	19.8	617	798
9 Milk	94.5	112.0	99.2	3092	2273
10 Meat and fish	19.2	42.0	25.4	790	947
11 Fats and oils	2.5	7.6	3.9	121	137
12 Vegetables	25.1	41.2	29.4	917	997

[a]Scenario 4 is with average annual per capita incomes increasing by 1% per annum in urban and rural sectors and a medium population growth rate.
[b]The FAO high alternative is given for comparison: see Table 20 for details.

supported by calculations made on data available from the various household studies, which cover all except the top few per cent. A figure of four million tonnes seems reasonable.

Millet and sorghum. As urbanization progresses, average national per capita consumption levels for millet and sorghum will fall (Scenarios 2 and 3). This effect will be reinforced by higher per capita income levels for middle and upper income groups (Scenario 4). The FAO estimates consumption at 550 thousand tonnes, around 50 to 150 thousand tonnes above Kenya Case Study estimates. Demand other than for direct consumption may contribute up to 100 thousand tonnes so that a compromise figure of 500 thousand tonnes may be reasonable.

Wheat. Consumption is particularly sensitive to income changes and urbanization. Thus the FAO estimates 557 thousand and 819 thousand tonnes for its low and high options while Scenarios 2, 3, and 4 give 387, 484, and 550 thousand tonnes respectively. In view of the sharp urban–rural difference in consumption, the FAO high estimate may have overestimated the effect of expenditure change in rural areas. Around 550 thousand tonnes seems a reasonable compromise.

Other cereals (rice). Here FAO estimates are on the low side, probably owing to a low base estimate. Around 160–180 thousand tonnes seems reasonable.

Potatoes and cassava. There are some differences between the separate estimates for potatoes, sweet potatoes, and cassava. However, when these are combined the demand estimates fall in the range 1.3–1.6 million tonnes.

Sugar. FAO estimates of 690 (low) and 1066 (high) thousand tonnes appear to be considerably higher than Kenya Case Study estimates, which range from 365 to 496 thousand tonnes. Much of the difference may be attributed to the higher elasticity estimates

(around 1.0) used by the FAO. While these seem to be in line with much international experience, Kenyan data yield a much lower value for the elasticity for urban areas (0.32), where most of the additional income is expected to be generated. A figure of 500–600 thousand tonnes seems reasonable.

Pulses. Kenya Case Study estimates range from 400 to 600 thousand tonnes, while FAO estimates are about 200 thousand tonnes higher. Since Kenya Case Study estimates are based on Integrated Rural Survey 1, they include little other than beans. The FAO estimate is better for total pulse production.

Milk. Kenya Case Study estimates range from 2.1 to 3.1 million tonnes, while the FAO places demand in the 1.8–2.3 million tonne range. The FAO apparently underestimated the base year demand level. This, together with demand reinforcement by the school milk program, suggests that the higher Kenya Case Study figure may be more realistic.

Meat and fish. Demand will increase rapidly owing to higher per capita income levels and increased urbanization. Both sets of estimates overlap, suggesting that demand is likely to be in the range of 600–800 thousand tonnes.

Fats and oils. Both sets of estimates overlap, and the likely demand range should be 90–120 thousand tonnes depending on the growth rates for population and income.

Vegetables. The estimates overlap and suggest that demand should be in the 700–900 thousand tonne range. Again, this will depend on population and income growth rates.

Summary

The level and composition of food demand in Kenya by the year 2000 will depend on many factors, but primarily on the size of the population, the growth of income, and the price structure. Maize will still dominate the food crops. With medium population growth and 1% annual per capita growth in income (Scenario 4), the demand for maize in 2000 is estimated at 4.2 million tonnes. For this scenario, which seems closest to the aims of current planning, sharp increases in demand can be expected for wheat, rice, meat, and dairy products. If the income gain fails to materialize, demand for these four commodity groups would not rise as much, but the demand for maize would still be around 4 million tonnes.

In Section 4 the production side is analyzed and then both sides of the equation are considered in Section 5.

4 AGRICULTURAL PRODUCTION

4.1 Introduction

Agricultural production in Kenya is directed toward three primary objectives:

- satisfying domestic food needs
- supplying domestic commercial and industrial needs
- making a substantial contribution to the nation's balance of payments through exports

In Section 3 we discussed demand, and it was indicated that the average Kenyan diet is based on cereals, primarily maize, meat (mostly beef), and dairy products. Most of these needs are met by domestic production. In the second category of needs are cotton, pyrethrum, sisal, and wattle, while coffee and tea account for a major share in exports.

To achieve these objectives there are resources of varying quantity and quality – these include manpower, land, and various inputs, including energy, seed, fertilizer, and herbicides. The government then chooses an appropriate policy mix to try to ensure that resources are used as efficiently as possible to achieve the desired objectives. Invariably, optimum economic solutions are tempered by the sociopolitical reality and the historical evolution of the current structure. Within Kenya there is a great variety of modes of production, varying from large plantation operations to smallholder subsistence farming.

The policy maker must also be sensitive to the various noneconomic forces. In Kenya there is a very strong desire among most of the population to own a *shamba* (a piece of land). This supersedes in many instances any economically rational evaluation of the viability of certain smallholdings.

In Section 4 the ecological setting is first considered. Recent and past trends are considered for the various commodities. This is followed by a discussion of various policy instruments together with distribution and marketing issues.

4.2 The Ecological Setting of Kenya's Agricultural Sector

The most useful classification of land potential in Kenya was devised by Pratt *et al.* (1966). Their classification in terms of ecological land units derived from combinations of climate, soil, and topography equated with vegetation types is given in Table 25. Six broad ecological zones are distinguished, as follows.

Zone I comprises about 80,000 hectares, or about 0.1% of Kenya's land area, at high altitudes above the tree line. This is mostly barren land except for scattered moorland or grassland vegetation. Land use is limited to water catchment and tourism.

Zone II comprises Kenya's high potential agricultural area. It extends to some 5.3 million hectares, or 9% of Kenya's land area, and it embraces the bulk of Kenya's forests, both

TABLE 25 Ecoclimatic land potential: classification of agricultural land in Kenya.

Zone	Current land use	Area (thousand hectares)	Percentage of total
I	Water catchment and tourism	80	0.1
II	Coffee, tea, pyrethrum, cotton, and livestock	5300	9.3
III	Maize, wheat, barley, cotton, groundnuts, pulses oilseeds, and livestock	5300	9.3
IV	Subsistence crop farming, livestock, sisal, and wildlife	5300	9.3
V	Wildlife and livestock	30,000	52.5
VI	Livestock	11,200	19.6
TOTAL		57,180	100.0

SOURCE: Based on Pratt *el al.* (1966).

indigenous and exotic. The vegetation is forest and its derivatives. The agricultural potential of this land is very high, especially in the highland areas. Coffee, tea, and pyrethrum are important cash crops at high altitudes, while cotton can yield good results at lower elevations. Land in this zone is also suitable for intensive livestock farming.

Zone III is a medium potential agricultural area. It also covers some 53 million hectares, or 9% of Kenya's land area. Most of the large-scale mixed farming areas are in this zone, in which hybrid maize*, wheat, and barley are the most important cash crops. The small-scale farming comprises maize (hybrid and local varieties), cotton, groundnuts, pulses, and oilseeds. Cashew and coconuts are also grown in this zone. Livestock does well and carrying capacities are high.

Zone IV has a total area again of about 5.3 million hectares, or 9% of the land area. This zone has only a marginal potential for agriculture. Subsistence crop farming and animal production are the important occupations of the smallholder farmers in this zone. Sisal plantations are located here, and it is also the area in which most of Kenya's game is found.

Zone V covers just over 30 million hectares, or 52% of Kenya's land area. It is an area of moderate rangeland development potential. Wildlife is important in many areas, but this area has also been the focus of many of the present and proposed livestock development programs.

Zone VI extends to approximately 11.2 million hectares, or 20% of the total land area, and comprises most of northern Kenya. Rainfall is sparse and erratic. Vegetation is annual grass species which spring after the rains. Livestock is kept by nomadic pastoral people who inhabit this zone. There is a more limited development program for this zone.

This classification gives a general indication of the agricultural potential. It is also in line with recent estimates by government sources for land potential. These are given by province in Table 26. Whether this potential is realized or not depends on many factors. It should be noted that a large part of Kenya is not good farming land. It is on this land that most of Kenya's 14 million population is located. The remaining 80% of the land cannot support food production without irrigation and other inputs. Current investment levels and technology in the dry low potential areas can only support extensive livestock production and pastoral nomadism. However, even a pessimistic estimate of high potential agricultural land is about 6 million hectares. This should be more than adequate to support the current population.

4.3 Agricultural Production

4.3.1 Current Situation

The general composition of agricultural production is shown in table 27, which is taken from the chapter on agriculture in the Development Plan (1979–83). This gives the estimated value of production for crops and livestock. The composition could also be given in terms of employment or land use, which would give a different emphasis.

*Maize is both a cash crop and a subsistence crop.

TABLE 26 Land potential: provincial and national land areas (1978).

Land type	Land area (thousand hectares) by province						
	Coast	Eastern	Central	Rift Valley	Nyanza	Western	TOTAL
Total area	8303.0	15,576.0	1330.3	16,845.4	1260.5	828.1	44,143.3
High potential	581.8	334.0	604.4	2193.7	961.3	660.2	5335.4
Medium potential	1238.7	819.5	168.3	922.2	163.9	3.4	3316.0
Low potential[a]	6148.5	12,860.1	438.4	12,007.4	9.2	81.8	31,583.0
Other[b]	830.3	1561.5	132.9	1688.2	126.0	82.7	4377.5
Cropped areas[c]	240.9	558.6	307.9	503.0	267.7	304.2	2182.3
Cropped area as a percentage of high and medium potential land	18	34	40	16	24	46	25

[a]Includes marginal, range, and desert areas.
[b]An average of 10% was deducted from high, medium, and low potential land to represent land not available for agricultural production (roads, infrastructure, rocks, and swamps).
[c]Long rains only.
SOURCE: Otieno *et al.* (November 1978).

TABLE 27 Total value of production of agricultural commodities (in thousand Kenya pounds (1976)).

Commodity group	1976 actual	1978 estimate	1983 target	Average annual rates of growth	
				1976–78 per cent	1978–83 per cent
Food crops					
Maize[a,b]	94,486	101,188	120,224	3.5	3.5
Wheat	11,248	11,429	12,030	1.0	1.0
Rice (paddy)	2670	3217	4449	7.6	6.7
Sorghum, millets, etc.	14,196	15,372	19,614	4.7	5.0
Pulses	22,946	24,994	32,340	5.0	5.5
Potatoes	20,400	22,200	27,400	4.3	4.3
Other starchy roots	11,900	12,776	15,241	3.6	3.6
Fruit and vegetables	8346	9399	14,469	8.2	9.0
Bananas and plantains	11,600	12,650	16,550	5.2	5.5
TOTAL	197,792	213,225	262,317	4.1	4.3
Industrial crops					
Oilseeds and nuts	3354	3659	5286	6.7	7.6
Sugarcane	8678	8925	17,850	10.9	14.9
Seed cotton	1669	1773	3546	11.4	14.9
Tobacco	237	444	1096	24.5	19.8
Barley	2644	2805	6042	12.5	16.6
TOTAL	16,582	17,606	33,820	10.7	14.0
Export crops					
Coffee[c]	98,792	117,315	138,309	4.9	3.4
Tea	32,763	45,975	57,601	8.4	4.6
Sisal	3856	3739	4674	2.8	4.6
Pineapples	1314	1823	3562	15.3	14.3

TABLE 27 *Continued.*

Commodity group	1976 actual	1978 estimate	1983 target	Average annual rates of growth 1976–78 per cent	Average annual rates of growth 1978–83 per cent
Pyrethrum	4347	4347	7763	8.6	12.3
Cashew nuts	1159	1546	2318	10.4	8.5
Wattle	515	515	552	1.0	1.0
TOTAL	142,746	175,260	214,779	6.0	4.2
Livestock products[d]					
Milk (dairy products)	60,900	67,515	86,100	5.1	5.0
Beef cattle	34,198	33,223	39,770	2.2	3.7
Sheep and goats	17,050	17,574	21,509	3.4	4.1
Pigs	1048	1114	1441	4.7	5.3
Poultry meat	8890	9843	12,383	4.9	4.7
Eggs	7350	8050	10,500	5.2	5.5
TOTAL	129,436	137,319	171,703	4.1	4.6
TOTAL AGRICULTURE	486,556	543,410	682,619	5.0	4.7

[a]The former major crops are maize, wheat, rice, sugarcane, seed cotton, tobacco, barley, coffee, tea, sisal, pineapples, pyrethrum, and cashew nuts. All estimates are of total production.
[b]The production data presented for the majority of these minor crops and livestock products are much less accurate than those for the "major crops" and are derived from various sources.
[c]Based on the assumptions that over the plan period 1976 coffee price levels will be maintained, and fertilizer application rates will double.
[d]Estimates without a reliable statistical base.
SOURCE: Development Plan 1979–83.

The three principal components are food crops, export crops, and livestock. Industrial crops do not currently command a very large share.

4.3.2 Future Prospects for Production and Employment

Kenya is faced with an acute shortage of high potential land together with one of the highest population growth rates in the world – about 4% per annum. However, the average output per hectare for many crops, such as maize, is relatively low by world standards. A number of authors (Ruthenberg 1978) have suggested that the major strategy be that of using land intensively.

4.3.2.1 Land Use Intensification

Most of the potential for output and employment is in the high and medium potential areas, which are also areas of high population density, especially Nyanza Province and Western Province. Rural poverty is also concentrated in these two provinces, which account for 60.5% of the total poor in the country (Crawford and Thorbecke 1978).

Three major elements of land use intensification are usually identified as*:

*After Ruthenberg, 1978. The first part of the Crawford and Thorbecke paper frequently draws on Ruthenberg's paper.

- higher yields per hectare of crop
- increasing the hectarage under intensive crops, i.e. under crops with a high value added of output per hectare and a high employment content
- multiple cropping, i.e. the interplanting of the main crop with a secondary, or the planting of two crops per annum

However, if land use intensification is to be economic, then various measures have to be deployed. These include the provision of agricultural innovations through research and extension, i.e. better varieties, tools, breeds, etc.; the provision of inputs, particularly chemical inputs; and the adaptation of cropping patterns and types of livestock production. The provision of research and extension by the government will be discussed at length in Section 4.6 of this report.

Changing cropping patterns on existing land can have a substantial impact on production and employment. Tables 28 and 29 show the employment estimates for different crops on small and large farms. It is evident that there is wide range in the employment and production potential of different crops.

Table 28 shows for example that tea provides four times as much employment as maize per hectare. Tables 28 and 29 show a more dramatic picture, where smallholder

TABLE 28 Estimated crop hectarage, livestock, and employment in the small farm sector in Kenya.

Crop	Hectares	Hours per hectare	Total hours (thousands)
1. Cereals, pure stands			
Local maize	224,600	800	179,680
Hybrid maize	258,200	900	232,380
Finger millet	30,500	1000	30,500
Sorghum	16,800	300	13,440
Other cereals	18,500	700	12,950
TOTAL			468,950
2. Cereals, mixed stands			
Local maize; beans, sweet potatoes	834,000[a]	800	667,200
Hybrid maize, other	242,600	900	218,340
Sorghum, grain legumes, etc.	97,600[a]	700	68,320
TOTAL			953,860
3. Pulses, pure stands			
Beans	49,900	400	19,960
Cow peas	11,700	300	3,510
Pigeon peas	100	400	40
Field peas	4100	600	2460
Groundnuts	3500	800	2800
Other	1100	300	330
TOTAL			29,100
4. Root crops, pure stands			
English potatoes	48,900	1100	53,790
Sweet potatoes	10,900	1000	10,900
Cassava	41,200	1100	45,320
Other	17,700	1000	17,700

TABLE 28 *Continued.*

Crop	Hectares	Hours per hectare	Total hours (thousands)
5. Fruit, vegetables, oilseeds, pure stands			
Bananas	19,600	1100	21,560
Other fruits	1200	1000	1200
Vegetables	4000	2000	5000
Oilseeds	13,000	800	10,400
6. Industrial crops, pure stands			
Sugarcane	55,000	1500	82,500
Pyrethrum	22,400	2800	62,720
Cotton	25,000	1500	37,500
Other	2600	1000	2600
7. Cotton, mixed stands	45,100	1000	45,100
8. Permanent crops, pure stands			
Coffee	92,000[b]	2500	230,000
Tea	59,000[c]	3200	188,800
Coconuts	2000	200	400
Cashew	5500	200	1100
Other	23,100	500	11,550
9. Permanent crops, mixed stands	19,300	2100	40,530
Coffee, bananas, maize	19,300	2100	40,530
Coconut, cassava, maize	49,300	1200	59,160
Cashew, cassava, maize	48,000	1200	57,600
Subtotal	2,397,300		2,440,340
Minus area doublecropped (15%)	−395,595		−366,051
Total crop hectarage	2,037,700		2,074,289[e]
Plus pastures, etc.	1,420,300[d]		
TOTAL SMALL FARM HECTARAGE	3,458,000		2,074,289[f]

Livestock type	Number of animals	Hours per head per year	Total hours (thousands)
Dairy cows (improved)	611,000[g]	400	244,400
Calves, heifers (improved)	661,448[g,n]	250	165,362
Bulls, steers, oxen (improved)	185,552[g,n]	200	37,110
Unimproved cows	1,942,000[g]	300	582,600
Unimproved other cattle	3,435,000[g]	200	687,000
Sheep and goats	6,522,000	25	163,050
TOTAL			1,879,522[h]

Total employment	Hours (thousands)	Percent of total	
Total crops (less doublecropping)	2,074,289	46.4	
Food crops[i]	1,358,823	66.0	Percentage of total crops
Industrial crops[j]	204,697	9.9	
Plantation crops[k]	500,769	24.1	

TABLE 28 *Continued.*

Total employment	Hours (thousands)	Percent of total
Total livestock	1,879,522.4	42.0
General farm work[l]	517,891	11.6
GRAND TOTAL	4,471,702.4[m]	

[a]Residual, after subtracting pasture and all other crop area from total holding area: 3.458 — 1.435 — 1.466.4 (million hectares) = 931,600. Table 9 in Integrated Rural Survey 1 (IRS1) gives the total mixed local maize area as 970,000 hectares and that for mixed sorghum as 189,600. These undoubtedly involve overestimation and double counting.
[b]The Coffee Board gives 86,389 × 2,500 = 215,972,500.
[c]The Tea Board gives 65,960 × 3200 = 211,072,000. With the Coffee Board figure of footnote *b*, this makes 427,044,500 versus 418,800,000 above: a difference of 2%.
[d]Pasture areas are estimated by province as follows (in hectares): West, 325,525; Rift Valley, 146,758; Nyanza, 271,574; East, 214,384; Coast, 1000; Central, 461,059; TOTAL, 1,420,300.
[e]Average 1018 hours per hectare of crops.
[f]89% of norm by IRS1: 1579 hours × 1.48 million.
[g]Ruthenberg breakdown of the average number of cattle given in IRS1 1974 and 1975.
[h]Average hours per head of livestock times number of holdings: 1368 × 1.48 million = 2,029,321,296; the figure given is 93% of this.
[i]Categories 1–5 minus oilseeds.
[j]Categories 6 and 7 plus oilseeds.
[k]Categories 8 and 9.
[l]Approximately 350 hours × 1.48 million holdings.
[m]Total ÷ 2000 hours per man year = 2,235,851 man years; total ÷ 2400 hours per man year = 1,863,209; total — general = 3,953,811,400, which is 1,976,906 man years at 2000 hours per man year and 1,647,421 at 2400 hours per man year.
[n]Proportional split of total 847,000.
SOURCE: Integrated Rural Survey 1, 1974–75; Crawford and Thorbecke (1978) Chapter 3.

TABLE 29 Estimated crop hectarage and employment in large-scale farming in Kenya in 1976.

Crop	Hectares[a]	Hours per hectare[b]	Total hours
1. Large mixed farm crops			
Wheat	86,595	70	6,061,650
Barley	13,141	70	919,870
Oats	4153	70	290,710
Maize	74,317	350	26,010,950
Other grains	1164	70	81,480
Sunflower	3890	120	466,800
Pyrethrum	3036	2000	6,072,000
Root crops and vegetables	3527	3000	10,581,000
Temporary fodder crops	8500	70	595,000
Other temporary crops	115,596	200	23,119,200
Other crops	265	200	53,000
TOTAL	314,184		74,251,660
Squatter maize	300,000[b]	800	240,000,000
2. Plantation crops			
Tea	25,301	4300	108,794,300
Coffee	29,841	2800	83,554,800
Sugarcane	30,098	1000	30,098,000
Sisal	76,994	300	23,098,200
Pineapple	5033	1500	7,549,500

TABLE 29 *Continued.*

Crop	Hectares[a]	Hours per hectare[b]	Total hours
Wattle	11,779	200	2,355,800
Coconuts	1636	200	327,200
Cashew	1121	200	224,200
Other	3063	500	1,531,500
TOTAL			257,533,500

	Number of animals	Hours per head per year	Total hours
3. Livestock			
Dairy cows	175,100	200	35,020,000
Heifers	95,800	20	1,916,000
Calves, bulls, etc.	19,200	24	460,800
Beef cattle	456,500	20	9,130,000
Sheep	325,700	2	651,400
Pigs	18,100	2	36,200
TOTAL			47,214,400

		Percentage of total
4. Summary		
Total mixed farm crop hours	74,251,660	12.0
Total plantation crop hours	257,533,500	41.6
Total livestock hours	47,214,400	7.6
Squatter maize	240,000,000	38.8
Subtotal	618,999,560	100.0
Overhead labor (20%)	123,799,912	
GRAND TOTAL	742,799,472[c]	

[a]Statistical Abstract (1977) Table 97(e).
[b]Estimate based on Hunting (1977).
[c]Equivalent to 371,400 employed at 2000 man hours per year, 309,500 at 2400 man hours per year.
SOURCE: Crawford and Thorbecke (1978) Chapter 3.

potato production uses more than 15 times as much and smallholder pyrethrum uses 40 times as much labor per hectare as large-farm wheat production*. The data in these tables further indicate that except for horticultural crops, such as bananas, flowers, vegetables, and other fruits, the diversification away from cash crops such as coffee, tea, cotton, pyrethrum, and sugarcane does not offer increased potential for employment. There is also the problem that concentration on cash crop production increases the dependency on erratic world markets and brings an element of economic instability into the development of the country (Ruthenberg 1978).

If we were concerned only with direct employment, the national cropping patterns should favor coffee, tea, pyrethrum, sisal, and sugarcane. The creation of employment is of great concern to the government.

*Tidrick (1979) has noted that it is difficult to distinguish the effects of changes in cropping patterns and changes in farm size.

Although it would appear from Tables 28 and 29 that the shifting of cropping patterns can offer a substantial increase in output and employment, one should not be misled into thinking that changes in cropping patterns are a panacea for all production and employment problems. There are limits to the operation of these changes, including land quality, product demand, the need to fit crops into the farming system, and inadequate supporting services and consumption patterns. For example, tea has on average a higher value added per hectare than maize, but there will be many areas in which maize will have a higher return per hectare than tea owing to land quality.

International agreements limit the expansion of such crops as coffee, pyrethrum, and sisal. Product demand is thus a limit to changing cropping patterns. Changing cropping patterns can also be limited by the need to fit crops into the farming system. The labor profile in a farming system is critical because peak season labor requirements may constrain production of some high value, labor-intensive crops. This means that comparison of the annual labor requirements of crops can be very misleading.

The supporting services available to the farmers can be a further limit to changing cropping patterns. A well-known example in Kenya is potato production, which is usually limited by inadequate storage and marketing facilities. Yet Table 28 indicates that potato production has a very high employment component.

The final limit to changing cropping patterns is consumption patterns. Here wheat is a good example: producers have followed the dictates of consumers. Demand for bread has increased in Kenya at a rate of 6–8% per annum. The production of wheat continues to be promoted despite the fact that the income per hectare of high potential land is relatively low. The employment content is negligible, as indicated in Table 29. Its foreign exchange requirement is very high since it requires high inputs of imported machinery. Here it can only be hoped that high wheat prices as well as the development of triticale will change consumption patterns in the long term. An enlightened pricing policy can have a large impact on cropping patterns.

Nevertheless, despite the above limitations, there is still considerable scope for increasing output and employment by changing cropping patterns. Changes in cropping patterns in Central Province between 1963 and 1974 increased labor demand by 28% or 2.3% per annum (Collier and Lal 1978). This mainly involved the expansion of tea, coffee, and hybrid maize. Much of the hybrid maize expansion replaced traditional varieties. In the future, similar or higher gains for changing cropping patterns should be experienced throughout the economy. The main requirement is for policy and institutional support: pricing policy, marketing and transport facilities, credit arrangements, improved input distribution, and research into ways to ease the constraints that prevent the adoption of high value, labor-intensive crops (Tidrick 1979).

4.3.3 Increased Yields

Yield increases are an important source of output growth; the average yields in Kenya are low. The average yield of maize for example is about one tonne per hectare, compared with 1.95 tonnes in Mexico and 5.4 tonnes in the US (Financial Times 1980).

Increased yields of labor-intensive crops such as tea, coffee, sugarcane, pyrethrum, and cotton can generate significant employment, especially in harvesting. However, doubling or increasing the yield substantially will not be automatic. Ruthenberg (1978) contends that yields may have stabilized or actually fallen in recent years, especially

among smallholders. He attributes this to the low use of fertilizer in smallholder agriculture. Fertilizer use in Kenya is very low in comparison with other tropical countries short of land, and smallholders accounted for less than one third of its consumption in 1976–77.

If yields are to be increased substantially, the current trend in fertilizer use by small-farmers must be reversed. This will hinge upon government policy and institutional support. The issue here is not farmers' technical capability of raising yields using fertilizers, but rather the profitability of using fertilizer, its availability at the correct time and at reasonable distances from farmers' fields, and credit facilities.

There is ample evidence that, given the incentive, smallholders can respond to fertilizer use. The Kenya Tea Development Authority (KTDA) is a good example: fertilizer use in tea growing has been promoted with much success. The KTDA provides fertilizer to farmers close to their fields and provides credit, and farmers have fertilizer when they need it. The KTDA can do this because they deduct the fertilizer cost at source.

The general marketing of fertilizers to small-farmers has been the factor limiting fertilizer use: farmers do not get fertilizer at the correct time and dealers do not extend credit. The dealers are not localized as in the case of the KTDA; farmers have to travel long distances and transport costs are prohibitive.

The study by Mwangi (1978) in Kenya's Central Province indicated that farmers traveled on average eight miles to buy fertilizers. Of all farmers using fertilizers, 42% transported their fertilizer by public transport (matatu) while 38% transported their fertilizer on foot. The average return fare for farmers was KSh2.50 and the average transport cost for a 50kg load was KSh1.45. These costs raised the price of fertilizer substantially, not including the opportunity cost of the time spent in going to buy it. The same study found that 59% of the farmers were not using fertilizers at all owing to lack of funds, while the same lack of funds made 68% of farmers use inadequate or subeconomic amounts at prevailing prices.

Thus for yields to be increased conditions must be created that are conducive to the use of fertilizers by small-farmers*. The areas that need special attention are price policy and institutional support, especially marketing, credit, and extension.

4.4 Land Redistribution

In this section the redistribution of large holdings is considered as another way of increasing the intensity of land use. The burning issue of land policy will be discussed later in this section in connection with government policy and institutional support for agriculture.

Tidrick (1979) has observed that few would dispute that land redistribution could increase agricultural employment, but the effect on output is much more controversial. However, after analyzing the available data, especially from Integrated Rural Survey 1, he has concluded that small farms have on average both higher employment and higher output per hectare than large farms using land of comparable quality.

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*There are also other technical inputs that increase yields, such as pesticides and improved irrigation where feasible.

Table 30 shows the current distribution of land holdings and employment. For example, assume as Tidrick (1979) did that there are about 585,000 hectares of large mixed farms not already subdivided plus gap farms (1 million hectares) that could be subdivided, and further that subdivided holdings would provide 0.64 man years of employment per hectare (the average for all smallholdings in 1974–75) compared with an average of about 0.09 man years employment per hectare on large mixed farms and gap farms. Under these assumptions, land redistribution would provide an additional 0.55 man years of

TABLE 30 Distribution of land and employment.

	Area (thousand hectares)	Employment (per cent)
Pastoralists, landless, and squatters	–	12.0
Smallholders	3500	(74.6)
Food crops		26.8
Livestock		29.0
Other		18.8
Irrigation schemes	9	0.2
Gap farms[a]	1000	2.5
Large farms	2500	
Mixed farms	900	2.3
Plantations	400	4.7
Ranches	1200	–
Squatters		3.7
TOTAL	7009	100.0

[a]Gap farms are those not covered by the Integrated Rural Survey or the Large Farm Survey and are considered to be 20–50 hectares in size.
SOURCE: Crawford and Thorbecke (1978); Development Plan 1979–83, Statistical Abstract.

employment per hectare on 1,585,000 hectares, or approximately 870,000 extra jobs. Thus from this one example it is clear that land redistribution would go a long way toward alleviating unemployment. In fact Tidrick (1979), in further calculations using other assumptions, shows that land redistribution could create approximately 4 million extra jobs. However, he places a caveat on this conclusion, since these calculations of the employment and output potential of redistribution require strong assumptions about land quality on large and gap farms and about the political feasibility of redistribution.

The discussion so far of the potential for increasing output and employment has been concentrated on the existing land area under cultivation. We now turn to exploring the possibilities of increasing output and employment through increasing the supply of agricultural land, which can be achieved through irrigation, drainage, or conversion of forests and pastures.

4.5 Increased Supply of Agricultural Land

4.5.1 Irrigation and Drainage

Irrigation and drainage afford substantial potential for the expansion of Kenya's cultivable land in the medium and long term. The potential area for irrigation is estimated

at about 600,000 hectares, while the country's potential area for reclamation through drainage is also as much as 600,000 hectares. At present less than 5% of irrigation and 1% of drainage potential has been developed (Toskoz 1979).

Toskoz (1979) has estimated that the development of 200,000 hectares of irrigation and 200,000 hectares of drainage, covering only one third of Kenya's potential, would cost K£1400 million. This would in turn generate an equivalent full-time employment potential of nearly 1.3 million people compared with the expected 7 million increase in the labor force between 1979 and 2003.

Irrigation could also provide substantial production benefits. The projected value added under the Bura project is around K£450 per hectare (in 1979 prices). At this rate the value added would be K£270 million if the potential area is 600,000 hectares.

However, the employment and production potential of irrigation must be treated with caution for two basic reasons. First, irrigation is enormously expensive. The latest cost estimate of the 6700 hectare Bura scheme is K£63 million, or about K£9400 per hectare. (This scheme is particularly expensive, though, because of high infrastructure expenditures that would not all be required in a less remote area.)

The Ministry of Agriculture estimates that the cost of irrigation development, including additional infrastructure costs but excluding much of the cost of dam construction, would range between K£3000–6000 per hectare. Thus the development cost of 600,000 hectares would be in the range K£1.8–3.6 billion. This is a big investment by the standards of any developing country.

The second reason for calling for caution in considering the potential of irrigation development is the technical and economic problems that have arisen in some irrigation schemes. Although the Mwea scheme is generally recognized as highly successful, other irrigation schemes in Kenya have been less so. Some of these schemes were established with other objectives; for example, the Mwea scheme was used to "rehabilitate" Mau Mau detainees. Tidrick (1979) notes that Perkerra has been regarded as a disaster while the latest cost estimates for the large Bura scheme have lowered the economic rate of return to 9%, which makes it a marginal project and raises questions about the economic viability of large-scale irrigation.

In the light of all this, the development of irrigation as a major source of production and employment is of dubious potential.

The government's strategy for irrigation seems highly appropriate under the circumstances: that is, to proceed cautiously with presently planned large-scale irrigation schemes, to make no new large-scale commitments, and to promote small-scale and private irrigation development (Tidrick 1979). Nevertheless, this alone could make a significant contribution.

4.5.2 Drainage

For drainage, unlike irrigation, there has been little investment. However, in the fourth Five Year Development Plan (1979–83) there is a commitment to drain about 3000 hectares in Coast Province in order to produce wet rice (Government of Kenya 1979).

Ruthenberg (1978) has been the staunchest advocate of drainage and valley bottom development in the Ministry of Agriculture. He claims the following advantages in increasing the supply of land through drainage.

- Some of the most fertile land is found in poorly drained valley bottoms. This land would respond well to the application of fertilizer and would have a lower risk of drought.
- Drained land could support very labor-intensive cropping and most of the potential products (rice, vegetables, and cotton) would find a ready market in Kenya.
- Drainage shows a high rate of return and results in permanent improvement.
- Valley bottom development is closely connected with resource conservation because it implies water control, land leveling, and protection of catchment areas.

Ruthenberg estimates that there are up to 1 million hectares of high and medium potential land with impeded drainage. Most of this land is in Western Kenya, but there are also extensive areas in Coast Province and Rift Valley Province. In Central Province drainage is of minor importance.

The cost of drainage is only K£400 per hectare, compared with over K£3000 per hectare for irrigation.

The advantages of drainage development are thus that is has a high employment content since it is a labor-intensive undertaking, it has a higher return of capital investments than irrigation, and it is likely to be more economic. One problem here is that Kenya has little experience in drainage and valley bottom development.

There are substantial externalities involved in valley bottom farming. Investment in drainage by one farmer will benefit neighboring farms, but it will be unproductive if neighboring farms do not also invest in and maintain their part of the drainage system. This implies that if drainage development is to be effective, the government would have to devise new institutions and procedures to coordinate planning. Because of the externalities involved in drainage maintenance, participation in drainage development cannot be voluntary. The government would also have to devise special arrangements to ensure equitable sharing of the costs and benefits of drainage development.

4.5.3 Clearing of Forest

Clearing large areas of forest is another possibility for increasing the supply of arable land for crop development. This is a controversial proposal because of its unknown ecological effects, which would depend very much on where and how the cutting was done. Moreover, memories are still bitter about the indiscriminate cutting of trees by a few influential Kenyans for the lucrative charcoal market in the Middle East.

From an economic point of view, proponents of this idea argue that tea and other crops, such as bananas, can provide an adequate watershed, while providing a large increase in employment and value added. From Tables 28 and 29, it is suggested that a hectare of tea provides about 2 man years of employment or about K£500 gross output (at 1976 prices). If, as claimed, 400,000 hectares of high potential land could be safely cleared, it would provide 800,000 jobs and K£200 million gross output. In practice this would take a long time and a detailed evaluation should be made of the effect on tea prices. The total area planted to tea in Kenya in 1976 was 66,000 hectares. Furthermore, as long as there are conflicting uses of forest, such as for harboring wildlife, or for tourism, and unknown environmental effects in replacing forests with permanent crops, this idea is bound to generate animated discussion in the near future.

4.5.4 Dryland Farming

Four fifths of Kenya's land area lies in the semiarid and arid agroecological zones IV, V, and VI. The marginal areas support 25% of the total human population and 50% of the livestock in Kenya. Much of the area is devoted solely to pastoralism, but there is increasing migration from densely populated high potential areas to sparsely populated marginal areas, particularly in Zone IV.

These areas have no potential for generating substantial output and employment. The development strategy in the marginal areas should be to try to raise the living standards of the existing population rather than to try to expand production through immigration.

At this stage we should also turn to a consideration of animal production. Beef production requires large areas of land, which are no longer readily available. This would call for a shift towards zero grazing, which is already being adopted in the high potential areas, or alternatively a combined effort whereby cattle could be reared, if not fattened, on rangeland. The alternative is to shift consumption to milk, sheep, and goats. Milk production on small farms generates a high income per hectare and a high employment content but currently there are significant marketing problems. The quick reproduction patterns of sheep and goats lend themselves to the use of crop byproducts in small farm units.

Table 31 shows the potential impact on production and employment of the possibilities that have been discussed in Section 4.

TABLE 31 Production and employment potential from alternative sources.

	Maximum estimate		Moderate estimate	
Source	Output (million K£)	Employment (thousands)	Output (million K£)	Employment (thousands)
Irrigation	225	2000	90	400
Drainage	300	2000	150	1000
Clearing of forest	200	800	6	40
Dryland farming	Negligible	Negligible		
Changes in cropping patterns[a]	200	2750	125	1750
Increased yields	600	1000	450	750
Land redistribution[a]	600	3800	50	870
TOTAL POTENTIAL INCREASE[b]	1925	9600	821	3940
Increase required by 2000	1000	3800	1000	3800

[a]Changes in cropping patterns and land redistribution are not additive.
[b]The total excludes the smaller of the changes in cropping patterns or land redistribution. Excluded from the total are changes due to increased yields from the application of technology not yet developed and intensification due to the subdivision of existing smallholdings.
SOURCE: Tidrick (1979).

In conclusion to this section, we should reiterate two points that were made by Tidrick (1979) concerning prospects for employment and production growth in agriculture.

Agricultural development will require major investments to expand land area, difficult political decisions to redistribute land, and careful attention to policy and the development of supporting institutions. Changes in government policy will be essential if the

slowing of agricultural growth is to be reversed. Secondly, although there are no technical problems in the medium term in expanding agricultural output and employment, if population growth does not slow down dramatically by the end of the century, the provision of adequate employment opportunities and indeed overall development will become intractable problems. The experiences of other countries suggest that a more equitable distribution of the benefits of economic growth may be essential to bringing down the rate of population growth.

4.6 Government Policies and Institutional Support

The targets of output as outlined in the Kenya Case Study can only be expected to be met through the promotion of smallholder farming. In this section of the report we shall turn our attention to the policies required for smallholder development. These policies include pricing, marketing, research, extension, credit, and land policy.

4.6.1 Pricing Policy

Prices of export crops are largely determined by world prices, as Kenya has little market power. The one exception is pyrethrum.

The price support system has played a useful role in the past in encouraging innovation by removing the risk of price fluctuations for important crops. Kenyan farmers have become exceptionally price responsive and very aware of market opportunities. This implies low supply elasticities and hence a low marginal cost to government. The government should thus seriously review its role in price support and give some consideration to the desirability of less government intervention.

Fixed price support may be justified in cases where the government is trying to expand production of a new or neglected crop, but in general farmers and consumers would be better off if government marketing boards played a more restricted role. The boards should set minimum and maximum support prices for maize and other key crops, but otherwise should permit full private sector compensation (Tidrick 1979).

The price policy has an impact on income distribution. Food price controls frequently benefit middle- and upper-income urban groups at the expense of lower-income rural producers. Cases in point are the price controls on meat and maize, which transfer income from low-income herdsmen and farmers to the benefit of middle- and upper-income urban dwellers.

It should be noted, however, that the scope for price policies is limited owing to the dependence on exports and the limited purchasing power of the internal market.

4.6.2 Marketing Policy

In Kenya the tradition of centralized marketing has been the order of the day. The government not only provides marketing organizations for many crops, but frequently forbids trade through unauthorized channels. Marketing policy is tied up with pricing policy. There is a preannounced support price for the major grain crops and single-channel marketing is the principal way the government seeks to make its support price effective. In practice, there is considerable illegal and semilegal trading in maize and rice because of inappropriate prices, inadequate storage facilities, or high marketing costs.

The storage issue is especially critical. In the recent food shortage in the country, although the shortage was blamed on a combination of bad planning, mismanagement, poor weather, and blatant profiteering, a large measure of the blame should have been placed on the lack of proper attention to storage facilities. The Financial Times (28 July 1980) had this to say: "Indeed, the poor maintenance of storage facilities may have been a factor in the apparent disappearance of the maize reserve. For example, at Nakuru only four of the 30 silos which form storage for the country's strategic reserve are properly water- and air-tight. At Kitale, the other centre for the strategic reserve, 10 out of 36 silos are out of commission". This reflects the storage situation across the country.

The maize marketing system in particular has often been criticized (Gsaenger and Schmidt 1977; Smith 1978), but the government has been reluctant to change it.

Most smallholder export crops are also sold through specialized single-channel marketing boards or cooperatives. Prices are primarily those set by the international market less marketing costs. However, some boards weigh heavily their financial reserve position and often adjust prices to suit this objective.

Prices were rigged in favor of the settlers; an example is the formula for maize in the 1950s (Heyer 1976; Smith 1978). The export marketing boards were initially set up to protect the interests of white settler farmers. Heyer (1976) concludes that large farms are favored over small farms in many respects. In most instances this is because the marketing system operates better for crops favored by large farms. Table 32 indicates that wheat production, for example, is almost completely dominated by large-scale farms.

Most of the country's marketable surplus passes through parastatals and cooperatives that operate without competition, and some of which are clearly not as effective as they could be. In this light, then, it is imperative that the government reconsiders the institutional setting in marketing. In some cases it would be economically prudent to allow effective competition between parastatal, cooperative and private bodies dealing in various crops. The government has started examining the roles of various parastatals in order to improve their performances. But here the words of Heyer (1976) are appropriate when she observed that there are "political interests that prevent changes from being made. There are the vested interests in large-scale farming, the vested interests that prevent the marketing system from divesting itself of its large-farm bias, the vested interests in the marketing system itself that are against disbanding the centralized organization, and the vested interests in cheap and limited credit".

4.6.3 Credit Policy

Agricultural credit is provided through commercial banks, cooperative societies, individual crop authorities and several specialized government institutions, the most important of which are the Agricultural Settlement Fund and the Agricultural Finance Corporation (this is to be converted into an Agricultural Bank).

The Kenya credit system has many shortcomings. It has failed to reach most of the small-farmers, it is not properly integrated into the overall financial system, and it charges too low interest rates (Heyer 1976; Long 1978; Donaldson and Von Pischke 1973).

Provision of credit in the past has tended to widen rural income disparities (Heyer 1976). Smith (1976) has also added to this evidence when he speaks of credit as "a useful

TABLE 32 Selected statistics for smallholders, large-scale farmers, and pastoralists.

	Smallholders	Large-scale farmers	Pastoralists	TOTAL
Maize (1976)				
Area (hectares)	1,860,000[a]	74,300		1,934,000
Production (tonnes)	2,158,000	309,000		2,467,000
Yield (tonnes per hectare)	1.16[a]	4.54		1.3
Wheat (1976)				
Area (hectare)	–	135,000		86,600
Production (tonnes)	–	187,000		187,000
Yield (tonnes per hectare)	–	1.4		1.4
Tea (1976–77)				
Production (tonnes)	27,720	58,571		86,291
Yield (tonnes per hectare)	0.64	2.37		1.26
Livestock[b]				
Dairy	1392	290	1980	
Beef	5559	157		
Sheep and goats	6959	326	9000	
Credit (thousand K£) (1976–77)	12,300[c]	8651		
Gross marketed product (1977) (million K£)	209	206		415
Population (millions)	10.11	0.52	1.29	

[a] Average area and yield. Smallholder maize consists of: (a) 480,000 hectares of hybrid maize, of which about 50% is in pure stands and the remainder in mixed stands; (b) 1,190,000 hectares of local varieties, of which 20% is in pure stands and the rest in mixed stands.
[b] Statistical Abstract 1977; A Brief Review of Farming Activities 1978 (Kenya Central Bureau of Statistics).
[c] Including cooperatives.

method of redistributing income in favor of those who are fortunate enough already to own sufficient resources to meet the minimum required for credit recipients".

More fundamentally, Kenyan agricultural policy makers and aid agencies have overemphasized the role of credit to the neglect of other important development constraints (Von Pischke 1976).

4.6.4 Agricultural Research Policy

Kenya has one of the largest agricultural research establishments in Africa, which allocates a substantial amount of resources for agricultural research. Table 33 shows planned resource allocation for agricultural research in the fourth Development Plan.

The major criticism of agricultural research policy has been its bias toward the problems of large farms and cash crops, i.e. coffee, tea, pyrethrum, sisal, and wheat. This concentration on large-scale farming has tended to exclude small-scale farming and so in most instances has indirectly resulted in negative effects on the distribution of rural incomes.

Gerhart (1975), however, has observed that the development of higher-yielding and drought-resistant strains of maize has been a major result of past research that has been

TABLE 33 Agricultural research provisions (K£) to government institutions during the period of the 1979–83 Development Plan.

	Agricultural research provisions, 1979–83 (K£)				
	1978–79	1979–80	1980–81	1981–82	1982–83
Recurrent research	5,811,897	6,351,945	7,573,364	8,742,472	9,947,390
Development research	3,805,081	4,971,410	4,659,040	4,937,000	5,092,330
TOTAL	9,616,978	11,223,335	12,232,404	13,679,472	15,039,720

SOURCE: Fourth Development Plan, 1979–83.

widely applied on smallholdings; the drought-resistant varieties have also been suitable for areas of lower potential. In the period 1964–73, production of hybrid maize in Kenya grew to an estimated 800,000 acres with a rate of diffusion higher than that for hybrid corn in the US in the 1930s (Gerhart 1975).

Such technological breakthroughs are not envisaged in the future, as is clearly stated in the fourth Five Year Plan (Government of Kenya 1979). This state of affairs could be improved if some of the resources withdrawn from maize research were restored to that area.

The government has also outlined in the same plan the direction of future agricultural research. It states that "Increased emphasis, including greater investment of human and financial resources, will be placed on those lines of agricultural research that are appropriate for land use intensification in smallholdings and on production techniques for areas of low and unpredictable rainfall. Research on developing viable mixed crop and livestock systems for arid areas will be emphasized. In the allocation of research resources preference will be given to research which is likely to increase both employment and productivity".

There will be some lag, however, before the intentions outlined here begin to redress the effect on income distribution that past research has had.

The major constraint in the future development of agricultural research and its potential contribution to agricultural development is the lack of qualified staff. One of the main reasons for this is the unattractive salaries (Ruthenberg 1978). The government would therefore need to provide ample finance for agricultural research and would need to organize it effectively, perhaps outside the regular civil service, to avoid some of these salary issues.

The present institutional arrangement does not permit competitive salaries to be paid, but the government has recognized this and founded the Kenya Agricultural Research Institute*; this may circumvent this problem.

Ruthenberg (1978) contends that the other major problem that seems difficult to solve is that Kenya is endowed with many different climates. This makes it difficult to conduct research on all of them effectively. This would therefore require that Kenyan researchers keep very much in touch with their counterparts working elsewhere in the tropics so that they can import innovations as soon as they become available.

*Founded by Act of Parliament in 1979 and located at Muguga, Kenya.

4.6.5 Extension Service Policy

Just as for agricultural research, Kenya has a large extension service establishment. Currently it has about 6000 employees. The government also devotes substantial resources to the agricultural extension service. There is a close connection between the extension service and research in that the latter transmits results to farmers and provides a feedback to researchers on the needs of the farmers.

The extension service has pursued what is popularly known as a "progressive farmer" strategy. In practice, those farmers regarded as most innovative and most likely to respond to advice are singled out for special attention on an individual farmer basis. These farmers are expected to "spread the gospel" to others.

All the studies that have analyzed this service in Kenya (Ascroft *et al.* 1972; Hunt 1974; Leonard 1977) have shown that the service is biased toward progressive farmers. There has also been a bias toward farmers who were given land in the government resettlement schemes. Staudt (1977) has further observed that the service has discriminated against women: "Women farm managers experience a persistent and pervasive bias in the delivery of the government agricultural services to which they are entitled. The bias increases as the value of the service increases. Moreover, the bias persists under a number of circumstances, including economic standing, size of land holding, and demonstrated interest in adopting agricultural innovations in a timely way".

For example, she found that 28% of farms jointly managed by men and women had never been visited by an extension worker, while the proportion was 49% for farms managed by women alone.

Past extension policies have been inegalitarian and have also widened disparities in agriculture. The progressive farmer approach accentuates this.

The Tetu experiment, and work elsewhere, has indicated strongly that focusing on "average" farmers through group extension methods is likely to be more effective (Ng'ethe *et al.* 1977; Leonard 1977; Schönherr and Mbugua 1974).

The fourth Development Plan (Government of Kenya 1979) has indicated an important shift in policy away from the progressive farmer strategy on individual farm visits: it states that "group extension programmes designed to reach more farmers will become the normal approach".

This approach will definitely meet with strong resistance from well-established extension agents who strongly support the progressive farmer strategy, as well as from the progressive farmers themselves. There is a natural tendency for extension services to drift toward the more progressive farmers. They respond and also demand service. Perhaps the main fault with the Kenya approach was to follow a laissez faire policy. Just as in research and other services, the change in policy here will need a great deal of political will on the part of the government as well as clear criteria for selecting group trainees and in devising an appropriate reward system. This approach, if it works, will definitely help in ameliorating the worsening income distribution in agriculture that has to some extent been created by the extension service.

4.6.6 Land Policy

Land policy is still one of the most crucial areas of agricultural policy in Kenya today. It is a major political issue and has been for decades. The most controversial land issue concerns the size distribution of holdings. This is not simply the question of

large versus small. It is the question of access to land, and to a lesser extent the distribution of ownership within both the large- and the small-farm sectors (Heyer *et al.* 1976).

In this section, past land policies are first reviewed and then current policy and future strategy are discussed.

Past land policy since independence has concerned the resettlement of European farms and land tenure reform. The resettlement of European farms continues and has definitely had some impact on income distribution. The increased smallholder production has reduced rural poverty. This transfer of land from Europeans to Africans has especially reduced racial inequality, but on the other hand it has substantially increased inequalities between the resettled farmers and those remaining in their original smallholder areas.

Collier (1978) gives further evidence that shows that the distribution of land in Africanized large-farm areas is still highly concentrated and that cooperative settlements have made only a small contribution to redistribution. For example, in the mixed-farm area of Nakuru the distribution of all forms of ownership, such as proprietor, cooperative, partnership, private, and public company, is highly skewed, with 2% of farmers owning 69% of the land. Of the 18,115 owners, 16,500 held plots of slightly more than 1 hectare, while 38 farmers had farms in excess of 400 hectares.

Land tenure reform is also a continuing policy of the government. This policy has tended to improve the productivities and incomes of some smallholders but has at the same time worsened the incidence of landlessness and increased the concentration of land ownership.

Current and future land policy is mainly based on institutional changes. This is primarily the question of large farm subdivision. Little change is expected in the near future in the institutional setup of the plantation economy, i.e. coffee, tea, and sisal. The situation is different, however, with large-scale mixed farms. Here, subdivision is going on, albeit unofficially.

The fourth Five Year Plan (Government of Kenya 1979) has clearly spelt out the aims of official land policy, which is mainly directed to smallholder development: "The main lines of government policy are clear. The small-farm family that works on its own land is the main instrument for farm management and rural development. Exceptions to this style of agricultural production exist where economies of scale require other forms of organization, as with ranching, wheat farming, sisal and pineapple plantations, and nucleus estates. In the latter cases, the form of organization of the farming system, i.e. cooperative farming, limited liability company, partnerships, etc., will be determined by efficiency criteria. The emphasis on the small-farm family derives from evidence that, on the whole, small farms produce more per acre, utilize land more fully, employ labor-intensive methods of production, and are a source of subsistence as well as cash crops. The family farm as the focus for agricultural development has three implications which underlie more detailed government policies. First, the family owns its land. Second, the family manages its land. Third, the family works on its land. Ownership of large holdings of land suitable for small-farming will therefore be discouraged, and so will absentee landlords, a landlord–tenant system of farming, and the holding of idle land for speculative purposes".

The other measure that has been advocated to reduce concentration of land ownership and ownership for speculative purposes is a land tax. The government committed itself in 1973 to introducing a land tax as soon as adjudication and registration were

complete, and the plan suggests that this process may begin in districts in which registration has been largely completed.

A land tax has many advantages, which are well summarized in Ruthenberg's words: "A land tax is the ideal instrument for income distribution without reducing the incentive for the better farmers. It is equitable. It is a minor charge for the man with little land and a major charge for the man with much land. It is a minor charge for the good farmer and a major one for the poor farmer".

The government has formed a National Land Commission and it is to be hoped that it will seriously study the issue of land tax. The National Land Commission should also investigate other policy instruments, such as a ceiling on land holdings or a capital gains tax, to see whether they can be used in reducing land concentration and the ownership of land for speculative purposes. Here again, though, a great deal of political will, rather than rhetoric, is called for.

The role of the government in bringing development to agriculture, especially smallholder development, has been emphasized throughout this report. However, this role should not be overemphasized, even when the political will is there. As Heyer and Waweru (1976) have pointed out: "The pace, pattern, and character of development in small areas is determined by a whole range of factors, only some of which are subject to influence by government. The initiative rests with the farmers, who can be persuaded but not forced to comply with particular policies". Nevertheless, the framework-setting policies concerning prices and markets, land, institutions, and organizations is critical to the development of agriculture to achieve the targeted output and employment, and hence the distribution of income desired.

5 PRODUCTION ESTIMATES

The Kenya Case Study (KCS) estimates are based on the best evaluation of the preceding analysis. Area and yield possibilities were considered separately for each crop, where feasible. Aggregate land estimates were modified by a realistic assessment of what additional land might be cultivated either in the semiarid zones or through irrigation and drainage.

It should be noted that these projections are to some extent speculative. They could possibly be improved by a more detailed analysis, but it is not clear whether any other estimates for the year 2000 would be much better.

5.1 Kenya Case Study Estimates

A summary is given in Table 34 of the crop production estimates for the year 2000. These estimates reflect a judicious mix of analysis and a strong component of common sense.

TABLE 34 Kenya Case Study crop production estimates for the year 2000.

Main commodity group	1976 figures			Kenya Case Study estimate for 2000		
	Area (thousand hectares)	Yield (tonnes per hectare)	Production (thousand tonnes)	Area (thousand hectares)[a,b]	Yield (tonnes per hectare)[c]	Production (thousand tonnes)[d]
Maize	1934	1.3	2467	2050	2.93	6006
Wheat	135	1.4	189	135	2.31	312
Rice	12	3.2	38	30	4.06	122
Millet and sorghum[e]	376	0.9	338	601	1.55	932
Pulses[e]	497	0.6	298	646	1.05	678
Roots and tubers	200	9.0	1800	392	13.49	5288
Fruit and vegetables	66	6.8	446	174	12.90	2245
Industrial crops						
Oil[f]	27		33	81		99
Sugarcane	85	19.5	1658	169	39.64	6699
Cotton	71	0.2	14	114	0.36	41
Barley	26	1.9	49	101	3.06	309
Tobacco	4	0.4	2	16	0.64	10
Export crops						
Coffee	87	0.9	78	120	1.27	152
Tea	66	0.9	59	87	1.45	126
Sisal	77	0.4	31	77	0.51	39
Pyrethrum	25	0.6	15	43	0.89	38

[a]The approach used in obtaining the hectarage was to assume that the percentage increase in hectares as given in the Development Plan for 1979–83 would triple for the period 1976–2000, except for tea and coffee.

[b]The resultant total change in hectares amounted to 1,040,000. About half this is expected to come from irrigation and drainage. The remainder can be obtained through expansion in semiarid areas, where pulses, millets, roots, and tubers are expected to show increases. Hectarage expansion through irrigation and drainage will be highly influenced by the cost of investing in irrigation and land reclamation through drainage, as well as by the availability of skilled manpower such as irrigation engineers and technicians. For coffee and tea the Ministry of Agriculture estimates land expansion at 38% and 32% respectively over the period 1976–83. We estimate that this target may be achieved by the year 2000.

[c]For the yield estimates, it was decided to take a value between the current average yield and the potential yield, i.e. that currently achieved on demonstration plots in Kenya. The yield growth rate y^* that would result in achieving this potential by the year 2000 was then computed. It was thought that half this rate, $y^*/2$, would be a reasonable achievement for the period 1976–2000. Thus the yield in year 2000 is given by the formula

$$\text{yield}_{2000} = \text{yield}_{1976}(1 + y^*/2)^{24}$$

[d]Production for the year 2000 was given by the formula $p_{2000} = \text{yield} \times \text{area}$. This same result could be obtained using the formula

$$\text{production}_{2000} = \text{production}_{1976}(1 + y^*/2)^{24} A_n/A_o$$

where A_n is the new area and A_o is the original area. A_n/A_o is essentially an area correcting factor.

[e]The apparent large acreage and low yield reflects the fact that millet, sorghum, and pulse production is from interplanted crops.

[f]Acreage estimate includes mixtures with cashew and cassava.

5.2 A Comparison of Kenya Case Study and Food and Agriculture Organization Production Estimates

The Kenya Case Study and the FAO estimates for the year 2000 are given in Table 35. The Ministry of Agriculture's figures for 1976 and 1983 are also given. There are some differences that require consideration.

Maize. The KCS estimate of 6 million tonnes is a gross estimate and, as discussed in Section 4.3.1, should be reduced by about 26% to give a figure of 4.44 million tonnes for unsifted maize. The FAO estimate of 3.2 million tonnes seems too low. The difference may be attributed to a low base year estimate by the FAO and also to their low expectations for yield gains. It is thought that the KCS estimate is more acceptable as its base

TABLE 35 Production estimates – Ministry of Agriculture (1976), FAO (2000), and Kenya Case Study (2000).

	Production estimates (thousand tonnes)			
Main commodity groups	Current (1976)	Ministry of Agriculture (1983)	FAO (2000)	KCS (2000)
Food crops				
1 Cereals	3080	3983	5038	7372
2 Maize	2467	3139	3203	6006
3 Meat	187	200	777	312
4 Rice	39	65	129	122
5 Millet and sorghum	338	467	829	932
6 Pulses	298	420	750	678
7 Roots and tubers	1800	2341	3523	5288
8 Fruit and vegetables	214	371	3214	2245
Industrial crops				
10 Oils	33	52	17	99
11 Sugarcane	1653	3400	8480	6699
12 Cotton	16	34	30	41
13 Tobacco	0.8	3.7	2	10
14 Barley	49	112	100	309
Export Crops				
20 Coffee	80	112	195	152
21 Tea	62	109	153	126
22 Sisal	33	40	49	39
23 Pyrethrum	14	25	25	38
Livestock products				
30 Milk[a]	1160	1649	1537	2296
31 Beef	141	164	231	337
32 Sheep and goats	65	82	65	157
33 Poultry meat	28	39	120	99
34 Eggs	21	30	89	75
35 Pigs	3.2	4.4	29	10.1

[a]The Ministry of Agriculture estimates include milk products while the FAO and Kenya Case Study estimates are for whole milk.

year estimate and its estimate of the potential for improved yields by better seed and fertilizer use are based on more complete information.

Wheat. The FAO estimate of 777,000 tonnes seems too high in the absence of a concerted policy to change land use in this direction. At present this does not appear to be forthcoming, so the KCS figure, at 312,000 tonnes, seems reasonable.

Rice. The Kenya Case Study figure, at 122,000 tonnes, is about twice the FAO's 65,000 tonnes. Given current irrigation and drainage initiatives the KCS figure seems closer to the mark.

Millet and sorghum and pulses. The two sets of estimates are in reasonable agreement.

Roots and tubers. The Kenya Case Study estimate, at 5.3 million tonnes, is much higher than the FAO's 3.5 million tonnes. These are difficult crops to estimate, but the FAO base levels seem on the low side while the KCS estimate for increasing the hectarage by 100% and the yield by 50% may be overoptimistic.

Fruit and vegetables. Both estimates are substantially greater than the 1976 production of 214,000 tonnes. The FAO opts for an increase by a factor of 15, while the Kenya Case Study aims for what appears to be a somewhat more reasonable increase by a factor of 10. These estimates will be strongly influenced by the amount of investment forthcoming and by the ability of producers to increase their penetration of export markets.

Oils. The FAO estimate is unrealistically low, below even the Ministry of Agriculture estimate for 1976. Given recent Ministry of Agriculture policy initiatives, the KCS estimate of 99,000 tonnes seems feasible.

Sugarcane. The FAO estimate, at 8.48 million tonnes, is somewhat higher than the KCS estimate of 6.7 million tonnes. Kenya is rapidly approaching self-sufficiency in sugar and further expansion of production will be tempered by its ability to develop export markets. This in turn will require production costs to fall from their current levels. The KCS figure seems more realistic.

Cotton. The Kenya Case Study estimate of 41,000 tonnes is somewhat higher owing to the consideration of increased irrigation and drainage and improved marketing. Policy pronouncements seem to support this view.

Tobacco. The KCS estimate of 10,000 tonnes is based on the strong private sector input, especially by British American Tobacco. In the current political climate in East Africa, Kenya would appear to be well placed to increase its tobacco crop.

Barley. For barley also, the strong input from the private sector (Kenya Breweries) both for extension and marketing services indicates a substantial expansion for barley. The KCS figure of 30,000 tonnes by the year 2000 seems feasible.

Coffee. The Kenya Case Study estimates 152,000 tonnes, while the FAO suggests 195,000. The two are in reasonable agreement on yield, but the FAO seems to envisage a greater hectarage. Current knowledge in Kenya does not support the larger FAO hectarage figure.

Tea. The Kenya Case Study estimates 126,000 tonnes while the FAO opts for 153,000. Again, the FAO envisages a greater hectarage expansion but slightly lower yield gains.

The specific ecological milieu suitable for tea suggests that the FAO may be unduly optimistic in its hectarage assessment.

Sisal. The two estimates are in reasonable agreement. If recent price increases continue, the FAO estimate of 49,000 tonnes may be closer.

Pyrethrum. The current plan calls for a major expansion of pyrethrum production to 25,000 tonnes by 1983. If current market conditions are sustained, the KCS estimate of 38,000 tonnes by 2000 can be achieved.

Milk. The KCS estimate of 2.3 million tonnes is somewhat higher than the FAO estimate of 1.5 million tonnes. In view of the current milk programs the Ministry of Agriculture will be obliged to make a strong effort in this area and will expect to achieve 1.6 million tonnes by 1983. The KCS estimate seems better.

Beef, sheep and goats. The current market situation and resultant policy measures suggest that production here will reach the higher Kenya Case Study levels of 337,000 tonnes for beef and 157,000 tonnes for sheep and goats. Given adequate investment and the development of export markets, these figures could be surpassed.

Poultry meat and eggs. The estimates are in reasonable agreement.

Pigs. The FAO estimate is perhaps too high at 29,000 tonnes. The present organization of the industry, coupled with various cultural traditions, preclude production very much in excess of the KCS figure of 10,000 tonnes by the year 2000.

5.2.1 Changes in Input Needs

These increases in output will necessitate some changes in inputs. Part of the increase is expected to come from area increases, but the vast majority is expected from higher yields.

5.2.2 Area

The increase in area will require some additional capital expenditure for land improvement, drainage, and irrigation. For current plan objectives it is envisaged that capital formation for agriculture will grow at 8.5% while that for central government is put at 5.2%. The total growth rate of capital formation is placed at 6.2%. This should be sufficient when combined with private investment to permit the modest growth rates needed for increased acreage to be fulfilled. The financing of investment was not particularly difficult for Kenya up until the late seventies. Over the period 1970–79 domestic savings averaged 72.6% of investment, with the remainder financed by external loans and grants. Kenya was luckier than many developing countries as the sharp oil price increases were cushioned by a large increase in coffee export prices. However, the adjustment problems are now beginning to place severe constraints on the balance of payments. This is compounded by an increased debt burden caused by steep rises in defence expenditure.

5.2.3 Yield

Yield increases reflect changes in technology. The envisaged levels of around 2.5 to 2.9 tonnes per hectare for maize and 2.3 tonnes per hectare for wheat, for instance, seem well within the bounds of technical feasibility by the year 2000. However, changes

in technology are required to achieve these levels. In particular, major increases will be needed in a number of inputs. Some FAO estimates are summarized in Table 36. In this chapter the analysis suggests that targets for seed, fertilizer, pesticides, and labor should not pose too great a problem. The tractor estimates look somewhat daunting. If current energy costs are not moderated this may be an overestimate. In particular, smallholders simply do not have the capital. Perhaps the research efforts discussed for these sectors will yield some form of small hand tiller; this should also be helpful in keeping down energy import costs.

The Input–Output table for 1976 published by the Government of Kenya (1979 prices) estimates that total imports for agriculture were about K£11 million, or 2% of the gross output value of that sector. These represented less than 2% of total imports. Even with the dramatic changes envisaged, we should expect that the imports necessary for agriculture will not be a particular problem with regard to the balance of payments.

TABLE 36 Inputs to agriculture.

	FAO estimates	
	1975	2000
Seeds (for cereals)		
Traditional	46	16
Improved	19	98
Labor (10^6 man days)	493	936
Animals (thousand head)	800	1593
Tractors (thousand units)	7	144
Fertilizer (thousand tonnes)		
Nitrogen	23	150
Phosphates	18	118
Potash	3	31
Others	10	38
Land (thousand hectares)		
Good rainfed	1656	2248
Cropping intensity	0.92	1.15
Arable	1809	1955
Low rainfed	948	1986
Cropping intensity	0.64	0.60
Arable	1491	3310

5.3 Economic Policy

The role of prices, taxes, credit, and administrative measures in influencing profits and thereby the level and allocation of resources becomes more important while agriculture is undergoing rapid change.

5.3.1 Institutional Factors

In Kenya, as in most countries, various institutional factors play a major role in fashioning and implementing the pace and style of change. While in principle institutions

may be created to fill various needs, in practice this is often a long and arduous task. The process in other countries has been documented by a number of researchers – see for example Hayami and Ruttan (1971) or Binswanger *et al.* (1978). Accordingly, it seems desirable to take a closer look at some of the present institutional arrangements to try to determine which features are relevant for Kenya. Agriculture and marketing policies are reviewed through the Annual Agricultural Price Review, the Office of the Price Controller, Inspectorate of Statutory Boards, and at the district level there is usually a strong input from the District Commissioner's office. The various parastatals and statutory boards wield a strong hand. Recently they have been the subject of much criticism, and major plans have now articulated the need to improve the performance of the Maize and Produce Board in particular (Ndegwa 1979). Recent analysis by Sharpley (1980), who incidentally was a member of the Ndegwa Commission charged with reviewing the statutory boards, suggests that in the case of marketing boards, cooperative societies, and processing firms, there may be considerable scope for reducing overheads. This would enable the share of the price received by the grower to be increased. In particular she suggests that one of the areas in which to reduce some overhead margins might be the Kenyan railway and post charges. This proposal merits consideration, as it is important to try to increase producer farmgate prices without the usual problems of a corresponding increase in consumer food prices or a heavier fiscal burden.

The role of these boards has also been questioned with regard to the implicit redistribution that some of their policies entail. Thus the low producer prices for beef are passed on to the higher income groups in Nairobi (von Kaufmann 1976). Similarly Schmidt (1979) has argued that smallholders could also have benefited from the reorganization of maize marketing.

It is important to realize that Kenya does have the ability to run a reasonably efficient marketing organization. Aldington (1979) noted that organizations handling coffee and tea seem to have a much better record than those handling the domestic commodities. Unfortunately for smallholders, they are often at the receiving end of these shortcomings.

Similarly, Kenya has demonstrated the ability to mount an effective extension service for smallholder tea growers. Admittedly, the extension workers here may be higher paid and better motivated so that the results are quite good. It also indicates that the smallholder does respond when there is something to extend. Consequently, recent efforts to reorient the extension service toward a broader range of smallholders do have some precedents for success.

In the present transitional situation, in which modern agriculture is becoming increasingly based on purchased inputs in contrast to inputs generated on-farm, it is desirable that the price structure provide an economic incentive to use the most advantageous inputs.

In the longer term it is inevitable that market forces of supply and demand are the basic determinants of price levels. However, the government can attempt to modulate the operation of market forces to improve the economic environment in a number of ways.

It can implement a system of support prices, announced in advance of sowing and backed up by guaranteed purchases, to provide a minimum expected price to reduce the risk in taking production decisions. Kenya does have support prices for a number of commodities such as maize and wheat, but the effectiveness of this policy is often limited by the inability to announce the prices far enough in advance to allow farmers to adjust their planting decisions.

For other commodities it can provide some degree of price stability from year to year and season to season to minimize economic waste due to inefficient production, marketing, and consumption decisions. Support prices provide the lower limit for harvest prices. Seasonal prices might be allowed to rise above the harvest price level to encourage proper storage investment.

Government policy can seek to correct supply–demand imbalances in specific commodities so that undesirable substitution effects in production do not occur.

Currently the government operates a national food reserve system through the Maize and Produce Board. The stipulated national reserve is 2 million bags per year. The Maize and Produce Board stocks have fluctuated between 2 and 5 million bags. The cost of storage per bag (90 kg) has been KSh8.50, and consequently the total cost of storage has ranged between K£850,000 and K£2,125,000 (Maize and Produce Board data). This cost could be met by increased consumer prices, but the government has been reluctant to use this tool. On the other hand, the Treasury has not been anxious to meet all the costs and the Maize and Produce Board has been and still is in debt. The decision on who should pay for this rests more in the realm of politics than of economics. The recent decision to lower the maize price to producers from KSh85 to KSh65 per bag (90 kg) placed the burden on the farmers.

The 1979–80 maize crop failure moved the debate to the center of the stage. The short-term policy was to move the maize price back up to KSh80.

This argument may be used in support of requiring all taxpayers, rather than consumers, to foot the bill for maintaining a national reserve, especially of maize, since transferring the cost to consumers would have a severe impact on the poor.

The maintenance of a buffer stock would be paid for by the same group of people. However, the cost of a buffer stock is found to be less than the current cost of maintaining the national reserve, since a buffer would not be as large as the national reserve. The population would be still better off if the current spending level of K£2 million could be reduced.

5.3.2 Taxation

The incidence of taxation in Kenyan agriculture is low. While there is ample scope for research in this area, the probability for implementing higher taxes is low primarily for political rather than economic reasons. Kaplinsky (forthcoming) suggests a number of areas where multinationals wield a particularly heavy hand. One company continues to announce low or negative profits for Kenyan tax purposes yet seems willing to increase its investments year after year! Nonetheless, taxes are costs. They may have an undesirable disincentive effect on the use of some important inputs such as fertilizer. On the other hand, taxation on selected inputs may be a flexible method to shape private decisions toward more socially desirable goods.

Taxes have many different effects. The overall influence of the taxation policy must therefore be assessed in conjunction with the influence of other policies to determine the net economic effect.

The introduction of a land tax should be given serious consideration. It could encourage more intensive land use and could curtail the holding of land for speculative purposes. It could also encourage the subdivision of large farms, many of which are not made economic use of at the moment. A well-designed tax package would stimulate employment and would help toward a more equitable distribution of incomes.

In general, to promote agricultural development the taxation system should encourage sound land use and resource allocation, exports, import substitution, the use of labor, and the development of the small-farm sector. The system might also include selected export taxes for products that face favorable market conditions, as do coffee and tea at present. However, the overall system should be flexible enough to allow for unpredictable factors such as the weather or sharp market changes.

5.4 Summary

The FAO seems to have underestimated maize, milk, beef, sheep, and goat production primarily because its base year estimates are low and because in the case of maize it does not envisage reasonable yield gains. Some of their pessimism about maize is compensated for by a higher wheat estimate. In the Kenya Case Study it was thought that lack of suitable land will restrict wheat production to about half their estimate. For coffee and tea it was thought in the Kenya Case Study that the FAO estimates are on the high side because of their unduly optimistic expectation of increased hectarage.

All these estimates could be changed substantially by many factors. While many of these factors are outside the control of government, such as the weather, prices of imported inputs such as tractors, petroleum, and most exportables, there are many policy initiatives available. In the export area Kenya could move strongly towards the production of vegetables, fruit, and meat. This is particularly desirable in view of the balance of payments. However, it is essential to maintain progress in domestic staple production, as the growing demand driven by high population growth could easily result in disastrous consequences for the balance of trade. There are many examples of countries that have achieved success in relatively short periods of time. Immediate examples are the soybean and citrus fruits in Brazil or cassava in Thailand. Success at this level would require a major reorientation from current urban-oriented development toward agriculture and agriculture-based industry. In particular, manufacturing investment incentives could be weighted toward agrobased industries.

6 CONSUMPTION AND PRODUCTION -- POLICY IMPLICATIONS

6.1 Consumption–Production Balance

In the previous sections consumption and production have been discussed separately. In reality they evolve interactively to a greater or lesser degree for various commodities. In some instances price serves as an equilibrating mechanism, falling in the case of excess supply and rising where shortages occur. For many commodities prices are controlled, with the result that inventories are built up in times of surplus (e.g. for maize in 1979), while various unofficial markets develop during periods of shortages. Some of the broad aspects of consumption and production are reviewed in what follows before we present a more detailed consideration.

6.1.1 Consumption

The primary forces determining consumption patterns by the year 2000 should be population growth, increased urbanization, and purchasing power. The population is

expected to have doubled its current level, i.e. to have reached about 30 million by that time*. Population policy poses a number of problems. The current plan indicates a desire on the part of the government to curb population growth. A high population has some positive side-effects, but it is desirable to have a balanced growth so that structural transformation and improved living standards can be harmonized.

Increased urbanization will have a number of effects. It is anticipated that 20% rather than 38% of the total population will be directly employed in agriculture. This implies that agricultural labor will be required to show a substantial increase in productivity. The other major influence on agriculture will result from the urban consumption pattern being somewhat different from the rural one. Across all income groups the urban dweller tends to consume more wheat (bread) and rice but less total cereals, particularly millets and sorghum, and less roots and tubers. He also consumes more meat, fats and oils, sugar, and beverages. These trends in national consumption patterns can be expected both to induce change in the composition of production, and to be influenced in turn by the changing nature of production.

By the year 2000 overall production should increase by 100% or more for most commodities. Only a limited portion of this increase will be achieved by land-augmenting policies involving irrigation and drainage schemes**. This will primarily affect rice and horticultural products. The increase in production will be achieved most cost effectively by higher yields and improved cropping practices rather than by augmenting land. The technology to achieve these yields will require more and better inputs, primarily fertilizer, seeds, herbicides, and pesticides.

Much of the increase will come from the smallholder. This will require a major reorientation of the extension service. Up until now the extension service, and indeed most agricultural policy, has been largely oriented toward the large-farm sector and the "progressive" African farmer. To some extent this may have been justified in the past when these farms were essential in generating a surplus for both the domestic and the export market. Much of agricultural policy was heavily involved in the transfer of land from European owners and this tended to limit the availability of funds for other initiatives. With most of these land transfers completed, increased resources can now be directed toward improved agricultural performance, particularly by smallholders.

With less of the population involved in direct agricultural production, the marketing system will need to be developed with the increasing new demands *pari passu*.

6.1.2 Consumption–Production

The "most likely" *ex ante facto* scenarios for consumption and production are shown in Table 37. It appears that certain adjustments are unavoidable to produce equilibrium.

Maize. According to the Kenya Case Study the production (after allowing 26% for seed and various losses) should exceed demand by a few hundred thousand tonnes. It should be emphasized that these are long-term forecasts. For short-term policy decisions, particular attention must be paid to year-on-year fluctuations. Thus the 1979 maize crop was about 30% below trend owing to a combination of factors that included poor weather

*The Economic Survey (1979) estimates the population growth rate at 3.9%. This would result in a population of about 34.4 million in the year 2000.

**In Section 4 it was estimated that we might expect about 400,000 additional hectares.

TABLE 37 Production–consumption balance: major food items for Kenya in the year 2000 (values given in thousand tonnes).

	Demand scenario[a]	Production (KCS estimate)	Demand (FAO estimate)	Production (FAO estimate)
Maize	4178	6606[c]	2551	5038
Millets–sorghum	414	932	553	829
Wheat	550	312	819	777
Other cereal (rice)	189	122 (rice)	124	129 (rice)
Potatoes	908	5288	447	3523
Cassava	720		1117	
Sugar	496	670[d]	618	848[d]
Pulses	617	678	798	750
Milk	3092	2296	2273	1537
Meat and fish	970	593[e]	947	416[e]
Fats and oils	121	99[a]	137	17[a]
Fruit and vegetables	917[b]	2245	997[b]	3214

[a]Estimate does not include fats.
[b]Vegetables only.
[c]This figure should be reduced by 26% to take account of seed and other losses.
[d]Based on a 10:1 conversion factor.
[e]Excluding fish.

and the absence of a government guarantee of adequate return. Historically, about two bad harvests in 10 can be expected for Kenya, and planning should allow for this through various stock security measures. This *ex ante facto* excess supply can be reduced by (a) a fall in the real price of maize, or (b) the development of alternative markets and uses.

Since much of the production is by the rural poor, any precipitous fall in price would have severe negative welfare implications for those producers who depend on some sales for cash income. On the other hand, current market prices exclude Kenyan maize from the world market. The free on board export price might be reduced to some extent by reducing some costs; in particular, the current storage approach needs improvement.

A recent analysis by Sharpley (1980) suggested that transportation and handling costs also leave considerable room for improvement. Maize could also satisfy some of the domestic industrial needs but the required investment in processing plant would need government support, at least in the early stages.

The Guaranteed Minimum Return Scheme (GMR) supported much of large farm production but encountered major repayment problems.

Millets – sorghum. The supply will exceed domestic human consumption. Some of the supply will probably be used for animal and poultry feed.

Wheat and rice. Consumption will exceed domestic supply unless policies are modified. This will be a burden on foreign exchange unless domestic production can be increased by higher relative prices.

Potatoes and cassava. Here we find that potential production is far in excess of the envisaged demand. Again, alternative markets are desirable. The pelleting plant proposed at Mombasa geared toward the European market would appear to be a step in the right

direction. Even here caution must be exercised as the market might be unduly perturbed by changes in prices for European protein sources use to complement the cassava.

Sugar. It seems that supply will rapidly exceed domestic demand. Before continuing current sugar policy, it is desirable to identify the market for this excess supply. Otherwise much of the investment currently earmarked for sugar should be rechanneled into other products.

Milk. Demand and supply will be reasonably well balanced on allowing for butter and cheese uses.

Meat and fish. The demand for meat will exceed supply unless measures are taken to improve production.

Fats and oils. Production of vegetable oils needs to be encouraged in the near future by providing the necessary infrastructure for processing and marketing.

Fruit and vegetables. For both these there is also a potential excess supply which could be channeled into the export market with proper planning.

6.2 Income Distribution

Recent development policy in Kenya has produced the classic urban–rural duality. Investment in the relatively prosperous urban areas has been closely linked to a relatively free hand for the multinationals. Most money going to the rural areas has gone toward purchasing farms from Europeans, with relatively little investment in productivity. Inevitably this has resulted in a fairly skewed income distribution. It remains to be seen whether income distribution by the year 2000 will be shaped by the interaction of similar sociopolitical and economic forces.

While some of these may be predicted, inevitably many of them will be unexpected. Currently there is a sharp dichotomy between rural and urban sectors. Rural areas, where most of the population currently reside, are characterized by a large number of smallholders, pastoralists, and landless at one end of the income range with a small number of relatively wealthy farmers at the other end. There are about 1,500,000 smallholders and 3000 large-farmers. The distribution of incomes among agricultural households is relatively even. Lijoodi and Ruthenberg (1978) estimate a Gini coefficient (see p. 80) of 0.49 for this group, which is considerably less than typical estimates of around 0.60 for Kenya as a whole. The production structure for large and small farms is different both in terms of the cropping patterns and the technology used. There is little or no middle class in the conventional sense.

The urban areas, on the other hand, have only about 13% of the population at present. Average incomes here are about five times higher than rural levels. At the lower end of the urban income range are the unemployed and the working poor, while at the upper end are the entrepreneurial and professional classes. The urban areas do have a small but growing middle class. This includes civil servants, intermediate entrepreneurs, and skilled workers. It is interesting to surmise what will evolve if the current policy is continued in the near future, and also to predict what the outcome might be of significantly changing this policy. First the "current" situation is reviewed.

6.2.1 National Income Distribution

The estimation of income distribution is a perilous pursuit in most countries. On the one hand, radicals feel they can promote their cause by emphasizing how unequal it is, while many of the establishment often feel subject to attack when their policies lead to a more inequitable distribution. In the context of Kenya these discussions become even more perplexing owing to a number of particular features. First it is not clear to what extent people perceive the relative importance of absolute rather than relative income levels. Does a reasonably successful pastoralist in Samburu cast a longing eye at the higher income of a laborer on a Nairobi construction site? Secondly, there are very substantial differences in what may be necessary for an urban or rural family. Those that come to mind immediately are housing and transportation costs. For these reasons it seems that relative incomes assert their importance for people who live in similar locations and are exposed to and conditioned by similar sociocultural values. It therefore seemed more appropriate to consider urban and rural dwellers separately in the earlier sections. However, we can persist in looking at the overall national picture if we bear these reservations in mind.

6.2.2 Income Distribution in 1976.

An estimate of the income distribution in Kenya for the base year, 1976, is given in Table 38. This is obtained by combining the estimates for urban and rural groups developed in Section 2. In reality there would be some overlap between these groups, but for convenience they are ordered by the average income per capita for each group. At the lower end of the range are the rural poor, who are mostly pastoralists, landless and poor smallholders, while at the upper end are the urban rich. This is not particularly surprising, even though some eyebrows might be raised at the relative income difference

TABLE 38 Estimated income distribution in Kenya in 1976[a].

Group	Share of population (per cent)	Share of income (per cent)	Annual income per capita in Kenya pounds (1976)	Calorie[b] intake per capita per day
Pastoralists, landless, poor smallholders	34.7	7.54	16.4	1620
Smallholders	34.7	17.31	37.5	2070
Urban poor	5.3	4.93	69.0	1900
Rural rich	17.3	28.92	125.4	2800
Urban middle income	5.3	17.12	242	2200
Urban rich	2.7	24.18	683	2500
TOTAL	100.0	100.0		
Average per capita income in K£ (1976):		75.2		
Average per capita daily caloric intake[c]:		2050		
Population in millions:		13.75		

[a]National estimate obtained by combining urban and rural estimates from Section 2.
[b]Estimate derived from Frohberg and Shah (1978) and Smith (1978).
[c]The FAO estimate for 1974–76 is 2151 calories.

between these groups of more than 40 to one. What may be surprising to some is the ordering of some of the intermediate groups. Thus the urban poor, with an average per capita income of K£69 (1976), are ranked above rural smallholders. However, in terms of at least one welfare measure, caloric intake, the ranking should be reversed. This is typical of the issues that are masked in looking at an overall national picture.

6.2.3 Nutritional Status

Caloric intake is often used as a measure in assessing nutritional status, but it should be so used only with reservation: many other factors need to be considered. There are food studies available of the nutritional status of large populations. Small-scale studies and a recent study of Tunisia by Kamoun and Perisse (1979) suggest a strong correlation between nutrient intake and nutritional status. Other determining factors include health and metabolism. If this correlation is accepted then a further link, to relate food intake to nutrient intake, is needed. In most societies an adequate calorie intake seems to ensure the satisfaction of nutrient requirements. The more obvious exceptions are in regions where the diet is heavily dependent on low protein staples such as cassava or manoic. This situation arises in Western Kenya. If an individual is not meeting his caloric requirements, it is evident that the intake needs to be increased if his nutritional status is to be improved. However, this is a necessary but not a sufficient condition; for instance, his state of health also needs consideration.

There is also a considerable diversity of opinion on what caloric requirements should be. At the aggregate level these are usually estimated by considering such variables as weight, age structure, sex, and working environment. The absolute lower limit for an individual to maintain body weight in rest conditions is defined as the basal metabolic rate (BMR). The joint FAO/WHO committee suggests 1.5 BMR as desirable. The present study chooses 1.2 BMR as a threshold for assessing malnutrition. Since the coefficient of variation is about 10%, this suggests that even in an adequately fed population about 2% of that population would have an intake below 1.2 BMR. This measure is used in the present analysis to assess the Kenyan situation. The 1.2 BMR critical limit for Kenya is estimated at 1517 calories per capita per day (World Food Survey, 1977). Thus we can presume that in most situations linkage between income, caloric intake, and nutritional status exists, but it should not be viewed as a definitively causal relationship.

6.2.4 The Current Situation

The current nutritional status for Kenya is reviewed in the Food and Nutrition section of the government's current plan. The situation is summarized in Table 39. Inadequate income is identified as a leading cause of protein energy malnutrition (PEM). Other causes, such as seasonal variations in earnings, lack of education, and poor food practices, are also listed. One estimate of PEM may be gauged from the Rural Kenyan Nutrition Survey (1977). About one third of all the children surveyed (in rural areas) had a weight-for-age index below 80% of standard. This index may be taken as a measure of mild and moderate PEM. The incidence of severe PEM was about 5%. The more comprehensive National Child Nutrition Survey (Central Bureau of Statistics, 1978–79) included children aged six months to five years in both urban and rural locations. The results of this survey indicate that the rural situation is essentially similar to that in the 1977 survey. In urban areas the figures are somewhat better, with about 20% malnutrition and of these about 5% in the severe category, similar to the rural situation. These data on children,

TABLE 39 Nutrition problems in Kenya, 1978[a].

Nutritionally deficient group	Nutrition problem	Cause of problem	Policies to alleviate problem	Estimated numbers in group
1. Smallholders				
Food crop producers average household income K£50 (1975), virtually no sales	Protein energy malnutrition (PEM)	Insufficient food production	Availability of improved inputs, hybrid maize, legume, and pulse production	2,200,000
Landless poor	PEM	Low income, consumer prices	Increased nonagricultural employment, public works, control of essential food prices	410,000
Cash crop producers household income K£125 (1975)	Periodic PEM	Low earnings poorly distributed throughout the year	Improved marketing, storage, stimulation of food production	1,090,000
2. Urban groups				
Unemployed, underemployed	PEM	Low income, consumer prices	Better employment opportunities, control of essential food prices	250,000
3. Pastoralists	Periodic PEM	Vulnerability to weather, lack of food security	Food security systems, better stocking practices, increased demand for produce	670,000
4. Special groups[b]				
Preschool children	30% mild PEM, 5% severe PEM	Inadequate household purchasing power, poor feeding practices, infection	Preschool feeding programs, nutrition education, more curative facilities	*c*
Pregnant and lactating mothers	Anemia	Poor diet, malabsorption infection, hookworms	Feeding programs, education, improved water supply	
Xerophthalmia bitot spots	Vitamin A deficiency	Poor diet, malabsorption	Increased availability of fruit and vegetables, improved water supply	
Goiter	Iodine deficiency	Endemic, particularly in Western Nyanza and Rift Valley Provinces	Iodization of salt	

[a]This is not a comprehensive analysis but is indicative of the situation.
[b]There are many other nutritional and nutritionally related problems that tend to be either more local or not as pervasive as those listed, but that would be included in a more comprehensive study.
[c]Estimates are not given, since many overlap those in groups given above.
SOURCE: Development Plan 1979–83, Government of Kenya.

together with food intake data and analysis of other surveys (these include Bohdal *et al.* (1969), Blankhart (1974), the Report on the Nutritional Status of Mwea-Tabere Irrigation Scheme Community (1978), and the Summary Report of a Workshop on a Food and Nutrition Strategy for Kenya (1975)), suggest that about 31% of the population suffer from some degree of PEM and do not have an adequate intake to satisfy their requirements. On using the 1.2 BMR standard, about 17% of the population in the rural area is in that category. The results of the National Child Nutrition Survey (1978–79) suggest that for urban areas the proportion in the mildly undernourished category is a little lower, but that the severely malnourished category is about the same size.

Average caloric intake per capita per day for each group is also given in Table 37. While these caloric intake estimates (for urban and rural groups from Frohberg and Shah (1978) and for rural groups from Smith (1978)) are positively correlated with income in both urban and rural sectors, this correlation does not hold at the national level. The caloric intake levels may be changed by changes in purchasing power. This is particularly true for the low income groups, where food dominates the expenditure pattern. This can be seen from Table 40, where food expenditure shares vary from 0.77 to 0.21 for different groups.

TABLE 40 Food consumption patterns by income group.

Group	Share of income spent on food	Share of expenditure spent on food	Expenditure elasticity for calories
1. Rural low income	0.80	0.77	0.74
2. Rural middle income	0.48	0.75	0.67
3. Urban poor	0.62	0.45	0.38
4. Rural rich	0.32	0.73	0.48
5. Urban middle	0.37	0.37	0.34
6. Urban rich	0.18	0.21	0.25

SOURCE: Income and expenditure shares are computed from the Integrated Rural Survey 1 (1974–75) and the Urban Food Purchasing Survey (1977). Elasticity estimates are computed fom the calorie expenditure data derived by Frohberg and Shah (1978) and Smith (1978).

Thus to the extent that nutritional status is determined by income, the problem may be considered as one of inadequate income for the low income rural and low income urban groups. Figure 1 shows a plot of per capita caloric intake against expenditure. The population histogram superimposed on this figure suggests that about 33% of the rural population have an intake of below 1800 calories per capita per day and included in these are about 17% of the rural population with an intake below 1517 (1.2 BMR).

The 1800 level is used as a measure for mild to moderate PEM, while 1517 calories is used as the datum for severe PEM.

6.2.5 Present Planning Direction

At this stage it is of interest to estimate what the likely impact on malnutrition will be by the year 2000 if the current planning direction is maintained. This situation is closely approximated by Scenario 4 (summarized in Table 21). The income distribution for

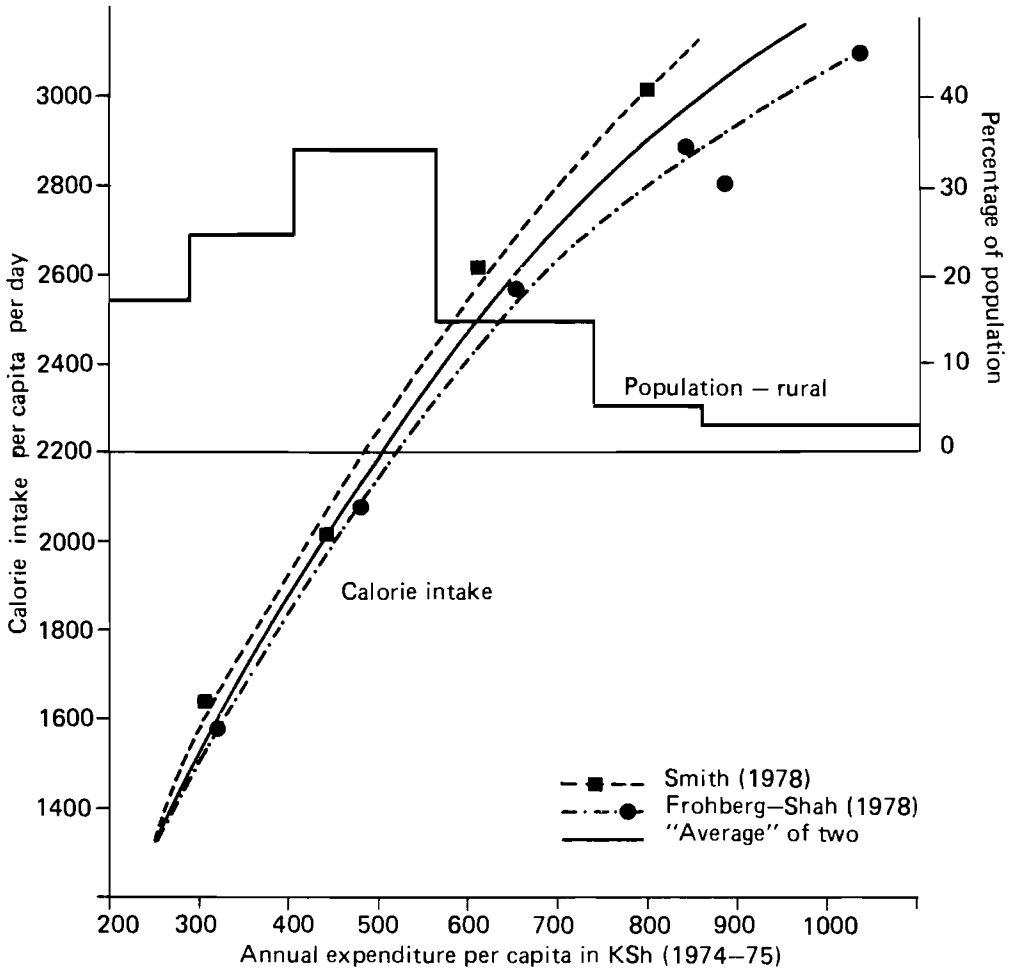

FIGURE 1 Calorie intake versus expenditure for rural Kenya (1974–75).

Scenario 4 is shown graphically in Fig. 2, together with the 1976 distribution (Scenario 1) and the major redistribution test scenarios. If per capita incomes in urban and rural sectors are unchanged, note that national income distribution as measured by the Gini coefficient (see Appendix) will become more skewed. The underlying mechanism that produces these seemingly paradoxical results is that the rural poor maintain their real wage, but there is a larger proportion of people in the urban sector assumed to have the higher real wage there. Thus without real per capita growth *within* each sector it can be expected that the percentage malnourished in rural (33%) and urban areas (20%) will remain unchanged. There will be some improvement in the national figure, however, because of the higher growth rate for the urban areas.

6.2.6 Real Per Capita Income Growth (Scenario 4)

The current plan calls for an annual real income growth of about 1% per capita. Let us suppose that this can be maintained to the year 2000. On average this means that

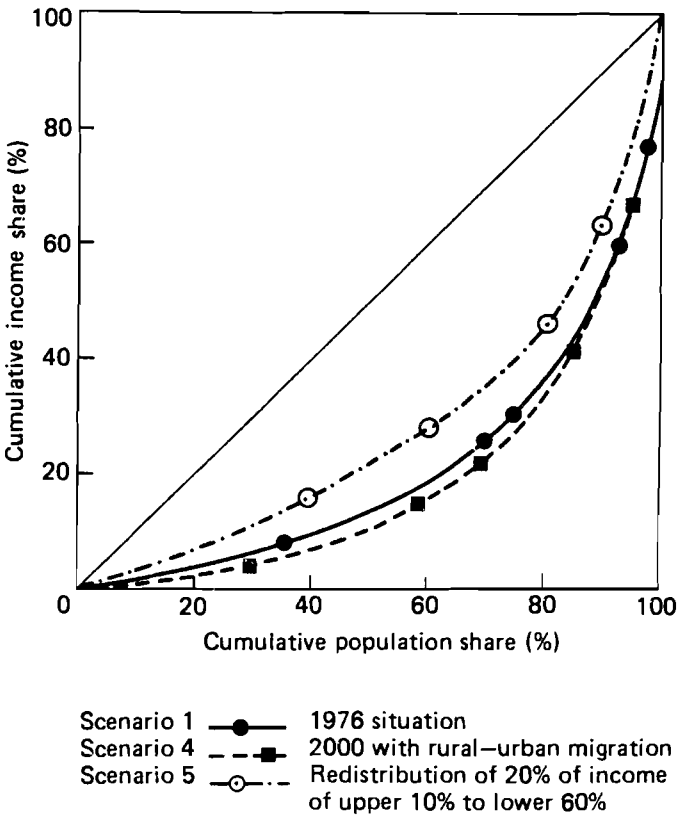

FIGURE 2 Income distribution in Kenya.

within the urban and rural sectors there will be a per capita growth of about 27%. Again, the national average growth rate will be much higher because it is assumed that the urban sector can indeed absorb the high number of rural-to-urban migrants at average urban wage levels. Note that the income distribution will still become more unequal, as shown in Fig. 2.

The caloric intake of the low income rural group should rise by 20%, however, while that of the low income urban group should rise by 10%. The overall impact on nutrition may be approximated from Fig. 3. The cumulative population curve is moved to the right by an amount corresponding to the change in expenditure for each group.

Thus the 27% expenditure gain produces a nonlinear shift, with those at the low end gaining little in absolute terms while those around the 350 KSh level gain a rather substantial 94.5 KSh. Redrawing this curve (Fig. 4) indicates that in this case only about 20% of rural dwellers will remain below the 1800 calorie datum for mild and moderate malnutrition with 11% below the 1.2 BMR level. A similar analysis for the urban sector (Fig. 5) indicates that those below the mild-to-moderate PEM datum will drop from about 20% to 14%.

6.2.7 Income Redistribution (Scenario 5)

In this section we consider the possibility of a major income redistribution. The particular form assumed is summarized in Table 21 as Scenario 5. From the norm, Scenario 1

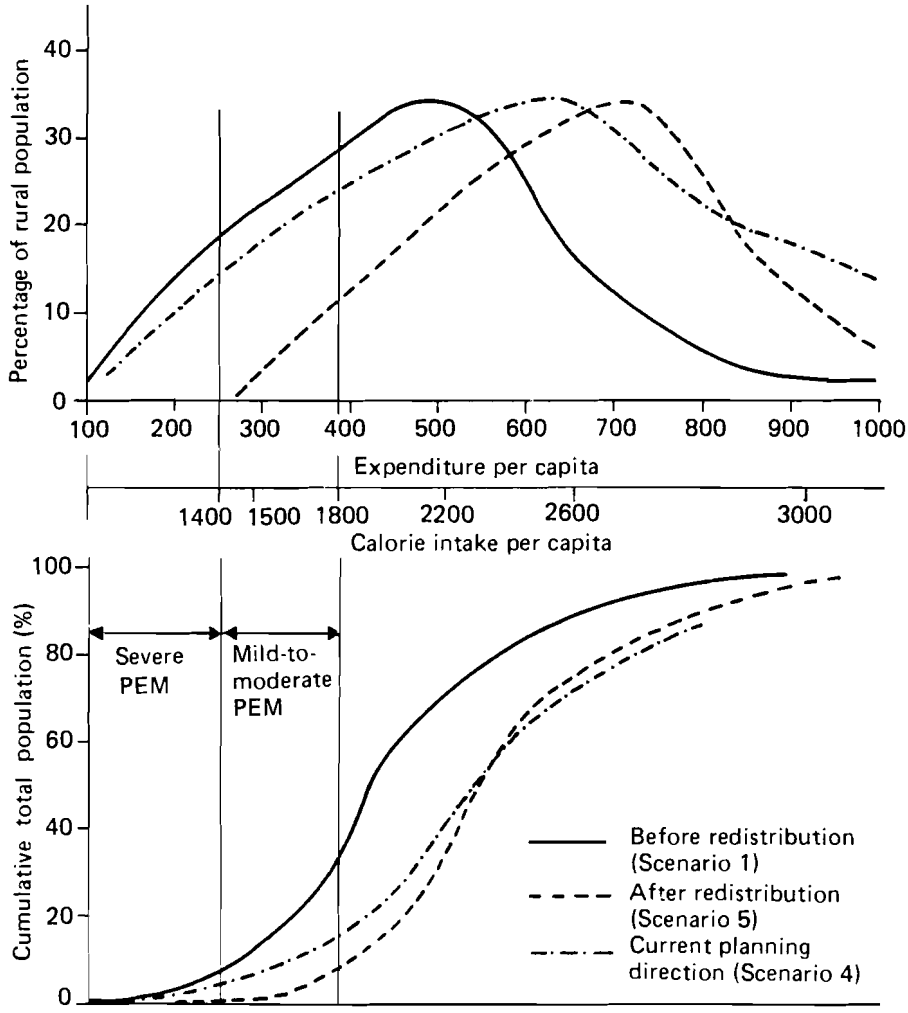

FIGURE 3 Income redistribution at the national level – the impact on the rural population.

(income distribution as in 1976), the following adjustment is made. A slice of 20% of the income is removed from the upper 10% of the population. This reduces their share from 0.457 to 0.366. This income slice is then distributed *equally* (on a per capita basis) to those in the lower 60% of the population. This produces an income gain of 66% for those in the lowest 40% class and a gain of 32% for those in the 40–60 group. (It should be emphasized that it is extremely unlikely that an income redistribution of this magnitude could be achieved without an intervening period of severe dislocation.)

The redistribution on an equal per capita basis is particularly significant for those at the low extreme of the income spectrum. They each receive KSh236; thus the whole population curve is moved laterally through roughly this substantial amount at the lower end. This shift is shown in Fig. 4. On the cumulative curve it is noted that the percentage

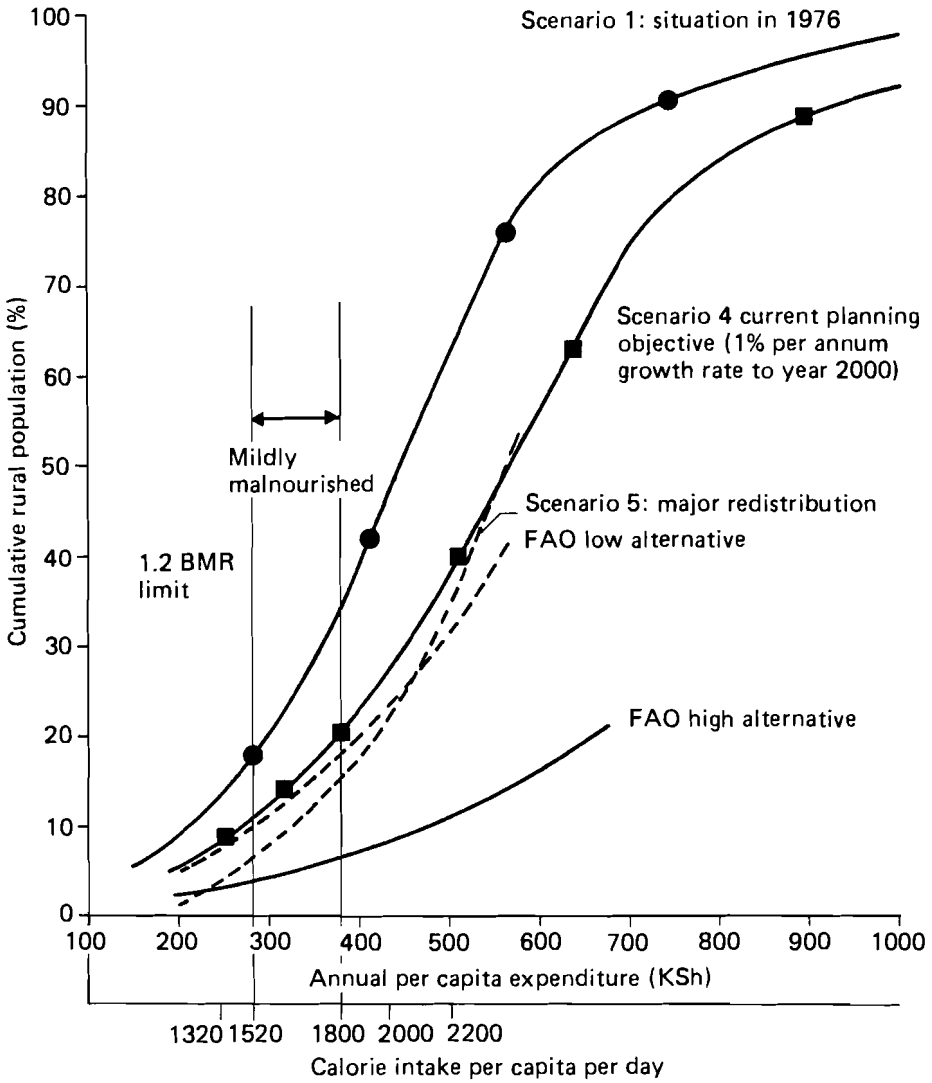

FIGURE 4 Impact of income distribution changes on calorie intake for rural Kenya.

below 1800 calories (the mild to moderate PEM threshold) falls from 33% to 15% and the proportion below 1.2 BMR falls from 17% to 6.5%.

This redistribution mechanism would not benefit the urban poor, who are in a (nominally) higher income bracket, but they could be included by suitable modification of the program.

6.2.8 Scenarios Compared

Scenario 1. The cumulative curves in Fig. 3 give the best indication of the effect of redistribution. The results are summarized in Tables 41 and 42. Note that currently 33% (4.29 million) suffer from malnutrition and that of these there are 2.19 million, 16% of the population, below the 1.2 BMR level.

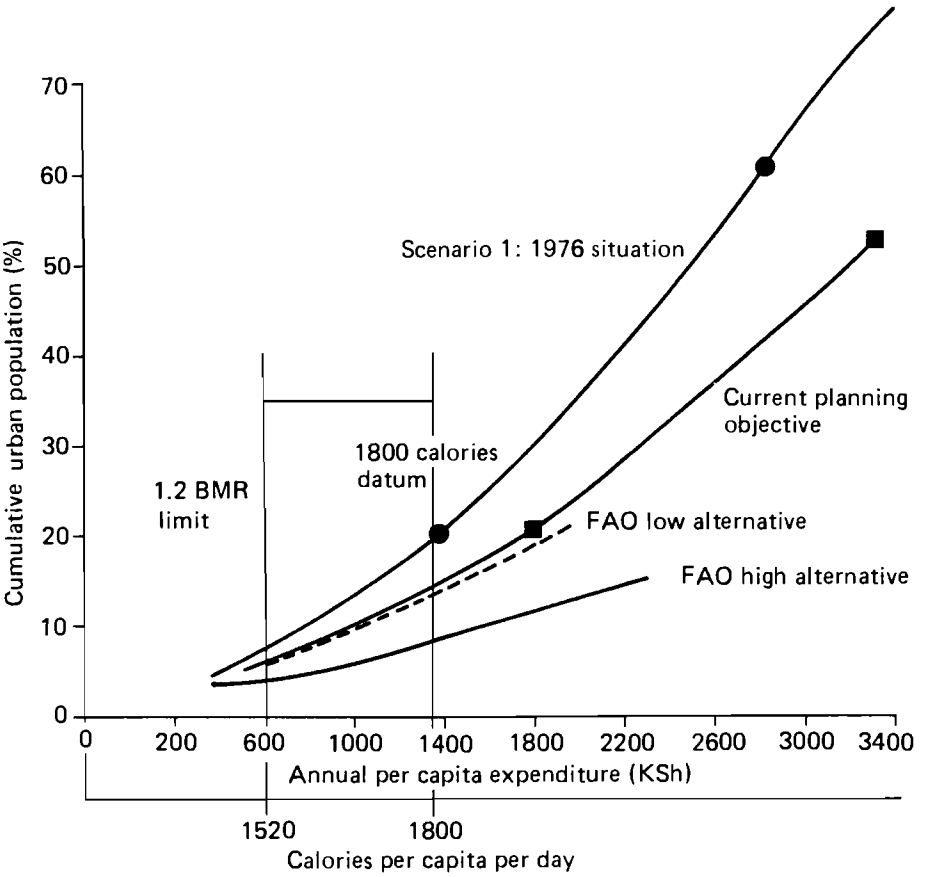

FIGURE 5 Impact of income distribution changes on calorie intake in urban Kenya.

Scenario 2. If the per capita income in urban and rural sectors does not change by the year 2000 then at that time the proportion malnourished will be 29% (9.18 million). There is a slight fall in this share due to increased urbanization, but population growth doubles the number in absolute terms.

Scenario 4. If the per capita growth rate for income of 1% per year is achieved in urban and rural locations, then by the year 2000 the proportion malnourished will be 18% (5.73 million) with 3.01 million or 10% below 1.2 BMR. This is a significant improvement in the percentage measure, but in absolute terms it is rather poor owing to the population growth.

Scenario 5. The impact of income redistribution is evident; in the rural areas the proportion malnourished falls from 33% to 9%, but even more striking is the change in those below the 1.2 BMR level, where there is a fall from 17% to 6.5%. For a normal healthy population one would expect a figure of around 2%.

Scenario 6. This is the FAO low alternative, but it still postulates an average per capita expenditure gain of 37% by the year 2000. The impact would be slightly better than the current planning objective, with an estimated 2.62 million people, or 8.4% of the population, below the 1.2 BMR datum by the year 2000.

TABLE 41 The impact of different scenarios on malnutrition by the year 2000.

Scenario	Mild to moderate PEM (1400–1800 calories per capita per day)	Severe PEM (less than 1400 calories per capita per day)	Total malnourished (less than 1800 calories per capita per day)
Current situation			
Rural			
Per cent	25	8	33
Millions	2.98	0.95	3.93
Urban			
Per cent	15	5	20
Millions	0.27	0.09	0.36
National			
Per cent	24	8	31
Millions	3.25	1.04	4.29
Scenario 4: without income growth			
Rural			
Per cent	25	8	33
Millions	5.68	1.82	7.50
Urban			
Per cent	15	5	20
Millions	1.26	0.42	1.68
National			
Per cent	22	7	29
Millions	6.94	2.24	9.18
Scenario 4: current policy			
Rural			
Per cent	11	5	16
Millions	2.50	1.14	3.64
Urban			
Per cent	9	3	12
Millions	0.76	0.25	1.01
National			
Per cent	10.5	4.5	15
Millions	3.26	1.39	4.65
Scenario 5: income redistribution			
Rural			
Per cent	8	1	9
Millions	1.82	0.23	2.05
Urban			
Per cent	9	3	12
Millions	0.76	0.25	1.01
National			
Per cent	8	2	10
Millions	2.58	0.48	3.06

TABLE 42 The impact of different scenarios on caloric intake by the year 2000.

Population group	Kenya Case Study estimates				FAO estimates	
	Scenario 1: current situation	Scenario 2: urbanization[a]	Scenario 4: current policy to 2000[b]	Scenario 5: major redistribution	Scenario 6: FAO low alternative	Scenario 7: FAO high alternative
Percentage figures						
Malnourished, rural	33	33	20	15	17.5	6.5
Below 1.2 BMR, rural	17	17	11	6.5	9.5	4
Malnourished, urban	20	20	14	14	13.5	8
Below 1.2 BMR, urban	8.5	8.5	6	6	5.5	4
Population in millions						
Malnourished, rural	3.93	7.50	4.55	3.41	3.96	1.47
Below 1.2 BMR, rural	2.03	3.86	2.50	1.48	2.15	0.91
Total rural population	11.92	22.73	22.73	22.73	22.64	22.64
Malnourished, urban	0.37	1.68	1.18	1.18	1.13	0.67
Below 1.2 BMR, urban	0.16	0.72	0.51	0.51	0.46	0.34
Total urban population	1.83	8.42	8.42	8.42	8.38	8.38
Malnourished, total	4.30	9.18	5.73	4.59	5.09	2.14
Below 1.2 BMR, total	2.19	4.58	3.01	1.99	2.61	1.25
TOTAL POPULATION	13.75	31.15	31.15	31.15	31.02	31.02

[a]Real per capita incomes remain unchanged in urban and rural areas, but the total composition changes.
[b]1% growth per year in per capita income for both urban and rural dwellers.
The malnourished datum is 1800 calories per capita per day; 1.2 BMR is 1517 calories per capita per day.

Scenario 7. The FAO high alternative postulates an increase in average per capita expenditure of about 120%. Few countries have ever succeeded in approaching this figure and for Kenya it is extremely unlikely barring a major oil strike. Even then it is not clear that the economy could absorb the impact of a major oil strike. For the record, it is estimated that in this scenario the number below 1.2 BMR would be reduced to 1.25 million, or 4% of the population. Given that one might expect 2% of a normal healthy population to be in this category, this outcome would certainly be desirable, but again, this scenario is extremely unlikely.

The obvious difference between Scenarios 5 and 4, the number in the less than 1.2 BMR category, is due to the lump sum increase being far more effective for the extremely poor than a proportional change in their meager income. Supply should not be a constraint, as evidenced by the production analysis in Section 4.

In summary, steady income growth rates will significantly reduce the percentage in the mildly malnourished category, but for those in the severe category other more direct approaches, such as lump sum transfers, are needed to produce significant change. While removal of malnutrition is a desirable goal, government policy must also strive to satisfy other goals. Some of these may conflict to a degree, so that the policy maker is inevitably faced with assessing appropriate trade-offs.

6.3 Current Government Policy

Viewed in a broad context, the government of Kenya has three broad classes of policy tools at its disposal: monetary, fiscal, and exchange rate policy. With these they aim for (again at a general level) full employment, price stability and external balance. If all these were achieved, goals such as adequate nutrition for all would presumably follow. Currently it may be said that these goals are being achieved with only limited success, so inevitably we must consider whether the tools are being used as effectively as possible.

Contrary to numerous pronouncements on the subject, the rural sector, which includes the vast majority of the population, certainly does not appear to be receiving a reasonable share of the budget. Typical numbers are given in Table 43 for some categories.

TABLE 43 Selected per capita expenditure by province, in Kenya pounds.

Province	Curative expenditure on health (1974–78)	Recurrent expenditure (1973–74)
Nairobi	6.59	70.76
Central	0.50	9.69
Coast	0.97	13.07
Eastern	0.64	6.42
Northeastern	0.04	3.54
Nyanza	0.58	3.28
Rift Valley	0.34	8.84
Western	0.18	4.09

SOURCE: Bigsten (1977).

It appears that resources are strongly directed to the urban areas. The next question is whether this is justified. In terms of the impact on employment and welfare for the bulk of the population, this is evidently not so. Nor does it seem to be paying dividends in terms of the goal for the external balance. Coffee and tea continue to be the mainstay of exports, with a rather dismal export performance for the other sectors. This suggests that strong consideration should be given to reorienting investment toward rural areas. This would involve greater encouragement to agriculture and agrobased industries and a careful pruning of some of the current urban industries.

The Agriculture Ministry, for its part, should seek to encourage the smallholders. In particular, the extension service will have to play its part in ensuring the proper utilization of investments. The share of the Ministry of Agriculture in the current forward budget is more than 12%. If it succeeds in utilizing this, then a substantial improvement in rural welfare should be achieved*.

6.3.1 Recent Policy Initiatives

Recent trends suggest that by the year 2000 there should have been a considerable overall alleviation of poverty. Yet even at this late date many will still be malnourished. This situation may be improved by more direct approaches to the poverty problem. Historically, most policies in Kenya have had a strong production orientation. Such policies often have a fairly undesirable distributional impact, as the more advanced producers are generally better poised to take advantage of them.

The cold world of reality suggests that institutional change generally comes about slowly, so it is much more likely that conventional policies will be modified or reoriented than that major new policies will be introduced. It is interesting to note the response of the government to the dramatic shortfall in the 1979–80 maize crop. Their major policy change was to increase the procurement prices for maize from KSh60 to KSh80 a bag.

Similarly, the plan (1979–83) emphasizes the strategy to be adopted for agricultural development toward the overall plan theme of "the alleviation of poverty". This development of agriculture includes the following initiatives:

- the government will have first option on the purchase of any areas of high potential land greater than 20 hectares offered for sale; this land would then be leased to landless families
- research and extension is to be oriented, with increased emphasis on smallholders
- there is to be an expenditure of K£71 million on small farm areas

The overall growth of employment in agriculture is projected as 2.7% per annum during the plan period, while rural employment is expected to grow at 3% per annum.

The overall share of agriculture in investment will not change very much. It is expected to remain at about 10% of the total while the manufacturing share will approach 20%. This is partly due to increased defense expenditure but also reflects the general feeling that returns on investment in other sectors, notably manufacturing, have simply been higher. This opinion has been much influenced by substantial costs overruns in recent

*The performance of the Ministry during the last few years suggests that they have not been able to utilize a substantial portion of the funds allocated to them.

irrigation schemes. Given the desire of decision makers to favor manufacturing, it seems that a compromise might be to tilt toward food and agrobased industries. If these could also be located in rural areas it would in addition have the socially desirable effect of moderating the urbanization process.

There is another whole set of policies that might loosely be termed consumption policies. In the few months after he took office President Moi proposed a number of interesting initiatives that seemed to signal a major shift in policy making. Notable among these are his pronouncements on literacy, school fees, free milk in schools, and land ownership.

6.3.2 Recent Initiatives for Consumption Policies

The impact on purchasing power of these programs will be strongly progressive and more immediate than anything that may result from the trickle-down effect of more conventional (in Kenya that is) policies.

It has been proposed to abolish school fees forthwith. In Section 3 it was indicated that the smallholders, even at the lowest income levels, strove to achieve some minimum cash level before increasing even food intake above the minimum level. In many instances much of this cash expenditure was for school fees. This policy would in fact be a direct transfer to these groups, and would either release cash for other needs or permit them to retain more of their food production for home consumption. Similarly with the milk program: each school child in standards one to six would be given a free ration*.

It is expected that small-farmers will meet much of the increased demand, but the marketing and storage facilities need considerable improvement.

The campaign aimed at literacy for all by 1983 should be a beneficial enabling investment. It should help to create greater awareness, to bring smallholders together and generally to facilitate the efforts of various agencies such as the extension service to improve their performance.

The overall thrust of the present plan is a greater emphasis on human development and the fulfilment of so-called basic needs. Some of the goals are given in Table 44: food and nutritional intake levels are considered a key measure of the overall planning operation.

Employers have now been directed to increase their work force by 10%. Since this is expected to be accomplished without complete wage constraints, the net effect on income distribution should be progressive.

In addition there is the issue that perhaps evokes strongest feelings among Kenyans – land. This was the issue at the core of the struggle for independence, and it continues to simmer at the front of the sociopolitical scene. Many landless still aspire to their own plot, but it is not clear that this will be physically possible. Some preliminary populist pronouncements indicate that the distribution of land should not deteriorate, and to underline this certain beach areas near Mombasa will be given back to the public.

6.4 Conclusion

The general conclusion is that, with appropriate policies, sufficient food from domestic resources should be available by the year 2000 to feed the expected population at that time of about 30 million people.

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*This program has since been contracted owing to food shortages resulting from inclement weather and a deterioration in the balance of payments.

TABLE 44 Basic needs targets[a].

Target	1976	1983	Measurement
GDP at market prices	1429	2194	K£ million (1976), 6.3% growth rate
GDP per capita	103.9	125.6	K£ (1976)
Inflation	16%	6.8%	Annual rate, GDP
Population	13,752,000	17,470,000	Based on a 3.5% growth rate
Population growth rate	3.5%	3.5%	This may be slightly higher
Crude birth rate	49.0	46.5	Births per 1000 population
Employment			
Modern sector	915,000	1,250,000	
Rural	4,045,000	5,140,000	
Urban informal	125,000	195,000	
Total	5,085,000	6,585,000	
Employment as percentage of labor force	90.6	92.2	
Education (1978–84)			
Rural literacy, population over 15	65% M, 31% F	100% M, 100% F	Ability to read in any language
Primary	3,135,000	3,825,000	Total enrolment
Secondary (government aided)	133,000	157,000	Form 1 to 6 includes vocational, agricultural, commercial
Harambee Institutes of Technology	1007	3859	
Harambee other than Institutes of Technology	190,799	233,000	Assisted and aided, including church and private
Technical	6480	8424	
Polytechnic	3282	4185	
Special education	3619	9629	
University	6250	8900	
Health care			
Hospitals	64	70	Government hospitals – province and district
Health institutions	761	806	Government hospitals, health centers, and subcenters, dispensaries
Doctor density	10.3	11.9	Number per 100,000 population
Registered and enrolled nurses density	95	110	
Access to health centers – rural	11%	12%	Households less than 2 km distant
Malaria	250,000 (1977)	150,000	Number of cases
Water[b]			
Rural holdings	44%	60%	Holdings with water
Rural access to water	11%	8%	Over 2 km to water service

TABLE 44 *Continued.*

Target	1976	1983	Measurement
Housing			
Rural[b], number of permanent structures	27%	30%	Dwellings with corrugated roofs
Dwellings with more than two rooms	48%	52%	
Houses with electricity	1%	1.2%	
Urban			
Number of units planned		13.6	Thousands per annum
Number of plots serviced		5.6	Thousands per annum
Foods[c]			
Calories intake	2070	2220	Per capita per day
Protein intake	57	65.5	Grams per capita per day
Mildly malnourished	30%	22%	Children aged 1–4 years
Severly malnourished	5%	2.5%	Children aged 1–4 years
Rural impoverished	40%	33%	Household income less than K£120 (1975) per year
Infrastructure			
Rural access to –			
Cooperative store	18%	21%	Less than 2 km
Market	38%	47%	Less than 2 km
Duka	64%	70%	Less than 2 km
Bus	46%	51%	Less than 2 km to public bus route
Matatu	61%	67%	Less than 2 km
Primary school	68%	72%	Less than 8 km
Secondary school	54%	60%	Less than 8 km
Telephone	1.01 (1978)	1.52	Per thousand population
Security			
National social security fund	1,028,000	1,333,000	Number of employees registered

[a]This is a selection of targets and is not meant to be exhaustive.
[b]Based on data from Integrated Rural Survey 2, 1976–77. This survey covered rural smallholders and the rural nonagricultural population, who are estimated at 11.7 million or about 80% of the total population.
[c]Based on Integrated Rural Survey 1, 1974–75. This survey covered rural smallholders and represents a population of about 10 million. Parts of the Rift Valley were somewhat underrepresented.
SOURCE: Development Plan 1979–83.

Increased production will mainly be achieved through higher yields as opposed to increasing the land area cultivated by irrigation and drainage. This effort needs to be complemented by an extension service oriented more toward smallholders to help channel the required inputs and expertise. This could be further helped by reorienting investment toward agriculture and rural industry.

Income distribution will be changed to some extent by urbanization and higher productivity. There will still be sharp urban–rural differences and the distribution within

each sector will remain skewed. The inequalities will be gradually reduced, resulting in about 18% of the population suffering from protein energy malnutrition at that time, and still including 10% below 1.2 BMR rather than the 2% that would be expected in a normal healthy population. This is not a very encouraging prospect for the year 2000. These figures could be reduced to 15% and 6.5% respectively by the direct transfer of income to the poorest. Such a dramatic change would require a major reorientation of national policies. This suggests that the potential exists for Kenya in the year 2000 to be a much more egalitarian country than could have been anticipated from policy trends in recent years.

REFERENCES

Aldington, T.J. (1979) The Monitoring of Performance in Agricultural Markets and Its Control. Seminar on Price and Marketing Controls in Kenya, Institute for Development Studies, University of Nairobi, March 1979.

Ascroft, J., *et al.* (1972) Does extension create poverty in Kenya? *East African Journal.*

Ascroft, J., N. Roling, J. Kariuki, and E. Chege (1972) The Tetu Extension Project: First Report of a Field Experiment. University of Nairobi, Institute for Development Studies, Discussion Paper No. 133.

Bigsten, A. (1977) Regional Inequality in Kenya. Nairobi: Institute for Development Studies, No. 330.

Binswanger, H.P., *et al.* (1978) Induced Innovation. Baltimore: The Johns Hopkins University Press.

Blankhart, D.M. (1974) Human Nutrition, in Health and Disease in Kenya, edited by L.C. Vogel, A.S. Muller, R.S. Odingo, Z. Onyango, and A. De Geus. East African Literature Bureau, 1974.

Bohdal, M., N.W. Gibbs, and W.K. Simmons (1969) Nutrition Survey and Campaign against Malnutrition in Kenya 1964–68. Report to the Ministry of Health. (Unpublished.)

Casley, D.J., and T.J. Marchant (1977) Urban Food Purchasing Survey 1977. Central Bureau of Statistics, FAO Marketing Development Project, Nairobi.

Casley, D.J. and T.J. Marchant (1978) Smallholder Marketing in Kenya. FAO Marketing Development Project, Nairobi.

Collier, P. and D. Lal (1978) Poverty and Growth in Kenya. Washington, DC: The World Bank.

Collier, P. (1978) The Rural Economy of Central Province. Mimeo.

Crawford, E. and E. Thorbecke (1978) Employment, Income Distribution, Poverty Alleviation and Basic Needs in Kenya. Ithaca, NY: Cornell University.

Donaldson, G.F. and J.O. Von Pischke (1973) Small Farmer Credit in Kenya. Washington, DC: Agency for International Development.

Faruqee, R., *et al.* (1980) Kenya 1980 – Population and Development. Washington, DC: The World Bank.

Financial Times, 28 July 1980. Special Supplement on the Kenyan Economy.

Frohberg, H.C. and M.M. Shah (1978) Nutrition Status of Rural and Urban Kenya. Marketing Development Project, FAO, Nairobi.

Gerhart, J. (1975) The Diffusion of Hybrid Maize in Western Kenya. Centro International de Mejoramiento de Maiz y Trigo, Mexico.

Gsaenger, H.G. and G. Schmidt (1977) Decontrolling the Maize Marketing System in Kenya. Discussion Paper No. 254, March 1977. Nairobi: Institute for Development Studies.

Hayami, Y. and V.W. Ruttan (1971) Agricultural Development. An International Perspective. Baltimore: The Johns Hopkins University Press.

Hazlewood, A. (1978) Kenya: Income Distribution and Poverty – An Unfashionable View. *Journal of African Studies*, 16, 1.

Heyer, J. (1976) The Marketing System. In Agricultural Development in Kenya, edited by J. Heyer, J.K. Maitha, and W.M. Senga. Nairobi: Oxford University Press.

Heyer, J. and J.K. Waweru (1976) The development of the small farm areas. In Agricultural Development in Kenya, edited by J. Heyer, J.K. Maitha, and W.M. Senga. Nairobi: Oxford University Press.

Hunting Technical Services (1977) Large Farm Sector Study. Nairobi: Ministry of Agriculture.

Hunt, D.M. (1974) Agricultural Innovation in Mbere. Working Paper No. 166. Nairobi: Institute for Development Studies.

Institute for Development Studies (1975) Summary Report of a Workshop on a Food and Nutrition Strategy for Kenya. Occasional Paper No. 14, Nairobi.

International Labour Organization (1972) Employment, Incomes and Equality. A Strategy for Increasing Productive Employment in Kenya. Geneva.

Johnston, B.F. (1977) Food, Health, and Population in Development. *Journal of Economic Literature*, XV(3), September 1977, 879–917.

Kamoun, A. and J. Perisse (1979) Le Prix de la Satiété (The Price of Satiety). FAO Nutrition Division.

Kaplinsky, R. (forthcoming) Ownership and Equity in Kenya, 1966–76.

Kenya, Central Bureau of Statistics.

Economic Survey, 1978, 1979, 1980.

Integrated Rural Survey 1974–75, March 1977.

The Rural Kenyan Nutrition Survey, February–March, 1977.

National Child Nutrition Survey, 1978/79, 1980.

Kenya Statistical Digest, various issues.

Market Information Bulletin, various issues.

Crop Forecast and Crop Review, various issues.

Kenya Fertility Survey, 1980.

Input/Output Tables for Kenya, 1976, October 1979.

The Implications of Kenya's High Rate of Population Growth, *Social Perspectives*, November, 1979.

Statistical Abstract, various issues.

A Brief Review of Farming Activities, Agricultural Census of Large Farms, 1975–1976, 1978.

Kenya, Government. Kenya Development Plan, 1979–1983, 1974–1978. Nairobi.

Kenya, Government (1974) Population Projections During 1969–2000, EPD/SC 417/0. Ministry of Finance and Planning, October 1974.

Kenya, Government (1978) Report on the Nutrition Status of Mwea-Tabere Irrigation Scheme Community, Provincial Medical Headquarters, 1978.

Kenya Ministry of Economic Planning and Community Affairs (1978) Kenya Cooperative Creameries Report.

Kuznets, S. (1966) Modern Economic Growth. New Haven: Yale University Press.

Ley, C. (1975) Underdevelopment in Kenya: the Political Economy of Neocolonialism. 1964–71. London: Heinemann.

Leonard, D.K. (1977) Reaching the Peasant Farmer. Chicago: University of Chicago Press.

Lijoodi, J.L. and H. Ruthenberg (1978) Income distribution in Kenya's agriculture. *Zeitschrift für ausländische Landwirtschaft* (Journal for Foreign Agriculture), April–June 1978.

Long, M. (1978) Interest Rate Policy of Credit. Mimeo.

Massel, B.F. and J.U. Heyer (1969) Household expenditure in Nairobi: statistical analysis of consumer behavior, *Economic Development and Cultural Change* 17(2), January 1969.

Mbaja, G.O. and J. de Graaff (1978) Milk Marketing and Pricing in Kenya: The Role of Cooperatives Marketing Development Project. Nairobi: FAO.

Mwangi, W.M. (1978) Farm Level Derived Demand Responses for Fertilizer in Kenya. Unpublished PhD thesis, Department of Agricultural Economics, Michigan State University, East Lansing.

Ndegwa, P. (1979) Review of Statutory Boards. Nairobi: Government of Kenya.

Ng'ethe, N. (1976) Income Distribution in Kenya: The Politics of Mystification and Possessive Individualism. September 1976. Nairobi: Institute for Development Studies.

Ng'ethe, N., *et al.* (1977) Reaching the Rural Poor: Lessons from the Kenyan Special Rural Development Programme. Working Paper No. 296. Nairobi: Institute for Development Studies.

Otieno, J.O., *et al.* (1978) Basic Agricultural Data for Kenya. Ministry of Economic Planning and Community Affairs, Government of Kenya. November 1978.

Pratt, D.J., P.J. Greenway, and M.D. Gwynne (1966) A Classification of East African Rangeland, with an appendix on Terminology. *Journal of Applied Ecology*, No. 3.

Pratt, D.J. and M.D. Gwynne (1977) Rangeland Management and Ecology in East Africa. London: Hodder and Stoughton.

Ruthenberg, H. (1978) Outline of a Strategy for Agricultural Development in Kenya. Mimeo.
Schmidt, G. (1979) Effectiveness of Maize Marketing Control in Kenya. University of Nairobi, Institute for Development Studies.
Schönherr, S. and E.S. Mbugua (1974) Extension Methods to Speed up Diffusion of Agricultural Innovations. Discussion Paper No. 200. University of Nairobi, Institute for Development Studies.
Schultz, T.W. (1978) Distortions of Agricultural Incentives. Indiana University Press.
Shah, M.M. (1978) Food Demand Projections Incorporating Urbanization and Income Distribution. FAO Marketing Development Project.
Sharpley, J. (1980) Pricing Policies and Rural Incomes in Kenya. A 174, Ferag Working Papers, The C.H.R. Michelsen Institute, Bergen, Norway, April 1980.
Smith, L.D. (1976) An Overview of Agricultural Development Policy. In Agricultural Development in Kenya, edited by J. Heyer, Maitha, and Senga. Nairobi: Oxford University Press.
Smith, L.D. (1978) Low Income Smallholder Marketing and Consumption Patterns, Marketing Development Project, FAO, Nairobi, September 1978.
Staudt, K.A. (1977) Inequalities in the Delivery of Services to a Female Farm Clientele: Some Implications for Policy. Discussion Paper No. 247. Institute for Development Studies.
Tidrick, G. (1979) Kenya: Issues in Agricultural Development. Mimeo. Ministry of Agriculture, Nairobi.
Toskoz, S. (1979) Irrigation and Drainage Development in Kenya – Some Policy Issues. Development Planning Division, Ministry of Agriculture, Nairobi, March 15, 1979.
United Nations Food and Agriculture Organization (1977) World Food Survey. Rome.
von Kaufman, R. (1976) The development of range land areas. In Agricultural Development in Kenya, edited by J. Heyer. Nairobi: Oxford University Press.
Von Pischke, J.D. (1976) A Critical Survey of Approaches to the Role of Credit in Smallholder Agriculture. Discussion Paper No. 233, March 1976.
World Bank (1973) Agricultural Sector Survey – Kenya, Vol. II.
World Bank (1978) World Development Report. Washington, DC.

APPENDIX: The Gini Coefficient

The Gini coefficient is a measure frequently used as an indicator of income inequality. The coefficient is computed from a Lorenz curve obtained by plotting the cumulative share of the population on the horizontal axis and the corresponding cumulative share of total income on the vertical axis. A typical Lorenz curve ABC is shown in Figure A1. This

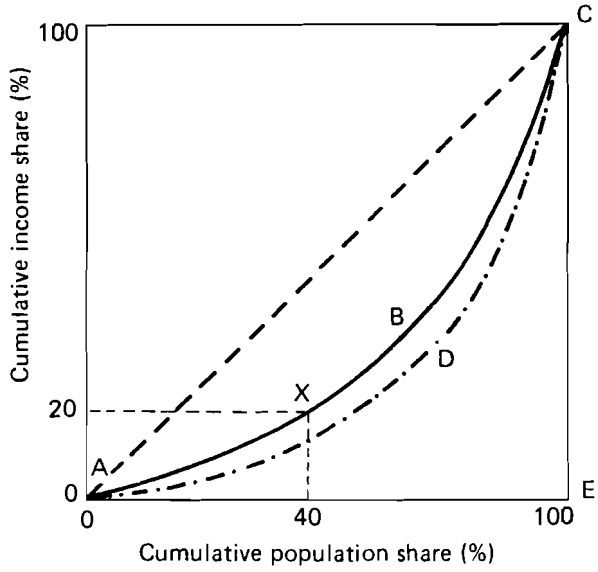

FIGURE A1 Income distribution in Kenya.

curve may be interpreted as follows. The point X on the curve indicates that the lowest earning 40% of the population receives 20% of the total income. If income were distributed absolutely equitably then the corresponding Lorenz curve would be the diagonal AC. For the limiting inequitable distribution the Lorenz curve would be AEC. This latter case would correspond to the situation where all but one of the population had zero income while one person received the entire income. A population with Lorenz curve ADC would have greater inequality in its income distribution than one with the curve ABC.

The Gini coefficient, then, is the ratio of the area between the curve and the diagonal (ABCA) to the area of the triangle AEC. Thus the Gini coefficient can vary in principle from zero (absolute equality) to unity (complete inequality). For most countries the Gini coefficient lies between 0.4 and 0.6.

It should be emphasized that the Gini coefficient is simply one summary statistic of income inequality and should be interpreted with caution.