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IIASA Working Paper

WP-96-073

August 1996

Working Paper

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ABSTRACT

The database structure for agro-ecological land resources assessment for development planning in Kenya comprises two broad categories of data: the Land Resources Inventory (LRI) and socio-economic data or statistics. Socio-economic data, compiled primarily from Kenyan sources, are records of actual population, land use, crop production, livestock population, farming inputs, food, demand, etc. The agro-ecological zones (AEZ) methodology utilizes the LRI to assess, for a given level of input, all feasible agricultural land use options as well as expected production of relevant and agro-ecologically feasible cropping activities. With the benefit of socio-economic parameters which are used to define constraints, targets, production and consumption levels for planning objectives, optimal resource allocation schemes corresponding to the desired objectives can be derived. The administrative districts of Kenya cover a wide range of physical conditions and socio-economic characteristics. It has been necessary, therefore, as part of the update of the socio-economic database for Kenya to disaggregate socioeconomic data, where possible, at the district level. This update includes also new estimates of socio-economic parameters that will facilitate analysis at the district level. These new estimates and disaggregation represent certain methodological improvements in the application of the AEZ methodology to development planning in Kenya.

ACKNOWLEDGEMENTS

The authors gratefully acknowledge the financial support provided by the Food and Agricultural Organization of the United Nations for carrying out a Case Study of Kenya within the framework of Project FP/4102-93-01 (PP/3037) Climate Change and Global Agricultural Potential.

The study has greatly benefitted from the active participation of staff members from the National Agricultural Research Laboratories of the Kenyan Agricultural Research Institute and the Ministry of Planning and National Development of Kenya. We thank Dr. F. N. Muchena and Mr. W. Aore for organizing and coordinating the research inputs from the Kenyan participants.

Finally, the authors want to acknowledge with thanks the critical review and constructive comments by Dr. H. T. van Velthuizen on various aspects of the work presented in this report.

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INTRODUCTION

The database structure for agro-ecological land resources assessment for agricultural development planning in Kenya comprises two broad categories of data: the Land Resources Inventory (LRI) and socio-economic data or statistics. The LRI consists of inventories of climate, soil and landform conditions and specific land use information such as game parks and cashcrop zones, assembled over the years and updated to adjust for new information. Using a geographic information system (GIS), these inventories have been overlaid on the soil map of Kenya to derive agro-ecological zones---tracts of land with unique combinations of climate and soil, and other factors (FAO, 1993). Within these unique ecological land units (agro-ecological cells) soil, land form and climatic conditions are quantified. Socio-economic data are numerical information on potential[1] and actual population, land use, crop production, livestock, farming inputs, etc. These have been compiled primarily from Kenyan sources. They are useful for specifying constraints (and targeting objectives) of a resource allocation problem. In agro-ecological zone (AEZ) modeling, socio-economic variables, however, can not always be directly used as model inputs but must, sometimes, be transformed first into parametric forms (e.g., rate of land depletion, per capita food demand projections, livestock density, etc.). Such parametric derivatives form part of the socio-economic data base.

The AEZ methodology utilizes the LRI to assess, for a given level of input, all feasible agricultural land use options as well as expected production of relevant and agro-ecologically feasible cropping activities. On the basis of these assessments and using the socio-economic

[1]Including, intermediate input data generated from preliminary land productivity and crop suitability assessments.

data to specify constraints, targets and production options, spatial resource allocation objectives can be optimized[2]. The optimization results provide perspectives on the capability of Kenya's land resources, technology, and policy, etc., to improve as well as sustain agricultural production. These perspectives are intended to provide a useful guide to national planning. This paper describes the socio-economic data base and the derivation of its parametric values.

Sustaining agricultural or food production is a major agricultural development policy of the Kenya government as set out in various government documents (see for example, Republic of Kenya, 1986, 1994a; 1994b). This policy recognizes the importance of the agricultural sector which in 1992 accounted for about 27% of Kenya's total Gross Domestic Product (GDP), about 81% of total employment in the economy, and also earned substantial amount of foreign exchange. The agricultural development policy of Kenya defines specific objectives and targets that include but not limited to: growth of agricultural GDP, increasing foreign exchange earnings, enhancing food security and nutritional status, increasing employment and revenue generation, combating rural poverty and ensuring regional equity, increasing farm incomes, improving resource conservation. Insofar as socio-economic data reflect the demands placed on the agricultural sector or of changing conditions and needs, a reasonable assessment and attainment of these objectives will depend, in part at least, on reliable estimates of the socio-economic parameters.

The data presented in this report are mostly at the district level since the emphasis is on district analysis. There are eight administrative Provinces including Nairobi. Each province, except Nairobi, is made up of Districts divided further into smaller administrative formations (e.g., division, location, sub-location). Until recently there were forty-one districts[3] in Kenya.

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[2]Two alternative optimization techniques are applicable in this regard: the linear programming technique and the multi-criteria optimization technique.

[3]This number has increased. In the Eastern Province, Kitui district has been split into Kitui and Mwingi; Machakos into Machakos and Makueni; Meru, into Meru and T/Nithi. In the Nyanza Province, South Nyanza district has been split into Homa Bay and Migori districts; and Kisii into Kisii and Nyamira districts. In the Rift Valley Province, Kericho district has been split into Kericho and Bomet districts. And in the Western Province,

Because of the lack of adequate or sufficient information on the newly created districts, data presented in this report are only for the original forty-one districts. For the same reasons data have not been reported at beyond the district level.

1. POPULATION

The 1989 census results provide the basic population figures. These have been projected by the Ministry of Planning and National Development to 1990, 2000, and 2010 at the respective annual growth rates of 3.5% (1989-1990), 2.7 % (1990-2000), and 2.2% (2000-2010). Simple exponential projections of population usually assume that demographic features such as age-specific-death and age-specific-fertility rates are constant over the projection period. For short-term projections of only a few years this assumption may be reasonable. But for projections over the long term (ten or more years) during which changes occur in the demographic transition the assumption may no longer be tenable. Demographic developments in Kenya in the past twenty years indicate that progress has taken place in the demographic transition. Total fertility rate has fallen from 8.0 children per woman in the late 1970s to 6.7 in the late 1980s (Cohen, 1993)[4], and the probability of dying by age 5 has been halved between 1945 and 1985 (Hill, 1993)[5]; and mortality, also, has decreased between 1970 and 1988. **Table 1.0** presents the population data by district/province. In 1989 the population of Kenya was reported as 21.4 million. This was projected to reach 22.2 million in 1990, 29.1 million in 2000, and 36.3 million in 2010.

Population plays diverse roles in an economy and particularly in development planning. The pool of labor force is drawn from it and, generally, it fosters (or can foster) industrial growth by expanding domestic demand. Population provides the basis for assessing progress in economic development (growth)[6], and for setting targets (objectives) for the same. By

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Bungoma district has been split into Bungoma and Mt. Elgon districts while Kakamega has been split into Kakamega and Vihiga districts.

[4]van de Walle (1993), however, argues that age at marriage has changed little.

[5]This is generally true for most developing countries.

[6]As when development indicators are measured in per capita terms, or population growth is compared with growth in major economic indicators, e.g., value of agricultural output. Generally, it is desirable (and indicative

expressing resources (e.g., land) in per capita terms, their real scarcity is readily appreciated. Per capita arable land has, over the years, been on the decline and seems poised to continue in this downward trend. Using World Bank population projections and FAO estimates of potential arable land, cultivable[7] land area per capita was 0.64 ha in 1964/66 and had dropped to 0.34 ha by 1989/91 and is even projected to further fall to 0.17 ha and 0.08 ha in 2000 and 2025, respectively. This problem is not unique to Kenya. For example, cropped area per capita in Egypt amounted to 0.12 ha in 1976; by 1990, it had fallen by some 17% to 0.1 ha per capita and is estimated to further decline to 0.05 ha per capita by the year 2060 (Onyeji and Fischer, 1994). This trend is also borne out by sub-Saharan Africa as a whole. Cultivable land area per capita for the region was estimated at 3.3 ha in 1970; by 1990 it had fallen to 1.8 ha and is projected to further decline to 1.3 ha and 0.7 ha per capita by the year 2000 and 2025 respectively (Rempel, 1994). Even if uncropped land with rainfed crop production potential in developing countries appears large, only very few countries hold much of the land balance: Brazil, in South America and Zaire in sub-Saharan Africa (FAO, 1993).

Thus, level and growth of population are important parameters in AEZ modeling. To facilitate their use in setting objectives or targets for district-level analysis, it has been necessary to disaggregate[8] the 1989 population into its urban and rural components. Disaggregation was achieved by first estimating urban population for each district on the basis of estimates of district urban population for 1979 reported by Jaetzold and Schmidt (1982) in accordance with the Kenya population census of that year. For 1989 we then identified the same urban places reported by Jaetzold and Schmidt, and treated their 1989 populations as the 1989 urban populations for the corresponding districts. In cases where the 1979 urban towns reported by Jaetzold and Schmidt were not available in the current (1989) records, the 1979 populations of such urban towns were respectively projected to 1989 and

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of progress) for population growth to lag behind economic growth as measured by growth in the value of sectoral outputs.

[7] Estimates include land assessed as "very suitable" as "suitable" for crop production, corrected for fallow requirements, protected land, habitation and infrastructure requirements.

[8] This disaggregation will become handy when we estimate per capita food consumption in a later section.

the resulting values taken as the urban populations for the corresponding districts. In this projection due consideration was given to the overall potential and prospects for urbanization in the districts. Once the urban population for a district was approximated in this manner, the corresponding rural population was obtained by subtracting the urban population from the total district (1989) population. For the district of Mombasa and for Nairobi (the two places that dominate Kenyan urban population) whose population figures were not reported by Jaetzold and Schmidt we assumed an urban population share of 95%). The results of this disaggregation are presented in **Table 1.1**. The aggregate percentages of urban (20.1%) and rural (79.9%) population arrived at in this manner seem reasonably close to the projections by the Food and Agriculture Organization of the United Nations (FAO). For 1988/90 FAO estimates Kenyan nonagricultural and agricultural[9] populations as 22.6% and 77.4% of total population respectively.

Whereas in the mid-1970s urban areas consisted mostly of Nairobi, Mombasa, Kisumu and Nakuru (Fischer and Shah, 1985, etc.) all of which accounted for more than 80% of total urban population, by 1989 (**Table 1.1**) urbanization had spread into more districts: Machakos, Kiambu, Meru, Bungoma and Uasin Gishu. These nine districts together account for more than 70% of urban population (and 23% of rural population).

2. LAND USE

The total land area of Kenya is roughly 580 thousand square kilometers, about 8% of which is estimated to be used as agricultural land (Republic of Kenya, 1992). Ministry of Agriculture defines three categories of land in relation to annual rainfall (Republic of Kenya, 1991, Table 71). According to this classification, about 12% of the land is in the high potential zone, some 6% in the medium potential zone, and 74% is in the low potential zone. The remainder, roughly 9%, is termed "All other land" and has not been classified according to potential. Thus land is a major constraint to agricultural activity. **Table 2.0** describes the present land

[9]The actual designation by the FAO is agricultural/nonagricultural population rather than rural/urban. But these two designations are often synonymous with one another. In the Kenyan case where rural population may be broadly classified into pastoral, small holder, and large farm areas this synonymity is quite in order since these three broad categories are essentially agriculture-based.

use pattern in Kenya. Information on land use and land availability provides useful guide for the setting of physical constraints on land when modeling optimal resource allocation within the AEZ framework. However, it is not so much the availability of land as the quality (or suitability) of available land that makes for productive agriculture - especially in those systems where technology and inputs still play a limited role. Available (arable) land, moreover, gets encroached upon for non-agricultural purposes[10] making it necessary to take into account such land encroachments in order to obtain more realistic results. Increasing population density, scarcity of good quality land and limited technological inputs are familiar characteristics of the Kenyan agricultural system. The present inventory and overview of land availability and use patterns in Kenya helps to conceptualize land use scenarios necessary for obtaining solutions for the desired agricultural policy objectives. According to **Table 2.0**, about 37% of total agricultural land is located in the Rift Valley province, 23 % in the Eastern province, 8% in the Nyanza province, 8% in the Coast, and about 11% in the Western provinces. The North-Eastern province has almost no agricultural land.

2.1. Land Suitability Classes

An initial AEZ assessment of resources indicates the productive potential of land and of individual crop suitability determining simultaneously the extent of potential arable land as well as of land quality classes. Five such classes are defined according to crop production potential. Specifically, the productive potential of land with regard to a particular crop type is defined in terms of average attainable yields: the closer is the average attainable yield of a land unit to the maximum agro-climatic yield of that crop, the more suitable is the land for agricultural production. The results from this assessment, by land unit and crop type, provide a fundamental input into the optimization routines that finally solve for optimal resource allocation scheme(s). The five land suitability classes[11] are: C1, denoting land whose average attainable yield is greater than 80% of maximum agro-climatic yield; similarly, C2, C3, C4

[10]This tendency is indicated by population density (persons per land area) or the rate of urbanization.

[11]A set of assumptions underlies land suitability definition. The present results are based on the assumption of single crop suitability and production potential on all lands that are not indicated as forest zones, game park, or belong to an irrigation scheme (See Fischer et al (1991).

and C5 each denote land classes whose average attainable yield ranges between 60-80%, 40-60%, 20-40%, and 5-20% of maximum agro-climatic yield, respectively. Only land in suitability classes C1 to C4 are considered viable for agricultural production. Suitability class C5 includes land that is only very marginally suitable[12]. For the purpose of this report, potential arable land is defined to include only land classes C1 through C4. Note that the results also include an assessment of soil and terrain conditions.

The distribution of potential arable land by province is presented in **Table 2.1**. Most of the potentially very high productive land (about 61%) in Kenya is located in the Rift Valley province which accounts for about 30% of total land area. In contrast, the provinces of Nyanza, Western and Central have about 12%, 3%, and 10% of the most productive land class (C1) respectively while accounting together for less that 7% of total land area in the country. North Eastern province has the third largest share (22%)[13] of total land area although most of this land (>99%) is unsuitable for cultivation and none at all is in the C1 suitability class. On the whole, the preliminary land suitability assessment indicates the Rift valley province as having the largest share (about 42%) of potential arable land in the whole country; about 17% of this province's total land area is deemed potentially arable, although about half of this falls in suitability class C4. Intra-province comparison reveals that about 50% of the total land area in Nyanza and Central provinces and more than 70% in the Western province are potentially arable. For the remaining provinces this share is assumed to be sometimes significantly less than 20 percent of the total land area.

Based on the mean total dominant length of growing periods (LGPs)[14], land classes have also been assessed for four broad categories of agro-climatic zones[15] as shown in **Table 2.2.** The

[12]See Fischer et al (1991) for further details on suitability classification.
[13]After Rift Valley (30 %), and Eastern (27%) provinces.
[14]Mean total dominant length of growing period is defined as the number of days when available soil moisture (assuming 100 mm soil depth) exceeds 0.5*PET (potential evapotranspiration). Note that in Kenya this will often occur in two distinct growing periods.
[15]Agro-climatic zones as used here refer to mean total length of growing period (LGP) comparing soil moisture conditions determined by a water balance model to potential evapotranspiration. (see FAO/IIASA, 1991).

arid zone includes land areas with LGP less than 120 days: the semi-arid zone describes areas with LGPs of 120 to 179 days; the subhumid zone comprises of land areas with LGPs between 180 to 270 days; and the humid zone has land areas where LGPs exceed 270 days.

Table 2.2 shows arable land distribution by productivity classes and climatic zones. The assessment excludes land indicated as forest or park/reserve areas. About 36% of land with very good, good and moderate productive potential (classes C1-C3) is located in the humid zone, 54% in the sub-humid zone, 10% in the semi-arid zone and <1% in the arid zone. Similarly, of all the land in Kenya's entire arid zone <1% is assumed as suitable for rainfed agriculture (C1-C4); the percentages for the semi-arid, sub-humid and humid zones are respectively, 19%, 61% and 50%. The preliminary land suitability assessment indicates that more arable land area (62%) is potentially located in the humid/subhumid zones than in the arid/semiarid zones which account for 38%[16].

2.2. Urbanization and Land Encroachment

Kenya is largely an agricultural economy[17] dominated by small holder farms, particularly, in the Central, Eastern, Nyanza, Western, Rift Valley and Coast provinces[18]. In 1961, agricultural population accounted for 89% of total population. By 1990 this share has declined to 76%. Similarly, agriculture's contribution to GDP has steadily declined over the years, and so has the share of the agricultural labor force in the total labor force. With the gradual decline of agricultural population - a familiar trend in the process of economic

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For broad agro-climatic characterization we distinguish an arid zone, with LGP less than 120 days, a semi-arid zone (LGP between 120 to 180 days), sub-humid zone (LGP from 180 to 270 days), and a humid zone with LGP exceeding 270 days.

[16]The picture changes somewhat if potential arable land is defined to include land suitability classes C1 through C5 for then, more arable land (51.4%) would be located in the arid/semiarid areas than in the humid/subhumid zones (48%). Arid and semiarid lands are of lesser productive quality and the areas in Kenya are, not surprisingly, prone to famines and food crises; accordingly, this definition of arable land, perhaps more than the present working definition that includes only land classes C1-C4, seems to suggest the need for greater technology-orientation in farming practices such as could make less (marginally) productive arid lands potentially more productive. Defining arable land to include only land in classes C1-C4 leaves us with a disproportionate share of low productivity lands; this would seem to be making a case for greater integration of crop-livestock systems as part of a technology-oriented strategy for increasing food production and self-sufficiency. The possibility that such combined strategy would sustainably meet the needs of a growing population is demonstrated by the AEZ methodology.

[17]Though with some (important) diversifications in tourism, services, industry, etc.

[18]Large farms, though, are found in the Rift Valley and Central provinces.

development - rural Kenya is also gradually urbanizing. Kenya's urban population is projected to increase from 3.8 million in 1989 to 6.4 million in 2000 at the annual rate of 4.8% (Republic of Kenya, 1994). Inevitably, this increase in urbanization creates competition over land between agriculture and human settlements. Because this trend affects land use patterns, an index of land depletion as population increases is an important parametric input in the AEZ methodology of land resources assessment.

2.3. Land Depletion Factor

In the past, AEZ assessments for national planning in Kenya have used a land depletion rate of 0.01 hectares per person obtained on the assumption of a linear relationship between population increase and the depletion of available land. This index has been criticized as probably excessive (Republic of Kenya, 1986). Moreover, that the relationship between land depletion and population growth is more likely to be nonlinear than linear prompted some objections. Subsequently, a rate of 0.0037 hectares per person was adopted and generalized to all Kenya. This rate was derived using data for the Central province district of Kirinyaga (Republic of Kenya, 1986) which, however, is a fairly densely populated district (264 pers./sq. km). Not only do we not know the procedure used in deriving the rate of 0.0037 hectares per person, the implied assumption that Kirinyaga's rate of land depletion (as population increases) applies to both low and high density districts alike is probably incorrect and is very likely, therefore, to result in sub-optimal resource allocation solutions for low density areas[19].

The FAO (1993) estimates human settlement areas for developing countries (excluding China) as 94 million hectares or 1.4% of their total land area in 1990. This estimation was based on Chinese data on population density and non-agricultural land[20] use per person. While estimation results based on a Chinese model may yield approximations to actual

[19]Even high density districts are not necessarily homogeneous and therefore are very likely to vary in the rate at which per capita proportion of land is allocated to nonagricultural uses (urban residential and infrastructural needs) as population increases.

[20]Residence and infrastructure areas.

human settlement areas for the rest of the developing countries it should, however, be kept in mind that because of their specific, internal dynamics individual countries are likely to exhibit different land encroachment tendencies than are suggested by the Chinese data. Thus if a given developing country's response to changes in population density differs from Chinese response, then the use of Chinese model to approximate encroachments on agricultural land will most probably give misleading results. For similar reason, differences in the rate of agricultural land depletion may not only exist from one country to another but also from one region to another within a country.

To overcome some of the shortcomings of previous efforts to obtain a land depletion index an attempt has been made to derive a functional relationship as a means to estimating the rate of land depletion over time. The results of the derivation are presented in this report. The hypothesized functional relationship was estimated by the method of nonlinear regression. Several functional forms were tried out using district data of non-agricultural land per capita (dependent variable) and district population density (explanatory variable). The hypothesized functional form which exhibited the best fit to the data is:

$$Y = \frac{1}{(\alpha + \beta X)} + \delta + \varepsilon \qquad (1)$$

where Y is non-agricultural land per capita (hectares/capita); X is population density (persons per hectare), and α , β and δ are parameters to be estimated. ε is a random disturbance term. Estimating equation (1) yields the following results:

parameter	estimates	T-value
α	4.2644	5.16
β	28.182	5.65
δ	0.0074165	3.68

R. squared = 0.74; No. of obs.= 39.

Judging from the statistics the hypothesized nonlinear equation seems to fit the data well. The parameter estimates are statistically significant and the r-squared indicates that about 74% of variations in the dependent variable is accounted for by the explanatory variable. Note that the *t* statistics are applicable in the nonlinear case for performing *t*-tests since they are obtained in the final linearization of the iterative process used in the nonlinear estimation (see, Pindyck and Rubinfeld, 1981). Let us note that also in the nonlinear case the r-squared still retains its usual indication of overall fit[21]: **Figure 2.0** presents a scatter plot of the predicted and observed nonag land values against population density. Evidently there is a marked similarity in trend.

The above results indicate that as population density increases to high concentrations the resulting encroachment upon land for residential and infrastructure purposes will approach 0.0074165 hectares per person - this being the limit value that non-ag. land requirement will take when population density increases indefinitely. For district analysis it is now possible to input a land depletion parameter that is specific to the location of interest by obtaining a prediction of non-agricultural land use per capita from the estimated model. These estimates are, however, tentative - needless to say. For although they appear reasonable and seem to compare well with similar estimates derived for other developing countries e.g., China, their estimation may not have captured all the relevant factors of urbanization and land encroachment. Nevertheless, the derivation of these new land depletion rates for Kenya represents certain methodological improvement in the application of the AEZ methodology. It is hoped that this, in turn, will improve the accuracy of AEZ assessment results.

3. PRODUCTION

FAO (1993) projects that crop production in developing countries will increase by 66% (an annual rate of 2.4%) from 1988/90 to 2010 and that this aggregate growth over the projected

[21]A sample size of 39, as in this case, is probably also in order. Goldfeld and Quandt (1972) show that a sample size of 30 is sufficiently large for estimators to display their asymptotic properties particularly if emphasis is on estimating coefficients (as in the present case) rather than on estimating estimator variances in which case large sample sizes may be needed.

period will derive from two sources: increases in yield, and expansion of harvested area. The latter source of growth is supposed to come about through expansion of arable land and through increase in cropping intensity. Given the steady decrease in per capita arable land noted above, increases in cropping intensity - in combination with higher crop yields and better crop mixes, especially in the arid and semiarid areas with short rainy season - would seem the likely source of future growth in agricultural production in Kenya. The observed production patterns reported in this paper provide a useful background for the planning activity entailed in AEZ methodology applications. Observed production patterns enable appropriate anticipation of agricultural productivity constraints and options[22]. The present level of farming technology in Kenya suggests that higher (advanced) levels of agricultural technology would be necessary[23] in order for the country to meet the established production targets that will ensure self-sufficiency in food by the year 2000 (see Republic of Kenya, 1994).

Production data are district-level observations on crop and livestock production. Livestock data are population figures for livestock. Food crops for which data are reported are maize, wheat, millet, beans, cassava, sorghum, and rice. Cash crops include tobacco, tea, pyrethrum, sisal, sunflower, coffee, and cotton. Crop production data relate to output, harvested area and material (fertilizer, seeds, machinery etc.) and service (marketing, transportation, planning, insurance etc.) inputs. Presented in this report are the three year average (1989-1991) of crop output and area harvested. Since data were not provided on all of the crops listed above, supplementary data have been taken from the National Water Master Plan of Kenya (Republic of Kenya, 1992). This was the case for production and acreage data for beans (Eastern Province), maize, sorghum, millet, beans and cassava (Nyanza Province), rice (Western Province), and millet and beans (Coast Province). Occasional single entry omissions (or doubtful entries) have been filled-in similarly. Examples in the latter case are

[22]Including technological.

[23]That the high annual rate of growth (6.2%) in agriculture for the period 1963-1973 could not be sustained thereafter has been attributed to decline in technical progress in seed varieties among other causes (e.g., the lack of new high-quality land on which to expand production, poor weather.).

cassava production and acreage data for Isiolo district (Eastern Province), maize and sorghum data for Turkana and Samburu districts (Rift Valley Province) respectively, and maize production data for Lamu district (Coast Province). When the National Water Master Plan data are used production values are obtained by multiplying crop yield by the reported acreage harvested. In cases where corresponding yield values were not reported "representative" yield values have been derived as averages of yields in preceding years. Except for crop production data for Rift Valley province which were reported in bags[24] the rest of the commodity data were reported in tons. Non-entries indicate that data were either not available or not reported or that the crop (or livestock type) in question is not grown in the district.

3.1. Food Crops

Table 3.0 presents the three-year average data on production and area harvested for food crops in Kenya. Maize, not surprisingly - being the staple food in the country - is the most important food crop in terms of acreage harvested. More than half of the land planted in food crops[25] is allocated to maize which is grown in every district of the seven provinces. Although beans and sorghum are almost as commonly grown they are not as important as maize in terms of the land area allocated to their production. About one-quarter of the total land allocated to food crop production is planted in beans while even much less land (about 3% of total food crop land) is planted in sorghum. In small holder farms beans are inter-cropped with maize. Wheat and millet account for about 6% and 5% of food crop land respectively. Less land is allocated to cassava production (3%) than to wheat, millet or sorghum. To attain self sufficiency in food by the year 2000, food commodity requirements have been projected as shown in **Table 3.1.** Rice production, according to this projection, should grow at the annual rate of 12.5% ; wheat by 7.8% and beans by 6.6%. Maize, sorghum/millet as well as milk production are each required to grow by under 5.0% annually in order for Kenya to be self-sufficient in food.

[24] 1 bag = 90 kg.

[25] These seven food crops in Table 3.0 do not exhaust the total number of food crops grown in Kenya.

3.2. Cash Crops

From **Table 3.2** we note that about 45% of total land allocated to cash crop production[26] is used for coffee production. Cotton is second in importance, claiming some 22% of total cash crop land while tea follows with about 14% of land allocated to its production. More than other cash crops coffee and tea have, over the years, made the most important single contributions to the value of domestic exports of principal commodities (**Table 3.3**). In 1982, coffee accounted for about 27% of total domestic export value while tea was responsible for some 14%. By the mid-eighties (1986) the respective percentage shares of the two crops in domestic export value were 41% and 18%. Except in 1982, 1983 and 1990[27], the contributions of coffee, tea, sisal, pyrethrum and cotton (minus sunflower and tobacco) together amounted to more than half of total value of exports. Although cotton production takes up a sizable area of land (22%) compared to other cash crops its contribution in value terms seems to be disproportionately low. Cotton's share in domestic export value of principal commodities was not more than 0.3% during the 1980s. In 1990 cotton yielded a total export income of only one thousand Kenyan pounds. The past five years have seen the share of tea in export value continuously overtake that of coffee.

3.3. Harvested Area

Figure 3.0. shows that over the years greater land area has been allocated to food crop production than to export crops. Among the food crops, cereals have had the greatest share of land followed by pulses and then roots and tubers.

3.4. Livestock

Livestock data are the number of cattle (zebu and grade), goat, sheep, pigs, poultry, camels and donkeys per district, and are reported for the year 1990. These population figures have

[26]Again, the listed crops above do not exhaust the number of cash crops grown in Kenya.
[27]In these three years the total contribution of coffee, tea, sisal, pyrethrum and cotton to export value was 45%, 48% and 47% for each respective year.

been converted into the Tropical Livestock Unit (TLU)[28] equivalent which expresses the herd structure of animals of various species and sizes in terms of a common unit thus enabling equivalent comparisons of stocking rates expressed as TLU per net grazing areas. Livestock numbers and corresponding estimates of TLU for 1990 and 2010 (projected) are represented in **Tables 3.4** and **3.5**[29]. Also reported are data on the production of meat and milk (**Table 3.6**).

3.5. Inputs

The trend in agricultural and livestock input use has generally been on the increase (**Figure 3.1**) during the 1980s. While material input levels grew over the years, service input levels tended to be constant except towards the end of the decade when some increases begin to show[30]. This is perhaps a reflection of current Kenya government policy on agricultural and livestock inputs. This policy (see Republic of Kenya, 1994) is designed to ensure the availability to farmers of adequate and quality inputs in materials and services. Among the specific measures by which government intends to realize the current policy are: supplying high quality seeds of improved varieties of a wide range of crops; increasing the availability and quality of concentrates, compound feed and minerals required for increased livestock and poultry production; allowing livestock drugs, semen and embryos to be imported duty free so as to keep their prices low; supporting the private sector in the development and wider distribution and maintenance of more appropriate agricultural machinery; encouraging farmers to intensify agricultural production through use of agricultural and livestock inputs (Republic of Kenya, 1994). Levels of agricultural inputs and technology that satisfy

[28]The TLU conversion factors are taken from Sloane (1985) and are: Cattle (zebu), 0.7; Cattle (grade), 1.0; Goat. 0.1; Sheep, 0.1; Pigs, 0.2; Camels, 1.25; Donkeys, 0.5. For pastoral zones, with length of growing period (LGP) less than 120 days, the TLU conversion factors for goat and donkey are 0.08 and 0.7, respectively.

[29] The assumed growth rates used in projecting livestock population are: sheep(5%), goats(2%), pigs(7%), poultry(3%), cattle(3.3%) - for 2000-2010.

[30]Material inputs comprise: fertilizers, and other agricultural chemicals, livestock drugs/medicines, fuel, power, machinery spare parts/maintenance, bags, manufactured feeds, seeds, office expenses, small implements, and other; Service inputs include: marketing, research and publications, artificial insemination, aerial spraying, accounting, etc., tractor services, private vetenery services, govt. seed inspection services, farm planning and survey, govt. vetenery inoculation, insurance, transportation, and other (Republic of Kenya, 1991).

government policy measures and achieve the desired production targets can be modeled at the technology levels available in the AEZ system.

4. FOOD DEMAND

Ultimately, the success of national planning will be gauged, at least, by the development and distribution of per capita food supplies; or equivalently, by the ability of greater number of people - especially rural Kenyans (in the present case) - to obtain adequate food supplies. In rural Kenya where food supplies are derived from farming and not necessarily bought, this ability includes the ability to produce as well. The foreseeable prospects for Kenya, like for most developing countries - especially those of sub-Saharan Africa (see FAO, 1993) - do not appear very optimistic in this regard.

Since the 1960s when Kenya's per capita income grew at the impressive annual rate of 5.5% - almost twice the rate of population increase - subsequent decades have seen population overtake income in growth and remain ahead. The apparent rate of population growth over the years of about 3.8% annually might have been less worrying had income growth matched or superseded it. But income has not been able to grow by more than 1.5%. In fact, during the 1980s per capita income grew by less than 1.0% annually; and it is projected that during 1988/90-2000 income growth will remain below 1.0% while population increases at an average annual rate of 2.7%. Projections of future average per capita food demands which reflect anticipated growths in rural and urban populations (Republic of Kenya, 1992) are presented in **Table 4.0**. They define basic production targets indicating, thereby, expectations about future food supplies. The food items include: maize, millet, wheat, rice, potatoes, other roots, sugar, pulses, milk, beef, fat, vegetables and fish. Average annual per capita consumption is held constant at the 1990 level through 2000 and 2010 suggesting that the implied nutritional levels associated with the 1990 consumption pattern is, at least, satisfactory.

For analysis at the national level these predictions are adequate. At the district-level, however, they may not be appropriate since national *averages* obscure differences at the regional or district levels and within them. Dietary requirements in Kenya are known to vary among population groups within and across regions (see Shah, 1978; Frohberg and Shah, 1980; Fischer and Shah, 1985). And although poverty is widespread in all small holder agricultural areas, the incidence is considerably higher in some than in others (Heyer, 1991). For example, the pastoral areas in arid and very arid areas - noted for recurring food shortages - have more severe cases of poverty than others. Previous food consumption surveys in Kenya reveal that urban incomes are much higher than rural incomes, and that the incomes of the urban poor are higher than those of the rural poor. Differences in income result in differences in consumption. To account for the heterogeneous pattern of per capita food consumption, average (national level) projections of per capita food consumption have been disaggregated at the district level[31]. District-wise per capita food demand estimates were obtained by weighting each of the national urban and rural per capita food demand projection by the proportion of the district population that is urban and rural respectively, and then summing the two weighted values. Maize, millet, wheat and rice were aggregated to cereals while potatoes and other roots were aggregated as roots. The rest of the food items were retained as originally reported. The resulting district level estimates of per capita food demand are presented in **Table 4.1**. Again, these estimates are tentative and essentially illustrative. They assume that as rural population urbanizes it takes on urban consumption habits.

5. CONCLUSION

This paper has presented an update of the socio-economic database used in the AEZ assessment for Kenya. As part of this update, new estimates of district-wise socio-economic parameters have been provided. Socio-economic data have also been disaggregated at the district level. With this update it is hoped that AEZ based studies of Kenya will provide more

[31] In previous AEZ assessments, per capita food consumption levels were estimated by provinces, and assumed constant over time.

accurate indications for agricultural planning, particularly at the district level. More work still needs to be done to prepare data at more disaggregated levels than are reported in this paper.

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Table 1.0: Kenya Population (1989) and Projections (1990-2010) by District (in thousands)

YEAR	1989	1990	2000	2010
KIAMBU	914	947	1241	1546
KIRINYAGA	392	405	531	662
MURANGA	858	889	1164	1451
NYANDARUA	345	378	469	584
NYERI	607	629	824	1027
CENTRAL PROVINCE	312	3228	4228	5269
KILIFI	592	613	803	1001
KWALE	383	397	520	648
LAMU	57	59	77	96
MOMBASA	462	478	626	781
TAITA TAVETA	207	215	281	350
TANA RIVER	128	133	174	217
COAST PROVINCE	183	1894	2482	3092
EMBU	370	383	502	626
ISIOLO	70	73	95	119
KITUI	653	676	885	1103
MACHAKOS	1402	1452	1902	2370
MARSABIT	129	134	175	219
MERU	1145	1185	1553	1935
EASTERN PROVINCE	3769	3903	5113	6371
GARISSA	125	129	169	211
MANDERA	124	128	168	209
WAJIR	123	127	167	208
NORTH EASTERN	371	385	504	628
KISII	1137	1178	1543	1922
KISUMU	664	688	901	1123
SIAYA	639	662	867	1081
SOUTH NYANZA	1067	1105	1447	1803
NYANZA PROVINCE	3507	3632	4758	5929
BARINGO	348	360	472	588
ELGEIYO MARAKWET	216	224	294	366
KAJIADO	259	268	351	437
KERICHO	901	933	1222	1523
LAIKIPIA	219	227	297	370
NAKURU	849	879	1152	1435
NANDI	434	449	588	733
NAROK	398	412	540	673
SAMBURU	109	113	148	184
TRANS NZOIA	394	408	534	666
TURKANA	184	191	250	311
UASIN GISHU	446	461	604	753
WEST POKOT	225	233	306	381
RIFT VALLEY PROVINCE	4982	5159	6758	8421
BUNGOMA	679	703	921	1148
BUSIA	402	416	545	679
KAKAMEGA	1464	1516	1985	2474
WESTERN PROVINCE	2544	2635	3452	4301
NAIROBI	1325	1372	1797	2239
TOTAL KENYA	**21444**	**22207**	**29091**	**36250**

Table 1.1: Percent Shares of Urban and Rural Population by District (in thousands)

DISTRICT	Population 1989	% Urban in District Pop.	Urban pop Absolute	% Urban in Total Pop.	Rural pop. Absolute	% Rural in District Pop.	% Rural in Total Pop.
KIAMBU	914	20.9	191112	4.4	723300	79.1	3.4
KIRINYAGA	392	7.5	29364	0.7	362152	92.5	1.7
MURANGÁ	858	7.3	62639	1.5	795424	92.7	3.7
NYANDARUA	345	8.3	28670	0.7	316750	91.7	1.5
NYERI	607	12.1	73482	1.7	533810	87.9	2.5
CENTRAL	3117						
KILIFI	592	10.5	62150	1.4	529753	89.5	2.5
KWALE	383	8.7	33326	0.8	349727	91.3	1.6
LAMU	57	24.8	14082	0.3	42701	75.2	0.2
MOMBASA	462	95.0	438665	10.2	23088	5.0	0.1
TAITA TAVETA	207	10.2	21142	0.5	186131	89.8	0.9
TANA RIVER	128	11.8	15154	0.4	113272	88.2	0.5
COAST	1829						
EMBU	370	11.4	42196	1.0	327942	88.6	1.5
ISIOLO	70	10.0	7008	0.2	63070	90.0	0.3
KITUI	653	6.3	41114	1.0	611489	93.7	2.9
MACHAKOS	1402	14.9	208898	4.8	1193104	85.1	5.6
MARSABIT	129	12.8	16546	0.4	112716	87.2	0.5
MERU	1145	15.0	171689	4.0	972905	85.0	4.5
EASTERN	3769						
GARISSA	125	28.5	35578	0.8	89257	71.5	0.4
MANDERA	124	7.4	9160	0.2	114627	92.6	0.5
WAJIR	123	16.1	19766	0.5	103003	83.9	0.5
NORTH-EASTERN	371						
KISII	1137	6.8	77320	1.8	1059734	93.2	4.9
KISUMU	664	35.8	237743	5.5	426343	64.2	2.0
SIAYA	639	5.0	31972	0.7	607467	95.0	2.8
SOUTH NYANZA	1067	5.9	62928	1.5	1003655	94.1	4.7
NYANZA	3507						
BARINGO	348	12.1	42107	1.0	305883	87.9	1.4
ELGEYO MARAKWET	216	3.1	6711	0.2	209776	96.9	1.0
KAJIADO	259	21.7	56129	1.3	202530	78.3	0.9
KERICHO	901	7.3	65768	1.5	835166	92.7	3.9
LAIKIPIA	219	22.4	49046	1.1	169911	77.6	0.8
NAKURU	849	31.7	269163	6.2	579933	68.3	2.7
NANDI	434	6.1	26450	0.6	407163	93.9	1.9
NAROK	398	6.8	27082	0.6	371190	93.2	1.7
SAMBURU	109	2.9	3158	0.1	105726	97.1	0.5
TRANS NZOIA	394	12.0	47242	1.1	346440	88.0	1.6
TURKANA	184	13.5	24848	0.6	159212	86.5	0.7
UASIN GISHU	446	24.9	110937	2.6	334593	75.1	1.6
WEST POKOT	225	10.1	22770	0.5	202679	89.9	0.9
RIFT VALLEY	4982						
BUNGOMA	679	22.9	155524	3.6	523622	77.1	2.4
BUSIA	402	15.0	60249	1.4	341409	85.0	1.6
KAKAMEGA	1464	11.1	162451	3.8	1301074	88.9	6.1
WESTERN	2544						
NAIROBI	1325	95.0	1258342	29.1	66229	5.0	0.3
TOTAL	**21444**		**4319682**	**20.1**	**17123954**		**79.9**

Table 2.0: Percent Land Use by District/Province and Use Category (sq. km)

DISTRICT	Total Area	Land Area	Water Area	Forest & Park	Swamp	Townships	Barren	Agric. Land	Other Land
KIAMBU	2451	2448	3	513	0	155	0	1409	371
KIRINYAGA	1437	1437	0	513	0	86	14	815	9
MURANGÁ	2476	2476	0	366	0	161	0	1200	749
NYANDARUA	3528	3508	20	850	22	266	31	1487	852
NYERI	3284	3284	0	1526	0	60	5	1104	589
CENTRAL	13176	13153	23	3768	22	728	50	6015	2570
KILIFI	12523	12414	109	2650	12	412	0	1204	8136
KWALE	8322	8257	65	792	0	486	0	1000	5979
LAMU	6814	6506	308	2534	0	119	0	200	3653
MOMBASA	275	210	65	8	0	143	0	59	0
TAITA TAVETA	16975	16959	16	10604	131	179	0	800	5245
TANA RIVER	38694	38694	0	5267	118	3	0	239	33067
COAST	83603	83040	563	21855	261	1342	0	3502	56080
EMBU	2714	2714	0	289	0	8	8	2398	11
ISIOLO	25605	25605	0	726	705	43	1935	220	21976
KITUI	29389	29389	0	6572	0	161	51	968	21637
MACHAKOS	14183	14178	5	1666	2	337	88	4465	7620
MARSABIT	78078	73952	4126	5661	403	390	46488	85	20925
MERU	9922	9922	0	2582	0	212	242	2773	4113
EASTERN	159891	155760	4131	17496	1110	1151	48812	10909	76282
GARISSA	43931	43931	0	3425	56	251	0	12	40187
MANDERA	26470	26470	0	51	0	251	1512	55	24601
WAJIR	56501	56501	0	291	388	565	679	25	54553
N-EASTERN	126902	126902	0	3767	444	1067	2191	92	119341
KISII	2196	2196	0	1	0	29	0	585	1581
KISUMU	2660	2093	567	28	160	475	0	790	640
SIAYA	3528	2523	1005	0	96	1002	0	800	625
SOUTH NYANZA	7778	5714	2064	119	52	715	0	1500	3328
NYANZA	16162	12526	3636	148	308	2221	0	3675	6174
KAJIADO	21105	20963	142	3300	1233	16	192	1757	14465
KERICHO	4890	4890	0	1063	0	300	0	2330	1197
LAIKIPIA	9718	9718	0	938	64	187	41	446	8042
NAKURU	7200	7024	176	1460	94	946	173	4122	229
NAROK	18513	18513	0	2887	69	13	89	1300	14155
TRANS NZOIA	2468	2468	0	451	110	86	0	1777	44
UASIN GISHU	3784	3784	0	661	42	82	0	1247	1752
BARINGO	10790	10627	163	835	128	213	636	1078	7737
ELGEYO MARAKWET	2722	2722	0	990	40	85	0	1328	369
NANDI	2745	2745	0	415	0	4	0	171	2155
SAMBURU	20809	20809	0	3288	0	13	3568	50	13890
TURKANA	69684	67405	2279	826	2551	66	17984	69	45909
WEST POKOT	9056	9056	0	548	3	228	1454	1470	5353
RIFT VALLEY	183484	180724	2760	17662	4334	2239	24137	17145	115297
BUNGOMA	3074	3074	0	552	0	334	0	2188	0
BUSIA	1766	1629	137	2	184	159	0	455	829
KAKAMEGA	3520	3520	0	332	1	542	0	2548	97
WESTERN	8360	8223	137	886	185	1035	0	5191	926
NAIROBI	684	684	0	215	0	93	0	53	323
KENYA	**592262**	**581012**	**11250**	**65797**	**6664**	**9876**	**75190**	**46582**	**376993**
		100	**1.9**	**11.3**	**1.1**	**1.7**	**12.9**	**8.0**	**64.9**

Source: Republic of Kenya, 1992.

Table 2.1: Distribution of Potential Arable Land by Province

Distribution of Land Suitability Classes by Province (sq. km)

	c1	c2	c3	c4	c1-c4	other	total extent
CENTRAL	840	1596	1547	2208	6191	7033	13224
COAST	988	1970	3128	9323	15409	68419	83828
EASTERN	183	387	963	6408	7941	148600	156541
NORTH-EASTERN	0	0	1	158	159	127101	127260
NYANZA	982	945	2268	3766	7961	8219	16180
RIFT VALLEY	4989	4014	7334	15535	31872	152076	183948
WESTERN	235	887	2275	2521	5918	2252	8170
NAIROBI	1	1	3	65	70	682	752
KENYA	8220	9801	17518	39983	75522	514381	589903

Inter-Province Distribution of Land Suitability Classes (%)

	c1	c2	c3	c4	c1-c4	other	total extent
CENTRAL	10.2	16.3	8.8	5.5	8.2	1.4	2.2
COAST	12.0	20.1	17.9	23.3	20.4	13.3	14.2
EASTERN	2.2	3.9	5.5	16.0	10.5	28.9	26.5
NORTH-EASTERN	0.0	0.0	0.0	0.4	0.2	24.7	21.6
NYANZA	11.9	9.6	12.9	9.4	10.5	1.6	2.7
RIFT VALLEY	60.7	41.0	41.9	38.9	42.2	29.6	31.2
WESTERN	2.9	9.1	13.0	6.3	7.8	0.4	1.4
NAIROBI	0.0	0.0	0.0	0.2	0.1	0.1	0.1

Intra-Province Distribution of Land Suitability Classes (%)

	c1	c2	c3	c4	c1-c4	other	total extent
CENTRAL	6.4	12.1	11.7	16.7	46.8	53.2	100.0
COAST	1.2	2.4	3.7	11.1	18.4	81.6	100.0
EASTERN	0.1	0.2	0.6	4.1	5.1	94.9	100.0
NORTH-EASTERN	0.0	0.0	0.0	0.1	0.1	99.9	100.0
NYANZA	6.1	5.8	14.0	23.3	49.2	50.8	100.0
RIFT VALLEY	2.7	2.2	4.0	8.4	17.3	82.7	100.0
WESTERN	2.9	10.9	27.8	30.9	72.4	27.6	100.0
NAIROBI	0.1	0.1	0.4	8.6	9.3	90.7	100.0

Arable Land (c1-c4) as Percent of Total Land Extent

CENTRAL	46.8
COAST	18.4
EASTERN	5.1
NORTH-EASTERN	0.1
NYANZA	49.2
RIFT VALLEY	17.3
WESTERN	72.4
NAIROBI	9.3
KENYA	12.8

Table 2.2: Arable Land Distribution by Climatic Zone and Crop Productivity Potential: Kenya

Arable Land Productivity Classes (sq. km) by Climatic Zone

CLIMATIC ZONE	c1	c2	c3	c4	c1-c4	other	total extent
Arid	0	1	82	1344	1427	402840	404267
Semiarid	445	798	2463	12526	16232	67376	83608
Subhumid	4856	5710	8464	17008	36038	22588	58626
Humid	2919	3292	6509	9105	21825	21577	43402
Total	8220	9801	17518	39983	75522	514381	589903

Inter-climatic zone shares of arable land classes (%)

CLIMATIC ZONE	c1	c2	c3	c4	c1-c4	other	total extent
Arid	0.0	0.0	0.5	3.4	1.9	78.3	68.5
Semiarid	5.4	8.1	14.1	31.3	21.5	13.1	14.2
Subhumid	59.1	58.3	48.3	42.5	47.7	4.4	9.9
Humid	35.5	33.6	37.2	22.8	28.9	4.2	7.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Intra-climatic zone shares of arable land classes (%)

CLIMATIC ZONE	c1	c2	c3	c4	c1-c4	other	total extent
Arid	0.0	0.0	0.0	0.3	0.4	99.6	100.0
Semiarid	0.5	1.0	2.9	15.0	19.4	80.6	100.0
Subhumid	8.3	9.7	14.4	29.0	61.5	38.5	100.0
Humid	6.7	7.6	15.0	21.0	50.3	49.7	100.0
Total	1.4	1.7	3.0	6.8	12.8	87.2	100.0

Distribution of Arable Land (c1-c4) by Climatic Zone

CLIMATIC ZONE	%
Arid	2
Semiarid	21
Subhumid	48
Humid	29
Total	100

Table 3.0: Food Crop Production and Harvested Area by District

DISTRICT	MAIZE		WHEAT		MILLET		BEANS		CASSAVA		SORGHUM		RICE	
	89/91 hectares	89/91 tons	89/91 hectares	89/91 tons	89/91 hectares	89/91 tons	89/91 hectares	89/91 tons	89/91 hectares	89/91 tons	89/91 hectares	89/91 tons	89/91 hectares	89/91 tons
S. NYANZA	57128	127115			3261	6304	12209	54434	17237	8339	26117	49681	292	420
KISII	46557	106783			3138	10490	27955	136349	100	78	755	1193		
KISUMU	16234	45714			106	111	13817	69087	1390	2697	9790	17671	1645	5316
SIAYA	46843	106365			124	277	21987	67224	5928	3303	17266	45514	30	72
NYANZA	166762	385977			6629	17183	75969	327094	23164	11642	53928	114059	1967	5808
KERICHO	77435	243920	369	662	1559	1403	11248	101232	21	6	444	4884		
NANDI	69713	219596	87	157	1133	816	4650	23250	45	24	270	2160		
TRANS NZOIA	63090	227124	3966	8924	332	299	23000	158000			96	576		
NAKURU	51240	115290	30256	54425	410	406	22408	154448			4	40		
UASIN GISHU	54600	127764	41550	74790	790	569	12600	37800	18	16	52	416		
NAROK	26000	88920	46000	86400	150	54	2500	25000	20	2	180	2700		
E. MARAKWET	21765	39177	1606	2280	2829	1782	7393	66537	239	258	435	3480		
KAJIADO	28151	50672	452	407		0	57366	286830			21	147		
LAIKIPIA	17367	28135	4711	8480		0	11623	92980			220	1760		
WEST POKOT	17445	39251			1478	1862	4850	33950	475	513	1785	21420		
BARINGO	16670	48010	460	621	1784	1284	6800	40800	124	112	180	1440		
SAMBURU	980	1588	2700	3926		0	290	870			15	116		
TURKANA	240	672				0					1397	15464		
RIFT VALLEY	444696	1230118	132157	241071	10465	8475	164728	1021697	942	931	5099	54603		
MANDERA	1278	15435					4	4			838	1323		
GARISSA	162	270									141	397		
WAJIR	713	632					21	59			218	105	23	156
NORTH EASTERN	2153	16337					24	63			1197	1825	23	156
MERU	66119	117260	8797	14184	13671	9427	47164	20327	772	13968	8865	8034		
EMBU	48468	72894			10076	6667	23050	126722	753	6491	9401	8896		
MACHAKOS	194449	290959			3078	811	79636	370921	4569	45687	32629	2873		
KITUI	52700	35402			40880	17763	28047	140797	1372	11070	30520	19405		
MARSABIT	8677	6217	121	36	77	35	2159	11259	12	53	189	43		
ISIOLO	428	719					75	392	4	16	4	30		
EASTERN	370840	523451	8918	14220	67781	34701	180131	670418	7483	77285				
KIAMBU	25702	29784					15060	9557	545	1166	8	1		
MURANGA	46400	78880			9	31	27300	9828	195	3519	35	13		
KIRINYAGA	29820	45624			442	3773	18392	10321	15	150	25	14	5763	22672
NYERI	19565	27397	2274	2274	300	135	18595	12017	1	10				
NYANDARUA	19520	52704	2960	7992			5250	3150						
CENTRAL	141007	234389	5234	10266	752	3939	84597	44873	756	4845	68	27	5763	22672

Table 3.0 (cont'd): Food Crop Production and Harvested Area by District

DISTRICT	MAIZE		WHEAT		MILLET		BEANS		CASSAVA		SORGHUM		RICE	
	89/91 hectares	89/91 tons	89/91 hectares	89/91 tons	89/91 hectares	89/91 tons	89/91 hectares	89/91 tons	89/91 hectares	89/91 tons	89/91 hectares	89/91 tons	89/91 hectares	89/91 tons
KILIFI	43614	57600					506	2270	11707	116940	460	418	2872	2749
KWALE	17018	43395			40	96	585	2888	10556	102223	80	72	1184	1146
TAITA TAVETA	4143	10282			117	284	2249	10466	270	4020	102	85	4	5
TANA RIVER	2720	3961			50	152	243	1163	49	493	91	87	797	1275
LAMU	1663	6933			57	77			406	4058	181	127	29	20
MOMBASA	707	808							339	2988	6	5	88	116
COAST	69863	122979			264	608	3583	16785	23327	230723	921	794	4974	5312
KAKAMEGA	107215	247777	120	227	2891	37715	64561	37715	3628	40355	4295	3820	350	830
BUNGOMA	76098	181338	238	570	29913	12373	29913	12373	1370	14151	1063	889	895	1679
BUSIA	23152	28577			12243	8213	12243	8213	15280	143935	15813	13489	1258	2638
WESTERN	206464	457691	358	797	45048	58301	106718	58301	20278	198441	21172	18199	2503	5146
KENYA (HECTARES)	**1401785**	**2970942**	**146667**	**266353**	**130938**	**123208**	**615750**	**2139231**	**75951**	**523867**	**82385**	**189505**	**15230**	**39094**
KENYA (%)	**57**	**48**	**6**	**4**	**5**	**2**	**25**	**34**	**3**	**8**	**3**	**3**	**1**	**1**

Table 3.1: Projections of Food Production/Requirement for Self Sufficiency

	1990	2000	Required	1989-93
	Production	Requirements	Annual	Annual
	1000 tons	1000 tons	Growth(%)	Growth
Maize	2480	3676	4.0	4.0
Wheat	190	401	7.8	2.0
Sorghum/Millet	181	284	4.6	3.0
Rice paddy	36	117	12.5	8.0
Beans	256	486	6.6	5.0
Potatoes	450	737	5.1	5.0
Other Roots/Tubers		762	5.0	
Sugar	433	660	5.2	5.0
Beef	228	241	1.0	1.0
Milk (billion litres)	1.826	2.795	4.4	2.0

Source: Republic of Kenya, 1994a

Table 3.2: Cash Crop Production and Harvested Area by District

DISTRICT	TOBACCO		TEA		PYRETHRUM		SISAL		SUNFLOWER		COFFEE		COTTON	
	89/91 hectares	89/91 tons	89/91 hectares	89/91 tons	89/91 hectares	89/91 tons	89/91 hectares	89/91 tons	89/91 hectars	89/91 tons	89/91 hectares	89/91 tons	89/91 hectares	89/91 tons
MERU	1334	1224	6841	42626	1406	555			9524	4762	22840	15176	12333	2
EMBU	468	1044	3014	21159	11	3			523	508	5920	6104	7300	1
KITUI	150	163					3400	45669	383	327	19	5	10000	4
MACHAKOS	50	100					5522	15870	512	1827	10139	6527	8550	1
MARSABIT											10	2		
ISIOLO													187	0
EASTERN	2002	2531	9855	63784	1416	558	8922	61539	10942	7424	38927	27815	38370	9
KAKAMEGA						0			521	1408	2212	409		
BUNGOMA					87	21			528	2565	5421	2177	34	1029
BUSIA					0	0			87	458	288	81	3334	9783
WESTERN					87	21			1135	4431	7921	2667	3368	10813
KILIFI							3991	4599			6		4572	1216
KWALE							2590	1817			10		160	114
T.TAVETA							6931	14414			682	7656	1552	872
T. RIVER													2260	3273
LAMU													1485	2087
MOMBASA													7	4
COAST							13512	20831			698		10036	7566
KIAMBU	18	16	5273	87320	319	211			2	9	33492	532523	25	39
MURANGA			9285	45312							18610	668099	380	300
KIRINYAGA	58	698	3998	42729					320	224	9134	45670	520	416
NYERI	8	8	4938	53006	520	156					8231	295493		
NYANDARUA					3175	1329			115	46				
CENTRAL	84	722	23494	228367	4014	1696			437	279	69467	1541785	925	755
S/NYANZA											1605	9310	7266	1453
KISII				30214							7380	23689		
KISUMU											192	3192	3411	861
SIAYA											65	458	4032	540
NYANZA				86638							11583	36649	14709	2855

Table 3.2 (cont'd): Cash Crop Production and Harvested Area by District

DISTRICT	TOBACCO		TEA		PYRETHRUM		SISAL		SUNFLOWER		COFFEE		COTTON	
	89/91 hectares	89/91 tons	89/91 hectares	89/91 tons	89/91 hectares	89/91 tons	89/91 hectares	89/91 tons	89/91 hectars	89/91 tons	89/91 hectares	89/91 tons	89/91 hectares	89/91 tons
KERICHO			7202	62881	850	530					1679	514		
NANDI			3721	6248	6	87					750	93		
TRANS NZOIA			17	1279					2115	3172	1331	311		
NAKURU					8016	4730			44	51	2927	1252		
UASIN GISHU					1397	705			124	94	147	33		
NAROK					560	216								
E. MARAKWET					640	232					129	0	206	62
KAJIADO											73	9	268	241
LAIKIPIA					43	14					115	17		
WEST POKOT					29	11			63	50	53	4	82	63
BARINGO					441	180					750	138	791	778
SAMBURU														
TURKANA													125	102
RIFT VALLEY			10940	70408	11981	6705			2345	3368	7954	2371	1337	1126
KENYA	**2086**	**3253**	**44288**	**449197**	**17498**	**8980**	**22434**	**82370**	**14859**	**15501**	**136550**	**1611287**	**68745**	**23123**
KENYA (%)	**1**	**0**	**14**	**20**	**6**	**0**	**7**	**4**	**5**	**1**	**45**	**73**	**22**	**1**

Table 3.3:

Percent Shares of Principal Commodities in Total Value of Domestic Exports

	1982	1983	1984	1985	1986	1987	1988	1989	1990
Coffee, not roasted	26.5	25.3	27.0	29.4	40.6	25.8	26.6	20.4	17.9
Tea	14.2	19.5	25.1	24.4	18.0	21.7	20.2	27.2	25.5
Petroleum products	26.0	19.5	17.4	14.8	10.3	12.6	12.0	10.2	11.4
Sisal fibre and tow	2.0	1.9	1.7	1.8	1.1	1.3	1.3	1.6	1.5
Meat/preparations	0.8	0.6	1.0	0.9	0.2			0.1	0.5
Pyrethrum	1.8	1.4	1.3	1.2	1.2	1.3	1.3	1.7	1.7
Hides, skins, furskins	1.5	1.0	0.9	1.3	1.3	2.2	2.8	3.3	0.1
Cement, building	3.6	3.4	2.5	2.1	1.4	1.4	1.1	1.1	1.0
Wattle bark/extract	0.6	0.5	0.5	0.5	0.5	0.7	0.6	0.5	0.6
Sodium carbonate	0.3	1.1	1.4	1.7	1.5	1.8	2.0	2.2	2.0
Pineapples, tinned	2.7	3.3	3.4						
Cotton, raw		0.1		0.3	0.1				
Wool, raw	0.2	0.1	0.2	0.1	0.1	0.2	0.2	0.1	
Cashew nuts	0.3								
Beans, peas, lentils	1.2	2.2	0.3						
Oil seeds, nuts, kernels	0.3	0.3	0.2	0.2	0.1	0.1	0.2	0.2	0.1
Scrap metal	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.2
Butter and ghee	0.2	0.2	0.1	0.1	0.1	0.1			0.1
Maize, unmilled	0.1	1.9	0.8	0.2	1.5	2.6	2.4	1.6	1.7
Horticulture				7.7	8.2	12.5	12.5	11.2	13.0
Other	17.6	17.6	16.1	13.2	13.6	15.5	16.6	18.3	22.7
TOTAL	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: Republic of Kenya, 1991

Table 3.4: Livestock Numbers in 1990 ('000s) and the TLU Equivalent

DISTRICT	ZEBU	GRADE	GOAT	SHEEP	PIG	POULTRY	CAMEL	DONKEY	TLU
KAJIADO	553	80	738	633	3	115	0.13	81	648.1
KERICHO	312	353	154	167	0.2	497			608.5
LAIKIPIA	251	27	236	359	0.3	117	1.84	5	268.2
NAKURU	185	275	113	635	7	666		2	488.4
NAROK	845	60	950	1490	0.3	96		225	1035.0
T/NZOIA	50	105	25	49	1.3	233		0.8	150.4
U/GISHU	22	286	67	62	11	230			318.8
BARINGO	220	91	780	282	0.1	312	5.9	4	348.9
E/MARAKWET	126	55	154	182		225		6	182.1
NANDI	76	321	33	37	0.4	455			385.8
SAMBURU	19	0.4	355	280		30	15.4	8	95.3
TURKANA	420		1958	1001		10	116.9	3	699.1
W/POKOT	202	16	133	252		200	0.5	42	219.5
RIFT VALLEY	3281	1669.4	5696	5429	24	3186	140.67	376.8	5440.9
BUNGOMA	327	40	41	53	2	417		0.9	283.3
BUSIA	173	2	62	25	7	434		0.4	137.7
KAKAMEGA	395	61	65	86	7	2691		0.41	381.1
WESTERN	895	103	168	164	16	3542	0	1.71	799.2
KIAMBU	28	154	47	64	16	1059		1.9	199.4
KIRINYAGA	24	72	39	13	5	273			97.7
MURANGA	15	175	55	43	17	297			201.7
NYANDARUA	7	256	50	231	6	211		0.3	292.5
NYERI	9	137	52	112	5	440		11	170.6
CENTRAL	83	794	243	463	49	2280		13.2	959.7
KILIFI	212	15	166	32	0.8	863		0.3	188.9
KWALE	268	2	147	74	0.5	1358		0.6	222.9
LAMU	26	2	26	8	0.3	83	2.6	10	34.2
MOMBASA	3	2	7	2	0.6	244			7.4
T/TAVETA	131	11	155	50	0.5	190		0.3	122.3
T/RIVER	547		200	161		150	15	12	443.7
COAST	1187	32	701	327	2.7	2888	17.6	23.2	1019.3
EMBU	65	41	117	30	1.3	155		0.3	103.2
ISIOLO	199	0.2	173	252		31	308	0.6	564.3
KITUI	368	8	660	85		262		10	347.7
MACHAKOS	483	44	480	186	0.6	857			457.4
MARSABIT	394		53	513		62	2415	0.3	3350.9
MERU	236	169	315	286	5	750		12	408.8
EASTERN	1745	262.2	1798	1352	6.9	2117	2723	23.2	5205.3
GARISSA	600	0.4	400	200			70	5	563.4
MANDERA	143		177	170			137	5	306.0
WAJIR	322		487	383			262	8	635.8
NORTH-EASTERN	1065	0.4	1064	753			469	18	1505.2
KISII	227	117	94	67	0.7	3175		1.3	324.5
KISUMU	254	5.5	106	144	2.2	644			215.2
SIAYA	468	2.5	168	114	1.2	841			367.0
S/NYANZA	495	2.3	231	171	1.6	1739		1.6	407.5
NYANZA	1444	127.3	599	496	5.7	6399		2.9	1302.8
NAIROBI	4	15	17	11	27	309			29.1
KENYA TOTAL	**9704**	**3003.3**	**10286**	**8995**	**131**	**20721**	**3350.27**	**459.01**	**16261.0**

Table 3.5: Projected Livestock Numbers in 2010 ('000s) and the TLU Equivalent

DISTRICT	ZEBU	GRADE	GOAT	SHEEP	PIG	POULTRY	CAMEL	DONKEY	TLU
KAJIADO	667	140	775	705	9	195	0.22		743.4
KERICHO	387	437	166	185	0.6	840			751.5
LAIKIPIA	311	34	248	399	0.9	198	3.12		322.5
NAKURU	230	340	118	707	21	1126			599.0
T/NZOIA	61	131	27	1659	0.9	162			344.1
NAROK	1046	75	999	55	3.9	394			897.3
U/GISHU	27	354	70	69	33	389			397.3
E/MARAKWET	155	68	162	203		381			216.8
BARINGO	272	115	819	314	0.3	528	9.6		419.7
NANDI	94	398	35	41	1.2	770			479.3
SAMBURU	23	0.6	373	312		51	26		110.8
TURKANA	520		2057	114		17	197.6		787.1
W/POKOT	249	21	140	279		338	0.85		241.6
RIFT VALLEY	4042	2113.6	5989	5042	70.8	5389	237.39		6291.1
BUNGOMA	405	50	43	59	6	705			352.0
BUSIA	489	76	68	96	21	4547			484.4
KAKAMEGA	214	4	65	28	21	733			174.6
WESTERN	1108	130	176	183	48	5985			1007.4
KIAMBU	35	191	50	71	48	1790			255.1
KIRINYAGA	29	89	41	15	15	462			122.5
MURANGA	19	217	58	48	51	515			256.3
NYANDARUA	9	316	53	257	18	356			360.5
NYERI	11	170	55	125	15	744			206.1
CENTRAL	103	983	257	516	147	3867			1195.3
KILIFI	263	19	174	36	2.4	1454			235.6
KWALE	309	4	154	82	1.5	2294			264.1
LAMU	31	4	28	8	0.9	140	4.4		35.8
MOMBASA	4	4	7	2	1.8	412			12.2
T/TAVETA	162	13	163	56	1.5	191			147.3
T/RIVER	678		210	180		253	25.35		543.6
COAST	1447	44	736	364	8.1	4744	29.75		1238.4
EMBU	80	50	123	34	3.9	263			125.1
ISIOLO	246	0.5	182	385		52	52		291.3
KITUI	255	11	694	95		1058			279.0
MACHAKOS	598	55	504	207	1.8	1448			559.5
MARSABIT	489		56	571			4082		5506.4
MERU	291	211	330	318	1.5	1267			492.5
EASTERN	1959	327.5	1889	1610	7.2	4088	4134		7220.7
GARISSA	743	1	420	223			1183		2055.8
MANDERA	177		186	189			2314		3050.2
WAJIR	399		512	426			4428		5897.9
NORTH-EASTERN	1319	1	1118	838			7925		11003.8
KISII	282	144	99	75	1.3	2140		1.6	381.3
KISUMU	314	7	111	161	6.6	1088			266.2
SIAYA	579	4	176	127	3.6	1421			454.5
S/NYANZA	613	4	243	190	2.4	2939		1.94	507.2
NYANZA	1788	159	629	553	13.9	7588		3.54	1597.4
NAIROBI	6	19	19	13	81	523			47.8
KENYA TOTAL	**11772**	**3777.1**	**10813**	**9119**	**376**	**32184**	**12326**	**3.54**	**29602.0**

Table 3.6: Meat and Milk Production by District in 1990 (tons/1000 lt)

	BEEF	GOAT MEAT	SHEEP MEAT	PIG MEAT	POULTRY MEAT	MILK ZEBU	MILK GRADE	MILK TOTAL
KAJIADO	11356	2391	2038	98	86	33180	39200	72380
KERICHO	11930	499	537	7	373	18720	172970	191690
LAIKIPIA	4987	765	1156	10	88	15060	18900	33960
NAKURU	8252	366	2045	228	500	11100	134750	145850
NAROK	16250	3078	4798	10	72	50700	29400	80100
T/NZOIA	2781	81	158	42	175	3000	51450	54450
U/GISHU	5525	217	200	358	173	1320	140140	141460
BARINGO	5579	2527	908	3	169	13200	44590	57790
E/MARAKWET	3247	499	586		234	7560	26950	34510
NANDI	7122	107	119	13	341	4560	157290	161850
SAMBURU	341	1150	901		23	1140	196	1336
TURKANA	7535	6344	3223		8	25200	-	25200
W/POKOT	3911	431	808		150	12120	7840	19960
RIFT VALLEY	88816	18455	17477	769	2392	184740	815836	1000576
BUNGOMA	6584	132	171	65	313	19620	19600	39220
BUSIA	3140	201	80	228	326	10380	980	11360
KAKAMEGA	8181	211	277	228	2018	23700	29890	53590
WESTERN	17905	544	528	521	2657	53700	50470	104170
KIAMBU	3265	152	206	520	794	1680	76440	78120
KIRINYAGA	1722	126	42	163	205	1440	35280	36720
MURANGA	3409	178	138	553	223	900	85750	86650
NYANDARUA	4718	162	744	195	158	420	125440	125860
NYERI	2619	168	361	163	330	540	67130	67670
CENTRAL	15733	786	1491	1594	1710	4980	390040	395020
KILIFI	4073	538	103	26	647	12720	7350	20070
KWALE	4844	476	238	16	1018	16080	980	17060
LAMU	503	85	26	10	62	1560	980	2540
MOMBASA	90	23	6	20	183	180	980	1160
T/TAVETA		502	161	16	143	7860	5390	13250
T/RIVER	9813	648	518		112	32820	-	32820
COAST	19323	2272	1052	88	2165	71220	15680	86900
EMBU	1901	379	97	42	116	3900	20090	23990
ISIOLO	3570	561	811		23	11940	98	12038
KITUI	6745	2138	274		470	22080	3920	26000
MACHAKOS	9454	1555	599	20	643	28980	21560	50540
MARSABIT	7068	172				23640	-	23640
MERU	7266	1021	921	163	563	14160	82810	96970
EASTERN	36004	5826	2702	225	1815	104700	128478	233178
GARISSA	10764	1296	644			36000	196	36196
MANDERA	2565	578	547			8580		8580
WAJIR	5777	1578	1233			19320		19320
NORTH EASTERN	19106	3452	2424			63900	196	64096
KISII	4682	217	161	13	790	10500	42140	52640
KISUMU	4646	343	464	72		15240	2695	17935
SIAYA	8432	544	367	39	630	28080	1225	29305
S/NYANZA	8916	748	551	52	1304	29700	980	30680
NYAMIRA	1489	87	55	1	159	32120	15190	47310
NYANZA	28165	1939	1598	177	2883	115640	62230	177870
NAIROBI	341	55	35	878	232	240	7350	7590
KENYA	**225393**	**33329**	**27307**	**4252**	**1745604**	**599120**	**1470280**	**2069400**

Table 4.0: Food Consumption Projections 1990-2010

	Urban kg/p/yr	Rural kg/p/yr	Urban 1990	Rural 1990	Total 1990	Urban 1995	Rural 1995	Total 1995	Urban 2000	Rural 2000	Total 2000	Urban 2005	Rural 2005	Total 2005	Urban 2010	Rural 2010	Total 2010
Population (mill.)			4.0	18.8	26.4	5.5	20.9	30.7	7.9	22.8	35.2	10.1	25.1	40.3	12.7	27.6	43.7
Maize	97.1	125.6	385.0	2359.3	2744.3	535.5	2.621.8	3157.3	770.3	2861.1	3631.4	978.2	3157.0	4135.2	1233.0	3467.4	4700.4
Millet	0.0	19.8	0.0	371.9	371.9	0.0	413.3	413.3	0.0	451.0	451.0	0.0	497.7	497.7	0.0	546.6	546.6
Wheat	24.7	10.0	97.9	187.8	285.7	136.2	208.7	344.9	195.9	227.8	423.7	248.8	251.4	500.2	313.7	276.1	589.8
Rice	13.1	1.4	51.9	26.3	78.2	72.2	29.2	101.4	103.9	31.9	135.8	132.0	35.2	167.2	166.3	38.6	204.9
Potatoes	14.8	26.2	58.7	492.1	550.8	81.6	546.9	628.5	117.4	596.8	714.2	149.1	658.5	807.6	187.9	723.3	911.2
Other Roots	3.0	30.5	11.9	572.9	584.8	16.5	636.7	653.2	23.8	694.8	718.6	30.2	766.6	796.8	38.1	842.0	880.1
Sugar	30.0	15.0	119.0	281.8	400.8	165.5	313.1	478.6	238.0	341.7	579.7	302.2	377.0	679.2	381.0	414.1	795.1
Pulses	13.8	14.2	54.7	266.7	321.4	76.1	296.4	372.5	109.5	323.5	433.0	139.0	356.9	495.9	175.2	392.0	567.2
Milk	88.6	72.1	351.3	1.354.3	1.705.6	488.7	1505.0	1993.7	702.8	1642.4	2345.2	892.6	1812.2	2704.8	1125.1	1990.5	3115.6
Beef	11.9	6.8	47.2	127.7	174.9	65.6	141.9	207.5	94.4	154.9	249.3	119.9	170.9	290.8	151.1	187.7	338.8
Fat	6.5	1.7	25.8	31.9	57.7	35.8	35.5	71.3	51.6	38.7	90.3	65.5	42.7	108.2	82.5	46.9	129.4
Vegetables	36.9	20.4	146.3	383.2	529.5	203.5	425.8	629.3	292.7	464.7	757.4	371.7	512.8	884.5	82.5	46.9	129.4
Fish	1.9	1.7	7.5	31.9	39.4	10.5	35.5	46.0	15.1	38.7	53.8	19.1	42.7	61.8	24.1	46.9	71.0

Source: Republic of Kenya, 1992.

Table 4.1: Estimated Food Consumption per capita (kg/pers/year) for 1990

	CEREAL	ROOTS	PULSES	SUGAR	MILK	BEEF	FAT	VEGET.	FISH
KIAMBU	139.5	48.6	14.1	18.1	75.5	7.9	2.7	23.8	1.7
KIRINYAGA	136.5	53.8	14.2	16.1	73.3	7.2	2.1	21.6	1.7
MURANGA	136.5	53.9	14.2	16.1	73.3	7.2	2.1	21.6	1.7
NYANDARUA	136.7	53.5	14.2	16.2	73.5	7.2	2.1	21.8	1.7
NYERI	137.5	52.0	14.2	16.8	74.1	7.4	2.3	22.4	1.7
KILIFI	137.2	52.6	14.2	16.6	73.8	7.3	2.2	22.1	1.7
KWALE	136.8	53.3	14.2	16.3	73.5	7.2	2.1	21.8	1.7
LAMU	140.3	47.1	14.1	18.7	76.2	8.1	2.9	24.5	1.7
MOMBASA	155.7	19.7	13.8	29.3	87.8	11.6	6.3	36.1	1.9
TAITA TAVETA	137.1	52.7	14.2	16.5	73.8	7.3	2.2	22.1	1.7
TANA RIVER	137.5	52.1	14.2	16.8	74.0	7.4	2.3	22.3	1.7
EMBU	137.4	52.3	14.2	16.7	74.0	7.4	2.2	22.3	1.7
ISIOLO	137.1	52.8	14.2	16.5	73.8	7.3	2.2	22.1	1.7
KITUI	136.3	54.2	14.2	15.9	73.1	7.1	2.0	21.4	1.7
MACHAKOS	138.2	50.9	14.1	17.2	74.6	7.6	2.4	22.9	1.7
MARSABIT	137.7	51.7	14.1	16.9	74.2	7.5	2.3	22.5	1.7
MERU	138.2	50.9	14.1	17.3	74.6	7.6	2.4	22.9	1.7
GARISSA	141.1	45.6	14.1	19.3	76.8	8.3	3.1	25.1	1.8
MANDERA	136.5	53.8	14.2	16.1	73.3	7.2	2.1	21.6	1.7
WAJIR	138.4	50.4	14.1	17.4	74.8	7.6	2.5	23.1	1.7
KISII	136.4	54.1	14.2	16.0	73.2	7.1	2.0	21.5	1.7
KISUMU	142.7	42.8	14.1	20.4	78.0	8.6	3.4	26.3	1.8
SIAYA	136.0	54.8	14.2	15.8	72.9	7.1	1.9	21.2	1.7
SOUTH NYANZA	136.2	54.4	14.2	15.9	73.1	7.1	2.0	21.4	1.7
BARINGO	137.5	52.0	14.2	16.8	74.1	7.4	2.3	22.4	1.7
ELGEIYO MARAKWET	135.6	55.5	14.2	15.5	72.6	7.0	1.8	20.9	1.7
KAJIADO	139.7	48.3	14.1	18.3	75.7	7.9	2.7	24.0	1.7
KERICHO	136.5	53.9	14.2	16.1	73.3	7.2	2.1	21.6	1.7
LAIKIPIA	139.8	48.0	14.1	18.4	75.8	7.9	2.8	24.1	1.7
NAKURU	141.8	44.4	14.1	19.8	77.3	8.4	3.2	25.6	1.8
NANDI	136.2	54.3	14.2	15.9	73.1	7.1	2.0	21.4	1.7
NAROK	136.4	54.1	14.2	16.0	73.2	7.1	2.0	21.5	1.7
SAMBURU	135.5	55.6	14.2	15.4	72.6	6.9	1.8	20.9	1.7
TRANS NZOIA	137.5	52.0	14.2	16.8	74.1	7.4	2.3	22.4	1.7
TURKANA	137.9	51.4	14.1	17.0	74.3	7.5	2.3	22.6	1.7
UASIN GISHU	140.4	47.0	14.1	18.7	76.2	8.1	2.9	24.5	1.7
WEST POKOT	137.1	52.8	14.2	16.5	73.8	7.3	2.2	22.1	1.7
BUNGOMA	139.9	47.8	14.1	18.4	75.9	8.0	2.8	24.2	1.7
BUSIA	138.2	50.9	14.1	17.3	74.6	7.6	2.4	22.9	1.7
KAKAMEGA	137.3	52.4	14.2	16.7	73.9	7.4	2.2	22.2	1.7
NAIROBI	155.7	19.7	13.8	29.3	87.8	11.6	6.3	36.1	1.9

Figure 2.0: Relationship between per capita non-agricultural land use and population density.

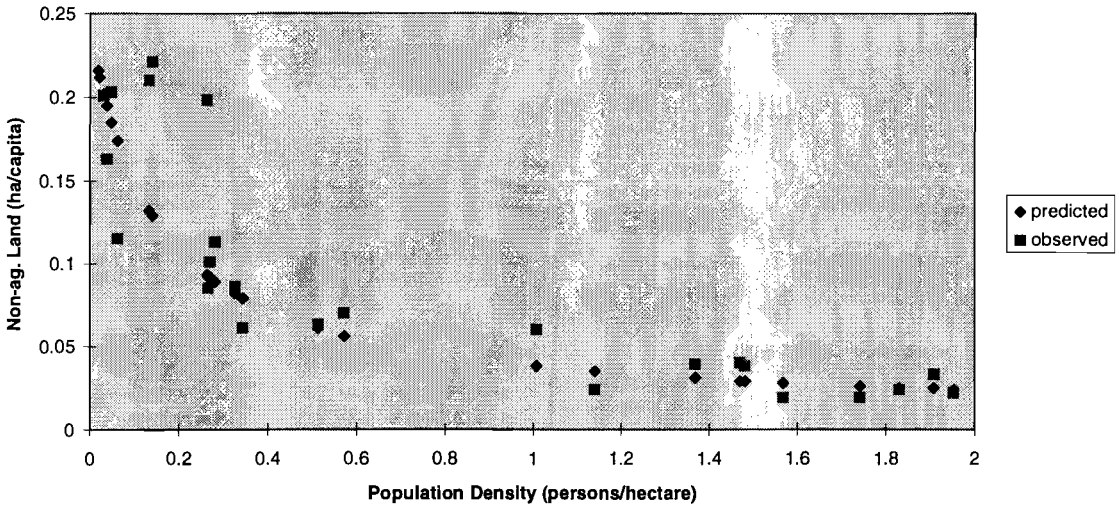

Figure 3.0: Harvested area by major crop groups.

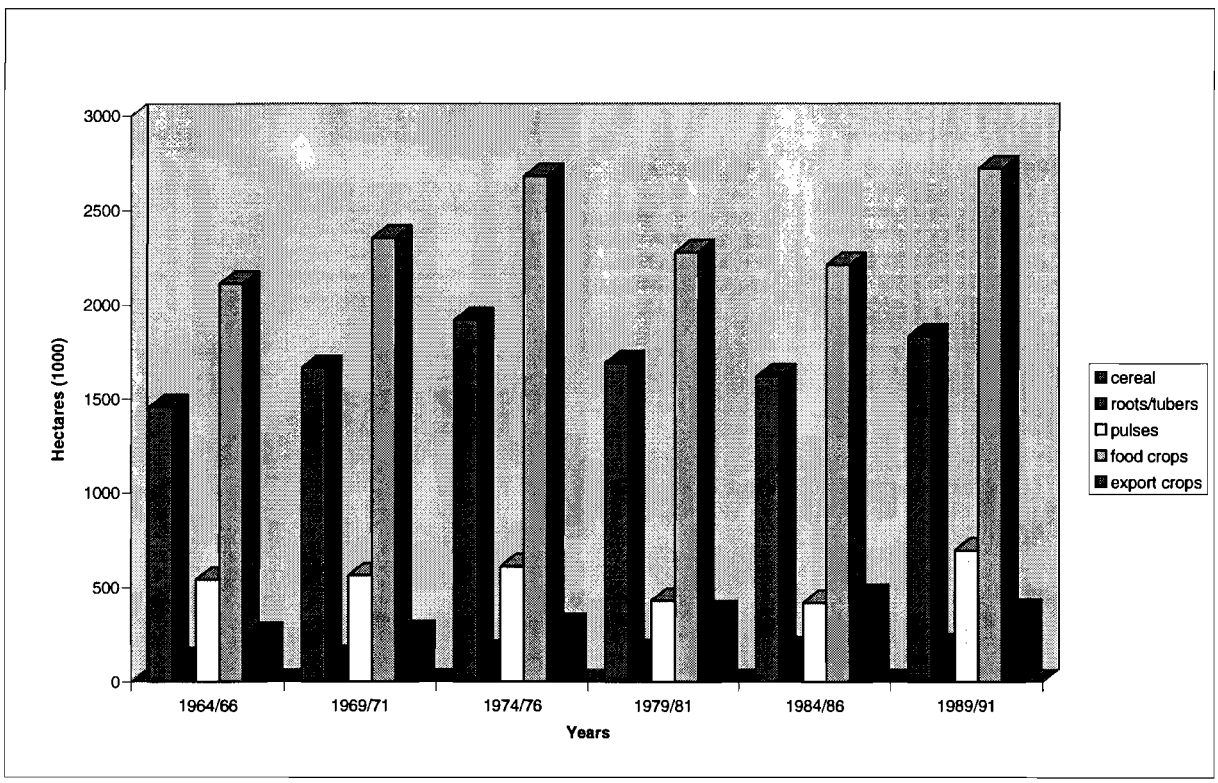

Figure 3.1: Use of agricultural inputs, 1984-90.