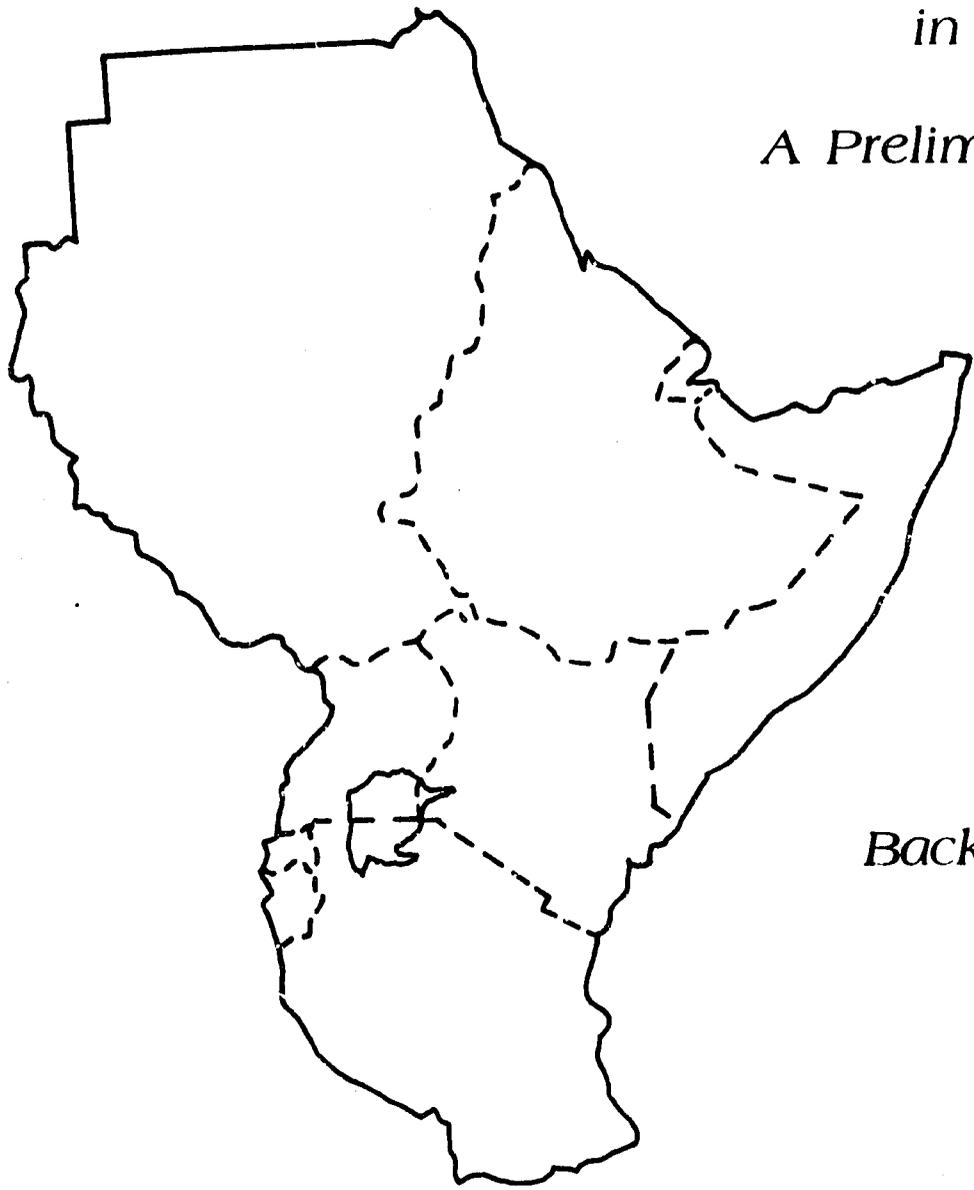


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Eastern Africa Regional Studies

*Trends and interrelationships
in food, population, and energy
in Eastern Africa:*

A Preliminary Analysis



Volume II

Background Papers



December, 1980

Program for International Development
Clark University
Worcester, Massachusetts 01610

PYAN 681

**TRENDS AND INTERRELATIONSHIPS IN FOOD,
POPULATION, AND ENERGY IN EASTERN AFRICA:**

A PRELIMINARY ANALYSIS

VOLUME II

B A C K G R O U N D P A P E R S

**Eastern Africa Regional Papers are prepared on behalf of the United States
Agency for International Development, under contract, by:**

**The Program for International Development
Clark University
Worcester, Massachusetts 01610
USA**

December 1980

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'NEWS' REPORTS ON EAST AFRICAN SITUATION

"Addis Ababa, Ethiopia, June 29 - The long rains have arrived at last but thousands of Ethiopians are still starving and cattle are still dying because of an eight month drought."

New York Times - 7/1/80

"Nairobi, Kenya - From Sudan to the South African Border, more than 60 million women and children will experience prolonged hunger this year because of mounting food problems in Eastern and Southern Africa.

Drought or rain at the wrong time is the immediate cause but hunger is part of an even more depressing picture as Africa falls farther behind in efforts to feed itself."

Washington Post - 6/9/80

"Kenya's economy, showpiece of capitalist Africa, is sliding downhill. Its boast of feeding its own people rang hollow this year: cereals worth \$75 million had to be imported, some from South Africa..... Kenya must cope with the impact of higher prices on agricultural costs (fertilizers, chemicals, fuel) as well as on the balance of payments (oil accounts for 30% of imports)."

The Economist - 11/22/80

"Kampala, Uganda - Hundreds of men and women and children in the Karemoja region of Northern Uganda are dying each week because food cannot be sent to the famine stricken areas for lack of funds."

New York Times - 5/27/80

"Tanzania spends half its annual export earnings on crude oil and oil products a crushing burden which has increased tenfold in ten years."

The Guardian - 11/9/80

"Perhaps the biggest threat to Kenya's success is energy problems. The cost of oil coming in has passed the value of coffee going out. The oil induced trade deficit of \$563 million last year has brought increased borrowing and restrictions in other needed imports..."

Most of the country's energy comes from wood which is fast running out. Moreover, deforestation is endangering the animal herds that make tourism Kenya's third largest industry. The resultant erosion has added so much silt to the water that hydro-electric plants are getting gummed up and breaking down.

The Wall Street Journal - 10/27/80

"In one glimpse here was the accelerating problem of Somalia - indeed of much of Africa.

It is a problem of too many mouths to feed and land becoming increasingly incapable of providing enough food. It is a problem of drought and of slow, quiet almost hidden wars grinding on and on, chewing up what is left of land that is hospitable or even habitable."

Los Angeles Times - 9/22/80

"Following the acute food shortages experienced this year, farmers in Western Province have vowed to go back to the land and produce not only enough food to feed themselves but to leave some surplus for the rest of the country."

Daily Nation (Nairobi) - 11/27/80

FOREWORD

This set of Background Papers is the second of three volumes concerned with interrelationships in food production, energy use, and population growth in Eastern Africa. Volume I is a brief overview document; Volume III is an extended and annotated review of pertinent literature.

The three volumes are intended as a quick and preliminary response to a long and deep seated problem. Although much is available on the individual issues of food, population, or energy, there is a dearth of material which analyzes linkages and interactions among the three.

Many individuals have worked to produce this set of materials in such a short period of time. AID mission directors and their staffs, REDSO/EA, AID/W East Africa office, and AFR/DR agriculture have been especially helpful. International organizations in the United States, Europe, and Africa supplied many documents. Colleagues in African government and university departments gave freely of their time.

Responsibility for the document rests with the principal authors listed on the title page. However, many of the research and support staff of the International Development group contributed their time and effort. Sian Steward took initiative to coordinate research efforts with the able assistance of Demetrius Kantarelis, Leigh Dillard-Campbell, Richard Perritt, and Nancy Villanueva. Pat Hart has managed logistics and production. The typing was done by Jane Bachand and Lu Ann Renzoni and all met impressive deadlines.

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CHAPTER I

INTRODUCTION

In some ways, Eastern Africa is among the most diverse regions on the continent. Elevation ranges from sea level to almost 20,000 feet -- the highest point in all of Africa. Rainfall varies from quite wet along portions of the Kenya coast to moderate in central Kenya and Uganda, to precariously dry in much of Somalia and major parts of Tanzania, Sudan and Kenya. Livelihood systems are very different with extremes including subsistence pastoralism and agriculture as well as highly sophisticated manufacturing and distribution networks branching out from Nairobi. Ethnicity, language, culture, and history are also quite diverse with Eastern Africa serving as a meeting place and melting cauldron for the generally Semitic, Hamitic and Nilotic groups from the north and the Bantu-speaking peoples of central and southern Africa.

With such vast differences, questions emerge as to whether there is any possibility of regional commonality or cooperation to solve basic problems in development and development planning and analysis in Eastern Africa. To this end, USAID mission directors from Eastern Africa have been meeting periodically for the last two years to explore ways in which regional cooperation might enhance the effectiveness of AID initiatives and also to determine whether one part of the region has any development lessons or experience to share with other parts.

This volume is part of this regional analytical process. It parallels, on a much smaller scale, efforts which have been undertaken in other parts of Africa. For example, as AID has explored program priorities in the

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Sahel, regional analyses in livestock, farm systems, education, marketing, transport, employment, etc. were launched to determine how donor support could achieve maximum impact. A similar set of regional studies has been underway in Southern Africa. Although AID has attempted no formal regional analysis for Eastern Africa, the periodic meetings of mission directors have identified a series of issues common to the region including:

Refugees

Transportation

Employment

Energy

Food Production Systems

Water, including both potable water
systems and irrigation

Livestock Management

Population

Energy

Of this list, the unique interaction among increased deficits in food production, energy shortages, and population expansion have been suggested as one area where:

- 1) pressures appear to be approaching crisis proportions;
- 2) the problem transcends national capabilities to respond;
- 3) responses cut across traditional ministerial and sectoral responsibilities;
- 4) and the data base is, at best, uncertain in the reliability and usefulness of information supplied

Further, the interlinks of food, population, and energy needs in Eastern Africa offers a focal point for AID planners to consider in terms of

planning both short and longer range interventions which will reduce pressures in areas critical to the future well being of East Africa.

This immediate report (Volume II) is part of a larger series of documents which are described as:

Trends and Interrelationships in Food, Population,
and Energy in Eastern Africa:

A Preliminary Analysis

Volume I	<u>Overview Report</u>
Volume II	<u>Background Papers</u>
Volume III	<u>Literature Summaries and Reviews</u>

The rapidly growing awareness about the problem of food production and supply, population, and energy in East Africa and more generally in Africa has produced a number of initiatives in recent years. These include reviews by IFAD, FAO, and USDA and a general background paper by AID and a number of initiatives within the countries themselves. While AID Mission Directors were aware of many of these initiatives, it was uncertain how effectively the activities were achieving their goals or whether there were areas not being reviewed. Thus, it became apparent that before AID contemplated any kind of Eastern Africa activity, it should carry out a comprehensive literature and document review and liase closely with individuals and institutions before more definitive action might be planned. AID mission directors asked for a two part report:

- 1) a review of work and material available or underway on the topic;
- 2) a preliminary analysis of the data to identify major gaps or inconsistencies. Specific recommendations on how to fill these gaps were also called for.

These two needs were incorporated into a contract between USAID and the

International Development Program of Clark University (AID-623-80-048, effective September 30 to December 31, 1980.)

The work at Clark was carried out by a group of five professors representing a wide range of African perspectives and experiences; a contract administrator and production manager; four senior graduate student research assistants; and various clerical and cartographic backup staff. The work was directed by an executive committee of three professors. In addition, significant input came from African colleagues both here in the United States and in East Africa. Furthermore, USAID Missions in East Africa and many Eastern African and International Organizations contributed either by suggestions or formal documentation.

This Volume (Volume II) contains background papers and reviews of project activities that form the basis for Volume I (Overview). It reviews in some detail work underway in food, population, and energy as well as brief reviews of the situation in individual countries. It also contains a more detailed set of recommendations as an expansion of the items appearing on page 36 of the Overview document.

Work was initiated at a meeting of the entire project staff on October 3, 1980. At this meeting, the detailed project scope as contained in the contract documents was reviewed and task assignments made. The detailed scope was as follows:

Detailed Scope

1) Literature Search

The Contractor should identify and review existing material in this field, including work in progress, by national (East African), international and U.S. organizations. The review should lead to a summary report outlining:

- a) purpose of each major study
- b) methods of the study
- c) results or anticipated results of study

In addition, a review of the regional data base on food, population and energy should reveal major categories of statistical data available and some preliminary assessment of its reliability.

2) Preliminary Analysis

An analytical review of the available data should be carried out to yield further information on:

- a) quality and reliability of data base
- b) degree of specificity of information (i.e., within countries how much do we know of different trends in population, food production and energy use?)
- c) major gaps in our information on and understanding of the food, population, energy situation in East Africa.

3) Specific Recommendations

The work carried out under items 1 and 2 should lead to specific recommendations on the work needed to fill any gaps of information identified. If a further comprehensive study is judged necessary, the recommendations should include a draft scope of work for an in-depth analysis of aspects of the population growth, food production and energy situation in East Africa.

Working papers prepared according to each person's assignment were reviewed at twice weekly meetings of the staff. The material for these papers and for the bibliography were collected from many sources. They were sources available at or through Clark University, other U.S. sources and a

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number of contacts in Europe and Africa. Field data collection included one major trip overseas and several overseas visits in connection with other projects.

The following sources were consulted and the following contacts made:

In the U.S.: Documents collection of the Program for International Development, Clark University

Goddard Library and CENTED Libraries, Clark University

Boston University Library

CDR - Copenhagen

Eleven Computerized Information Systems or Data Banks (major sources were AGRICOLA, CAB abstr. SOCSCO SEARCH. The other eight produced little information.)

USAID Library, Washington

World Bank, Washington

USAID Library, Washington

World Bank, Washington

Institute for Food Policy Studies, Washington

Cornell University, Ithaca

African Studies Association Meeting, Philadelphia

RAPID c/o The Futures Group

USDA

UNDRO, New York

USAID/AFR/DR Agriculture and USAID/EA

In Europe: WHO, Geneva

WMO, Geneva

UNCTAD, Geneva

World Wildlife Fund, Morges, Switzerland

Center D'Etudes Industrielles, Geneva

Department of Geography Technische Universitat Munchen,
Munich

IFO-Institut fur Wirtschaftsforschung, Munich

FAO, Rome

In Africa: Ford Foundation, Cairo

USAID Mission, Cairo

USAID Mission, Dar es Salaam

BRALUP and University of Dar es Salaam, Dar es Salaam

Government of Tanzania Offices, Dar es Salaam

FAO, Dar es Salaam

Local Consultant, Dar es Salaam

USAID Mission, Khartoum

University of Khartoum, Khartoum

USAID Mission, Nairobi

REDSO, Nairobi

UNEP, Nairobi

SIDAM, Mogadishu

ILCA, Nairobi

ICIPE, Nairobi

ECA, Nairobi

Population Studies Center, University of Nairobi, Nairobi

Environmental Secretariat and other offices of the Government
of Kenya, Nairobi

Ford Foundation, Nairobi

At each of these contacts, knowledgeable individuals were interviewed, collections examined and when possible publications acquired.

All working drafts were examined by all professional team members and in the case of the summary by some individuals at USAID Washington. The

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final report was the prepared in three volumes, Summary, Background Papers and Literature Reviews.

In the constraints of a study which began on October 3rd and where report writing started on Devenber 5th, and final reports submitted on December 31st, we judge that we have been able to identify most of the major activities and a large part of the literature. There are undoubtedly some omissions and misinterpretations and we would be pleased to hear them. Much remains to be done.

CHAPTER II

FOODI. Introduction

Food issues in eastern Africa involve production and consumption problems. Most attention, both applied and theoretical research, and national/international monies, has been directed to production issues, particularly toward attempts to increase total output. Despite these efforts, food production throughout the region is down (USDA 1980) and large segments of farmers are becoming increasingly vulnerable to various perturbations (Wisner 1978). Consumption issues, such as food preferences and access, have received less consideration than those of production. Briefly stated, those food issues in eastern Africa could be addressed by technological measures alone, mostly production problems, have been favored over those issues requiring socio-economic considerations, some production, and numerous consumption problems.

Any analysis of food issues in eastern Africa must emphasize that the traditional economies of the region, for the most part, have provided adequate subsistence (food) for their populations. These economies have shown an ability to improve their output as needed, given minimal exogenous interference (e.g. Thornton and Rounce 1963; Basehart 1973; also see Boserup 1965; Brookfield 1972; Turner et al., 1977). Colonialism and the emergence of a world economy have been perturbations of a major kind for the traditional economies (Sheriff 1974; Bernard 1972). The assumption that a rapid shift from traditional, subsistence-oriented norms to capitalistic, market-

oriented norms could and would be made by the economies in question was and is erroneous. The view that the shift in norms is irrelevant to food issues is naive. The appropriate perspective at this time may not be a focus on the so-called problems of traditional production, but on the issues involving the new demands and constraints placed on these economies.

II. Key Issues

A. Production

1. Discrepancies between subsistence and market production.
2. Environmental qualities of the region.
3. Disincentives to production.
4. Governmental policies.
5. International pressures.
6. Philosophy of technology
7. Farm size.
8. Commercial energy inputs.
9. Labor inputs
10. Pastoralism and livestock.

B. Consumption

1. Techniques of distribution, preparation, and storage.
2. Cultural preferences.
3. Livestock needs.
4. Access to food.

III. State of Arts in Relation to Each Issue

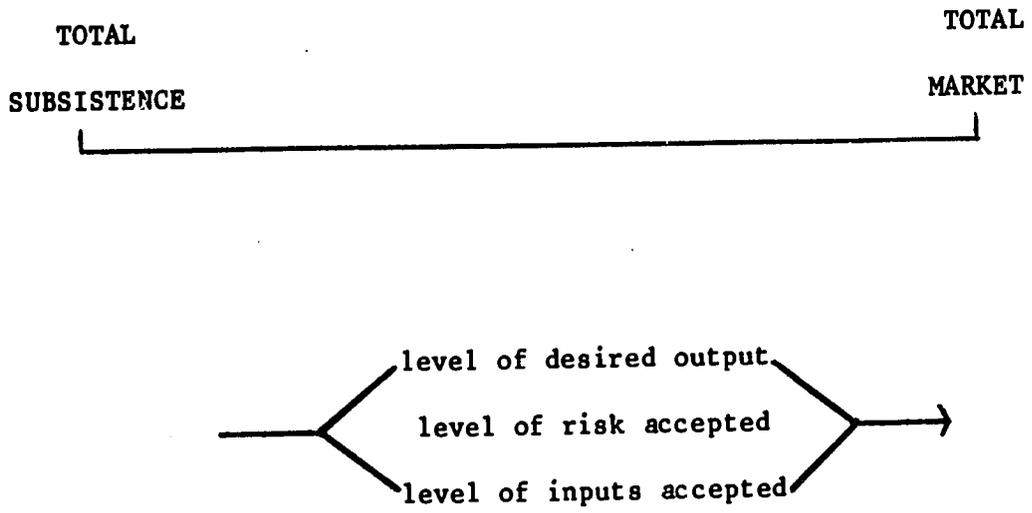
A. Problems of Production

Discrepancies Between Subsistence and Market Oriented Production.

Perhaps no circumstance has drawn more academic and less donor attention the norms and objectives of traditional economies and how they differ from those of fulltime market economies (Boserup, 1965; Brookfield, 1972).

Agriculturalists operate in context of a behavioral continuum in which values or levels of the particular norms change (Figure 1). These norms involve standards of output, risk, and standards of inputs.

FIGURE 1
BEHAVIORAL CONTINUUM



The basic argument is that a "pure" subsistence farming unit has a desired output largely related to the subsistence needs of the farming unit, and attempts to achieve this goal by a play-off between least risk and least effort. Hence, even though the farming unit has the capabilities of increasing output, it will do so only if its level of desired output increases. In contrast, market farming usually involves high levels of desired output which increases levels of acceptable risk and inputs. These levels increase because the market entails higher degree of uncertainties than does subsistence production, requiring greater inputs to circumvent them as well as to increase output. The farmer not only accepts the usual

environmental risks, but increases them by specializing production in a limited number of crops. Furthermore, the farmer must accept risks of fluctuating costs of inputs (hired labor, inorganic resources) and of reward from the market (price of crops). In comparison to subsistence costs, the farmer accepts greater risks to feed the unit, i.e. to purchase subsistence generally costs more than to grow it. Finally the level of the farmers' knowledge decreases on entering the market, enhancing perceived risk, such that the uncertainty of levels of risk increases.

Livelihoods in eastern Africa have been of the kind falling along the middle of the continuum in which there are dual goals--those of the subsistence section of the farming unit (often performed by women) and those of the market section of the unit (usually performed by men). The former is characterized by attempts to maximize efficiency (input/output ratios) for subsistence needs. The latter is characterized by a greater emphasis on maximization of output. The result of this duality is less total production, but greater food security than could be achieved if the entire farming unit effort were geared to greater market participation. The reasons for not completely accepting the market alternative are clear.

That these basic norms hold for traditional economies in eastern Africa have been suggested by numerous micro-level studies or syntheses of them (Boserup 1965; Turner et al., 1977 Fleuret and Fleuret 1980; Bernard 1972; Porter 1979; Bellete 1979; Harwood 1979). At least one micro-study indirectly has disagreed with the argument (Dattoo 1976).

Pastoralists operate within a framework not unsimilar to that discussed above. The ploy here is to avert risk in high risk, semi-arid environments with least effort. This goal is achieved by emphasizing large herd size, although each livestock unit is at lower productivity than if herd size were

lowered (Dyson-Hudson, 1969). For pastoralists to become more market-oriented and ranch-like in procedures requires that such ventures offer as high or higher standards of production at less levels of risk. Where livestock prices have increased to acceptable levels, some pastoralists have demonstrated direct market involvement (Jacobs, 1978). Dyson-Hudson's (1969) work on the Karamojong pastoralists of Uganda tends to support these arguments. Numerous studies on "dual" farmers (subsistence and market production), elsewhere tend to support the strong influence of risk/uncertainty and least effort on input/output relations (e.g. Schultz, 1964; Mellor, 1966).

2. Environmental qualities of the region. While many economic analyses have tended to give little attention to the special qualities of the eastern Africa environment, a few (e.g. Porter, 1980; Berry, 1976; 1979), have emphasized environmental problems. Eastern Africa does have a large amount of extensively used land (AID, 1980; Turner, 1980). However, large parts of these lands tend to have high levels of constraint for agriculture, involving soil, water, disease, and other limitations. Each microenvironment offers a different degree of resistance to increases in production such that the amount of effort and level of risk vary enormously.

A continuum exists such that land can be categorized as more marginal or more optimal in terms of agriculture feasibility (Turner et al., 1977; Brookfield, 1972). Such analyses have not been made for much of eastern Africa, although a series of BRALUP reports approach the topic for Tanzania. Indications are that good land everywhere is in short supply and a high level of inputs is needed to improve per acre output in most areas.

Eastern Africa is also inflicted with various disease/pest-vermin problems that are unique to the tropics and/or to the region. High humidity

and temperatures exacerbate pest and disease growth. In addition the region has a high incidence of locust swarms because of the semi-arid regions within and nearby which act as breeding grounds. Trypanosomiasis is another problem that impedes use of various areas by both cultivators and pastoralists, particularly in Tanzania and the lacustrine zones. Finally, the region is beset by vermin, large and small, including birds, rats, insects, wild pigs, primates, and elephants. Livestock of pastoralists locally compete for grasses with large game herds, although the possible symbiotic relationships between pastoralist activity and game animals is not well understood.

While eastern Africa is not dominated by poor quality soils exhibiting lateric processes, the overall quality and cultivation characteristic of soils by micro-zone are not well known. Of the three most common quality soil types in the tropics-- mollisols, various volcanic soils, and certain alluvial soils (Sanchez 1976)--eastern Africa has a limited area of the alluvial variety (Excepting Sudan). Mollisols, particularly vertisols, often are dense and require considerable manipulation to cultivate, but are not beyond the means of traditional cultivators to manage as some texts imply (Hopfen 1969). These are more common in the area.

Insufficient rainfall and surface water sources are a key constraint throughout vast tracts of the region, particularly from Kenya northward and eastward. The semi-arid zones are succumbing to large influxes of poor farmers who lack sufficient resources to intensify production under such rainfall uncertainty. Here, vulnerability to drought by farmers is increasing (Wisner 1978). Because of the nature of most of the available water sources throughout the zone, water projects for cultivation tend to require labor or capital beyond the means of the farmers. Attempts to drill

wells for pastoralists have resulted in land degradation near the water points.

In contrast to aridity and those soil problems discussed, large segments of eastern Africa, particularly the Sudd zone of Sudan and segments of the lacustrine zone, suffer from soil inundation and extreme dichotomies in seasonal soil moisture due to prolonged flooding. Such conditions can be countered without modern technology, but such procedures require enormous effort on the part of the people concerned (Denevan and Turner 1974). Burundi and Rwanda have been engaged in manipulating such wetlands (MAAH n.d.).

Considering the large areas of eastern Africa which are affected by desiccation, inundation (or their mix), steep slopes, marginal soil fertility, disease and pest problems often in combinations, there is little basis for the assertion that the region has abundant lands for agricultural expansion. Much land is available and can be improved, but only at the cost of high levels of inputs for improvements and risk aversion. This constraint appears to be beyond that which people in most livelihood systems are willing to invest at least until such time that alternatives are not available or that use of such land appears viable in comparison to the alternatives, such as migrating to the city for example.

Our overall ignorance on the characteristics of eastern African environments is troubling, and some previous assessments appear to have been over-optimistic. A study of the Kilombero Valley in Tanzania is an example of the recent downgrading of assessed potential (Baum 1968).

3. Disincentives to production. Regardless of the type of livelihood employed, production can be strongly affected by disincentives from many forces (Schultz 1978). Some of the forces are directly related to

governmental policies and similar factors, (e.g. Commonwealth Secretariat 1979). Disincentives have tended to be relegated in significance in most assessments of agriculture in eastern Africa, but of late, the literature has documented the production effects of such forces in Uganda and elsewhere.

By far the greatest disincentive to production in eastern Africa is sociopolitical instability, which not only disrupts markets, but decreases production by increasing farmers' insecurity, destruction, looting offenses, and population movements (refugees). The social upheavals and warfare in Uganda reduced a surplus producer to substandard production levels (Commonwealth Secretariat 1979). Production problems in Ethiopia are undoubtedly attributable to recent political instability in that nation. Other disincentives are discussed below.

4. Governmental policies. As well as the obviously negative procedures which affect agriculture, a number of well-intentioned policies have exacerbated food problems in eastern Africa. Reward structures for export crops, initiated to help alleviate balance of payment problems, contribute to lower food production. Urban demands for non-tropical staples depress production of local staples with the effect of lower total caloric output because exotic crops may not be especially suitable to the environs of eastern Africa.

Various planned projects have forced or persuaded the use of new, high-cost technologies without the appropriate infrastructures to support them. Results include broken tractors, inadequate amounts of fertilizers, or poor transportation which increase farmers' risk and, hence, reluctance to engage fully in the efforts.

Sociopolitical fervor to increase standards of living have resulted in "communal" farming projects. Often these have been employed on the mistaken assumption that the traditional economies of the region were communal or that the peasant would benefit from a system that impedes food access, inequitable, and land distribution/accumulations that occur in capitalist economies. Such has not been demonstrated. Indeed, traditional farmers are frequently quasi-capitalists within the structure of their societal norms. Reciprocal labor and other such traditional mechanisms are employed to insure adequate access to critical resources, but such procedures should not be mistaken for true communal production. Unfortunately, few works have emphasized the role of project "philosophies" on food output.

Planned rural programs in Ethiopia and Tanzania have undoubtedly affected production, although documentation as to why is unclear. Regardless of the philosophies of the schemes and their long-run effects, the short-run is marked by disruption which contributes to initial depressed production. Interestingly communal farming in Tanzania is now given lip service only and most land is individually owned or farmed.

5. International pressures. The demand for agricultural goods in foreign markets, particularly western markets, often distracts from food production as needed for national markets. Foreign export crops tend to return higher rewards to the farmer than do local food crops; and, hence, farmers tend to cultivate the former under market-type norms at the expense of local staples. Indeed, farmers are encouraged to grow export crops, such as cotton, tea, and so forth, by their governments in order to help offset trade deficits. Encouragement takes the form of loan availability, agricultural extension interest, and so forth. Responses of the

international community to competitive production will be interesting. Many farmers in eastern Africa are hooked into international production, but may be placed into precarious circumstances if their wares threaten foreign producers, as attested by the recent constraints placed on the importance of manioc pellet fodder into Europe.

6. Philosophy of technology. Perhaps the key problem area as attested in the past literature is that of the use of appropriate technologies of production. In large measure this "problem" has not resulted from inadequate know-how by farmers and pastoralists, but from the "rational" decisions given traditional objectives. Reports of inadequate technologies to offset erosion and other such problems often are associated with sociopolitical disruptions or disincentives to the traditional economy. Various farmers in the region have adapted independently or with assistance to those technologies within their technological framework where needed and under suitable socioeconomic circumstances (MAAH, n.d.).

Traditional behavior tends to impede adoption of new technologies, such as hybrid crops, because of the uncertainty associated with them or because of economic constraints. Farmers and pastoralists tend not to accept additional risks, particularly when the uncertainty of those risks is large. Adoption of high capital input technologies without proper infrastructures and transformation of the traditional economies to market orientations increases uncertainty. Furthermore, small-holder circumstances are not conducive to large-scale mechanization. Herein lies a major problem to agricultural output in eastern Africa. Consolidation of land holdings drives people off farms and to urban zones which are not providing sufficient employment for them. Also, large-scale technologies require inorganic energy and other inputs, the costs of which are rising rapidly.

Interestingly, western companies and governments have pushed for large-sized machines, rather than small-sized machines, such as hand tillers-tractors used in Asia (Johnston 1979). The retort that small-sized machines are inadequate for African soils must be viewed with caution (Hopfen 1969). Donors' insistence on the use of large-scale machinery, or of any specific machinery, or of any specific machine is clearly linked to the donors' manufacturing component. Experimentation with small-sized machines throughout eastern Africa is needed.

7. Farm size. The issue of mechanization is closely associated with farm size. It is commonly argued that efficiency in terms of output per unit area, is increased by increasing farm size (Lord, 1963). This view, of course, fits nicely with that promoting consolidation of small farms in order that large-scale mechanization can be utilized. The question of efficiency is not resolved, however, and estimates of optimal farm sizes, by circumstance, are not usually available for eastern Africa. Those which are available often fail to account for the production of small holders in terms of their economics.

Various studies argue that smallholder farmers are efficient in terms of input/output ratios (e.g. Ruthenberg 1976; Harwood 1979). The problem is that efficiency, in this instance, does not necessarily lead to increased output per unit area and time (output intensification) (Turner and Doolittle 1978), and may not necessarily lead to increases in output per farming unit. Small-scale mechanization (as noted above) may hold the key to intensification with resulting high rewards to the farming unit. Certainly, it cannot be implied, with any accuracy that eastern African farmers are not sufficiently adept to utilize such technology (Hopfen 1969).

Interestingly, use of work animals has frequently been overlooked

as a means of increasing agricultural efficiency and production on small farms. This circumstance may have resulted from the problems of trypanosomiasis, but probably relates to the emphasis placed on mechanization. Studies have demonstrated the usefulness of oxen in the short grass zone of Uganda (Okai, 1972), and recent changes in western views have emphasized the role of animals in the total small farm system (Rockefeller Foundation, 1976; Baldwin, 1980).

The issue of optimum farm size by ecological zones, crops, machine types, and so forth are not well understood. Furthermore, few studies exist which assess optimum play-offs between retaining the maximum number of farming units and maintenance of various levels of production. It seems that a de-emphasis on large-scale mechanization and an emphasis on working livestock and small-scale machinery could lead to increased output on small farms.

8. Commercial energy inputs. Most livelihood systems in eastern Africa are based on low levels of total inputs. Increased output and transportation of produce will lead to rising commercial energy costs, an agricultural constraint, regardless of the scale and types of methods utilized. Currently, this problem is mostly a "potential" issue in regard to the transformation of labor-oriented to mechanized cultivation. In this regard small-scale machines may have a decided advantage over their larger counterparts, but this point is not documented. It is important to note that agriculture per se is not a major user of energy, but energy costs undoubtedly affect the willingness and abilities of farmers to mechanize.

The smallholder, however, has various direct and indirect traditional energy costs that affect their activities. Reliance on and scarcity of fuelwood requires a large percentage of time used to obtain fuelwood at the

expense of other (including agricultural) endeavors. In addition, increased need for fuel-wood will lead to direct competition for land with food and export crops.

9. Traditional energy inputs. The role of labor in issues of production is somewhat controversial. Basically, labor problems consist of the size of the labor pool and its composition. The rationale for the "backward bending labour supply curves" formulated for traditional economies failed to account for traditional goals. "Development" has had the effect of raising desired standards of living and increasing populations, both of which necessitate rises in levels of output. However, the movement of peoples to urban areas and insufficient employment in farming zones may create labor shortages or "bottlenecks" for production.

The degree to which labor bottlenecks affect production is not clear. The problem may be minimal to subsistence production because of multicropping, relay cropping, use of root crops, and other procedures which spread cultivation and harvesting over a long period of time. Shifts to market food production, particularly to cereal crops, demand a relatively short harvest period. Also, the shift to larger farms, both for food and export crops, often necessitates labor at key time periods. Some of the labor bottlenecks for food crops may result from the inability of the farmer to pay for sufficient labor. Emphasis on small farms and small-scale mechanization may be one solution to the problem.

The division of labor also affects the production of food crops in much of eastern Africa. Men often produce market crops and women produce subsistence. This circumstance has numerous direct and indirect consequences. More capital and energy inputs generally go into male-market production. Women generally must provide numerous household services in

addition to cultivating which reduces potential work time in subsistence. During key agricultural periods (harvest), women must relax their household services, such as food preparation, in order to devote more time to cultivation. The result can be considerable change in diet/nutritional levels for the household (Bleiberg, et al., 1980). This circumstance may make the unit more vulnerable to various health problems and less capable of producing strenuous work.

10. Pastoral economies. Pastoralist's activities in arid or otherwise agriculturally marginal habitats is not usually considered to be an inappropriate land use contributing to food problems, although various attempts have been made to improve the output or off-take of livestock (USAID 1980). Pastoralism has become a controversial issue where it is pursued on lands which have become economically viable for cultivation because of land pressures. These lands include the semi-arid regions bordering wetlands, particularly in Kenya and Tanzania. Attempts have been made to settle pastoralists, such as the Maasai, particularly as "ranchers". The success of these projects have varied; the problems are similar to those of agriculture--the transition from a subsistence to a market economy. Mere technical or land restriction procedures do not a rancher make.

Traditional pastoralists have developed a livelihood geared toward efficiency of production (input/output ratio), and risk aversion. Each type of system is intricately linked to ecological conditions. Plans to "develop" these livelihoods must take into account the norms and environmental constraints of the pastoralist. Offtake, for example, may be increased but only at the cost of higher inputs which are not generally available to the pastoralist and/or are economically unfeasible.

B. Problems of Consumption

1. Techniques of distribution, participation, and storage.

large amount of food in eastern Africa is lost directly in transport, storage, and processing. Of these, storage has been identified as a major problem; it is estimated that as much as 30 percent of stored harvests are lost to pests, pathogens, and decay (N.A.S., 1978). This circumstance must be changed if food problems are to be adequately combatted. Losses are also encountered in harvest, processing harvest, and movement to storage facilities. Such losses are inherent in any system, but the magnitude of them in eastern Africa appears unusually large.

2. Cultural preferences. Food problems are affected directly and indirectly by cultural attitudes toward preferred foods. Certain food avoidances have been documented for the area in precolonial/colonial times, although some of these "taboos" are founded on physiological principles, such as mild avoidance (Simoons, 1961, 1974). In contrast, fish avoidance may be entirely cultural preferences which is breaking because of the paucity of alternative animal proteins. Preparations of food can also influence nutrition and food problems. Maize (Zea mays) has increased as a food in the region, but the failure to prepare it, such that various key nutrients are released, may lower its value as a food source (Katz et al. 1974). Likewise, the increased consumption of manioc/cassava (Manihot sp.) may have a negative effect on nutrition if not used as part of a more complex dietary pattern.

Changes in food preference brought on principally by exogenous influence have also affected food issues. The increase in demand for wheats and other non-tropical produce in urban areas increases imports--a severe problem--and influences the cultivation of these crops. The problem here is that various midlatitude cultivators do not produce well in the tropics;

hence the replacement of a field of manioc or millet by wheat results in an effective loss of total foods.

The shift from breast to bottle feeding of infants is another serious food change brought on by western influences. Not only may breast feeding be more nutritious than bottle feeding, but the absence of breast feeding wastes a good food source and may increase fertility. Furthermore, since eastern Africa is not a major dairy zone, bottle feeding may increase imports. The total effect of this shift is less food at higher costs and reductions of natural checks on fertility.

3. Livestock needs. Although livestock are an important source of food, they are, of course, consumers of food. Some stock, such as swine, do not compete directly with people for food. In contrast, cattle, sheep, and goats, may require fodder if grazing lands are not available. Indeed, grazing may compete with cultivation for certain lands. Such conflicts over land are increasing and are likely to become more common in the future. Livestock provide insurance, food, labor, and fuel (dung), and their disappearance would necessitate costly substitutes. However, estimates of livestock contributions to the small farmer and their costs of upkeep are sparse.

4. Access to food. Totals of food production can be deceptive if it is assumed that it is equitable distributed, or that the general populace has equal access to it. Such, of course is not the case. The wealthy rarely suffer from food problems and differential patterns of access and consumption occur among the "poor" (Fleuret and Fleuret, 1980). Consumption problems are most severe among the poorest of the poor. This problem is most sensitive because its cause need not be production or consumption techniques, but involves the fundamental sociopolitical and socioeconomic strategies of the country involved.

IV. Data Problems

For the most part, data on food/agriculture in eastern Africa lack sufficient temporal and spatial depth. Food data (production, availability, consumption) throughout the region are sparse, are available usually on aggregate levels only, and are questionable in quality. For example, production is said to be down in Uganda, but the relative levels of this depression are obscured by the smuggling of crops to neighboring countries and other such black market activities (Commonwealth Secretariat 1979). Indeed, unaccounted, illegal sale of production is prevalent throughout many of the countries in eastern Africa where prices are established at low levels by governments.

Experience in Ethiopia (and, perhaps, elsewhere) indicates that local production figures are fabricated by officials because the data do not exist and/or because of political or economic motives. Unfortunately, sufficient studies are not available on a micro-level to effectively challenge aggregate data sets.

It is interesting to note that numerous ethno-studies of smallholders do not necessarily portray circumstances of excessive hunger/food problems. This comment suggests that immediate hunger problems are not spatially uniform and that much of the evidence is derived from "relatively" successful or viable producers. The exception to this point are areas in which major sociopolitical disruption has taken place or in which major transformations in national policies have occurred (e.g. Uganda and Ethiopia).

A tendency exists for information quality and quantity to increase for large-scale projects, for export crops, for zones of population/political

concentrations and for European settlements or potential large-scale projects. Input/output data, the key to understanding production problems, are best for the Gezira Scheme of Sudan, the highlands of Kenya, certain zones in Tanzania, and the cultivation of tea/coffee/cotton. It is noteworthy that much of the data for the export crops is collected and analyzed by grower associations.

Input/output data on pastoralists are sparse, with current studies of the Turkana (Dyson-Hudson) having the potential to be the most complete. However, the Turkana are under great stress at this time, such that the resulting data may not be the norm, at least historically, for that group.

Environmental assessments of eastern Africa cover larger areas than do agricultural assessments. This circumstance results largely from the relative ease in which environmental data (e.g. soils, vegetation) can be collected in contrast to input/output data, and from the need for environmental assessments by agencies interested in development. Unfortunately, such studies are often superficial and rarely standardized. Relatively good assessments have been made of sections of Sudan, Kenya, and Tanzania. Tanzania has complete aerial coverage by its BRALUP reports, but these are largely syntheses of available data and not standardized environmental data sets. Nevertheless, they form an initial data base which the various countries in eastern Africa would do well to follow.

It is, perhaps, as useful to note those areas for which environmental and livelihood data are poor or in need of vast improvement. These areas include northern Sudan and the Sudd region, most of Ethiopia, Djibouti, and Somalia, northern Kenya, various segments of Uganda (especially the north), central and southern Tanzania, and large portions of Rwanda and Burundi. The common data sets generally extrapolate production/consumption figures by

gross environmental/livelihood zones throughout the country in question.

V. Implications for Development Policies

Other than famine relief, the food policies of the governments of Eastern Africa and donor agencies have focused largely on the improvement of agricultural production. Traditionally, the broader philosophy has been based on a "trickle down" philosophy of development. Most monies have been pumped into national programs, such as agricultural research and educational services, the effects of which, it is assumed, will percolate to the majority of smallholders. The data does not suggest that this basic approach has worked. Below are listed some of the major components to development policies in the region.

1. Nature of traditional economies. The view that development programs have of the nature of traditional economies is critical to the type of policies that emerge. The dominant views in the past are usually not explicitly stated and are inconsistent by project. Implicitly two polar extremes are apparent: that traditional, smallholder cultivators (pastoralists?) are economically rational in a classical sense, or that such cultivators and pastoralists are culture bound, resistant to change, and in need of major nurturing in regard to lifestyles. The former view justifies macroeconomic policies and "trickle down" (growth pole) programs in which efforts center on the development of markets and export crops in which the smallholder will risk entry. The second view has been used to justify why the former approaches do/did not work adequately and to focus attention on teaching farmers, especially, how to cultivate. Recent donor policies have recognized the fallacies of either polar extremes (AID, 1980; Fleuret and Fleuret, 1980), although it is not clear that major programs have seriously attempted alternative strategies.

2. Research and development. Perhaps no single aspect of food improvement has received more attention in eastern Africa than research and development. Early policies focused on experimentations with various indigenous rotation and crop mixing patterns. The work, to date, has probably not equalled that of its counterparts in other regions (e.g. CATIE, CYMMIT). Minimal experimentation has also been given to livestock breeding, health, and "ranching" of native herd animals, Ranching of wild animals has yet to prove successful.

3. Agricultural expansion. Donor and local policies have called for major expansion of agriculture into semi-arid (pastoralists) zones both for dryland and cultivation and irrigation. Dryland schemes have not been overly successful from an agricultural perspective, both economically and ecologically. Data on irrigation projects are inconclusive. Schemes have been developed in Tanzania, Kenya, Somalia, Ethiopia, and Sudan. Such projects require high capital inputs for construction and, in many cases, have not resulted in high output production of food crops. Because of the cost of these schemes, they tend to emphasize export crops for balance of payments problems, such as the new sugarcane, irrigation scheme by the Juba River in Somalia. Indeed, private monies for such schemes invariably dictate that export crops are to be grown.

4. Agricultural intensification. This policy--increasing output per unit area and time--coincides largely with research programs but also includes implementation of terracing and other techniques which help retain land at a superior level of production capabilities than without their use. Much of the effort has involved export crops, but recent attention has

shifted to local food crops. Land preservation schemes, emphasizing terracing and strip cropping, in Burundi, have been successful in sustaining intensive cultivation. Pastoral policies in Kenya and Tanzania have been to reduce land holdings and to move these economies into semi-cultivation and/or ranching (Jacobs, 1976; Hedlund, 1971). Land pressures have resulted in the adoption of agriculture by some pastoralists, although the process of ranching efforts is dubious.

5. Pest/vermin and disease control. Minimal efforts have been given to control of pest/diseases of crops and animals, other than for key export items. Some quarantive programs have been implemented. R. & D. studies have examined means of smallscale pest protection.

6. Land and economic reform. Change in economic structures have largely been policies implemented by individual countries. In Kenya, Sudan, and Burundi, such reforms have been merged into the existing economic structures, and usually have taken the form of resettlement schemes, irrigation projects, or smallholder improvement. Ujamaa in Tanzania and recent policies in Ethiopia have focused on more fundamental changes in the economic/-land tenure structure. The results of the various projects have been mixed. Small-scale approaches and generation of increased output to market stimuli have apparently worked in various schemes in Kenya (Bernard, 1972), Rwanda (Nwafor, 1978), and Uganda (Scherer, 1969), but have had mixed results in Sudan (e.g. Briggs, 1978), and Kenya (Von Haugwitz, 1972), and failed in Tanzania (Lord, 1963). Ujamaa has not been overly successful in Tanzania, if success is defined by total production increases on communal versus individual farm units. Of course, success must be judged against objectives (as discussed below). Increased or decreased production does not necessarily imply that smallholders and the landless are eating better or worse.

Schemes for pastoralists have had mixed or uncertain results. Pastoralists ranching schemes in Sudan have failed because of poor planning and misunderstanding of the objectives of pastoralists (Mustafa, 1979; Thinn, 1979). The impact of Kenya ranch schemes among the Maasai, attempts which bend more toward the traditional patterns of the economy, are not clear. The Maasai may have accepted ranch ownership as a means to keep farmers off their land, not necessarily as a mechanism to jump into a ranching.

7. Policy objectives/cohesiveness. Well defined objectives for food/agricultural policies in eastern Africa are few and do not exist in regard to integrative efforts of various international agencies and, often, local agencies. USAID's program appears to be a mix of strategies guided by no overall policy. This problem is not unique to USAID (Gemmill and Eicher 1973). Some international organizations, such as Food Corps (NPIS, 1979), have well defined philosophies of approach, but often lack sufficient specific objectives and/or use of the "in the field" approach for defining them. Tanzania's Ujamaa was one of the few national level attempts to define precise objectives/philosophies for an entire country.

One result of the "mixed bag" approach by all levels of agencies are the absence of a regional-scale objectives. Programs in one area are not viewed in terms of pan-national impact and often, internal (national) impact. Local agencies may also lack sufficient coordination of efforts, finding one governmental agency developing water sources in a district that another agency has marked for no agricultural development.

VI. Application/Research Recommendations

A. Data Types. Although it is, perhaps, a cliché, the data on food

and agriculture in eastern Africa are sparse by world standards. Reviews of traditional economies, ecological zones and projects, and future projections for the region, or sectors of it, abound. Unfortunately, these studies draw on one another's data, such that perusal reveals that valid, hardcore evidence from which the larger studies are based are few. Critical micro-level data on environmental characteristics, economic descriptions, input/outputs, consumption, and so forth are few and, often, outdated. Exceptions exist in some academic work and through agencies such as I.F.O. (e.g. Jatzold and Norman 1973). It cannot be over-emphasized that micro-level environmental, economic, and cultural data are essential to understanding macro-level data and to creating adequate agricultural development projects.

Such data problems will always be exaggerated throughout the region because of the wide variety of environmental zones and the number of economic/agricultrual adaptations to it. It is doubtful, for example, that input/output data for pastoralists in northern Sudan will be applicable in northern Tanzania.

Recommendation one calls for more micro-level examinations of all facets of food/agriculture throughout the zone.

B. Development philosophy approaches. The best data and intentions can be misused and muddled when programs have poorly or partially defined philosophies and approaches/objectives. Recurrent in numerous assessments of development programs and projects (e.g. Gemmil and Eicher, 1973; Fleuret and Fleuret, 1980) are calls for defined purpose, goals, objectives, and for coordinated efforts among and within donor agents and national agencies. Furthermore, it is recognized that the implicit traditional approaches based

on the "trickle down" concept as instigated by agencies to the "subjects" designated for assistance cannot and will not work alone. Alternative approaches must include the bottom-up concept, self-help, agent-subject interaction and so forth. This approach, in itself, is micro-level.

Recommendation two is the need for improved definitions of program purpose/goals, for the adoption of alternative strategies of agricultural development based on bottom-up and agent/subject interaction, and for integrated efforts both by donor/local institutions and by topical scope, such as food, habitat, energy, and population.

C. Environmental feasibility. To properly plan and improve food production in the region it is essential to have an adequate understanding of the nature/quality of various facets of the numerous habitats throughout the region. Specifically needed are micro-level assessments by standardized measures, such as the USDA soil taxonomy or its modification by the U.N., of soils, hydrology, micro-precipitation, erosion, and so forth. Such data can be used to assess relative constraints to various land uses by district, nation, and region.

Recommendation three is the call for increased aerial and ecological coverage of micro-level environmental investigations.

D. Traditional economies. Perhaps no single issue is as paramount to improved agricultural development as a thorough understanding of the behavior/objectives of small holder farmers and subsistence-oriented pastoralists. This point has been recognized and called for in much of the recent literature (e.g. USAID 1980). Such understanding will undoubtedly lead to development foci involving smallholder alternatives, including the key influences of risk aversion, least effort and the problems of these influences on increased production/market-orientations. The specifics of

these factors and relationships need clarification. Nevertheless, they demonstrate that development must begin from the bottom-up approach of smallholders/pastoralists and that projects which fail to account for the traditional economies are doomed to failure.

Recommendation four is for increased awareness and understanding of traditional economies and development plans geared toward the incorporation of them.

E. Consumption. Food problems cannot be adequately understood without a better understanding and planning accountability for consumption factors. Such efforts should be directed to questions of nutrition and food avoidance, preparation, and intake. Storage and other post-harvest food losses need to be improved. Dichotomies between urban demand and suitable crop production need to be addressed. The problems of consumption are numerous and less well-defined than those of production.

Recommendation five is for increased consideration of food consumption factors in assessing the overall questions of agricultural development.

F. Research/education. Research efforts should be varied and directly involve national participants. Emphasis should range from environmental to economic issues. Technical foci should be placed on smallholder techniques/procedures of cultivation in which local systems are mimicked at agricultural stations and assessed on site. Farmers should be questioned as to their operations in an attempt to find out how their procedures work in comparison to alternative procedures, and why they do what they do. Such work in Tabasco, Mexico, for example, has found "cool" versus "hot" weeds which farmers selectively weed according to crop and has demonstrated why the technique works (Colegio Superior de Agricultura Tropical). Efforts in eastern Africa probably should be along the lines of the research at (Costa

Rica). Studies of low input/high output cultivation and ecologically "stable" livestock activities should be emphasized. Test of small-scaled machines, such as hand tractors, are needed. Finally, integrated movements of small-farmers into large-scaled activity should be examined.

Educational agents and programs need major overhalls, Most traditional livelihoods do not need to be "taught" per se. Farmers and cultivators need to be convinced that the technique/procedure which they are asked to adopt will lead to improvement within their scheme of things and that the adoption material is within their economic means and will not increase risk. To accomplish this task "on-the-site" extension programs may work. These programs could lead to better relationships and trust between agent and farmer/pastoralists. Agents also need to recognize the role of women in production and provide interest in that direction.

Perhaps the greatest need for improvement in education is that of the national research/technocrats. Past emphasis has produced too narrow a set of technicians who often mimic the test/research interest of their expatriot trainer. While specialists are needed, so are competent synthesizers who can coordinate multi-disciplinary research efforts.

Recommendation six is to continue to restructure the orientation of research/education as discussed.

REFERENCES

- Baldwin, R.L.ed., 1980.
Animals, Feed, Food, and People. Bolder: Westview Press.
- Basehart, H.W., 1973.
Cultivation Intensity, Settlement Patterns, and Homestead Farms Among The Matengo of Tanzania, Ethnology 12B.
- Brookfield, H.C., 1972
Intensification and Distintensification of Pacific Agriculture, Pacific Viewpoint, 13:30-48.
- Boserup, Ester, 1965.
The Conditions of Agricultural Growth. Chicago: Aldine.
- Datoo, B.A., 1976.
Relationship Between Population Density and Agricultural Systems in the Uluguru Mountains, Tanzania., Journal of Tropical Geography, 42:1-12.
- Denevan, W.M. and B.L. Turner, II, 1974.
Forms, Functions, and Associations of Raised Field Agriculture in the Old World Tropics, Journal of Tropical Geography, 39:24-33.
- Dyson-Hudson, Rada and Nevine, 1969.
Subsistence Herding in Uganda, Scientific American, 220:76-89.
- Katz, S.H., M.L. Hediger, and L.A. Valleroy, 1974.
Traditional Maize Processing Techniques in the New World, Science, 184:765-773.
- Mellor, J.W., 1966.
The Economics of Agricultural Development. Ithaca: Cornell University Press.
- Ruthenberg, Hans, 1976.
Farming Systems in the Tropics. Oxford: Clarendon Press, 2nd e'.
- Sanchez, P.A., 1976.
Properties and Management of Soils in the Tropics. New York: John Wiley and Sons.
- Schultz, T.W., 1964.
Transforming Traditional Agriculture. New Haven: Yale University Press.
- Schultz, T.W., 1978.
Distortions of Agricultural Incentives. Bloomington: Indiana University Press.

- Sheriff, Abdul H., 1974.
The Dynamics of Change in Pre-Colonial East African Societies,
African Economic History Review, 1:13.
- Simoons, F.J., 1961.
Eat Not This Flesh: Food Avoidances in the Old World. Madison:
University of Wisconsin Press.
- Simoons, F.J., 1974.
Rejection of Fish as Human Food in Africa: A Problem in History and
Ecology, Ecology of Food and Nutrition. 3:89-105.
- Thorton, D. and N.V. Rounce, 1963
Ukara Island and the Agricultrual Practices of the Wakara.
- Turner, B.L., II, R.Q. Hanham, and A.V. Portarare. 1977. Population
Pressure and Agricultural Intensity, Annals, Association of
American Geographers 67:384-9.

CHAPTER III

POPULATION ISSUES

The question of population growth and the issues that surround it is one of the most difficult problems of development. In East Africa, there are two factors present which add substantially to the difficulty of dealing with the population issue. These are population growth rates that are among the highest in the world and a general feeling by the governments that population growth is not a major issue of current concern. These factors, combined with the intrinsic long run nature of population dynamics and the incredible inertia of the process, make the issue of population policy one of the most controversial and potentially important issues facing development planners in East Africa.

The basic outline of the growth of population is clear enough. Table I presents estimates of population growth for the nine East African countries under consideration. The 1970-78 figures refer to estimated rates of growth over the time period indicated, while the annual rate of natural increase figures refer to the latest estimates of the growth rate. A casual inspection of the data indicates that the rate of growth of population has in general been increasing in recent years, a finding that is reinforced by examination of earlier data. This is a trend in opposition to that of much of the rest of the developing world. Most developing countries have managed to reduce their rates of growth during the past decade so there is now a gap of some magnitude between eastern Africa and the rest of the developing

TABLE I
CHANGES IN POPULATION GROWTH RATE IN EAST AFRICA

Country	Average ¹ Growth Rate 1970-1978	Estimated ² Growth Rate 1980
Burundi	2.0	4.5
Ethiopia	2.5	2.5
Kenya	3.3	3.9
Rwanda	2.9	3.0
Somalia	2.3	2.8
Sudan	2.6	3.1
Tanzania	3.0	3.1
Uganda	2.9	3.0

SOURCES: 1. World Bank, Development Report, 1980. Table .

2. USAID, Functional Review of Population/Family Planning Programs and Activities in Sub-Saharan Africa. (USAID/AFR/DR/POP, September 18, 1980).

world with the exception of several Central American countries. Using the 1970-78 data, the average growth rate for Eastern Africa, weighted by the population of each country was 2.7 percent as compared with 2.2 percent for the low income countries as a group. Using the latest estimates of growth rates, the Eastern Africa figure increases to 3.0 percent, a regional rate surpassed only by Central America at 3.4 percent. In comparison, India is currently growing at a rate of 1.9 percent, China 1.2 percent, and North America at 0.6 percent per year.

There are also variations within the Eastern Africa region. If we place Ethiopia, Sudan, Somalia, and Djibouti in a northern cluster and the rest in a southern cluster, we find the north growing at 2.7 percent and the south at a rate of 3.3 percent. These individual and regional variations suggest that while all of the countries have growth rates by international standards, there is quite a bit of difference in individual situations.

The recent acceleration of the population growth rates seems to have come as a surprise to the government planners. In Kenya, for example, a more modest figure was used as the basis of the 1978-83 five year plan. The initial findings of the census were met with some skepticism since they were so far out of line with much official thinking. Not surprisingly, such figures, combined with other shocks from the outside world, have led to rethinking and retrenchment in the development plans.

Naturally, unexpected results raise the question of whether or not the data is in fact reliable. The general appraisal of outside observers is that while there may be some problems with the various censuses, they are all of sufficient accuracy to indicate that there has indeed been an acceleration of the growth rate. There are few formal measures of reliability.

The U.N. attempts to assess reliability on the basis of expected patterns in the census data, but this measure itself is subject to some error since it is quite possible that at least a portion of any aberrant pattern found actually exists in the population. An example of such a pattern is the one found by Col¹ in the recent Uganda census data. Some regions showed rather unusually low male-female ratios of population. Upon closer examination, these patterns were quite consistent with what would be expected a priori since they were regions where a large portion of Amin's troops were recruited and one would expect them now to either be in exile, or at least not available to the census taker.

Prospects for the future do not look much different than the current situation. The use of birth control methods remains at very low level based on scattered information and the desire for large families remains unchanged. When one looks at the reason for the rapid rate of increase in population growth rates, it is clear that what has happened is not a major increase in the birth rate, it has remained relatively constant. Instead, there has been a rapid fall in the death rate resulting in the substantial increase in the rate of natural increase. While this seems to be a part of the "natural" process of development, there are no signs of an early decline in the birth rate as has been the case in many other developing countries. Eastern African birth rates are currently in the high 40's to low 50's (births per 1,000 population) in comparison to China's rate of 20, India's of 34, and North America's rate of 15. At the same time, for example, Kenya has a slightly lower death rate than India. Thus, the benefits of development have primarily impacted the Eastern Africa death rate, but had less effect than might be expected on lowering the birth rate.²

While virtually all observers agree on the basic picture with respect

to population growth, there is sharp disagreement on the implications of the data. Annex I presents a summary of current government policy with respect to population. A capsule summary of the table would be that in general the governments of Eastern Africa don't see any real problem. Some of them are a bit uncomfortable with the growth rates they are experiencing, but are beset with far more pressing (in their eyes) problems that have priority. Other governments see no problem at all. Tanzania, for example, sees itself as underpopulated with a great deal of land to be exploited. Government policy acts to encourage population growth by stressing improvements in maternal health and reduction in infant mortality while giving little attention to contraception as a means of limiting family size. Other motivations by governments, stated or unstated, might be the need for a large population to help insure military and/or economic parity with neighboring countries or competitors or perhaps concern over internal shifts in power if the population of one tribal or ethnic group slipped with respect to another.

However, as Kocher states:³

Whether Africa can support a considerably larger population is not an issue. Africa can and must. The relevant issue is the magnitude of the population increase during the next 75 years or so. Will the population only quadruple in size or will it increase five to eight times?

Since that was written population growth rate estimates have increased, so that one must revise the numbers in the quotation upward somewhat, but this is at the heart of the controversy between the governments and the donors. From the donor's perspective, there will inevitably be a substantial further increase in the population levels of eastern Africa.

What is needed now is a start on population control measures that will eventually slow the rate of increase down to manageable levels over the next

few decades. Otherwise, only a hard collision with food or land constraints is likely to slow the process down. Even if a country currently has surplus land that has great potential, Sudan for example, the necessary government resources to provide education, health care, roads, etc. for the increased numbers of people will be extremely difficult to find. Support of the present population is difficult enough without the added burden of providing the infrastructure for twice or four times as many people.

The root of the difficulty seems to lie in the two sides to the dispute being not fully aware of the others concerns. The national governments are hard pressed to deal with the immediate problems of development. Famine is an immediate concern needing attention right now, while the population problem if it really exists won't be much worse if we don't get to it this year. The donors, on the other hand, have not made a convincingly strong enough case for the fact that population problems in that the response time to government policy is measured in decades rather than the months and years that fit into a five-year development plan. One cannot wait until population levels are "just right" and then take action to control further increases; instead, one must anticipate the problem by generations.

A useful tool in facilitating the dialogue that must take place more candidly between host governments and the donors is the RAPID system.⁴ This is a population projection model developed for use interactively on a small microcomputer that can be hooked up to a television set. With it one is able to simulate long run consequences of alternative assumptions about various demographic parameters. The program produces bar graphs and charts of educational expenditures, land per capita, and other measures. Early indications are that it has been quite effective in conveying information about a subject that still remains rather sensitive. Perhaps additional

uses of this technique will help facilitate broader exploration of the issue.

Another issue that must be examined if one assumes that the rate of population growth is currently too high is the question of why the birth rate remains high. Is this a temporary situation which will soon be corrected by the natural progress of development? What is there about the eastern African environment that has sustained the birth rate? Are we dealing with a different process than the standard demographic transition?

Nag⁵ has examined the general question of how modernization can act to increase fertility, a factor sometimes overlooked in the dynamics of development. The findings are that four factors seem to be important in acting against the well recognized factors such as increased use of contraception and delayed marriage that reduce fertility as development proceeds. These factors are:

- (1) earlier postpartum resumption of ovulation and menstruation as a result of decreased breast feeding.
- (2) decline in the practice of postpartum abstinence.
- (3) reduction in the loss of reproductive performance in women caused by early widowhood and,
- (4) reduction in the incidence of sterility as a result of the improved treatment of venereal diseases.

Other factors such as improved nutrition do not seem to have much impact on fertility. Lesthaeghe⁶ commenting on these findings, finds them to be particularly potent in African societies and argues that eastern African population have abandoned these traditional control measures much more rapidly than western African ones. This thesis is elaborated in his forthcoming book⁷, which should provide much useful information on the subject. However, given the relationship between these control factors and the culture of the society, it is likely that much additional work will need

to be done in individual countries and subregions, before the mechanisms are clearly understood.

Related to this issue is the more general issue of the connections between behavior related to population growth and the rest of the activities of the family. One approach to this issue has been the econometrically oriented work in the Easterlin tradition.⁸ This attempts to use generalized concepts of supply and demand to help understand what role variables, such as family income and the cost of raising children have in explaining family size. Kocher⁹ has attempted to adapt this methodology to a study of two regions in northern Tanzania. While his results are not conclusive, they are in agreement that there are currently not any strong incentives to limit family size. The effect of changing levels of income on the demand for children seems relatively weak, while changes in the "cost" of children seem somewhat more important. It would be useful to see extensions of this work, particularly along the lines of trying to assess how the slow changes that development are bringing to the rural household, such as changes in the average size of farm, the technology of farming, the supply of social services, and the migration of family members to urban areas, impact the decision about family size. For example, in parts of eastern Africa, population pressure has led to such heavy deforestation that a significant part of a woman's work may now be trips for fuelwood with the result that less time is left for other activities such as tending crops. What impact does this have on the desirability of or ability to care for children? Without such answers, it will be difficult to chart the future course of population growth.

Not all population problems come about as a result of the total level of population within a country. The distribution of the population is also

of concern, generally of more concern to the governments than the level itself. One concern is over how to move population into areas that appear to have great potential for supporting agriculture. There are a wide variety of problems here, but they all tend to have in common the rather trite observation that there is usually a good reason why apparently desirable land is vacant even if the reason is not readily apparent.

Migration from rural to urban areas is also of concern. While the fraction of the population living in urban areas is relatively small in eastern Africa in comparison to other developing countries, the urban areas is relatively small in eastern Africa in comparison to other developing countries, the urban areas are growing at rates much higher than the already high rates of growth of the whole country. Aside from the obvious problem of providing services and jobs for the additional urban dwellers there are some additional difficulties that result from increased urbanization. When someone moves to the city he is no longer in a position to produce his own food and must rely on increased productivity by those remaining in the rural areas. At the same time, he creates two types of pressure that tend to reduce the incentives to produce food. On the one hand, he is likely to acquire somewhat different tastes for food and demand imported foods as well as making increased demands on imported energy sources and other goods. This in turn puts additional pressure on foreign exchange and is likely to lead the government to renewed pressure on the agricultural sector to concentrate more on cash export crops, for example, the recent focus on cotton in Sudan. This increases the competition for resources of the food producers both directly through the market and through government directives.

In addition to the export pressure, an increase in the proportion of

the population in urban areas leads to increased pressure on the government and by the government to hold down food prices in order to make the urbanites better off and more accepting of government austerity programs and wage adjustments. While this may be good politics in the short run in the city, it is a strong disincentive to food producers who will either switch to other crops, enter the black market or more tragically cut back on production. Mechanisms such as that just described are of course more complex than can be easily laid out on paper. Attempts have been made to use simulation modeling techniques to try to bring the interrelationships of various sectors of the society together. One such model, KENSIM, was developed at the University of Nairobi to help in the development of the previous five year plan, acting as a trial horse for various assumptions about planning variables. As our understanding of the social systems gets better, there is increased need for such models to help keep all the interrelationships straight.

A final issue that needs to be mentioned is the need for accurate detailed demographic data that goes well beyond the aggregates for the nation. There are, for example, some indications that while a given country may be growing at a rapid rate, there are regions within it that have much more modest rates of growth. Do these regions have clues as to the reasons and or solutions for rapid population growth. Or do the data merely reflect internal migration or worse yet just errors? There has been very little information released from the recent round of African censuses. Until it is, there will be no foundation for the detailed micro-level studies necessary to truly understand the causes and if necessary the cures for population growth.

ANNEX I: TO "POPULATION ISSUES"
EAST AFRICAN COUNTRY POLICY SUMMARIES
(Extracted from USAID Functional Review)

BURUNDI

Although the Government perceives its population size and growth to be satisfactory and intervention undesirable, Government officials have begun to express concern at over-population and food shortages. They have indicated that some redistribution of the population into previously under-utilized areas might be desirable. International migration is not considered to be significant.

ETHIOPIA

The Government perceives the current rate of population growth and anticipated population size to be satisfactory in relation to the substantial under-utilized natural resources of the country and to the opportunities for improvement in productivity with technological and organization progress. The principal population problem is considered to be the high levels of morbidity and mortality, and the need for reorganization of the rural economy, including local redistribution of population. Although no recent statement has been made on the desirability of expansion of the family planning services previously provided, it appears that a programme having as its objectives maternal and child health, family welfare, and a contribution to the modernization of the status of women would be considered acceptable. The movement of people from drought stricken areas has increased the number of settlement schemes and new areas have been brought into cultivation in Wollega, Illubabor, and Kaffa Administrative Regions. International migration is not seen as posing any problems because of its insignificant level, although concern has been expressed over the problem of refugees.

KENYA

The Government's policy of reducing the rate of population growth, primarily through decreasing fertility, has as its objective the creation of a better balance between population growth and economic development. The aim of the national family planning programme is to make family planning information, education, and services available on request, through free clinics in all Government hospitals and health centres. The programme is closely linked with the maternal and child health programme, and includes provision of assistance to couples with infertility problems. During the period 1978-1983, greater emphasis is to be placed on "delivering the message" through improved co-ordination of activities and improving administration and organization. Through rural health programmes and the basic needs approach, the Government plans to reduce maternal mortality by 46 percent and infant mortality by 30 percent by the year 1984. In order to achieve a

rural-urban balance, it is proposed to divert a large part of the available resources in the next five years for the development of Western Kenya, a region which has a large share of out-migrants to Nairobi and Mombasa. International migration is perceived as being satisfactory and not significant.

In June 1980, the mission reported that in meetings between Ambassador Benedict and high level officials in the ministries of planning, education, and finance, "an increased awareness of and commitment to population planning as an urgent development issue was manifested." There is clearly an improved political atmosphere for this subject.

RWANDA

The Government's second development plan, adopted in 1977, emphasized individual consciousness and collectivity with respect to dealing with demographic problems. The Government has indicated that its population size and rate of growth are too high and therefore has a policy of intervention to reduce the fertility rate, to increase emigration and to undertake development projects to better meet the health and nutritional needs of the population. A Government sponsored family planning programme is in existence with priority being given to the health and welfare aspects of the programme rather than its impact on the level of fertility. Emphasis is also being placed on rural development, including health delivery systems and development of sparsely inhabited zones.

On September 9, 1980 the mission reported that President Habyarimana had indicated his interest in P/FP matters, that the Council of Ministers is going to discuss P/FP next week, and that he foresees the establishment of a National Population Office which would become the focal point for population policy.

SOMALIA

The Government has indicated that its anticipated population size, the levels and trends of its population growth and its fertility rates are satisfactory. The Government's principal concern is with reduction of still very high levels of morbidity and mortality, and achievement of a pattern of spatial distribution of population appropriate for the developmental goals it has adopted and within the context of the severe environmental constraints which exist. Special measures have been taken to provide medical and health facilities to the rural areas, legislation to limit polygamy has been enacted and a policy to decrease immigration and emigration has been formulated. In order to deal with the sudden large influx of refugees, the Government has established numerous camps to shelter these refugees.

SUDAN

While the Government has expressed satisfaction with current rates of natural increase and fertility, a recent Ministry of Planning statement indicates that "the present trends of population change, which must inevitably persist until the end of the present century, have implications for consumption, the education task and the increased demand for health and other social services". The Government supports family planning services and information as part of its Maternal and Child Health Programme, and attaches principal concern to the reduction of still high levels of morbidity and mortality. Importance is also placed on encouraging greater research into the interrelationships between economic development and population trends, with a view to identifying the ingredients of a sound population policy. Great concern has been expressed at the large number of refugees in the country which are posing serious problems of health and nutritional care. At present there is a desire to improve the spatial distribution of the population by decelerating the flow of migrants to urban areas and adjusting the rural configuration.

In April 1980, the mission reported that the government has "recently taken a significant step in expanding the integration of family spacing into MCH services, conducting demographic analyses, and developing a population policy. These initiatives will be supported by a \$12.5 million UNFPA project which is expected to begin in June 1980."

TANZANIA

The Government has indicated that its anticipated population size, the levels and trends of its population growth and its fertility rates are satisfactory (indicating also that it has considerable unused physical resources). At the same time, the President has also indicated that "it is important for human beings to put emphasis on caring for children and ability to look after them properly, rather than thinking about only numbers of children and ability to give birth". The Government places concern for child-spacing within the context of improving family health and reducing mortality rates and is introducing child-spacing services throughout its maternal and child health system. The Government has undertaken a policy of resettling the residents of scattered hamlets into nucleated villages known as Ujamaa (self-reliance) villages and a new capital, Dodoma, is being constructed in the interior. In a further attempt to stem the rural-urban migratory flow, work permits have been issued in urban areas and unemployed migrants in the cities have been encouraged to return to the villages. Although the level of international migration is not considered to be significant, increasing concern has been expressed over the substantial number of refugees residing in the country.

In April 1980, the mission reported that "Tanzania does not have a

national population policy. However, following the RAPID presentation greater numbers of Government officials seem more willing to consider the need to directly address the population issue in the next five-year plan".

UGANDA

The Government, in its development programme announced in mid-1971, came out in support of family planning and indicated that it would be in a position to assist the Family Planning Association of Uganda. In 1976, the Government reiterated its position, stating that it considered rates of natural increase and fertility to be too high. It noted, however, that its programmes were in an early stage of implementation. While the spatial distribution of the population is considered to be inappropriate, the policy is one of decelerating the flow of migrants to urban areas without adjusting the urban and rural configuration. The level of international migration is perceived as being satisfactory and not significant.

NOTES ON POPULATION ISSUES

- ¹Col, J. M. 1980
"Food, Population, and Reconstruction in Uganda," An unpublished paper read at the African Studies Association meeting, Philadelphia.
- ²Myers, Norman 1980
"Kenya's Baby Boom," New Scientist, 18 September 1980, pp. 848-50.
- ³Kocher, James 1979
Rural Development and Fertility Change in Tropical Africa: Evidence from Tanzania, Rural Economy Paper #19, Michigan State, East Lansing.
- ⁴RAPID
The United Republic of Tanzania: Population and Development, The Futures Group, Washington, D.C.
- ⁵Nag, Moni 1980
"How Modernization Can Also Increase Fertility," Current Anthropology, Vol 21 #5, October, 1980, Page 571.
- ⁶Lesthaege, R. 1980
comment on Nag article, Ibid.
- ⁷Page, Hilary and R. Lesthaege (eds.) 1981
Child-spacing in Tropical Africa: Tradition and Change, London: Academic Press
- ⁸Easterlin, Richard (ed) 1980
Population and Economic Change in Developing Countries, Chicago: University of Chicago Press
- ⁹Kocher, Ibid.

CHAPTER IV

FOOD/ENERGY IN EAST AFRICA - A GENERAL REVIEWI. Introduction

The production, distribution and utilization of food can be expressed as a system of energy conversion processes. Solar energy plus the energy stored in soil and seed are converted into food energy, that is moved using energy, transformed, i.e. cooked by energy and when eaten by men or beast is again converted into another form of energy.

A system of energy processes must conform to the basic laws of energy, usually known as the first and second law of thermo dynamics. In their most general form these laws state; (1) that energy is neither created or lost, energy entering a system either leaves the system or is stored within it; and (2) that any energy flowing in a process must have part of its energy degraded to a lower quality, with the disorder of the environment increasing in the process. In other words, for a system without external energy source, the energy of the system available for work will decrease with every process.

An additional energy principle first stated by Lotka (1922) and developed by Odum (1971), (1973) states that "systems that survive in the competition among alternative choices are those that develop more energy inflows and use them best to meet the needs of survival." The first part of this principle seems obvious. A system that uses as many energy sources as possible will be most robust and will have the best chance for survival. The second part deals with the strategies that a system can use internally to increase its competitive advantage. During a period of energy expansion the

system that can capture the most energy is the one that is most likely to survive. But during a period of energy constraints the system with the best effective use of its available energy and the least amount of waste will win out in the competition. Therefore, to evaluate the relationship between energy and the food system we must consider the sources and channels of energy flows, the limitations of conversion processes, and the ration all energy input to the energy output that accrues.

A simple energy flow model of food production illustrates the first and second law of energy flows (Figure II). The energy entering the system from nature, i.e. sun and rain plus the energy stored in the soil, plus the energy input by man, i.e. manual and mechanical work equal the outputs. But these outputs consist of food and degraded energy, widely dispersed that is not further capable of doing useful work.

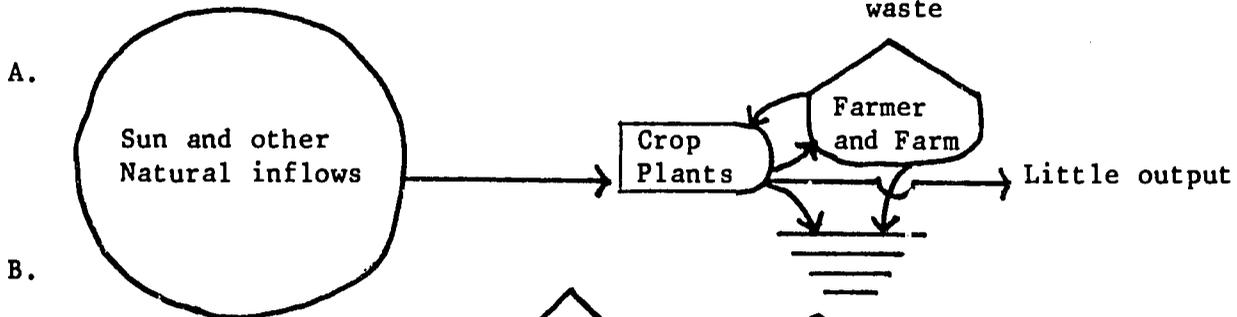
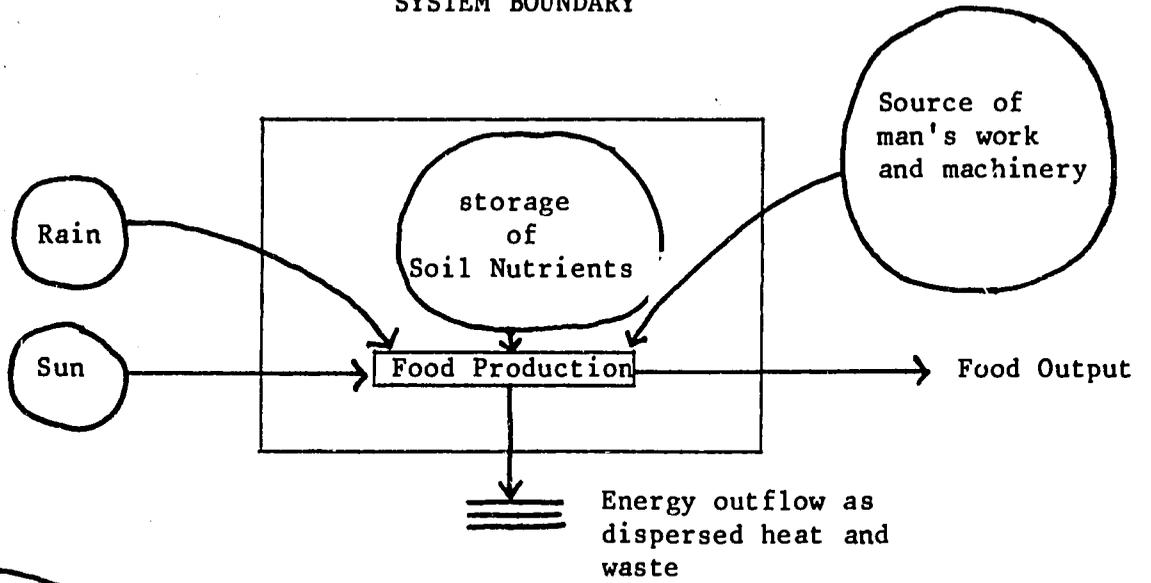
Figure III illustrates two different forms of simple agricultural energy flow models; Model A represents subsistence agriculture; Model B modern agriculture. In subsistence agriculture, available natural resources combine with the farmers input to produce crops that sustain the farmer and produce a little extra for the market. This system depends on internal, naturally available renewable and natural nonrenewable energy sources. If nature provides sunlight and rain such a system will survive until the soil becomes exhausted. It can continue for a very long time by careful husbandry of waste products and their return to the soil and proper choice of crops, crop mix, and crop rotation. As long as the overwhelming majority of people were food producers and only a few lived in towns, this system was adequate.

Modern day agriculture, Model B, depends on an energy subsidy to produce greater yields to feed the larger urban nonfood producing

FIGURES II & III

ENERGY FLOW MODEL IN FOOD PRODUCTION

SYSTEM BOUNDARY



Source: Odum, 1976

population. It depends on energy inputs directly into the food production mechanism and on the energy hungry, urban oriented, economic infrastructure.

The countries of East Africa are in a phase where both of these basic systems exist and where a transition from Model A to B is increasingly needed. However, energy is a major constraint in East Africa and the principle of system survival is important.

For successful survival under the existing conditions of energy constraints, an agricultural system must be devised in which the energy subsidy is as small as possible, the production of unusable, degraded energy minimal and the yield sufficient to feed both the urban and rural population in a nutritionally sound manner.

II. Key Energy Issues

A wide variety of issues are involved in the food energy interface.

Four key issue areas, however, can be identified. They are:

1. Energy costs and shortages
2. Appropriate technology
3. Energy allocation
4. Energy related management

1. Energy Costs and Shortages

Energy sources in East Africa are severely limited. This is a fact that must be kept in mind in any development plans. For the foreseeable future this scarcity will continue and with scarcity prices will continue to increase.

Of the renewable energy sources available, e.g., water, wind, and

only fuelwood is used as a man manipulated energy input in most of the traditional agricultural sector. With increasing population, the use of fuelwood has grown rapidly and supply has been severely affected. More labor is needed to collect it and it costs more (O'Keefe et al 1979). This depletion of wood resources has brought significant and severely damaging environmental consequences.

Water power is available in East Africa, but its development is very capital intensive, requires a large amount of imported goods, and requires a high degree of technical management for construction, maintenance and operation. Capital, foreign exchange and trained personnel all are in short supply. Furthermore, for at least the near future, water power and the electricity it generates will have but modest input into the food system. Wind, sun, and gas production from biomass offer opportunities for the food system, but the technology and its application in East Africa is in its infancy. Experimentation and studies are underway (McGranshan et al 1979, Schipper and Oyoko, 1979, for example), but widespread use is far in the future.

Fossil fuels are not widespread in East Africa; the most significant are coal in Tanzania, and recently discovered oil and gas in Sudan. Both sources, however, are not developed to the point to produce significant amounts for the local economy. Thus importation of oil and oil products is the major source of high value energy. Table II shows the percentage of recent change and oil imports as a percentage of total imports. Finally it must be recognized that machinery, fertilizers and other agricultural chemicals are all indirect energy inputs and their cost rises at least proportionally to other energy costs.

TABLE IIENERGY IMPORTS AS PERCENTAGE OF EXPORTS

<u>COUNTRY</u>	<u>1960</u>	<u>1977</u>
Low Income Countries	9 ^{w1}	16 ^w
Ethiopia	11%	27%
Somalia	4	13
Burundi	NA	7
Rwanda	NA	11
Tanzania	NA	22
Uganda	5	4
Sudan	8	26
Kenya	18	24

¹"w" after a summary measure indicates that it is a weighted average.

Source: World Development Report, 1980, Table 7.

2. Appropriate Technology

Appropriate technology for increased food production is that technology which will produce large yields with a minimum input of energy, especially commercial energy. It is not necessarily the most energy efficient agricultural technology, but it is the one that produces the maximum total net output. What is the best mix of technology is not clear. It is clear, however, that it is neither pure traditional agriculture or a simple transplanting of western agriculture. Appropriate technology will likely contain elements from both, as well as some new elements particularly appropriate to tropical environments.

3. Energy Allocation.

The allocation of scarce resources is a vital issue. It is not just the relatively simple problem of allocating between agriculture and industry, rural and urban consumers. The problem is complicated by the interrelation of the economic sectors (Table III). To get the complete picture of energy use in the food sector the simple conceptual models described in the introduction are insufficient. A much more rigorous and detailed analysis is needed. The full range of energy inputs must be considered. Table III shows the energy flow elements that must be considered; there are others that might be included in particular circumstances. While the table presents a general picture, specific studies appropriate to the country, the type of agriculture, food distribution and utilization system are necessary.

TABLE IIIENERGY ELEMENTS OF THE FOOD CYCLE

Location of Input	Element of Energy Input	Source of Energy	
On Farm	Sunlight	Nature	
	Rain	Nature	
	Soil nutrients	Nature	
	Labor	Human	
	Animal Power	Farm animals	
	Natural fertilizers	Animal, human and plant wastes	
	Seeds	Nature/commercial	
	Manufacture of implements	Commercial	
	Manufacture of farm machinery	Commercial	
	Manufacture of fertilizers	Commercial	
	Manufacture of vehicles	Commercial	
	Fuel for machinery and vehicles	Commercial	
	Fuel for irrigation	Commercial	
	Food Distribution, processing and storage	Construction of farm to market roads	Commercial/human
		Manufacture of transportation equipment	Commercial
Fuel for transportation		Commercial/animal	
Manufacture of containers		Commercial	
Construction of storage facilities		Commercial	
Manufacture of food processing machinery		Commercial	
Fuel for processing industry		Commercial	
Commercial and Home	Commercial refrigeration and cooking	Commercial	
	Home refrigeration	Commercial	
	Home cooking	Wood/charcoal/ Commercial	
	Commercial and home refrigeration and cooking equipment	Commercial/ Homemade	

4. Energy Related Management

The availability of energy in larger quantities and lower cost, the development of appropriate technologies and the complete knowledge for proper energy allocation will not necessarily solve the problems of the food system. Effective management of the system is needed. Seeds arrive two months after planting time because the trucks to carry were not available or operable; food arrives at a distribution point just to lie there and spoil --- these and many other examples highlight widespread management problems. Knowledge of the system and what should be done is useless if it cannot be implemented. Only meticulous attention to all parts of the system can make the food system function. The old saying, "For the want of a nail..." is rarely more applicable than to the food/energy system of East Africa.

III. State of the Art Knowledge in Relation to the Main Food/Energy Issues

The knowledge available to resolve the issues presented in the last section is spotty. On some aspects, knowledge is complete and detailed, even though it is not necessarily applied. On others, our understanding is still in its early stages. The worst situation is where the accepted knowledge is incorrect, but applied.

1. Energy Cost and Shortage.

The technology of production, transportation, and utilization of fossil fuel is fully developed. However, this development occurred in the context of the industrialized countries and the adaptation to East Africa is far less adequate. The same can be said for hydro-electric energy. Alternative sources, particularly those most adaptable to decentralized

rural use are still mostly in the development stage. The development of fuel efficient wood stoves and charcoal manufacturing equipment, culturally attuned to East Africa, is still needed (O'Keefe et al. 1979). The use and adoption of the Indian and Chinese experience in biogas production (Makhijani et al, 1979) will be important and should be given high priority. Wind and solar experiments are ongoing in most African countries, but the widespread use of these technologies is still in the future.

2. Appropriate Technology

The appropriate technology envisioned here is a low energy input, high food output, agricultural technology. The present knowledge of farming systems in East Africa is based on a number of studies of individual farms or farming projects in Kenya (Barnard, 1978), Tanzania (Ruthenburg, 1974, Collinson, 1969), and Sudan. While many of these studies are meticulous in their analyses of labor and seed inputs and food outputs, the energy inputs either as direct energy inputs as fuel, or indirect in the forms of implements, machinery, transport, or agricultural chemicals are usually not accounted for. Several studies show the negative side effects of high mechanization and irrigation. Little or no work has been done on intermediate technology, such as the use of garden type of tractors and small mechanical cultivators. Another area of need for additional knowledge is the energy/food output relationship of modern hybrid seeds in the East African context. Similarly much work will be needed on energy efficient, low loss, food processing and storage technology.

3. Energy Allocation

The knowledge of the distribution of energy inputs into the food system to the elements enumerated in Table III is almost completely missing. Macro-economic models that exist are not suitable to give guidance to energy

allocation at the level that will be required to improve the output of food under energy constraints. Models closer attuned to the food/energy interface will be needed to develop improved energy allocation. The most promising ongoing investigation directly applicable to the food/energy problem is being conducted at FAO Rome (Dr. Hrabovsky 1980). The preliminary agricultural economic linear programming model developed there is being expanded into the energy sector using Kenyan data, at the International Institute for Applied Systems Analysis (Schloss Loxenburg, Austria) and with Sudan data at the Stanford Food Research Institute (Palo Alto, California). These models are expected to test the sensitivity of the agricultural economic system to commercial energy constraints. Fuels, machinery, fertilizers, and transportation will be considered. Equally important are the fuel wood studies by FAO, the Beijer Institute and others. Most of these studies are ongoing and in their early stages. A conference in Nairobi in August, 1981 will consider some of their first results. Despite this work, much more development work will be needed to improve energy allocation for food system improvements in East Africa.

4. Energy and Energy Related Management

An analysis of the state of the art of management in East Africa is beyond the scope and the competence of this paper and its authors. It can be stated, however, that the major need will be multi-objective planning, pragmatic, objective oriented policies not fettered by political orthodoxy, and education and training blending modern technology with the cultural context of East Africa.

IV. Data Problems

Data on the energy input into the food system either directly as fuels

or indirectly as fertilizers, machinery or infrastructure is, except for a few outdated papers, inadequate to assess the energy need and energy allocation requirements of the food system in East Africa. Data collection on input of fuels, implements/machinery, fertilizers, pesticides, transport equipment, and infrastructure development to document present energy uses in all stages of the food system is needed. Such data collection should be on a sample basis as far as geographic areas and agricultural, distribution, marketing, and food utilization types are concerned. To produce adequate data it will be necessary to take data on the energy inputs at all major points of the food system as shown on Table III. It will further be necessary to take data over a number of years, at the very least, two.

Thus, good data is not likely to be available for considerable time. This should not be an excuse for inaction pending analysis. Data should be estimated for all the pertinent elements by experienced observers and such data can be used to test and verify models in a preliminary way. It even can be used to establish allocations as long as it is clear that these may be changed as better data becomes available.

V. Implications for Development Policies

----The most important implication for development policies is the requirement that no project can be evaluated in its own limited context. A full system view must become the watchword.

----Second, energy components must be considered in all decisions. This must not only include direct energy inputs such as machinery and materials and project appurtances, such as infrastructure and organizational components.

----Lastly, it should become general policy to evaluate all projects

for their impacts on the food system. An industrial development should be evaluated as to its effect on agricultural labor, transport or markets. Monetary policies must consider their effect on the balance between food and export crops and the competition for scarce resources.

VI. Applications/Research Recommendations

Two basic questions must be considered: (1) what kinds of energy and how much is used in the food system of East Africa in production, in processing, in distribution, and in consumption (i.e. cooking preparation); and (2) how is this energy use related to the overall energy use system in this area.¹ The obvious follow-up questions include: What kinds of production system are there? What are the processing and storage systems? What distribution systems exist? What consumption systems are used? Given the impossibility of studying all aspects of these issues, the study design will have to be structured so that attention can be focused on sectors where alternative energy sources are likely to be effectively introduced.

The basic hypothesis argues that two sets of food consumption patterns exist: urban and rural. Within each set, differences are related to income, status, cultural group affinity, degree of on-farm self sufficiency, size of household, number of active workers, and number employed off farm. There will be other variables yet to be established. Some of these apply only to the rural system, others are common to both urban and rural areas. It is

¹Note - the format for this section is based on Aid RFP for an energy study in Senegal. This RFP had, in our view, a very appropriate approach for many African countries.

also apparent that consumption patterns change over time and there are corresponding changes in energy needs. For example, there is a strong tendency for "upper income groups" and urban dwellers to eat more rice and wheat and less millets and sorghum. It will be necessary to have information on these food consumption and energy use trends.

The research design therefore begins with the identification of consumption patterns and considers how needs are met. As a preliminary assessment, the following food system appears to be pertinent:

A. Supply systems

Home production
Local Markets (and regional)
National markets
International markets

B. Processing and Storage

On farm (in house)	Both are low technology and use
Local	local labor
National	Generally higher technology and
International	machine factory processing

C. Distribution and Preparation

Home (including cooking)
Bicycles, Handcarts, animals to local markets
Trucks, rail to national markets
Ship, trucks, plane to international markets

In a similar way it is clear that there are two discrete energy production systems, one with low level technology using local resources of water, wood, human and animal labor; the other on high levels of technology using electricity, water power, and petroleum. There are also two discrete energy distribution systems related to the two supply systems. Consumption patterns frequently mix the two. For example, a rural farmer may use gasoline, kerosene, wood, charcoal, and animal power. The task on the energy front will be to identify the consumer use patterns, including

small-scale agriculture, large commercial and small commercial, large industrial and small industrial, large state and small state, transport systems, and private users.

Energy consumption will have to be related to these several dimensions of rural and urban food systems. Current consumption including human, animal, wood, petroleum, solar, water, and wind must be determined for each of these systems, thus enabling rough estimates of energy for the entire country to be established. This energy data base provides the raw material for an analysis of the effectiveness of energy use. Using techniques similar to those of Leach (1975), Pimental, et al. (1973, 1975), and Odum (1971), each of the food systems will be evaluated in terms of:

- a. the efficiency of energy conversion in terms of total energy inputs (e.g. fuels, machinery, labor, and other services) relative to energy returns (e.g. food calorie value);
- b. the vulnerability of each of the food systems to energy shortages;
- c. the alternative food system strategies which might more effectively maximize the net energy yield and nutritional quality of good production.

The techniques of energy analysis provide a powerful methodology for assessing the implications of alternative strategies for energy use in food production. The key element in the analysis is the application of energy quality factors for the conversion of different forms of energy into a common set of units. The conversion of all natural energy flows, fuels, and embedded forms of energy to a common basis provides both a quantitative assessment of the potential work derived from an energy source used in various applications and a basis for examining alternative strategies to reduce vulnerability and improve net yields of food production.

REFERENCES

- Amann, Hans 1969
Energy Supply and Economic Development in East Africa (includes good maps on energy supply)
- Brown, Lester 1980
Food for Fuel: New Competition for the World's Cropland, World Watch Paper #35.
- Brown, Norman and James Howe 1978
 "Solar Energy for Village Development," Science Vol 199, No. 4329
- Eckholm, Erik 1975
The Other Energy Crisis: Firewood World Watch Paper #1.
- Eckholm, Erik 1979
Planting for the Future: Forestry for Human Needs World Watch Paper #26
- Hayes, Dennis 1977
Energy for Development: The Third World Options World Watch Paper #5
- Makhijani, Arjun and Alan Poule 1975
Energy and Agriculture in the Third World Foundation Energy Project Report (especially good graphs and tables on energy situation and includes a case study of energy use in Tanzania).
- Marquand, C.J. and P.M. Githinji 1979
 "Energy Resources and their Environmental Impacts," unpublished paper read at meeting of Kenya Academy of Sciences-Beijer Institute Workshop on Rural Energy in East Africa, May 1979.
- McGranahan, G. Chubb et al. "Patterns of Urban Household Energy Use in Developing Countries: The Case of Nairobi," unpublished paper read at meeting of Kenya Academy of Sciences (as above).
- Openshaw, Keith 1978
 Woodfuel: A Time for Reassessment," Natural Resources Forum Vol 3, No. 1, pp. 35-52.

Rukuba, M.L.S.B. 1972

"Forestry in Uganda," East Africa: Its People and Resources, 2nd edition, Oxford University Press, pp. 221-228.

Schipper, Lee and Mbeche Oyoko 1979

"Energy Demand and Conservation in Kenya," unpublished paper read at meeting of Kenya Academy of Sciences (as noted in earlier references)

Sharma, A.C. 1974

Economy of Ujamaa and Individual Shambas in Iringa Region.

Tanzanian National Scientific Research Council 1977

1977 Workshop on Solar Energy.

CHAPTER V

DATA QUALITY
AND EASTERN AFRICAN DATA:
THROUGH A GLASS DARKLY

There is something quite reassuring about printed data. Numbers that have had a troubled life gain respectability when committed to a place in a well organized table in a report. While we may have some nagging doubts in the back of our minds about just how good the data is, the question is rarely raised in the social science literature and when it is, most of the concern is about only one aspect of quality, the conceptual appropriateness of the data. Relatively little attention is paid to the practical problems of data collection under less than ideal conditions, although the errors and distortions created at the collection stage form the basis for all subsequent analysis and policy making.

Why does this problem receive so little attention? Perhaps the reason is that the basic problems of data collection are not very interesting to policy makers or professionals in the field. There is instead a much more powerful incentive to say something useful on the basis of the data that is available. After all, the collection problem is really the government's problem; the job of the professional is to have the insights and make the analytic connections with the data rather than (ugh) actually collect it. Indeed, if one were to be too critical of the data, it would be impossible to reach the conclusions that our analysis leads us to. Thus, the normal

compromise is to make brief mention that the data is perhaps not up to the standards that might be desired and then go ahead and use it if it were perfectly accurate.

All countries have problems with data quality. Forecasters are often frustrated by revisions in GNP estimates in the USA that turn what looked like a very accurate forecast (based on preliminary estimates) into a mediocre forecast (based on preliminary estimates) into a mediocre forecast (based on "final" figures) and perhaps back into a rather good forecast (based on revised figures). The shifting sands of official statistics provide a treacherous base for precise forecasting. Housing data has at times had huge adjustments made to it retroactively even though there is a rather systematic reporting system.

When one looks at subnational regions, the picture is often much worse. One of the authors was involved in the assessment of a labor force survey for a county. The data showed an unemployment rate less than half the rate estimated by the Bureau of Labor Statistics. This in itself would be enough to raise serious questions since the BLS data is considered to be of excellent quality, but in addition, the county survey had design flaws that would be expected to seriously overestimate the unemployment rate. Without the BLS comparison one would have suggested that the numbers be adjusted downward modestly, but in light of it one can only conclude that a few hundred thousand dollars were spent to produce absolutely worthless garbage.

The standard reference on economic data accuracy is Morgenstern's On the Accuracy of Economic Observations.¹ While it was written in the context of developed western economies, there is much of value for the analysis of underdeveloped countries, since their data collection systems

are often directly modeled on those of their former colonial rulers.

Developing countries, as might be expected, have additional problems with the quality of their data. Perhaps the best way to illustrate this is to consider a typical data collection problem in a U.S. setting and then extend it to the situation in a developing country. Let us suppose that the data we wish to have is the number of faculty members teaching at various educational institutions. While this at first appears to be a rather straight forward process, upon reflection, there are some complications. There are a number of alternative measures we could use. Do we count only full time faculty or do we include part time as well? If we include part time, do we use a head count or do we measure full time equivalent faculty? If full time equivalent faculty, then do we use teaching duties or salary as the measure of equivalency? Do we count faculty on leave of absence? on sabbatical leave? Do we count their replacements if any? The list of questions could go on for some time and one would hope that the answer to each would be thought out in consideration of the ultimate use the data was to be put to. Obviously for some purposes one definition of faculty would be better than others. For the college catalog, one might choose a definition that would demonstrate a large number of faculty. In calculating the number of faculty eligible for faculty privileges one could well have a much smaller number.

Whichever definition is adopted, the actual counting of faculty would be left to lower level personnel - a clerk or a dean. The assumption would be that the necessary records are easily available as a result of the normal operations of the college and the collection problem is merely one of assembling information that has already been recorded. Indeed, there is a good chance that the requested data has already been prepared for some other

purpose such as EEOC compliance reports or W-2 forms.

Given a similar data situation at every college and a list (easily obtainable) of all the colleges in New England, it would not be an overwhelmingly difficult problem to arrive at a fairly accurate count of faculty which would reflect year to year changes fairly well.

Now let us change the assumptions a bit. While we are still interested in the total number of faculty members in New England, let us assume the last survey was done in 1958 by people who were not particularly interested and had their own motivations for collecting the data. We no longer have an accurate list of colleges. Indeed, some unknown number of them are teaching illegal material and are not interested in any publicity. Only the larger institutions keep any records at all and since their taxes are set in part by the number of faculty they have, they have no incentive to be generous in their counting. Mail or telephone surveys are of virtually no use so you must rely on personal observation. Unfortunately, gasoline rationing has reduced your ability to travel. You can make perhaps one trip per month from Boston to Providence, so it will be impossible to visit even a fraction of all the colleges. Other duties restrict the amount of time you can spend at each college, so you can take a glance at the faculty parking lot to see how many cars are there and perhaps ask a student or janitor how things are going. In addition to this information, you have some friends who have flown over some other colleges and you have talked to a few visiting faculty and students that happened to drop by your local bar. Your boss has very little interest in your work except to make sure you do it so he doesn't have to. After all, all the information you collect will be translated into Japanese and sent off to some international agency who will do who knows what with it. In spite of the difficulties, you arrive at a number for total faculty

in the New England states, send it off and three months later get a response gently criticizing you for not using salary data as the basis for calculating full time equivalent faculty.

While the above may be a bit exaggerated, it does illustrate some of the problems of data collection and quality in a developing country. Very often, the information is gathered under extremely trying circumstances, from and by people who are not highly motivated to get the right numbers, and for purposes that are not clearly relevant to anyone involved. It is no wonder that much of the data is almost useless as a measure of what is actually going on in the field.

Unfortunately, most of the literature concentrates on the problem of appropriate definition and selection of data. In the example above, we would expect to find substantial comment on the problem of whether salary or teaching hours was the better base for constructing full time equivalent faculty data and almost nothing on the problem of how to count faculty members by quickly peeking in the faculty parking lot.

A good example of the attention given to the conceptual problems is the FAO's Social Indicators and Social Statistics in the Context of FAO's Concerns.² It is a good survey of the types of data being collected for policy purposes in developing countries and makes a strong case for using data appropriate to the problems being dealt with as well as internationally comparable. Almost no attention was given to the possibility that the data being collected was only remotely connected to reality.

C.A. Gibbons, in a paper on "The Problem of Collecting Data on Food Production and Farming in African Countries" makes a useful categorization of data collection problems that can be extended to all types of social and economic data. He sees four types of basic difficulties; administrative,

technical, cultural on the supply side and cultural on the demand side.

Summarizing the basic difficulties, there is a group which might be called administrative: governments are poor; statistical bureaus are understaffed; statistical work by comparison with that in the Ministry of Public Works or the Ministry of Finance is unglamorous; opportunities for sudden wealth are nil; statistics cost money and there isn't money for statistics.

Secondly, there is a group one might call technical: agriculture is conducted partly by modern farms but partly in traditional fashion on numerous small irregularly shaped plots in a shifting setting by hand cultivation.

Thirdly, there are factors which I might call cultural on the supply side. These are illiteracy, a low level of knowledge, a multitude of languages, a lack of written records even in business, and a lack of standardized units.

Finally, and in some respects the most important, there are cultural difficulties on the demand side. Statistics are exotic; they are not historically African. There is no felt need for data on subsistence crops. Statistics on subsistence crops in Africa are about as useful to many people there as statistics on urban and suburban flower gardens would be to us.

How would you go about organizing a survey of flower production in the United States? What is a flower? How do you get the information from the gardener who can't remember what he had last spring? There are no scales, no records and there is no need for these statistics. This is the way it is with food crops in many countries in Africa.

Will the situation improve? Yes, slowly. Administrative difficulties will be reduced by international subsidies for training, technical advice, and equipment. Techniques of agriculture are changing and so is the organization of marketing and processing. Such cultural factors as illiteracy, ignorance, and lack of records are being overcome. Most hopefully, the growth of cities and improvements in transportation will gradually bring subsistence farmers into the market economy and generate needs by governments for better statistics. Several international agencies are promoting national agricultural planning and thereby generating a demand for statistics on subsistence crops and on livestock products.³

The four articles are one of the few candid discussions of some of the problems of data quality. While the scope is restricted to food production and farming, the inherent problems are much the same in other types of social and economic data. One particularly interesting article is by Gravel, an anthropologist, is "Culturally Determined Informant Bias in Food

Production Investigation." Gravel uses information on cattle and goat holdings in Rwanda as a case study. Because of the central role cattle play in the society as an indicator of power and prestige the number of cattle is considerably exaggerated. On the other hand, goats are considered to be beneath mention, while in fact there are rather large goat herds which play an important role economically and nutritionally. With this cultural environment, it is extremely difficult for even an outside "unbiased" observer to get accurate information since everything about the culture keeps reinforcing the feeling that there are many cattle and few goats.

What would be useful to the user of data would be some sort of measure of reliability that could be attached to each of the series being used. If one knew that Sudanese cotton export data were generally within 5% of the true value, Kenyan population data at the regional level was within 8% of the truth and Tanzanian subsistence crop data was within 45%, one would be in a much better position to make thoughtful interpretations of measured trends and changes. Unfortunately, such information is not available except in rare instances and would be extremely expensive to develop. Even if one had such data, the next change at the central statistical bureau could lead to radically different levels of data quality. One conspicuous exception to general pattern is the attempt by the Kenyan Central Bureau of Statistics to assess the reliability of their national income and product data.⁴ They have developed reliability categories A through D, corresponding to a range of variation about the true value of plus or minus 5 percent for A to plus or minus 40 percent for D. They caution that subjective judgment is involved in such assessments, but nevertheless, it is a very welcome bit of additional information for the users of their data. In addition, the above

cited publication gives a clear description of the methods actually used to arrive at the various components. One discovers, for example, that independent information is not available for the estimation of fishing for home consumption. Instead it is imputed from estimates of commercial fishing. Such knowledge is useful in explaining why fishing for home consumption follows the same pattern as commercial fishing; it had better!

In the absence of such assessments of data quality, one is left to rely on word of mouth evaluations by the users of data. Kenyan census data is quite good, even in the rural areas; recent Tanzanian agricultural production data is extremely suspect; the Ugandan census seems surprisingly good; no data on cattle is any good. While such information may be useful, it itself is rather unreliable. One doesn't know just why the data is as good or, more likely, as bad as is claimed. Comparisons are difficult. One person's "some difficulties" may be the same as someone else's "completely worthless". One is still left with a sense of unease about the inherent reliability of the data.

Two examples of data problems, both from East Africa, may be an appropriate conclusion to this chapter. The first, drawn from employment data in Addis Ababa, is a table giving the age breakdown by occupational category of employed persons. While there are 953 professional and technical employees between the ages of 50 and 54, and 246 between 60 and 64, there are none between 55 and 59. Similar "holes" appear in the rest of the chart. What are we to make of this? Evidence of powerful second half of decade age discrimination? Probably not. A likely cause is a sample size too small to support the detail of disaggregation called for. Large samples cost a lot of money. Possibly a clerk wrote the numbers in the wrong column or missed them altogether. Perhaps the sample questionnaires were filled

out in the office rather than as a result of interviews. What ever the reason, it is striking that the data could be published in such a form. Did anyone think this was a rather peculiar result? Did anyone care?

A second example comes from the Mudge, Crosswell and Kim study of Tanzanian Development Performance. The report is much more candid than most about data problems. In a discussion of agricultural export data they note:

The fact that the data for the physical amount of export commodities vary by source is noteworthy. The physical amount of commodities exported would, a priori, seem to be relatively unambiguous and well documented, but this is not the case here... The sources are not necessarily independent. For example, the World Bank appears to have drawn its data from the same source as that of the Economic Survey except for cotton, where the Survey data frequently exceed the World Bank data by a factor of two. Note that the Economic Survey data for cotton and the World Bank data series converge to become a single figure by 1975. The Economic Survey cotton data also converge with the USDA series and actually cross over between 1974 and 1975. If one series were consistent with respect to another, it would be plausible to attribute the discrepancy to a definitional problem such as one series measuring cotton lint plus cotton seed cake exports and the other including only one of the commodities. When the series converge or even reverse, speculation on plausible causes becomes impractical.

The picture is not optimistic. We really have no good idea of how reliable the East African data is. Familiarity and the need to have something to work with have led us to an acceptance of and use of data that may not in many cases be up to the standards needed to answer the questions being asked of it. This complacency only delays the major effort that must eventually be made to upgrade our statistics.

Perhaps a good starting point is the careful collection of micro level data with the purpose in mind of making comparisons and checks with the purpose in mind of making comparisons and checks with the more aggregated data at the national and regional level. Almost all micro studies are

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currently not designed to articulate with the larger framework of national data collection systems. A few careful studies might be of tremendous value in helping us understand more about the reliability of the data that forms the basis for almost every development policy decision.

NOTES ON DATA QUALITY

- ¹Morgenstern, Oskar 1963
On the Accuracy of Economic Observations (2nd ed.) Princeton.
- ²FAO 1978
Social Indicators and Social Statistics in the Context of FAO's Concerns, Rome. December, 1978
- ³McLoughlin, Peter Associates Ltd. 1974
"The Problem of Collecting Data on Food Production and Farming in African Economies," Notes and Papers on Development No. 10
- ⁴Central Bureau of Statistics, Kenya 1977
Sources and Methods Used for the National Accounts of Kenya, Appendix 9, pp. 188-192.
- ⁵Mudge, James, N. Crosswell, and K. Kim 1980
Tanzanian Development Performance and Implications for Development, USAID, 1980

CHAPTER VI

CAUSES OF FOOD SHORTAGES IN TANZANIA:A PERSONAL VIEWPOINT BY A TANZANIAN COLLEAGUE1. Introduction.

It is a fact beyond dispute that there has been food shortage in Tanzania in recent years which necessitated importation of huge quantities of grain to stave off possible starvation. There is, however, no agreement as to the causal factors. No single reason can be advanced to explain fully why this happened. The existing shortage is definitely an interplay of several factors over a period of time. In what follows, I will attempt to give my personal views on what I think were the major factors which led to the reduction of food supply in the country. However, due to the limited time available, it is not possible for me to support all my observations with statistical data although, I know that with more time this would have been possible.

Among the major factors which appear to have caused food shortage in Tanzania are: the adverse physical and climatic conditions and the existing political climate of production and distribution.

2. Adverse Physical and Climatic Conditions.

In general Tanzania's physical conditions are not the best for agriculture. Two-thirds of the country, for example, is infested with tsetse fly which make agriculture and pastoralism particularly difficult. Big portions of the country have poor soils which need heavy use of fertilizer to achieve increased yields. Vermin and pests affect the final

harvests. However important the above constraints may be, they alone cannot account for the recent fall in food production because Tanzania has in the past produced more food inspite of the fact that these constraints have always been there. The physical factors which help to explain the recent fall in food production in the country are climatic, especially rainfall. Rainfall variation has had negative impact on the country's food production.

Tanzania's agriculture depends very much on rainfall. There is very little irrigation practiced in the country. A good rainfall usually leads to a bumper harvest. Poor rains mean a poor harvest. During some years of the last decade, the much needed rainfall has either failed to come, or has not come in required quantities and at the right time. Many parts of the country which are the main grain producing areas have recently experienced prolonged drought periods which have resulted in reduced harvests or sometime total crop failures.

In other parts of the country reduced food production has been due not to failure of rains, but to too much rain at the time when it is least needed. Last year, for example, the rice growing areas of Kilombero valley and Kyera district suffered severe loss of crop because of floods. In these two areas the whole crop was destroyed and the areas were declared disaster areas. The impact of these floods on rice production was so great as to force the government to supplement the country's rice production with imports of large quantities of rice from Japan and U.S.A.

It is interesting to note that whereas these areas of Kilombero and Kyera were experiencing floods, other parts of the country were suffering from severe drought. Consequently food production in Tanzania was being hit hard simultaneously by both too much water and too little moisture.

It appears that the only solution to the uneven distribution of rainfall for agricultural purposes, at least in areas which experience prolonged drought, is to introduce irrigation. The ruling Party, Chama Cha Mapinduzi (C.C.M.) has realized the importance of irrigation agriculture in improving food production in the country and has therefore directed the government to invest more in irrigation than has hitherto been the case.

Implementation of an irrigation policy in Tanzania is not without its peculiar problems. Tanzania being technologically young, it would need to apply simpler irrigation models which would depend on availability of abundant surface sources of water. But, over 80 percent of the country is without lakes or permanent streams. The fertile, but dry central plateau (Dodoma, Singida, Tabora regions) lacks perennial streams which can be tapped for irrigation. The only possible dependable source of irrigation water in this area would be underground. In some locations within this area the water bearing aquifers are very deep and it would need sophisticated and powerful drills to be able to bring water to the surface. The required technology is not readily available in the country and even if it is made available it would still be very expensive. Furthermore, not all the underground water in the country is suitable for irrigation. Some underground sources which have been tapped in these parts of the country have been found to contain very high proportions of salts.

In a short run, irrigation in Tanzania seems to be possible in areas with permanent streams and rivers or with large surface water bodies. These are mainly Kilimanjaro - Arusha area, Usambara and Uluguru mountain areas, parts of Mbeya and Ruvuma regions, and the Lake areas. The high population densities in these areas, however, with the attendant problem of land shortage limits the contribution which irrigation would make to increased yields.

Moisture deficiency is still a major obstacle in increased food production in Tanzania. Any attempt at increasing food production has of necessity to address itself to how best to improve moisture reliability for crops. Irrigation will have to be practiced more in spite of the obstacles which I have mentioned above. However, given the country's spatial distribution of water resources, irrigation has to be supplemented by agricultural practices which tend to rely on optimum planting time that catches the elusive rainfall. Areas which get rain during very limited periods should also look into the possibilities of introducing quick maturing crops and drought resisting food crops.

Although variation in rainfall has contributed to a fall in food production, yet there are other factors which may have probably contributed as much to food shortages in Tanzania as have climatic factors. These are what I will, for want of better words, call the political climate of production and distribution. My hypothesis is that the mode of implementation of the political objectives of Ujamaa and Self-Reliance, had a negative impact on food production in the country.

3. The Political Climate of Production

From the time Tanzania got her independence, agriculture was rightly regarded as the backbone of the country's development. Throughout Tanzania's post independence history one is bound to see several efforts which were expended by government and other agencies in trying to improve and transform the country's agriculture. Immediately after independence in 1961, for example, young people whose enthusiasm for development has been kindled by the independence struggle moved quickly to form agricultural

producer cooperatives which were expected to raise agricultural productive capacity. Government gave support to these initiatives. However, these initiatives were on individual bases and government felt that if indeed agriculture is to develop systematically something more formal should be done. Thus the government came up with the idea of settlement schemes. Members of these settlement schemes were to be equipped with modern agricultural technology, advice and social facilities. It was expected that as a result of heavy investment in machinery and other infrastructure, the schemes would achieve a high level of productivity which would allow repayment of the initial investment and a high standard of living for the settlers. As is already known, the settlement schemes turned out to be very expensive failures. The expected high yields did not materialize.

A next step in trying to improve agriculture was the introduction of the Arusha Declaration which spelled out in broad terms Tanzania's path to development which was to be on the basis of socialism (ujamaa) and self-reliance. This declaration was followed up with a more detailed paper, Socialism and Rural Development, clarifying the way in which Tanzania was to achieve rural transformation. It was argued in the paper that development in agriculture would only be achieved if peasants worked harder and more intelligently; agriculture was organized at a scale where economies of scale would be achieved; marketing was better organized; agricultural capitalism was checked, controlled, and finally abolished; and local government became more democratic.

The first step in realizing the above conditions was for the peasants to move together and form "socialist villages", where land was supposed to be communally owned, labor would be pooled, and the fruits of collective

efforts, be it in agriculture, industry or commerce, would have to be distributed according to how much each contributed. The foundation of socialist villages was to be voluntary. Although social as well as economic activities in these villages were supposed to be on communal bases (with of course some division of labor being practiced) yet private economic activities were allowed to continue as long as it was judged necessary by the village members.

These attempts in rural communalization on voluntary bases had very limited success. Government soon realized that if development is to be achieved, some force had to be used in implementing its rural program. Thus in the early seventies, government abandoned its earlier stand of voluntary participation in the formation of socialist villages. Instead, government compelled peasants to move into large and accessible villages where private agricultural production would be subjected to close supervision and even control by the state. This new move was known as villagization and it is claimed that it was completed in 1976.

Rural development measures outlined above had as one of the objectives to increase food production by achieving higher yields through better organized agriculture. It is, however, apparent that the implementation of these policies may have instead contributed to the present food shortages rather than improved food supply.

The implementation of the settlement scheme program was based on the premise that with money and technology, higher yields would be achieved. The promoters of these schemes forgot to consider seriously the manpower bottlenecks. People who were settled did not have the required skills in modern agricultural practice. Furthermore, the settlers regarded the

schemes as purely government projects and they as simple caretakers of government undertakings. Consequently, instead of the schemes producing surplus food, food was supplied by the government. Other schemes which were started by the government were for the production of cash crops. The question of self-sufficiency in food production seems to have escaped the attention of the planners and the settlers.

The socialist villages program on the other hand, put emphasis on self-sufficiency in food production and one would have expected success in increased food production. It is not clear why the expected increased yield was not achieved. The answer to this question lies in examining the degree of success which was achieved in the formation of socialist villages. The available reports indicate that not much was achieved in this direction. Many implementors departed significantly from the original blueprint as contained in the document Socialism and Rural Development. Some administrators used force instead of persuasion in forming villages. Their motive in using force is not known, but the outcome of this departure from the suggested procedure was resistance and apathy. Many of the villages which were formed in this way were unproductive and had to rely on government for their food supply.

The villagization procedure of the early seventies had its share in the creation of food shortages which were experienced in the middle of the decade. As it was pointed out earlier, movement into "development villages" as they came to be known was by force. This created difficulties among the peasants who were forced to move and they were resentful. In some regions peasants were moved at the time when they were supposed to be working on

their farms, either planting, growing, or harvesting. Agricultural activities were greatly disrupted. Some villages were established in marginal lands which were not suitable for the crops which the peasants were used to growing. This factor of location also contributed to poor harvests. In other villages, peasants were required to travel long distances to their shambas (fields), a factor that was bound to reduce productivity. In one village, for example, it was calculated that a family, in order to bring home its produce from a one hectare farm, had to travel on foot a total distance of 450 miles!!!

Officially the failure of agricultural production during the villagization drive is attributed to adverse climatic conditions which the country experienced at that time and to poor planning and faulty implementation. It is very often argued that if the implementors of the policy had chosen an appropriate time when to move the people without disrupting the agricultural cycle and had included in their calculations the correct time that would be needed to settle the peasants, production would not have suffered the way it did. The above explanation seems viable in so far as the settlement period is concerned. Adverse climatic weather at the time and haphazard movement of peasants had a negative impact on food production. But these two reasons do not explain the continual fall in food production after the settling in period had passed and rainfall had improved.

I personally think the explanation of administrative ineptitude advanced above fails to question the viability of forced villagization as path to development.

Failure to achieve increased agricultural yields after the implementation of the villagization programme stems from the resentment and resistance of the peasants. The program required the peasants to depart drastically from the path of life in which they had faith and trust and instead jump on the government band wagon while they did not know where it was taking them. Furthermore, the implementation of the program was done in a manner that brought untold hardships to some groups of peasants. Government's unconcern with the hardships which the peasants experienced during villagization alienated further the peasants from the the program.

The new system threatened the peasant's long cherished pattern of life and ownership. The socialist village system threatened to take away the traditional (though implicit) land tenure from the individual family unit, which had hitherto been the principal unit of production and invest it in the village. Control of what an individual family produces was to be in the hands of the village. The peasants feared this move because their individualism was being threatened.

The question of food output cannot be fully explained without talking about the problems of agricultural inputs. To increase food yields, the government has urged peasants to use better seeds, fertilizers, and insecticides. The source of agricultural inputs and tools is the government owned corporations. These are usually inefficient and constantly bogged down in bureaucracy. Sometimes seeds have failed to arrive in time. Very often one hears that the required fertilizers are not available to the peasants when they are needed. The problems stem from the fact that parastatals which are supposed to supply the agricultural inputs to the peasant are usually not in contact with the consumers of their products. The farmer who knows best what he needs and at what time he needs it, cannot, under the existing

arrangements, get it from the producer. He has to pass through the inefficient bureaucratic machinery which helps to increase the costs of the inputs.

Nationalization of individual farms has had also an impact on food production in the country. The farms which were nationalized were managed by people who had accumulated a lot of knowledge about their environment. They knew what the soils needed to produce the best crop. In general the nationalized farms were efficient. The motive of nationalization of the large farms were, among other things, to abolish capitalistic modes of production especially in products which are central to the livelihood of man, such as food. One can say that there has been some success in abolishing capitalistic food producers in the country. But what has the country gained by such a step remains each one's guess. Tanzania now buys food from capitalistic producers on the world market at very high prices. Somehow, the country has neither the control of the quality of food she imports nor the price she pays for it.

Under the country's socialist policy, as spelt out in the Arusha Declaration, it is logical and justifiable to have the major means of production in the hands of the masses. Land, and for that matter good agricultural land, which it assumed was in the hands of capitalist food producers, should be turned over to the people who are to work it for the common good. What one fails to understand is why did food production fall after this good productive land was turned over to the people.

Another problem in the food production process in Tanzania stems from the assumption that anyone living in rural areas would make a good farmer. This is assuming that all people have the same qualities and abilities for

agricultural production. This assumption is exemplified by blanket orders requiring each member of any given village to plant so many acres of this or that crop without allowing individual initiatives in choosing the crop or size of acreage. If any member of a village would tend to be enterprising and cultivate a much larger acreage than the others, the implicit attitude of the village leaders would be to regard him as cherishing capitalistic tendencies. The next thing he would hear from the leadership would either be "villagization" of his farm tools or some other type of disciplining him. The outcome of these tendencies has been the stifling of the initiatives and inventiveness of progressive farmers.

Contrary to what one may expect in terms of investments in agriculture after reading government and Party documents on the priority they attach to food production is the fact that, although much money has been invested in agriculture, a small proportion of that investment has gone in food production for domestic consumption. Where large investment has been allocated to production of a food item, that food item has been earmarked for export. For example, of the Tsh. 964 million which has been allocated to agricultural development between 1964/65 and 1974/75 by the state and parastatal enterprises, 45 percent was spent on export crops, 26 on livestock, 18 percent on sugar and only 2 percent on cereals and other basic food crops.

This bias towards agricultural export production has had another negative effect on food production. It has gradually alienated good land and pushed the production of food crops into the more arid parts of the country. Sisal, for example, occupied the food lands of Morogoro and Tanga districts.

4. Distribution and Food Shortages

Whereas food shortages would in normal circumstances be expected to result from reduced production, sometimes shortages may be an outcome of inadequate collection procedures, inefficient storage facilities, and disorganized marketing.

The food shortages which have been experienced in Tanzania in recent years, if not caused by poor distribution, have at least been exacerbated by it.

It is true that the drought of 1973-74 caused a reduction in food production, but it should be remembered that not every part of the country suffered from this moisture deficiency. The typical rainfall pattern in Tanzania has been that when some areas are experiencing severe drought conditions which tend to affect negatively their crop production, other districts experience average or even above average rainfall which facilitate higher production to compensate for the loss in drought stricken areas. And this seems to have been the case in Tanzania during those years when the country faced a food crisis. The question which one is tempted to ask is why did National Milling Corporation not purchase food from the surplus producing areas and make it available to areas which were experiencing severe food shortage?

No single reason can be advanced to explain this failure. A few points may be advanced to explain the cause of this problem.

First, is the low producer prices which were paid to the farmers. The price the peasant received for his maize was low compared with what he had to pay when purchasing other consumer items. The tendency was, therefore, for the peasant to withhold maize for home consumption or for sale to

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illegal (magendo) markets either within the country or across the border into Kenya where he could be offered a higher price for this produce.

The second reason may be lack of efficient purchasing networks and shortage of storage capacity. In some areas maize was stored in the open ground where a good portion of the purchased crop got damaged by rain or eaten by rats and mice.

The third constraint has been shortage of funds. National Milling Corporation has at times failed to purchase peasants' crop because the corporation has claimed to be short of funds. And the peasants, on their part, have refused to allow the crops to leave their villages without being paid for this produce first.

In general, some of the food shortages in the country can be attributed to the inefficiency of the National Milling Corporation, which has failed to secure large quantities of food at the appropriate time.

CHAPTER VII: SECTION A

BURUNDI

Burundians' economic problems can be summarized by the adjectives which are often used to describe the country: rural, densely populated, and landlocked. Ninety-five percent of the population live in rural areas and the primary sector produces 75% of the total Gross Domestic Product. The major exports of coffee, cotton, and tea account for between 80-90% of foreign exchange earnings. Since 1970, however, the growth in production in the agriculture sector (1.6% per annum) has lagged seriously behind the population growth rate, which nationally averages an estimated 2.2 to 2.7 percent.

By contrast, urban based domestic production (the secondary and tertiary sectors) doubled between 1970 and 1977 and the value added per capita is approximately eight times higher in the urban than the rural sector. The lagging agricultural production is mainly due to the high population densities in rural areas (averaging 160 persons/km (415 per sq. mi.) with a high of 260 persons/km (676 per sq. mi.) in some areas). As a result, the traditional, largely subsistence agriculture system cannot cope with the increasing pressure on the land.

Rising coffee prices in the mid-1970's provided the Government of Burundi with greatly increased foreign exchange and budgetary resources to use in addressing these problems. The five-year Development Plan for 1978-82 reflected the increasing availability of funds and projected investments of approximately \$751 million (1976 prices) over the five-year period.

Of this amount, 20 percent was intended for the rural sector. The planned level of investment was expected to result in a rate of growth in the agriculture sector of 3.4% per annum over the plan period and an overall average annual growth rate of 5.6 in G.D.P.

Several circumstances, primarily external to Burundi have worked against this hopeful program: most importantly falling coffee prices, rising petroleum prices and the war in Uganda, which disrupted Burundi supply lines and restricted the amount of cement and petroleum available in the country during several months in 1979. As a result, the government was forced to revise the five year planned investment program downward to approximately \$550 million (1977 prices). This represents a reduction of 31.6 percent in real terms. During 1979 the growth of production in the primary sector remained a 1.6 percent. The secondary sector registered a drop in production of 5.9 percent (due to shortage of cement and fuel) while the tertiary sector increased by 5.3 percent for an overall growth in G.D.P. of 1.4 percent.

It is very sad to note that Burundi is one of the 17 least developed countries in Africa. The average per capita income is far below the absolute poverty level. Yet the majority of people manage to maintain adequate nutritional levels. Therefore, the challenge is to find how the minority who do not reach this level can be made smaller and smaller.

Malnutrition is essentially a part of the complex problems of poverty in the communities. The perennial food shortages in the communities have been greatly aggravated by global and national inflation resulting in soaring food and other commodities prices, and these together have weakened further the food purchasing capacity of the Burundian people.

Population Growth and Dependence Overload

Cultural and socio-economic factors in Burundian communities support a large average family size and a strong extended family system, especially in rural areas. The improvement of the health of the people has led to some reduction in mortality rates, resulting in increased life span and substantial increase in population.

Burundi now has a population estimated at 4.4 million. The population is now growing at the rate of 2.7 percent per annum and it is expected to reach 7.8 million by the year 2000. The expectation from this high rate of population increase is that every year there would be about 188,000 additional people for whom adequate food supplies would be needed. To meet that requirement, food production must increase at least by 3.5 percent annually. This figure is far from being achieved in Burundi.

Another feature of Burundi is that the population is also a very youthful one about 44 percent consisting of people under 15 years of age. Because of the low average per capita income and soaring food prices in many communities, the bread winner in the extended family unit is unable to provide adequate food and other family necessities for members of the family. With limited income and food resources, it is common for housewives to be faced with the problem of having to feed a large number of people from the same cooking pot. The resulting diets are deficient in energy, protein, and certain other essential nutrients.

General underdevelopment of the countryside and the increasing hard living conditions in the rural areas have accelerated the rate at which people migrate from rural to urban centers in search of social betterment.

There are many food and nutritional implications of the mass migration of farming families from the villages to the cities. In terms of agricultural activities and food economies, urbanization is a two edged sword.

Firstly, rapid urbanization reduces the number of food producers at the countryside. Secondly, a large proportion of the people migrating to the cities are ill-equipped in terms of qualifications, experience or skills for the very few jobs available in the cities. Consequently, the majority of the immigrants are not employed. Unemployed urbanities represent the waste of a potential labor force and live as parasites drawing on the meager food and other resources of their urban relatives or hosts.

Over 90 percent of Burundians live in rural areas and agriculture is predominant. Therefore it is to agriculture that Burundi must look in the first place for the solution of the perennial problem of hunger and malnutrition in the communities. Malnutrition in Burundi is due primarily to inadequate domestic food production coupled with inadequate food intakes (in quantity and quality). Most existing diets consist mainly of one kind of staple. The diets are therefore monotonous, low in protein and certain other essential nutrients, and sometimes also calorically insufficient. One of the most practical means of solving the problem would be to increase production and consumption of local staples together with complementary food rich in protein and other nutrients, as appropriate to the respective ecological zones.

The salient issues are the following:

- a) general improvement of the family or customary diets, and
- b) specifically, qualitative and improvement of the weaning child's diet. This calls for a comparative assessment of traditional staple food crops in order to determine food crops that provide balanced nutrients and hence are good sources of nutrition.

Dried legumes are of special importance. Peasant communities should be encouraged to adopt a mixed cropping system of arable farming. For communi-

ties which spend very little on food purchases, increased production and consumption of different kinds of nutritious staples could lead to balanced diets which would meet the nutritional requirements of all members including children.

Introduction of backyard gardening and poultry in all the communities would lead to increased family income, or reduction of family expenditure on food purchases and the consumption of better diets.

The increased production of dried legumes needs most emphasis. Groundnuts are rich in energy as well as protein, and it has been emphasized by Lathan (Human nutrition in Tropical Africa, FAO) that a handful of groundnuts daily would be sufficient practically to eliminate malnutrition from the region. Soya and other dried beans should likewise be much more intensively cultivated and used.

Conclusion

Medical evidence and food production and consumption data (Table 00) show that even apart from natural or man-made disasters (drought, flood, migration, wars, etc.) primary or secondary energy and/or protein deficiency is widespread among young children, especially those ages 1-2 years. It is manifested as protein energy deficiency, clinically presenting a range of conditions from Kwashiorkor to Marasmus. Other nutritional diseases found among Burundian children are those resulting from a lack of minerals, iron, iodine, calcium, etc. Of these, the most important are vitamin A deficiency, nutritional anemia, endemic goiter. Severe protein-energy malnutrition and other forms of malnutrition usually require hospitalization. The end result of severe malnutrition is death. Infant and child mortality is high and malnutrition contributes from 30 to 50 percent of the deaths of children

under 5 years of age. This proportion rises to well over 50 percent if the incidence of prematurity are taken into account. The incidence of malnutrition among infants and other children in the Burundian communities is associated with a number of problems. The basic problems include adverse environmental conditions; underdevelopment; poverty; high rate of population growth and dependence overload; migration and urbanization, polygamy and illegitimacy family organization, traditional beliefs and customs; family feeding habits, the burden of responsibility of African mothers, inadequate nutrition education, inadequate food and agricultural production, inadequate food processing marketing and storage. The magnitude of the problem of infant and child malnutrition calls for the most urgent consideration of the means for its elimination. There is therefore a compelling need for Burundian governments to adopt a strategy for food and nutritional improvement for the population especially focussed on the most vulnerable groups.

The main focus should be a general improvement of the family or customary diets and the production of low cost weaning foods from food available locally and usually already part of the family diet.

Because of the complexity of the problems of food and nutrition an effective solution to the problems requires an interdisciplinary approach. This stresses the need for the establishment of national food and nutrition policy by the government in order to provide the entire population at a given time with food and other cultural and economic conditions indispensable for an adequate nutrition and food welfare.

BURUNDI TABLE I

Production - Burundi
(thousand metric tons)
(estimates of trends)

<u>1977 Actual and Selected Basic Trend Values up to year 2000 and Long-Term Growth Rates</u>	<u>Actual 1977</u>	<u>1977</u>	<u>1985</u>	<u>1990</u>	<u>2000</u>	<u>Growth rate 1961-1977 Average % Per Annum</u>
Sheep Milk	1.4	1.4	2.3	3.2	5.9	6.39
Cow Milk	51.7	52.5	72.0	87.7	130.1	4.02
Goat Milk	5.7	5.5	6.5	7.3	9.1	2.24
Hen Eggs Production	2.2	2.3	3.6	4.8	8.6	5.90
<u>1977 Actual and 1985, 1990, 2000 Trend Values and Long-Term Growth Rates</u>	<u>Actual 1977</u>	<u>1977</u>	<u>1985</u>	<u>1990</u>	<u>2000</u>	<u>Long-Term Growth Rate 1961-1977 Average % Per Annum</u>
Poultry Meat	2.5	2.7	4.3	5.7	10.1	5.90
Indigenous Pigmeat	2.8	3.1	12.4	29.4	168.3	18.99
Indigenous Mutton & Goat Meat	3.1	3.1	4.1	4.8	6.8	3.52
Indigenous Beef & Buffalo Meat	15.7	13.9	21.4	28.0	48.1	5.56

BURUNDI TABLE II

Food Consumption Burundi - 1961-77

(metric tons per annum)

BP
100

	<u>1961-65</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972**</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>
Beans Dry	119,140	145,000	131,400	133,600	128,000	133,000	136,245	142,000	147,000	145,000	1,555,000	157,000	160,000
Peas Dry	31,900	37,370	37,400	35,700	19,817	34,376	36,000	32,536	31,400	25,200	31,800	32,550	35,000
Ground Nuts	3,420	4,150	6,500	7,199	9,697	10,224,	9,899	7,552	10,334	9,933	8,586	9,333	9,575
Bananas	345,000	370,000	385,000	390,000	400,000	400,000	414,500	372,500	423,000	423,000	448,500	457,300	466,100
Potatoes	72,571	92,850	95,689	100,000	41,221	101,120	90,120	183,071	235,000	238,300	146,038	200,000	220,000
Sweet Potatoes	627,100	743,280	747,200	758,000	874,119	800,000	820,000	840,000	860,000	800,000	810,000	840,000	880,000
Cassava	854,360	848,960	931,900	940,300	900,000	800,000	830,000	860,000	890,000	870,000	890,000	910,000	930,000
Roots NES	35,900	39,700	42,100	45,000	46,000	47,000	47,000	48,000	48,000	49,000	49,000	50,600	52,200
Wheat	8,891	12,828	11,976	15,295	11,590	23,740	13,839	16,380	10,375	16,850	19,490	12,747	11,920
Rice/Milled	3,206	2,029	976	3,833	2,355	4,711	1,177	5,002	3,045	3,311	4,552	5,186	6,816
Barley	2,194	3,712	4,105	3,989	4,204	4,704	4,530	5,268	6,358	6,748	6,316	6,845	7,891
Maize	98,380	109,740	115,599	119,999	119,999	119,999	119,999	119,599	135,800	108,599	137,100	139,899	139,999
Millet	19,097	20,788	21,098	22,498	21,425	34,303	22,127	35,040	31,998	19,492	24,569	29,313	29,998
Sorghum	104,378	122,388	135,998	115,998	114,998	96,035	109,998	107,286	114,999	146,999	129,297	119,870	113,999

** 1972 was a year of civil war

BURUNDI TABLE III

	<u>Production</u>								
	(metric tons)								
	<u>1961</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>	<u>1969</u>
Wheat	4,000	6,500	7,400	7,400	8,200	8,230	8,400	9,800	4,387
Rice	1,800	1,650	1,608	1,728	1,307	1,180	840	2,760	2,068
Maize	72,968	96,839	95,797	113,830	112,475	109,740	115,600	120,000	120,000
Millet	18,000	17,000	19,000	21,000	20,500	20,790	21,100	22,500	24,428
Sorghum	61,291	96,034	109,130	124,408	133,029	127,390	121,000	123,000	115,000
Potatoes	8,000	14,200	16,360	15,520	18,300	18,503	19,000	19,800	8,244
Sweet									
Potatoes	131,463	166,317	134,781	170,420	180,856	185,820	186,800	180,500	218,530
Cassava	295,675	241,233	246,896	260,178	250,575	257,260	282,394	284,394	284,939
Groundnuts	3,255	3,150	3,150	4,200	4,200	4,358	6,825	7,560	15,750
Bananas/ Plantains	117,273	125,615	141,332	152,092	153,664	148,000	154,000	150,000	160,000
Cereals	148,059	218,023	232,935	268,366	275,511	267,330	266,940	278,060	262,883
Roots/ Tubers	442,638	429,625	406,762	457,068	459,556	471,508	498,719	505,489	511,001
	<u>1970</u>	<u>1971</u>	<u>1972**</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>
Wheat	13,184	4,700	7,651	6,200	11,009	13,082	4,454	4,500	5,000
Rice	4,500	1,800	2,000	1,650	3,300	3,554	4,281	5,250	4,800
Maize	120,000	120,000	119,600	135,800	108,600	137,100	139,900	140,000	140,000
Millet	34,365	22,128	35,042	32,000	19,494	24,572	29,315	30,000	30,000
Sorghum	96,037	103,000	107,288	115,000	160,815	129,298	119,878	100,000	110,000
Potatoes	20,224	18,000	36,600	47,000	47,660	29,208	40,000	44,000	46,000
Sweet									
Potatoes	20,000	205,000	210,000	215,000	200,000	202,000	210,000	220,000	227,875
Cassava	242,424	251,515	260,606	269,697	263,636	269,697	275,757	281,818	283,636
Groundnuts	22,667	26,305	13,499	28,350	27,930	24,926	27,300	28,350	28,350
Bananas/ Plantains	160,000	165,800	149,000	169,200	169,200	179,400	182,920	186,440	189,960
Cereals	268,086	251,628	271,581	290,680	303,278	307,606	297,828	279,750	289,800
Roots/ Tubers	474,398	486,265	519,206	543,697	523,546	513,655	538,407	558,868	570,961

** 1972 was a year of civil war

BURUNDI TABLE IV

Production - Burundi

Total Non-Cereal

<u>1961</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>	<u>1969</u>
841,225	911,913	951,379	1,030,626	1,070,531	1,083,566	1,087,284	1,103,409	1,097,451
<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>
1,092,527	1,101,998	1,127,822	1,210,327	1,194,154	1,212,387	1,236,005	1,248,408	1,278,471

CHAPTER VII: SECTION B

KENYA

Food/Population/Energy - country issues.

Land availability and population pressure have been crucial issues at all stages of development in Kenya. Overcrowding, competition for land among different economic uses and social groups and depletion of resources have critically undermined strategies aimed at rural development.

Present impacts involving high population growth, food supply shortages and Kenya's energy crisis severely constrain opportunities for development in rural areas. These impacts are summarized in the following pages.

Rural development will continue to be a high priority objective in government development policies and programs in Kenya. Both the Kenya Development Plans for 1970-74, and 1979-83 emphasize rural development through such objectives as increasing household incomes and income earning opportunities in rural areas of the country. Kenya is predominately a rural society. Agriculture supports 86 percent of the population, accounts for 30 percent of GDP and 70 percent of all exports (1977).¹

Based on current population growth rates of approximately 4 percent per annum total population should double to about 32 million by the year 1998. If this extremely high growth continues, the problems of suitable and available land for rural development and agricultural production will continue to be a key issue for the overall development future of the

country. Current demographic characteristics include a high percentage of young people, declining death rates and high rural to urban migration. These will intensify pressures for increasing the efficiency and intensity of land utilization. Problems of land allocation, land availability and the maintenance or improvement of agricultural productivity are already serious. Land suitable for arable agriculture is extremely scarce, with more than four-fifths of the country's total land surface classified as only low potential or as unsuitable for agricultural use.² Only 17 percent is classified as having high or medium potential. Research suggests that only 7 percent of the total land area is suitable for agriculture.³ There is a strong correlation between land use suitability for arable agriculture and population density. Approximately half of Kenya's population lives on 8 percent of the land area and densities of 250-400 persons per km² are recorded in rural areas with the most fertile soil.⁴

The country's very young age structure has and will continue to have impacts on sustaining high population growth as well as efforts to increase job opportunities. At present, over half the population is below the age of fifteen and this percentage may rise slightly in the future.⁵ This age structure when coupled with a declining death rate, from 20 per 1000 in 1960 to currently 14 per 1000 means that massive population growth should continue in the future.

Agriculture and other forms of rural work provided 83 percent of Kenya's total employment in 1976.⁶ As a result of the very young age structure, the growth of the rural labor force should continue to be about 3.3 percent per year for the next 15 years.⁷ Such an increase in the number of people seeking work in rural areas will generate pressure for increased land productivity. The modern non rural job sector supplied only

*assuming a constant rate for migration.

17 percent of total employment in 1976, and should experience little expansion in the future. GDP in 1979 at constant prices rose by only 3.1 percent, half the growth rate achieved in 1978 and only two-fifths that of 1977.⁸ This decrease in the growth of GDP should have a dampening impact on the modern sector and the economy as a whole. Escalating prices of fossil fuel imports will also act to constrain growth in the modern sector as well as create serious balance of payments problems.

Increasing wage employment opportunities will depend to a large extent on expanding agriculture. Rural development opportunities are also important in relation to Kenya's increasing urban population.

Kenya is experiencing a rapid rate of urbanization. Largely as a result of rural to urban migration, the annual growth rate of urban areas is over 7 percent, more than double the rural population growth rate. The large number of cities and towns of over 10,000 people (24 cities and towns) means that rural areas will be expected to provide food surpluses to feed the increasing urban population.

Agricultural expansion during the 1970's has meant that Kenya has remained essentially self-sufficient in most food stuffs.⁹ Problems of distribution and storage, inequalities of purchasing power and seasonal fluctuations in the availability of food have generated at the same time nutritional deficiencies for some population groups.¹⁰ More recently, decline in production has created deficits in such foodstuffs as maize, the major staple crop of the country. Reasons for the decline, have been linked to such factors as: a substantial shift from maize to sugar cane production in the Western Region, poor weather conditions, and reduced credit to large producers. The deficit in maize production underscores the impact of

population pressure on agricultural production.

As a result of the current energy crisis in Kenya scarce land resources could also compete with energy supply schemes to provide fuelwood through forestation projects or alcohol for transportation needs.

The energy needs of the modern economic sector depend on 82 percent from oil, 17 percent from hydroelectricity and 1 percent from coal sources.¹¹ All the oil, coal, and approximately 25 percent of hydroelectricity consumed in Kenya is imported and has to be paid for in foreign exchange. Because of the rising prices of crude oil, Kenya has experienced serious balance of payments problems. In 1979 Kenya spent more than a quarter of its annual foreign exchange on importing energy resources. This percentage could rise to as much as 50 percent in light of price increases. To achieve any degree of energy autonomy, alternative energy sources must be sought and developed within the country. The most promising alternative energy sources are hydro-electric, geothermal power and wood.

It is estimated that over 90 percent of the energy needs of the non commercial rural population are met by fuelwood. The annual production of fuelwood was exceeded by the annual consumption of wood and charcoal by the early 1970's.¹² This is reflected in the consumption of fuelwood at a rate of over 20 million tons per annum.¹³ The accelerating depletion of the indigenous wood resources and consequent threat to rural development means that Kenya needs to promote significant agroforestry programs to expand fuelwood resources. Expansion of fuelwood sources is related to the problem of land availability. In view of the scarcity of high potential land and the competition between food and fuelwood production pressure will increase for the use of semi-arid land for agroforestry projects.

Energy use and the needs of the growing urban population should also

reflect changes in land utilization within rural areas. According to a household survey on energy demand in Nairobi, total primary energy use is shown to increase rapidly with rise in income. Transportation related uses were the demand. This increase resulted in greater length of trip distances and longer travel time rather than an increase in the number of new motor vehicles. Increases in trip distances should rise with urbanization as people are forced to live farther from employment sources.

One means of meeting fuel demand for transportation is by substitution of gasoline through biomass fuels such as alcohol. Presently two power alcohol plants are under construction in Kenya aimed at supplying 250,000 barrels of alcohol fuel annually for blending with premium motor gasoline.⁴ Sugar cane production would be the biomass source for these two plants. Increased production of sugar cane could further aggravate problems of arable land scarcity and food supplies.

Kenya at present has no national or centralized system for monitoring the state of environmental resources.¹⁵ It is not possible to quantify in exact terms the rate of overall depletion or degradation. However, the consequences of population growth, food production, and energy constraints is likely to aggravate the present deterioration. These same trends will increase the need for future rural development based on available resources. Rural development to a large extent will depend on the integration of ecologically sound planning in efforts to increase land productivity.

Some of the most serious problems related to depletion of environmental resources have been summarized by the Kenyan National Environment Secretariat as follows:

- (1) The cumulative pressure - in generalized terms - of increasing human populations on the carrying capacity or productive capacity of soils, especially throughout the "high potential" and "medium potential" zones which together make up 20 percent of Kenya's land area.

- (2) Over-intensive exploitation of soils (springing both from social and commercial impulses) expressed in terms of mechanical and/or chemical stresses which-in diverse ways-contribute to soil loss or degeneration of the soil complex.
- (3) The breakdown over a critical period of countrywide soil conservation programs and practices, mainly through failure to comprehend-at all levels of production and administration-the need for scientific/technological discipline.
- (4) An ever-increasing tendency, within the comparatively fertile agricultural areas, towards the cultivation of steep slopes, river-banks, and elements of sundry other unsuitable or fragile ecosystems, worsened in certain instances by sporadic practices of snatch-cropping.
- (5) The haphazard/uncontrolled spread of populations, on a more extensive scale, seeking to escape from the consequences of soil/loss via the pursuit of "opening up new lands" in marginal or semi-arid areas, which are vulnerable to such forms of exploitation.
- (6) Widespread destruction of catchment forests, most suitable in higher areas and on hillsides, for purposes of settlement and cultivation, sometimes accompanied or supplemented by hordes of livestock, and with impacts then compounded by other forms or resource depletion.
- (7) Overgrazing across huge tracts of arid rangelands, coupled with all the soil-pressure consequences of overstocking (cattle, sheep, goats) throughout most "medium potential" and "low potential" areas.
- (8) The indiscriminate destruction of protective vegetation-cover is the cause of commercial charcoal production, supplemented by mounting demands for charcoal/firewood leading to obliteration of tree-lines and shelterbelts on many farms and ranches.

FOOTNOTES

1. The Futures Group - RAPID, Kenya: The Effects of Population Factors on Development, Working Draft, (Washington D.C. July, 1980).
2. Kenya Statistical Abstract, 1978 Table 81 (Nairobi annual series).
3. Smith, L.D. "An overview of agricultural development policy." Chapter 4 of Heyer et al (eds.). Agricultural Development in Kenya. Nairobi, Oxford University Press 1976.
4. See Kenya, 1974, p. 100; Mbithi and Barnes, 1975 pp. 84-85. The densities quoted have been raised for the growth of population since 1969.
5. Susan H. Mott and Frank L. Mott, "Rapid Population Growth in Kenya," paper presented at the 23rd annual meeting of the African Studies Association. Philadelphia, Oct. 17, 1980.
6. William J. House and Tony Killick, Social Justice and Development Policy in Kenya's Rural Economy, (ILO January 1980)
7. RAPID, 1980
8. Kenya, Economic Survey, 1980 (Ministry of Economic Planning and Development, Nairobi June 1980).
9. House and Killick.
10. RAPID, 1980
11. Kenya, Economic Survey, 1980 p. 124.
12. Work Plan For an Analysis of the Fuelwood Cycle in Kenya and the Feasibility of Expanded Fuelwood Production. Clark University, Worcester, Ma. 1980.
13. Ibid. p. 4.
14. Kenya Economic Survey, 1980 p. 136.
15. National Environment Secretariat, A Preliminary Summary Report GOK/UNEP/UNDP/Project on Environment and Development, (Nairobi, March 1980).

CHAPTER VII: SECTION C

SOMALIA

Somalia is one of the few countries in the world where most of the people (55-60%) rely on herding and stock raising as their principal source of livelihood. Of the remainder, 15-20 percent are sedentary farmers and the rest work in services or industry.

Food production in Somalia, therefore, consists mainly of animal products, though in good years of good rainfall the southern third of the country produces enough grain to feed all of the country. However, two years in five yield well below average rainfall and grain imports are necessary.

Population totals for Somalia have long been a source of dispute but the generally accepted "normal" population in 1980 is about 4 million. Growth rates are estimated between 2.3 and 2.5 percent. Even in normal times, population estimates are difficult because of the mobility of many of the people, both within and outside the national frontiers. In the last two years, there has been a massive influx of refugees, many of Somali ethnic origin as well as considerable numbers of others from Ethiopia. Refugees in camps now number over 800,000 and estimates suggest there may be will over 500,000 additional refugees outside the camps. This additional amount constitutes more than 25 percent of the national population and has created a dramatic new situation in Somalia with considerable uncertainty about its future evolution or resolution.

Somalia has few "modern sector" energy resources, relying on imported oil for most of its modest needs. Most of the people still rely on wood and charcoal for household energy and it is this resource which is experiencing the greatest pressure. Even before the influx of refugees, there was a

rapidly growing shortage of woodfuel. For example, settlers from the Kurten Waarey settlement use trucks to search for wood up to fifty miles away. These energy demands, especially near the large camps in poorly wooded, semiarid areas, have deforested large, new parts of the nation's already marginally wooded areas.

Energy is a significant and growing problem in Somalia in both the traditional and modern context and much of Somalia's exports will be used to purchase energy, especially as the newly built road network in this very large country begins to become functional.

There is good potential in Somalia for the expansion of irrigation and one large new sugar producing scheme has just been completed. The new irrigation projects are expensive to build and run, and because of this they are currently planned to produce crops like sugar which meet domestic needs and export crops. It is not clear what the economics of grain production, other than rice, will be or how the irrigation projects will solve the difficult problems of management and labor supply. But they do augment a possible new factor in Somalia's ability to feed itself, either directly or indirectly.

Hopeful though these prospects may be, they are long term. It is clear to most observers that the next ten years will be difficult for Somalia. Can rainfed grain production be increased and made more reliable? Can livestock production continue to serve over half of an expanding population? Can irrigation both improve food self-reliance and provide for exports? How does the refugee problem impact all of agricultural and development planning over the next few years? Somalia has resources of animals, and fish (offshore) and development prospects in other sectors. How far they are sufficient and can be mobilized to serve an inflated population is far from clear.

CHAPTER VII: SECTION D

ETHIOPIA

Of all nations in Eastern Africa, the food/population/energy pressure may be the greatest in Ethiopia. Only in Ethiopia did recent drought and famine cause deaths among hundreds of thousands of livestock and perhaps thousands of people. Only in Ethiopia, out of the entire region, was famine-related suffering a major contributing factor in the overthrow of the government. Only in Ethiopia is famine such a persistent problem that roughly 20 percent of the districts have experienced famine during each of the last 20 years.

1. Food

Food production in Ethiopia has not been an encouraging enterprise in recent years. From 1979 to 1976, while population increased 2.4 percent, per capita food production decreased at an annual rate of 3.7 percent and production of cereals declined 5.6 percent per person. A recent USAID/USDA study found Ethiopian food production to be the least effective of all Eastern Africa with 1979 per capita levels equalling about half of 1970 levels. Although these were tumultuous years for Ethiopia, the net result is that Ethiopia faces major food production needs for the immediate future. For example, since 1974, U.S. P.L. 480 Food for Peace assistance has exceeded one million dollars per year and in 1979 -- a year when U.S.-Ethiopia relations were far from cordial -- U.S. government food aid was more than nine million dollars.

Related to food deficits is famine. In the last 20 years, Ethiopia has

suffered 4 national famines, 12 regional famines, and at least 4 local famines. Of these years, the most severe times came in the early and mid-seventies when the drought inflicted injury certainly as severe as that of the 1888-1892 famine, and perhaps even worse.

2. Energy

Energy is another concern for Ethiopia. Fuelwood depletion rates are well known though no quantitative national assessment or inventory is available. Political unrest has led to a burgeoning of urban populations--Addis is now over a million -- and urban charcoal prices are soaring beyond the grasp of the urban poor. Charcoal is now reported to cost more than \$10.00 a bag--perhaps 40 pounds weight. The government has recently tried to curb the use of charcoal by subsidizing the price of electricity. Yet such subsidies are helpful only in urban areas where the national grid is available. And they help only those who have the capital to buy appliances which can use the electricity. Even so, cheap urban electricity has made at least some differences and is attested to by the wave of extension cords which will snake through a compound or alley way when it comes time for households to cook their evening meal.

Of further concern is Ethiopia's access to the Red Sea and oil imports. There is no known domestic petroleum. All gasoline and diesel oil must move in through Asmara or Djibouti. As railroad transport is constantly disrupted, supplies of oil are uncertain.

3. Population

Population data are unreliable. Ethiopia has by far the largest population (32 million) of all countries in the region and is almost twice

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the size of either Tanzania or Sudan (both about 18 million) which are the next two largest. Urban growth is also accelerating, having climbed from 6 to 15 percent from 1960 to 1980. Current growth rates seem to be about 2.4 percent.

All of these figures, however, must be taken cautiously. The change of government, internal and external wars, urban migration, famine, refugees, and resettlement efforts are all variables which make data collection extremely difficult.

In summary, it seems apparent the Ethiopia's population pressure is no greater than other nations in Eastern Africa and probably is a lot less. However, its semi-arid environment, vulnerability to drought and famine, and precipitous declines in food production make its energy and nutrition levels extremely tenuous.

CHAPTER VII: SECTION E

SUDAN - ISSUES OF FOOD/POPULATION/ENERGY

The Sudan is the largest of African nations in terms of land area, but ranks only in a middle order in population. This apparently high ratio of land to people has not exempted Sudan from a deep concern with the issues of population/food/energy. This summary paper provides an overview of these issues.

I. POPULATION

Sudan has an estimated population of 16,919,000,¹ over 80 percent of whom live in rural areas. Population has been growing at a rate of about 2.5 percent per year, though detailed regional population figures are not available. It is not clear what the differential growth rates are in different parts of the country, though like most other developing countries, a large proportion (nearly 50%) is under 15 years of age.

Available data suggests that there are considerable differences in socio-economic wellbeing between the regions, the north and west being comparatively better off than the south and east.

Population growth has been accompanied in many areas by growth in the numbers of livestock and more people and more animals have combined to cause local and regional pressure on resources.² For example, in North Kordofan and North Darfur, recurrent drought over the last 11 years together with a 40 percent increase in people, has resulted in conflicts between nomads and settled agriculturalists over water resources and has resulted in migration of some nomads out of their usual pastoral areas.

Despite the increase in population, labor scarcity has characterized many of Sudan's development efforts in agriculture. Migration to urban centers has been a main factor for the scarcity in labor force, especially in rural development projects. There is also a continuous exodus of highly qualified manpower to Arab countries that offer not only very attractive salaries, but also a wide range of facilities. In contrast, labor is imported from the western and southern regions of Sudan to supply the irrigation projects and mechanized farming areas of central Sudan.³

Another important population issue is the refugees. Refugees from Uganda, Chad, Zaire, Eritrea, and Ethiopia have entered Sudan in large numbers and are concentrated in the poor, rural areas of eastern and southern Sudan. Food is not available in quantities large enough to meet their needs. There are at least 400,000 refugees from Eritrea and Ethiopia, most of whom are unskilled.⁴

II. FOOD

Sudan is always mentioned for its great potentiality for becoming the "bread basket" of the Middle East. However, the reality is that there is a famine threatening many areas of this nation, that the agricultural production has declined to below the averages of the last decade, yields have been poor, and soils in many areas are exhausted due to poor agricultural practices.⁵

This issue of food scarcity contrasts with the fact that the areas dedicated to cereal production have been expanded from 8.3 million feddans to 10.9 million.⁶ However, this intensive mechanization has brought about soil exhaustion requiring larger investments in fertilizers which can only be provided by affluent producers. Expansion of cultivated areas has also been met by labor shortages, especially at harvest time.

The "bread basket" policy also confronts other environmental problems. One-third of total Sudan's area is desert, and rainfall is very irregular over another third, especially in the west and south regions. On the east, irrigation is used by either traditional and modern agriculture, but, losses in the transmission of water occur due to a very deficient system and mismanagement of water supply. This is particularly true in the schemes.⁷

Sudan's agrarian-based economy is sustained by the production of export crops. In 1979, 95% of the exports came from agricultural commodities. The government has been maintaining a policy of promoting an expansion of wheat production for local consumption. But this policy has been running parallel to that of expanding export crops in irrigated areas. These policies are outlined in the government's latest programs for development.⁸ There is an acute need for increasing food production, but at the same time there is a need for cash crops which would finance imports. Increases in export crops signify an increase in the purchasing power of imports of technical inputs that would maintain large-scale agricultural projects, food commodities for consumption, and more important oil. Thus we find in the Sudan, large-scale agriculture projects focused on the production of export crops (cotton, groundnuts, sesame), interacting with small farmer production which supplies food crops for local consumption. Livestock production is carried out by traditional farmers, and according to some of the literature reviewed, this sector (under their limitations) has been effectively coping with increasing demands.⁹

There are large and ambitious projects planned. One of them is the expansion of mechanized farming in the Kordofan, Darfur provinces for the production of export crops. In the area of food production there are plans with the investment of Arabs "petrodollars" into large-scale irrigated and

mechanized agriculture for the production of cereals, fruits, and vegetables to be exported to the Arab world. The problem that arises is that these are long term projects which will not be able to solve the present crisis of food supply in the Sudan. Besides, such projects are more capital intensive than labor intensive. The competition that these large-scale projects present to the traditional producers poses a problem that not only affects this sector economically, but brings serious problems in terms of food availability. As a result of the steady replacement of small peasants and nomadic forms of food production by commercial agricultural ventures, acute differences of food supply have now emerged.¹⁰ In the review of literature concerning small farmers in schemes, it is stressed that commercial agriculture is unreliable for the tenants. Net revenues are sometimes insufficient to cover production costs. Thus, farmers' income has to be complemented by mixed farming. Livestock production represents a security and offers a source of extra capital that could be transferred to the agricultural sector. Income derived from livestock could be reinvested to hire extra labor or acquire more agricultural inputs.¹¹

Other factors contributing to food production limits are poor infrastructure, scarce transportation, distant markets, traders who benefit from marketing, and problems with excessive or scarce rains.

III. ENERGY

Sudan's excessive dependence on imported oil creates a balance of payment problem. Oil is the major factor for the high Sudanese foreign debt. This years' bill will be of \$450 millions.¹²

Oil is needed for transportation, for industries, maintenance of mechanized agriculture, and irrigation systems. Moreover, it represents a crucial issue in Sudan's policy on expanding food production. As mentioned

before, export crops are used to finance oil imports, and oil is used to expand export crops. Dependency on oil has created a vicious circle that puzzles the government and ties national earning to it.

For the last year, there have been some small oil and gas discoveries in Sudan. This year Chevron is investing \$20 million in a continuing search. Government officials claim that there will be enough oil to provide 50% of domestic demand in a few years, but this may be very optimistic.¹³

In the rural sector, the increase in the demand of wood for fuel has led to widespread deforestation. Deforestation has got to the point where 548 million acacias are being cut down to be used as firewood for cooking.¹⁴ Deforestation has also aggravated the problems of soil erosion and desertification.

IV. CONCLUSION

All of this brings us to a set of interrelated issues which are placed in a circle. Growing population means growing demand for food and oil or firewood. Growing demand for energy sources stimulate the production of export crops, Neglecting crops for food consumption. This returns back to a population that is suffering from food scarcity. Even though it is true that Sudan has a vast territory, and a comparatively low population, environmental problems greatly limit the pattern of land use and labor, and management problems compound the situation.

Footnotes

1. World Statistics, 1980.
2. Ibrahim, Dr. Fouad, 1978. The Problem of Desertification in the Republic of The Sudan with Special References to Northern Darfue Province. Development Studies. University of Khartoum, Monograph series No. 8. pp. 38.
3. Sudan Agricultural Survey, 1979. Eastern Africa Region, Northern Agricultural Division World Bank, May 18, 1980. Annex I Natural Resources and Their Developmental Potential. p.4.
4. New African Magazine, August, 1979. p.55.
5. Ibid, April, 1979. p. 16.
6. Sudan: Recent Economic Development, IMF. April 30/79. p. 10.
7. Sudan Agricultural Survey. p. 17.
8. I do refer here to the recently outlined: Basic Programme for Agricultural Development in the Democratic Republic of Sudan 1976-1985; Food and Natural Resources: Food Investment Strategy 1977-1985; and Sudan's Six Year Plan of Economic and Social Development (1977/78-1982/83).
9. Sudan Agricultural Survey, p. 18.
10. Oesterdiekoff and Karl Wohlmuth, 1980. The Breadbasket is Empty: The Option of Sudanese Development Policies. University of Bremen, West Germany, as quoted in Charles Starweather's review in Sudanow, Oct., 1980. p. 29.
11. Sorbo, Gunnar, 1977. How to Survive Development: The Story of New Haifa Development Studies and Research Center Faculty of Economic and Social Studies, University of Khartoum, Monograph Series, No. 5, p. 29.
12. "In Vast Sudan, Money and Skills are Always Missing". New York Times, Dec. 2, 1980. p. 2
13. Ibid.
14. Ibrahim. p. 28.

CHAPTER VII: SECTION F

KEY TRENDS IN TANZANIAI. POPULATION GROWTH

The most recent data available estimates Tanzania's population to number about 16.5 million in mid 1977 with an annual growth rate of 2.5 percent. The population is overwhelmingly rural although the urban sector has grown from 3.2 percent of the population 1957 to 11 percent in 1978. The birth rate is high, 43 per 1,000; the death rate is high, 22 per 1,000; the infant mortality rate is high, 167 per 1,000; and the life expectancy is low, 44 years. The age structure of the populace is skewed to the lower age brackets and this situation appears to be getting more pronounced. The proportion of persons under the age of 15 years has grown from 42 percent of the population in 1967 to 47 percent in 1977, presenting the country with an expanding pool of mainly dependent individuals. Two other facts are the unbalanced distribution of the distribution of the population within the country and the variations in the important demographic characteristics which occur from region to region. 60 percent of the population occupies 24 percent of the land, largely settled around the border areas of the country. After the 1967 census, the estimates of density in some areas varied from only 2 to over 221 persons per square kilometer. More important, perhaps, were the variations which could be found in the primary variables effecting the growth rate. One government sponsored study found that at the district level - the lowest level at which the results were evaluated - there were fluctuations in the birth rate from 31 to 58 per 1,000 and in the death rate from 1 to 33 per 1,000, producing a population growth rate which fluctuated from 0.9 to 3.7 percent among the districts.

II. URBAN GROWTH

Tanzania is one of the least urbanized countries in the world. The urban population was almost 12 percent of the total in 1980 while the average annual growth rate was 8.3 percent. The population of 19 regional centers totaled 1,653,434 in 1976, suggesting a current total urban population of at least two million. Urban population has grown by at least 150 percent since 1967 with Dar es Salaam being the main focus growing from 273,000 in 1967 to over 850,000 in 1978. It appears likely that Dar has accounted for 50 percent of the urban population of the country. It has done so for a variety of reasons. In the last decade, there has been a great increase in the functions the city has to perform. It has become the Terminus of the Tanzania rail, road, and pipeline links; it has become an international political center for Third World nations; it has become a focus for Tanzania industry, small and medium-scale; and it has become a visible area of opportunity for employment for many school leavers and others who do not want to go back to the farm.

A combination of all these plus attractions of comparatively good health and education facilities has resulted in a large influx of immigrants.

In general, rural Tanzania will have to cope during the 1980's, with the additional problems of an over large and growing major city and a subset of rapidly growing regional centers. (The growth of Dodoma as the new capital has been planned and Tanya and Mbeya, Arusha, and Mwanza as centers of productive areas each with new industry were also expected to expand.) Among other policies, there will be a growing need to provide alternatives and opportunities for the presently unemployed urban poor.

III. ENERGY COSTS

The energy resources most important of the everyday living conditions of the population are hydro-electric power, which is the chief source of electricity, and wood, which is the primary energy resource consumed to meet the basic energy needs at the village level. The recent energy "crisis" in Tanzania has had its principal manifestation for the vast majority of the population in the growing fuelwood shortage, which has been produced by the rapid, unregulated deforestation of the country's forestry resources. By recent estimated, 99 percent of Tanzania's population uses fuelwood and 96 percent of the yearly consumption of timber is fuelwood, amounting to 1.8 tons per capita annual consumption. Secondly, the crisis has been felt in the inability of hydro-electric power to expand sufficiently to meet growing domestic energy demands.

The country depends on imported oil which plays a very crucial role in the country's industrial and transport sectors; a striking aspect of one of the world's most poorly developed economies.

A key problem in Tanzania has been the failure of the energy producing sector to grow adequately to meet essential energy needs over the past decade. The growth in energy production has lagged so far behind demand that, according to the Statistical Yearbook of the United Nations, per capita consumption of energy actually declined in Tanzania between 1970 and 1975.

Coal is the only solid energy resource which the country possesses in quantity (it is the only Eastern African state with exploitable coal), yet its deposits have not been developed to any extent. Production has virtually stagnated since 1968.

The nature of the coal deposits are the primary cause: they are poorly located, difficult to extract, expensive to transport, and environmentally hazardous- obstacles which are exceedingly difficult for a financially troubled country. Even so, a recent report suggest that a joint Chinese/Tanzanian venture will be producing coal in the next few years.

Out of necessity (and circumstance, i.e. cheap oil) oil and, more recently, hydropower have served as the major sources of energy for the two most energy intensive sectors of the Tanzanian economy: manufacturing and transport.

The greatest economic impact of the oil situation came in the manufacturing sector where growth stagnated and has still not recovered (industrial production last year was down by fully one half!). Power and energy shortages have been cited by the government at the major causes of the chronic underutilization of productive capacity in manufacturing. The plight of the industrial sector in general has been magnified by these developments and its expansion is now the central focus of the current Five Year Plan.

The expansion of hydro-power generation, (one energy resource that Tanzania has in relative abundance), has been slow to occur, although it has been a priority of the government in recent years, largely because much of the funds which would have been devoted to its exploitation have been diverted to defraying the increased costs of food and petroleum imports. Electricity is available primarily to the large towns and this only to a small portion of the population. This situation appears unlikely to fundamentally change in the near future.

Fuelwood is and will remain the primary type of energy consumed by Tanzanians, especially in the rural areas where most energy consumption is

"non-commercial" and therefore not conducive to effective control. This has facilitated the rapid deforestation of the woodlands which has begun to produce serious fuelwood shortages in some areas.

"In the longer run, solar, wind energy, and geothermal may all play a part in Tanzania's energy portfolio. For the next ten years, however, the import energy bill is likely to remain a major problem in the balance of payments and foreign exchange issues."¹

IV. RESOURCE DEPLETION

"Tanzania has a varied environment in all aspects of rainfall and climate, soils, vegetation, water supply, and health.

Soil erosion and declining soil productivity:

This has been documented as a problem in some parts of Tanzania (Singida, Dodoma, Ulugurus, Sukumaland), for a long period of time.

Increasingly, the growing demand for wood and charcoal is becoming an important factor in soil erosion. Although in total, Tanzania has much suitable woodland for fuel, areas around large towns, in the drier parts of the country, and in high demand areas of tobacco production are under going devegetation and experiencing fuel shortages and price increases. In addition, the removal of the vegetation is causing soil erosion and downstream sedimentation.

Insect and animal pests:

An extensive survey of over 900 Tanzanian farmers all over the country (Porter, 1976) found surprising unanimity that their most serious crop production problems was destruction of growing or harvested crops by wild life and pests. To these farmers, this is the greatest environmental hazard.

Environmental Health:

Many of the diseases in Tanzania are insect or water borne and relate to environmental conditions. Given the organization of most Tanzanians into villages, there is both an opportunity to organize environmental conditions to reduce these hazards and also a danger that neglecting to consider environmental health issues may increase disease levels due to the greater proximity of people to one another.

Environmental problems associated with development activities and urban growth:

There are environmental risks involved in large and small scale water projects. (Tanzanian has emphasized water development including irrigation as part of the Third Five Year Plan.) Already the country has had some local problems from sisal waste in water supply, minor chemical accidents in industry, pollution near cement plants, unwanted side effects of irrigation projects.

Urban growth is rapid in the case of Dar es Salaam which has grown from 270,000 to 850,000 in ten years. The environmental problems of energy supply, water supply, sanitation disposal, as well as the growing problems of health in pre-urban areas, are growing rapidly."²

V. EXPORT IMPERATIVES

"Tanzania, which has had both chronic and acute balance of payments in its recent history, is now entering an era where the balance of payments outlook is even worse.

In common with other low income countries, Tanzania relies on primary agricultural products for the bulk of its export earnings. Coffee, cotton, and sisal are the three main export crops, accounting for over half of export earnings in 1978. This leaves Tanzania vulnerable to both fluctuations in world commodity prices and variations in weather.

Trends in agricultural production for export are of central importance for an assessment of the long term balance of payments. The picture that emerges from the data is one of a general downward trend in production, due perhaps to a decline in productivity although there is no hard data on this. Superimposed on this trend have been substantial fluctuations caused by variations in weather and price. Of the two, weather, particularly drought conditions, has been the most important because of its effect across the board on all crops. Price variations, although rather substantial, have had relatively less effect on Tanzania than other developing countries. With the exception of sisal, the major Tanzanian exports have had a record of relative price stability. In comparison, products such as sugar, cocoa and rubber have had substantially greater year to year price changes, creating severe planning problems for their exporters.

While year to year variations in price and production can cause severe short term problems, the long term trend of prices is of primary concern. Here, the evidence is somewhat mixed, but it appears that the prices of Tanzanian exports have roughly kept pace with the worldwide inflation of the 70's and there are no indications of a major change in this trend.

With regard to energy Tanzania spends a larger fraction of its export earnings on energy imports than most other low income countries. The data suggests that Tanzania has relatively less flexibility for cutting back on use and to the extent it is able to finally get some of its long term development projects on line, it will probably have demands for energy rising much faster than the overall rate of economic growth.

VI. INTERNATIONAL DISORDER:

"The East-African Community has broken up. Tanzania and Kenya could not agree on detailed industrial allocations and on methods to share the lucrative tourist trade of South Kenya and North Tanzania. Tanzania and Uganda split sharply after ex-President Mbote took up residence in Tanzania after the coup which brought Amin to power.

The nation is finding some major advantages to the closure of the frontier and is developing a new set of international relationships in the region. The manufacturing industry has benefited from the protection it is enjoying from Kenyan competition and even if the border is open, it is likely that strong support will be given for the maintenance of their industries. Similarly the tourist industry is growing steadily after initial setbacks and, equally important, much more of the revenue from tourist visits is remaining in Tanzania.

New infrastructural and political developments have also resulted in changed perspectives. Links with Zambia have been consolidated with the Tanzany railroad and the Tanzanian road and pipeline links. However, there are many problems in the operating of the port and in the overload on the Dar harbor facilities which has resulted. The independence of Mozan Gigne and the close political alliance between the two countries has brought increasing trade and Tanzania is looking southward as one outlet for its growing industrial production. The other direction is west to Rwanda and Burundi. Lastly the involvement of Tanzania in Uganda may result in the rebuilding of cooperation in a number of areas. There may be a renewed effort to develop good communication links around Lake Victoria which might service in the long run as Uganda's other outlet to the sea."⁴

VII. UNCERTAIN CLIMATE

"With the exception of the high mountain areas temperatures in Tanzania are not a major limiting factor for crop growth, though the range of altitude produces a corresponding range of temperature regimes from tropical to temperate. Rainfall is variable, both from place to place and time to time, and is generally lower than might be expected with 90 percent probability more than 30 in. of rainfall, and only about 3 percent can expect more than 50 in. The central third of the country is rather dry, with evaporation exceeding rainfall in nine months of the year.

For much of the country most rain falls in one rain season, December-May, with two peaks of rainfall in October-November and April-May are found in some areas. Apart from the problem of the long dry season over most parts of the country, there is also a marked fluctuation in annual rainfall from one year to the next, and this may be reflected in the crop production and livestock figures."⁵

Drought and floods have been a factor in several years in the 1970's but no detailed analysis of the rainfall deficiencies has been made so that it is rather difficult to judge how much food shortages are a result of rainfall deficiencies and how much as a result of other factors.

VIII. RECURRENT FOOD SHORTAGE

In spite of Tanzania's relative economic poverty, maintaining an adequate supply of basic food crops was not a severe problem for the country prior to the late 1960's. By the late 1960's, however, the food situation had begun to seriously deteriorate and attention to the nation's "alarming increase" in food imports became one of the government's chief concerns. The onset of the 1970's which brought significant changes in the world food pricing and marketing system, saw Tanzania's food situation grow markedly worse and food import costs became a serious financial drain on the country. The "food problem" was now a major domestic issue and self-sufficiency in the basic food crops emerged in government policy pronouncements as a cornerstone of its development strategy. The performance of the food producing sector of Tanzanian agriculture has been characterized by wide variations in the yearly production levels of its staple crops. Domestic production has persistently failed to meet a growing demand and, as a consequence, the dependence of food imports to meet essential needs has

increased considerably. The poor performance of the food sector in this period has had major ramifications for the country, contributing to a steadily deteriorating balance of trade and a large reduction in the country's foreign exchange reserves since 1967. Its decline has led to increasing restrictions on the government's ability to pursue its overall development goals.

FOOD POLICY AND PROBLEMS: 1975 TO THE PRESENT

The 1976/1977 crop year saw production levels return to "normal" from the government's viewpoint. This was accomplished primarily through a widespread increase in acreage planted to grains, a development that was attributed by the government to the success of a political campaign which encouraged all sectors of the population to grow more food. The estate operators and the large-scale farmers in particular were the focus of this effort but all sectors participated in response to direct appeals by the President. The attempt to increase the food production role of the large-scale farmers initiated a distinct shift in the government's food policy away from its primary concentration on the small-scale subsistence farmer.

But the food storage problems have been discovered to be a major cause of wastage, leading to the loss of some 20-30 percent of crops yearly. The situation has also been made worse by the chronic transportation shortage within the country which have prevented proper timely collection of food crops. In response the government has embarked upon a project to build and improve storage facilities, which again relies on external funding, in this case primarily from the Danish government.

In an extensive critique of his government's food policy to date Nyerere suggest three primary causes for the food sector's poor performance:

1. the government's failure to adjust price levels for food projects,
2. the inefficient transportation system, and most importantly
3. a real failure in lack of political leadership and technical understanding at the village level, where the peasant farmers' interest and needs have been ignored.

This last point was one of the first clear indications from the government that despite its settlement achievements (by 1977 almost 13 million people out of a population of around 16 million were in villages) the Ujamaa program was not having the desired results on the country's food production capabilities.

The most recent summary of the government's perspective on the food situation is the Third Five Year Plan (1977-1982). Its policy goals in the food area reflect an optimism produced by a generally improving food situation; most notable in that for the first time in a decade the agricultural sector will not be the primary focus of the plan. The plan proposes to dramatically increase the growth rate of the GNP from its present 2.5% to 6% annually by concentrating on the industrial sector which will receive 27% of proposed expenditure, to 15% for agriculture. In regards to agriculture the plan calls for increases in the production of both food and cash crops and, off of recent favorable developments, goes so far as to project self-sufficiency in grain production by 1985. The successful implementation of the plan is critically dependent on external finance and cooperation with fully 50% of its estimated \$4-5 billion cost expected to be provided by sources outside the country.

IX. POPULATION PROBLEMS AND THE GOVERNMENT RESPONSE

The relatively high population growth rate and the large increases in population which have accrued in the last two decades have been but minor points of concern at the government whose stance on population growth has changed very little in the years after the 1967 census.

The most significant development has been a growing awareness of the fallout effects of the country's increasing population on general living conditions. The government has emphasized on a health-care oriented conception of family planning whose primary benefits will be to prevent infertility and subfecundity and reduce the level of infant mortality. The current goal is to provide Mother and Child Health Clinic (MCHC) services within 10 kilometers of 90% of the population by the end of 1980. The government's program in this area consists primarily of constructing the physical facilities in the rural areas and providing the medical staff and its expenditures in this regard surpasses that of most African states in recent years. The family planning services themselves are, however, still exclusively provided by the private organizations who are dependent on external aid for their funding.

At the World Population Conference in Bucharest in 1974, Tanzania was among those states characterized as "most seriously concerned" about the population issue. Some African demographers argue that there are good economic reasons for higher population growth rates within Africa's demographic context. Chief among these are the need for larger domestic markets to reduce external economic dependence and the serious lack of manpower in certain areas which besets many African states, as it does Tanzania. Population growth is seen as both an opportunity and a challenge, but not necessarily an impasse. It is not viewed as an issue per se while "the best pill" for the increasing population numbers is development.

X. ENERGY AND GOVERNMENTAL RESPONSE

The developments in the world oil pricing and distribution system, produced the following governmental activity on the energy front:

(1) Joint explorations with foreign corporations and governments A's. Subsequent payoffs have been minimal thus far, but have included the discovery of gas deposits offshore, which are projected for future exploitation with India's aid.

(2) Chinese aid to better the coal resources. The government has enlisted the aid of the Chinese to develop the country's coal resources, principally an air energy source for basic industries such as iron and steel production which are scheduled for future development as measures to increase Tanzania's self-reliance.

(3) The Kidatu Dam hydro-electric power project. (1975). This important development resulted in a considerable reduction in oil imports by displacing a thermal generator and has drastically improved the reliability of the electricity supply on which manufacturing relies.

(4) The deforestation problem. In the area of most immediate concern to the rural population the government has only recently undertaken an organized effort to deal with the deforestation problem. It has initiated a program throughout the mainland to develop village-level afforestation projects consisting of the creation of tree plantations and solar energy. The hope is that these will ultimately serve as primary regulated sources of both firewood and construction material for the villages.

The prospects for progress toward any degree of energy self sufficiency appear clearly to be a long-term proposition for Tanzania and one which is dependent upon a considerable amount of external aid and cooperation. Thus by most assessments, the "energy program" which the government has instituted will leave the current situation fundamentally unaltered until at least the late 1980's.

FOOTNOTES

1. (See, Eastern Africa Country Profiles, "TANZANIA" Jan. 1980) By L. Berry, Program for International Development - Clark University. p. 71.
2. See footnote 1, pp. 77-86.
3. See footnote 1, pp. 37-40.
4. See footnote 1, pp. 96-98.
5. See Africa South of the Sahara 1979-1980, p 995. Physical and Social Geography by L. Berry.

TANZANIA TABLESTANZANIA
TABLE 1

PRODUCTION OF MAJOR FOOD CROPS, 1967-1978

(thousand metric tons)

Year	Maize	Rice	Wheat	Total
1967	549	114	31	694
1968	664	136	44	844
1969	525	144	39	708
1970	767	184	71	1022
1971	730	193	84	1007
1972	881	171	98	1150
1973	603	204	78	885
1974	1446	293	46	1785
1975	825	150	46	1021
1976	897	172	58	1127
1977	968	194	71	1233
1978*	1000	260	65	1325

SOURCE: United Nations, Statistical Yearbook for 1971, 1974, 1976, and 1978. New York: 1972, 1975, 1977, and 1979.

*United Nations, Food and Agricultural Organization estimate.

TANZANIA
TABLE 2

IMPORTS OF MAJOR FOOD CROPS, 1967-1976

(thousand metric tons)

Year	Maize	Rice	Wheat	Total
1967	4	12	38	54
1968	8	15	36	59
1969	23	9	5	37
1970	-	4	2	6
1971	92	93	24	209
1972	79	62	21	161
1973	187	60	7	254
1974	247	71	106	424
1975	233	64	159	456
1976	73	9	16	98

SOURCES: For 1966-1970, Gabriel Ruhumbika, ed. Towards Ujamaa. Dar es Salaam: East African Literature Bureau, 1974, p. 93. For 1971 on, United Nations, Trade Yearbook, annual. Rome: UNFAO; and Bank of Tanzania. Economic Bulletin, July 1975.

TANZANIA
TABLE 3

IMPORT COSTS OF FOOD AND FUEL AS A PERCENTAGE
OF TOTAL IMPORT COSTS, 1968-1976

(money amounts in thousand US dollars)

Year	Total Imports	Food & Animals	Food & Animals As Percentage of Total	Mineral Fuels	Mineral Fuels As Percentage of Total
1968	214513	14148	7	18984	9
1969	198622	12485	6	20037	10
1970	271201	13328	5	23226	9
1971	337640	17309	5	30134	9
1972	363424	31241	9	34001	9
1973	447381	26285	6	48339	11
1974	60152	36951	18	140720	18
1975	740226	132500	18	79776	11
1976	565531	39693	7	102999	18

SOURCES: United Nations, Statistical and Information Bulletin for Africa, May 1977; and Yearbook of International Trade Statistics, 1977. New York: 1978.

TANZANIA
TABLE 4

ENERGY PRODUCTION AND CONSUMPTION, 1967-1976

Year	Coal* Production	Hydroelectric@ Production	Per Capital# Consumption
1967	2	29	71
1968	3	31	-
1969	3	34	-
1970	3	38	71
1971	3	38	-
1972	3	39	73
1973	2	44	95
1974	2	46	-
1975	1	n/a	70
1976	1	n/a	68

SOURCES: United Nations, Statistical and Economic Information Bulletin for Africa, May 1977; and United Nations, Statistical Yearbook for 1971, 1974, 1976, and 1978. New York: United Nations.

*metric tons

*thousands of coal ton equivalents

#kilograms

TANZANIA
TABLE 5PETROLEUM IMPORTS AS A PERCENTAGE
OF EXPORT RECEIPTS, 1971-1978

Year	Cost*	Percentage of Export Receipts
1971	215	11
1972	242	10
1973	338	13
1974	1004	35
1975	590	21
1976	789	19
1977	843	19
1978	1040	29

SOURCE: International Monetary Fund, International Financial Statistics. Volume XXXII, November 1979.

*millions of Tanzanian shillings.

CHAPTER VII: SECTION G

UGANDA

The Ugandan situation is more complex than most other Eastern African countries. It is difficult to distinguish the basic problems in food-population-energy from those issues more directly related to the internal disturbances of the last few years. This problem is particularly acute in that information is even more unreliable than elsewhere as official channels have been bypassed for a great deal of economic activity. The following comments should be read in the context of these uncertainties.

1. Food

Although there are no reliable, recent census data, it is generally estimated that the Ugandan population is now growing at a rate of three percent per year. This rate is higher than the rate of a decade ago and there is still potential for a considerable increase in this rate if social services and economic conditions improve. It is not clear what impact the considerable loss of life in the Amin era and since will have on the general population levels and age distribution but it will obviously only have a marginal effect on the general trend.

The impact of these growth rates has been to increase the total population of the country by about one-third to an estimated thirteen million. Most of this population still live in rural areas. The urban population is now about seven percent of the national total though growth rates in urban areas have increased to 8.5 percent. This trend may have slackened in the last two years.

The rising growth rate at the national level has meant that the dependent population under 15 years of age now makes up about 50 percent of the national total. The impact of the addition of this group to the work force in the next ten years is considerable, but for the present a major problem is the pressure the large young population places on health and education services. Although both these services were improving in distribution and quality in the 1960's, the late 1970's show a deterioration in both. A rural health infrastructure exists, but is poorly staffed and supplied and a rural education infrastructure, better in the south than the north and east, is equally poorly maintained. A major issue in the rehabilitation period will be a restoration of these services but also there is a need for reorganization and expansion in the light of the population and demographic changes of the decade. Details of these changes are an important tool for development planning.

Equally, or perhaps more fundamentally, the growth in population is changing the balance in Uganda's agricultural sector. The country has until now operated on the basis that agricultural land was in good supply and that extra people could be accommodated by an expansion of the cultivated area. Increasingly this is becoming less the case, though there is still much more good land available per capita than in neighboring Kenya for example.

In the more densely peopled areas of Bugisu and Kigezi, population density ranges upward to over 500 people per sq. kilometer while the national average of the people per sq kilometer of agricultural land has increased from 72 in 1960 to 116 in mid-1970's and perhaps around 130 at the present.

For Uganda, the Commonwealth team assessment that by 1981 Busoga, Bukedi, East and West Mengo, Kigesi, Ankole and Masaka districts will all have population densities which severely restrict the possibility of new entrants to agriculture, is remarkable. If they are right, new attitudes to agricultural change and perhaps new attitudes to population growth are already overdue.

Fleuret (1980) spells out the importance of these issues for nutrition, particularly in children.

"in Kabarole District, for instance, malnourished children brought to the nutrition rehabilitation unit came from the areas of desert settlement...land security means that people must plant crops that are highly productive per unit area, and these crops (in Uganda usually plantains and cassava), although very high in calorie content and calorie production per unit input, are lacking in protein." (Fleuret, p.14)

Although it has been conventional (and essentially correct) wisdom to depict Uganda as a country with few food supply problems, outside the dry areas of Karamoja, that situation is perhaps at a point of change. The current lack of data and general disruption makes it difficult to judge the longer term trends, or at least to pinpoint them. The general picture is pretty clear and food production, nutrition, and the pattern of agricultural development is clearly an issue for the eighties in Uganda.

Uganda is unusual in Eastern Africa in that potentially there is a good supply of energy to be derived from the hydropower resources of the Nile system, though considerable investment will be needed for that capacity to be realized. In most areas, wood and charcoal are not yet in short supply though in the drier zones the situation is a good deal more serious.

Uganda's biggest energy problem in relation to food supply is in transportation. All oil products are brought in through other countries, costs are high and supplies have been uncertain.

Uganda includes areas such as Karamoja where food yields will continue to be uncertain from year to year. But for the nation as a whole, a restoration of basic administration should enable the country to once more feed itself.

However, the trends are clear. Population growth rates are high; good land is scarce and new approaches will be needed to sustain self sufficiency beyond the next few years.

CHAPTER VIII

RECOMMENDATIONS

This set of background papers has been prepared in an extremely compressed time period. On one hand, the purpose was to review existing literature and activities as well as trends; on the other, the assessment was to come up with a series of practical next steps which might be taken to explore in more detail some of the preliminary findings of the review. The following nine recommendations are designed to do precisely that. They suggest both substantive needs as well as possible institutional arrangements, especially within the African context.

RECOMMENDATION #1

Information Systems

In view of the crucial need to have development policy decisions based on information as accurate as possible, we recommend that the existing data collection systems of host countries be strengthened. One step involves encouraging small area case studies and adding additional data collection capabilities to current and future development projects. The official data collection agencies of the Eastern African countries face almost overwhelming difficulties in keeping track of trends and indicators within their countries. Unfortunately, the research studies undertaken at the district or regional level or evaluations of development projects do not often provide useful information for planners or for validating the national data system since they are not designed to be compatible with national data systems. We recommend that, wherever possible, efforts be made to collect research and evaluation data which is comparable to existing systems. This will not only help establish national benchmark data, but also provide the necessary ground-base data for the use of remote sensing monitoring.

As understandings of the interactions among food, population and energy become more important, it is necessary to have good information on present and previous interactions. Few studies obtain information in all three sectors. Thus, it would be extremely valuable to obtain population and energy data on projects that are primarily food related; food and population data on energy projects, etc.

While any information is useful, its value is enhanced by being a part of a continuing series of data. To the extent possible, data collection

should be done in a way to encourage the continuation of the collection process after the individual study or project is completed. While this may be in conflict with the need for comprehensive data, it is a factor worth taking into account. Finally, inter-regional and inter-national comparisons are greatly facilitated by the adoption of standard data definitions, such as those proposed and used by the U.N. and F.A.O.

RECOMMENDATION #2

Better formal and informal means need to be established to assess location, nature, and severity of periodic food shortages.

Food shortages in Eastern Africa are real. Starvation and malnutrition exist. Yet they do not appear in all places nor do they persist throughout the year or decade. A better grasp of "normal" situations is required in order to determine the presence of abnormal and crisis situations.

Definitions of "normal" have two inherent problems. First, there is danger that "normal" becomes a permanently stagnated condition which affords no hope for growth or improvement. Defining normal should not impede plans for improvement in food production or consumption.

Second, defining "normal" could become an elaborate and extremely costly process. Data managers frequently become enthralled with information for the sake of information and accumulate masses of marginal material. Thus the challenge is to identify a very limited number of critical indicators which provide a representative sample of the food and nutrition situation for each country. The list of critical indicators will vary from country to country as will the method of selecting a sample.

The surveillance system should not rely exclusively on high technology such as remotely sensed satellite data although such imagery can be highly useful. Nor should the surveillance be limited to factors directly related to food as sometimes indirect measures provide valuable information. For example, in Botswana a surveillance system monitors range grazing condition, nutrition in children below the age of six, precipitation and soil moisture,

crop expectations, and livestock health.

Once "normal" is established, modest monitoring can follow to make possible much greater precision in identifying food deficit areas as well as the degree of the shortage. Such precision will be of enormous help to African governments, international agencies, and donor organizations.

RECOMMENDATION #3

The countries of Eastern Africa should be encouraged and assisted to develop food policies on a sub-national and national basis with a strong emphasis on increasing incentives and making local initiatives and food systems more efficient.

National interest will be reflected in agriculture. For the most part, this interest has been directed toward export crops at the expense of food crops. Food production has suffered as a result. National food policies, including but not limited to pricing policies, are needed, even if the policies do no more than declare a "hands off" approach. Policy tampering in one segment of agriculture, without an overall guiding policy (objectives), has been detrimental to food production. The forthcoming Kenyan National Food Policy may provide a useful model for the other countries to examine. However, the Sudan may be an exception as Sudan seems to have a different set of people/land problems from those of the rest of the region and may need a different kind of food policy.

National policies should not be geared solely toward the capital city, large towns, or favored regions. To ignore the problems of various sub-national regions will not make the problems of those regions disappear. Strategies should include measures that improve production incentives such that growth beyond that associated with external inputs will occur. Strategies should also emphasize efficient systems which will sustain themselves in the face of rising energy costs. Future transportation costs alone will probably be sufficient to demand that food be produced within the subregions in which it is consumed.

RECOMMENDATION #4

In areas where USAID has project activities a better understanding of the pattern of population change and its impact on the project is needed. This assessment should be a part of the project design process.

It is clear that better understanding of population change and energy issues is obviously something that would be useful at the national and even regional scale. As a start, however, we recommend this approach on a pilot basis for appropriate USAID projects.

There are a number of clear examples in Eastern Africa where development projects have not worked out as planned because of misjudgments of the impact of population growth. In the decade since Ujamma villages have been established in Tanzania, there have been situations where the originally designed village plan, geared to a stable population and organized to allow a convenient pattern of homes and agricultural land, has proved unworkable. As new age groups reach the stage when they establish their own farms, new land and buildings are required and a new pattern of housing and land allocation is needed. As the number of people in the village grows larger, it is more and more difficult to keep the centralized village plan because of the increasing distance to walk to the fields.

In a similar problem, the Kenyan "million acre scheme" which was designed to use large scale farms for small scale farming has not worked out as planned. Among the various reasons for this is the fact that land allocations and farm economies were planned with a clear idea of the size of family involved. As families grew and a new group worked to gain a livelihood, land was sub-divided or reallocated in other ways with the result that

many units are sub-economic in terms of crops grown.

In recommending ways for the population dynamics of an area to be more directly considered in project planning, it is not intended that this should be another add-on or proforma appendix to a project paper. Rather this food-population interface appears to us to be a central issue for most kinds of agricultural projects and for some other types as well. How many people can an irrigation scheme support now and in the future? How will population growth be accommodated in or outside the project. How many people will there be in the area and of what age groups? These and other questions need answers which can be incorporated directly into the project design. Long-range projections which provide some notion of demographic change over the next decade are vital. After all, some projects take three to five years to gain approval and revised demographic projections may be needed even for the "start-up."

RECOMMENDATION #5

Development projects need to focus much more directly on food production and consumption needs.

Development programs have been largely guided by an ill-defined or implicit "trickle down" growth pole approach in which it is assumed that sufficient monies pumped into the agricultural sector will result in improved cultivators and more food. Many expatriate and national donor agencies are now reexamining this approach as to its effectiveness and are now trying to define precisely the objectives of their programs. In so doing, alternative philosophies may emerge. Direct emphasis on local production and consumption problems, for example, strengthens the importance of bottom-up, self-help programs which will immediately assist the food producing unit.

RECOMMENDATION #6

Projects maintaining the greatest chances of long-term success are those that integrate activities into the traditional smallholder schemes of production. Greater emphasis should be given to such integration in future projects.

With certain exceptions, studies indicate a tendency for project success to be linked to the level at which it utilizes and builds upon the existing food system and to the degree to which the farmer feels that success is feasible. Both factors can be interpreted as meaning that risk and uncertainty of risk are key elements to success. Indeed, such emphases maintain higher correlations with project success than do such factors as environmental quality, education, or quantity of inputs. This finding is consistent with the so-called practical or traditional knowledge of peasant farmers. It is naive to assume that a farmer would be willing to move quickly into a system with which he or she is unfamiliar and at high cost/high risk. Movement of traditional farmers into full-scale market cultivation of an intensive type will most likely take place incrementally and over an extended period of time.

RECOMMENDATION #7

Given the lack of understanding of a number of issues in population, food, energy, we recommend that high priority be given to gaining a better understanding of these issues as a first step towards a focussed program dealing with population, food and energy.

- (a) How do the towns get fed, now and in the future?
- (b) What are the trends in population, food, energy in key food production systems?
- (c) Where can new initiatives in the food production system provide greatest impact and greatest short term pay-off?
- (d) What is the impact of new levels of energy cost in agriculture and especially in food production? How can these be minimized?
- (e) Can an integrated systems analysis of food production/processing/marketing alleviate the problem and provide answers or is it more appropriate to function within traditional sectorial divisions?
- (f) What are the viable food exchange patterns
 - (i) within countries?
 - (ii) between countries in the region?
 - (iii) outside the region?

While there is obviously a need for a continuation of and expansion of basic research in food crops and agricultural systems it is also important in our view to greatly improve our understanding of the food production system, their energy uses and needs and their modification according to the changing population and social framework.

The last question posed here is particularly important. Given the economics and politics, of national food self sufficiency and regional exchange what are the prospects for the short term and the longer term. An understanding of the possibilities within and between countries should lead to a more clearly articulated and workable food policy at all levels.

RECOMMENDATION #8

Every effort should be made to collect data and develop simple models of the energy flow through the food system in sub-national, ecologically defined areas.

Both the data and the interrelationships within the food system/energy interface are either missing or poorly understood. Models, supported by reasonably accurate and reliable data, would greatly improve the allocation of the scarce and expensive energy inputs between the agricultural sector of the economy and its remainder and between the sub-sectors within the food system. This work should build on the ongoing work of FAO, IIASA, and the Stanford Food Research Institute and others.

For example, only recently have planners begun to consider energy inputs in transportation costs when devising schemes for food production and distribution. The comparative advantage previously available by specialized, large-scale production may no longer apply and small-scale units may in fact be more economical. Energy costs involved in bringing water to arable land are also a vital part of the food-energy system but again have only recently taken on major importance to planners. Processing, storage, cooking, and even consuming of different food styles all have energy components which are rarely considered in their full systems interrelationships.

Analytical models of energy flow can help planners overcome these omissions.

RECOMMENDATION #9

A cooperative Eastern Africa/United States framework should be established to attempt some short term answers to these problems.

Analysis of food, population, and energy is not solely the domain of outside "experts". Rather it is an issue of high priority to African governments and research organizations. Should any formal efforts be undertaken to implement the above recommendations, a means should be explored to facilitate close involvement by Eastern African professionals and institutions. There is not now any obvious African regional organization which would be the prime contact for collaboration among US institutions and African. Nor is there any single unit in each nation for whom these issues are a primary responsibility.

Exploratory discussions and initiatives would have to be opened with several different groups. For example, at the regional level, the East African Mapping Center in Nairobi, an affiliate of the ECA, already provides regional services in monitoring, resource evaluation, and land use. The Center could lend considerable assistance to the analytical and information systems portions of the recommendations. The East African Management Training Center in Arusha is another organization which is not specifically charged with regional analysis but which has good facilities and staff. Primarily a training institute, the Center may be able to contribute to the managerial portions of the recommendations.

At the national level, in addition to national universities in each country, there are a host of research and analysis institutes. For example,

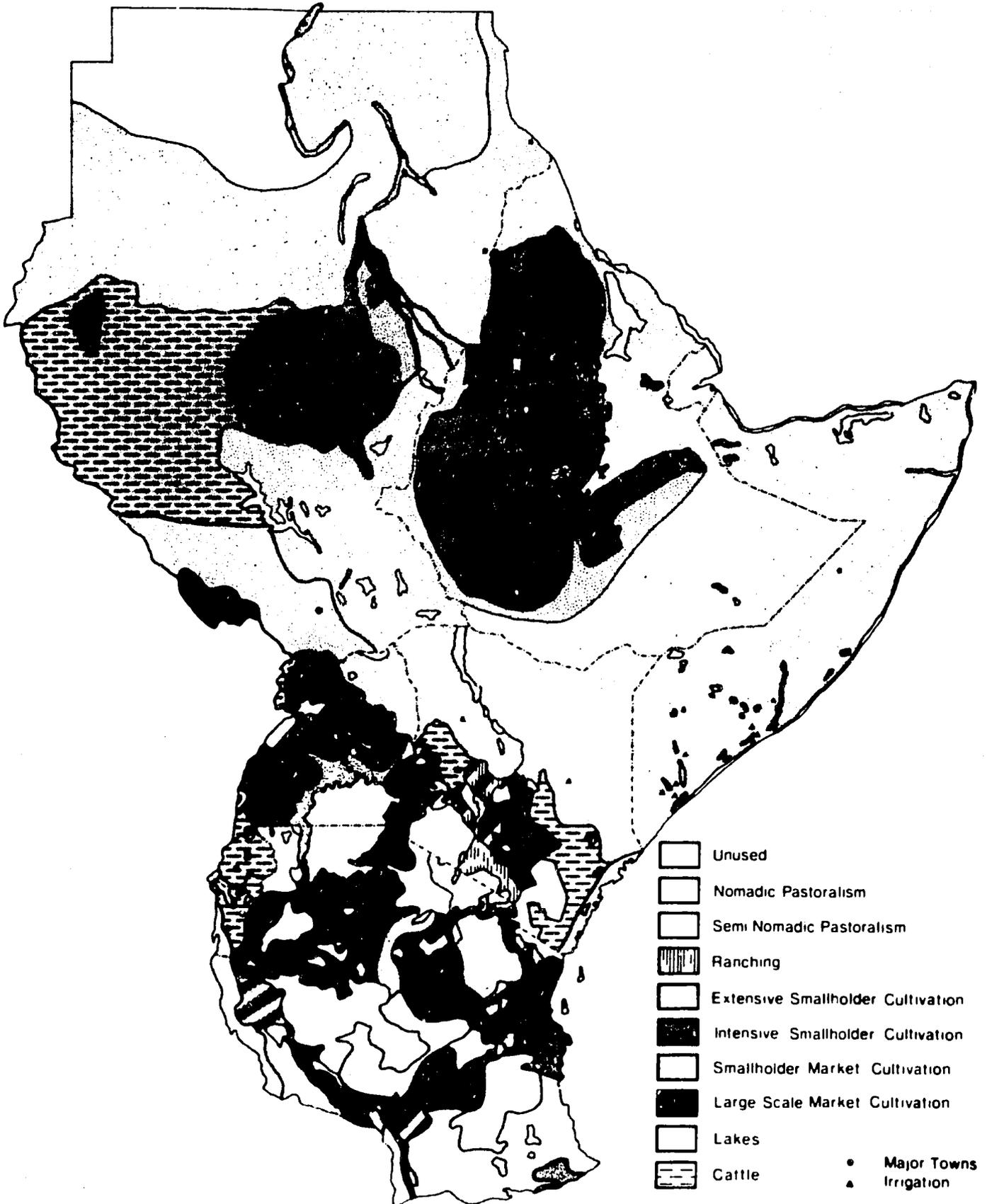
BP 154

in Mogadishu, the Somalia Institute for Development Administration and Management has considerable experience in the area; the Bureau of Resource Assessment and Land Use Planning in Tanzania is another potential collaborating institution; in Ethiopia, the Institute for Development Research has a staff experienced on issues of food and population pressures: in Nairobi, the population study center has published a great deal, especially in the area of demographic analysis; in the Sudan, the National Scientific Research Council has sponsored some energy efforts and would quite likely be open to additional possibilities. The point in this recommendation is to suggest that a network of African institutions could be called upon to enter into a collaborative arrangements with either U.S. government or other institutes engaged in carrying forward with the recommendations.

ANNEXES

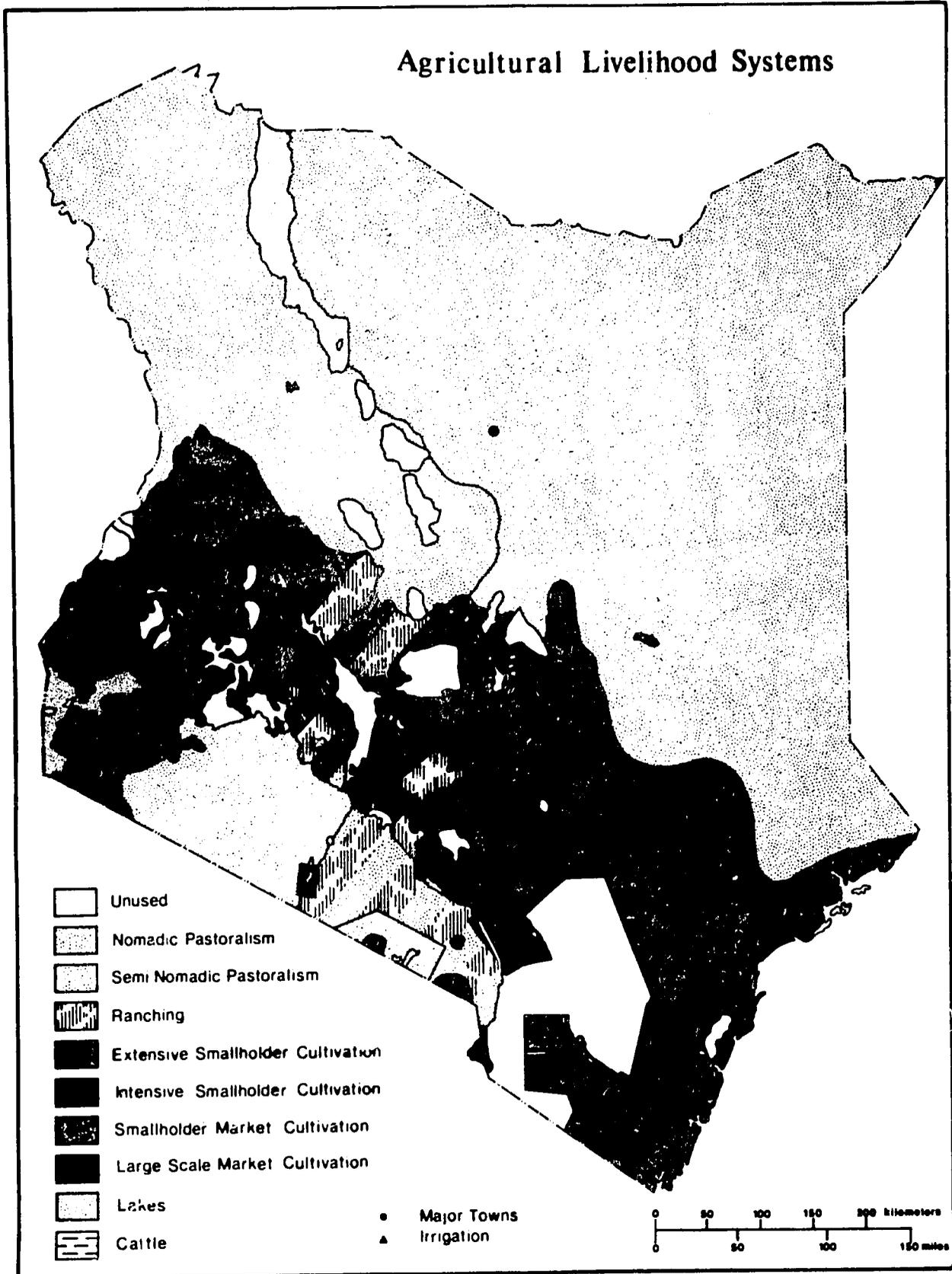
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ANNEX FIGURE 1
EAST AFRICAN
AGRICULTURAL LIVELIHOOD SYSTEMS



Distribution of Agricultural Livelihoods in Eastern Africa

ANNEX FIGURE II - KENYA



ANNEX FIGURE III - KENYA

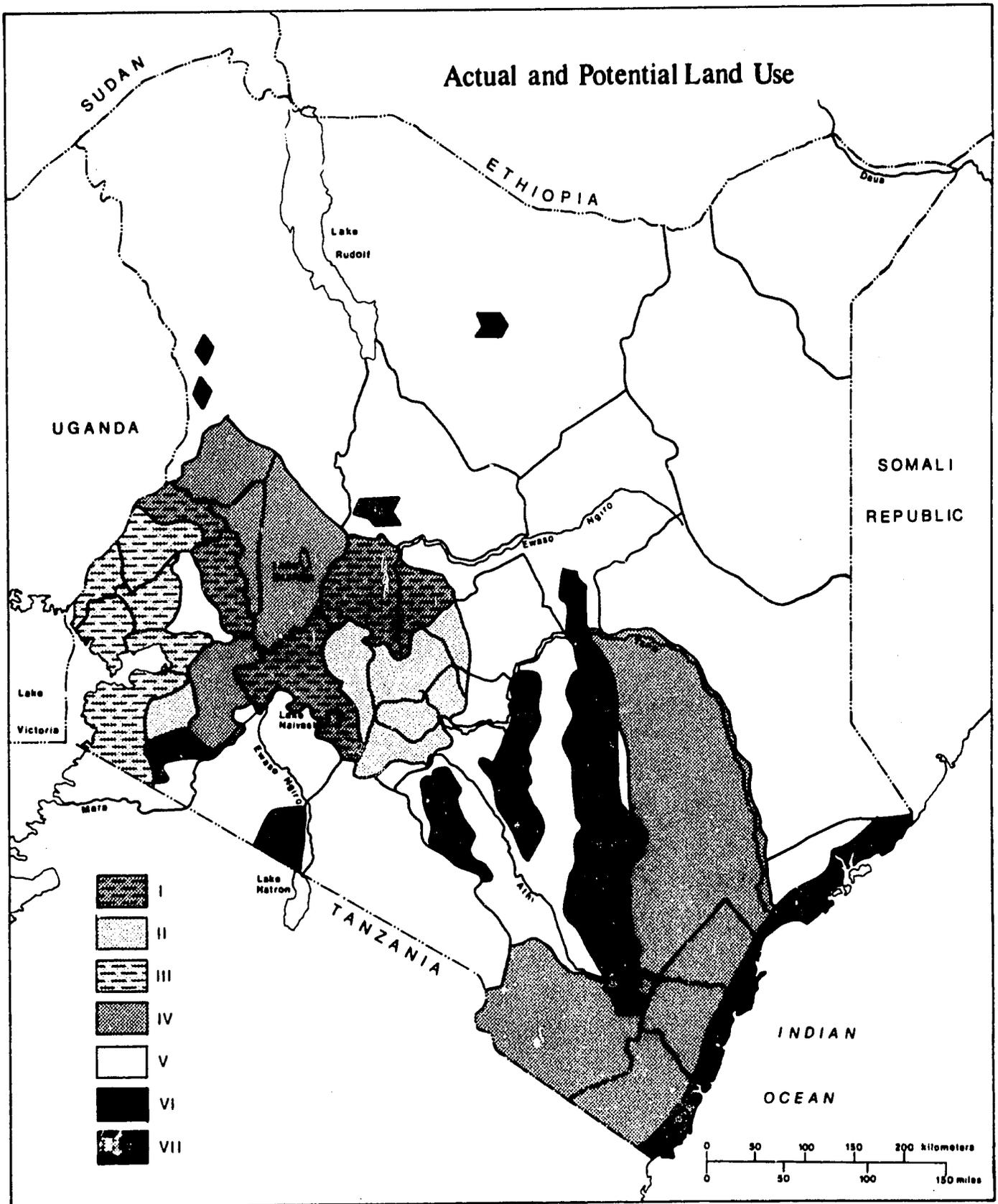


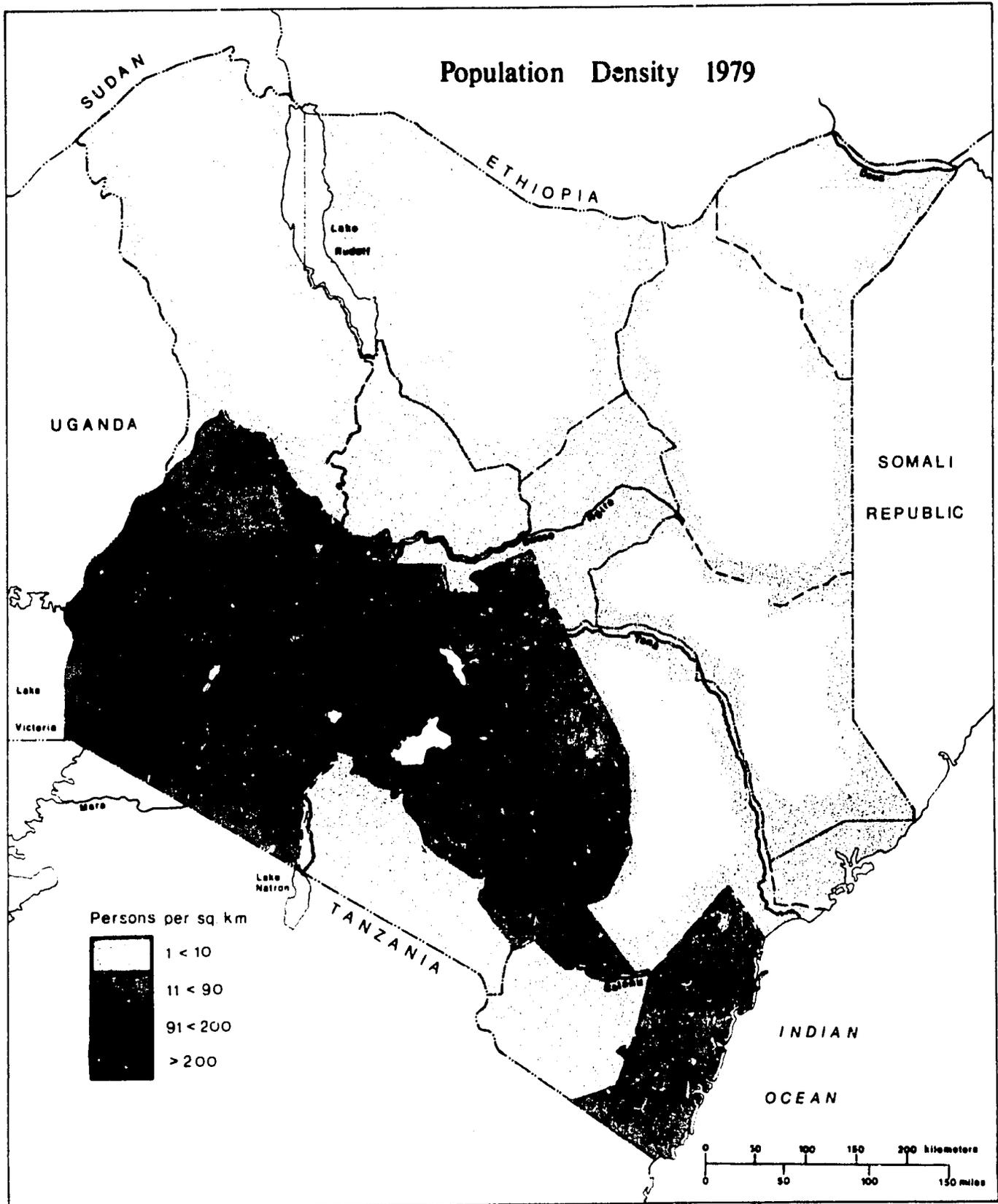
FIGURE XIV-a

ACTUAL LAND USE IN DISTRICT	LAND POTENTIAL IN DISTRICT
I Large farms, estates, or ranches	} Ecoclimatic zones II and III (high to medium potential for crops, ranching, and forestry) (Embu and Meru have portions of rangeland)
II Improved smallholder farming, cash crops	
III Dense poverty-level smallholdings	
IV Sparser subsistence smallholdings on the good cropland, marginal smallholdings on the poor cropland	— Districts having large portions of zone II and III cropland but other large portions of rangeland risky for crops
V Districts in trust for pastoral groups	— Predominantly in ecoclimatic zones IV through VI (rangeland of low to moderate potential; high risk of crop failure)
VI Marginal smallholders on high-risk cropland	
VII Zone II or III cropland currently underutilized, in trust for ethnic groups	— Isolated areas of high to medium potential (zone II or III) land

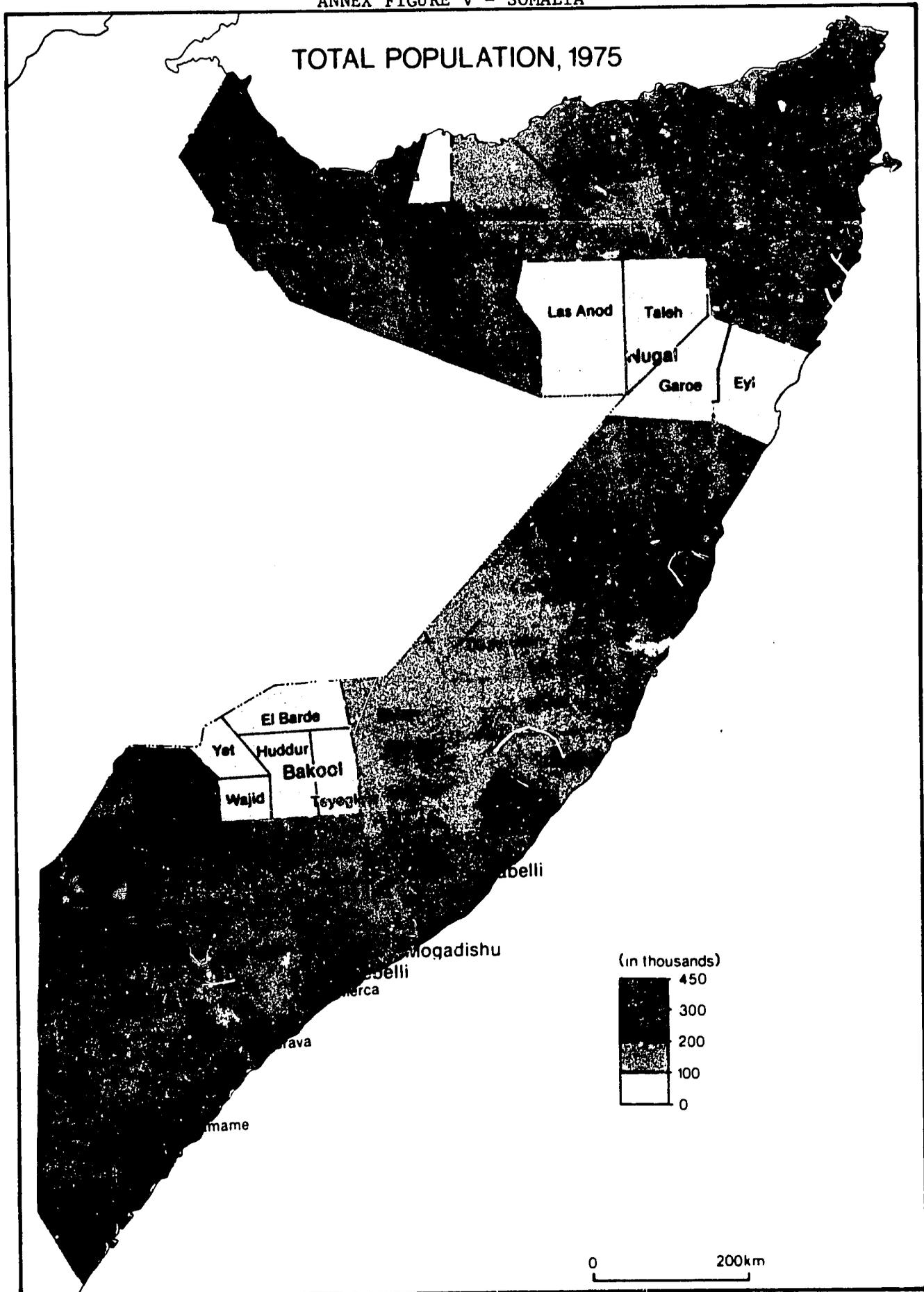
Note--Ecoclimatic zone I (barren land) occupies less than one percent of total land area.

KEY TO FIGURE III

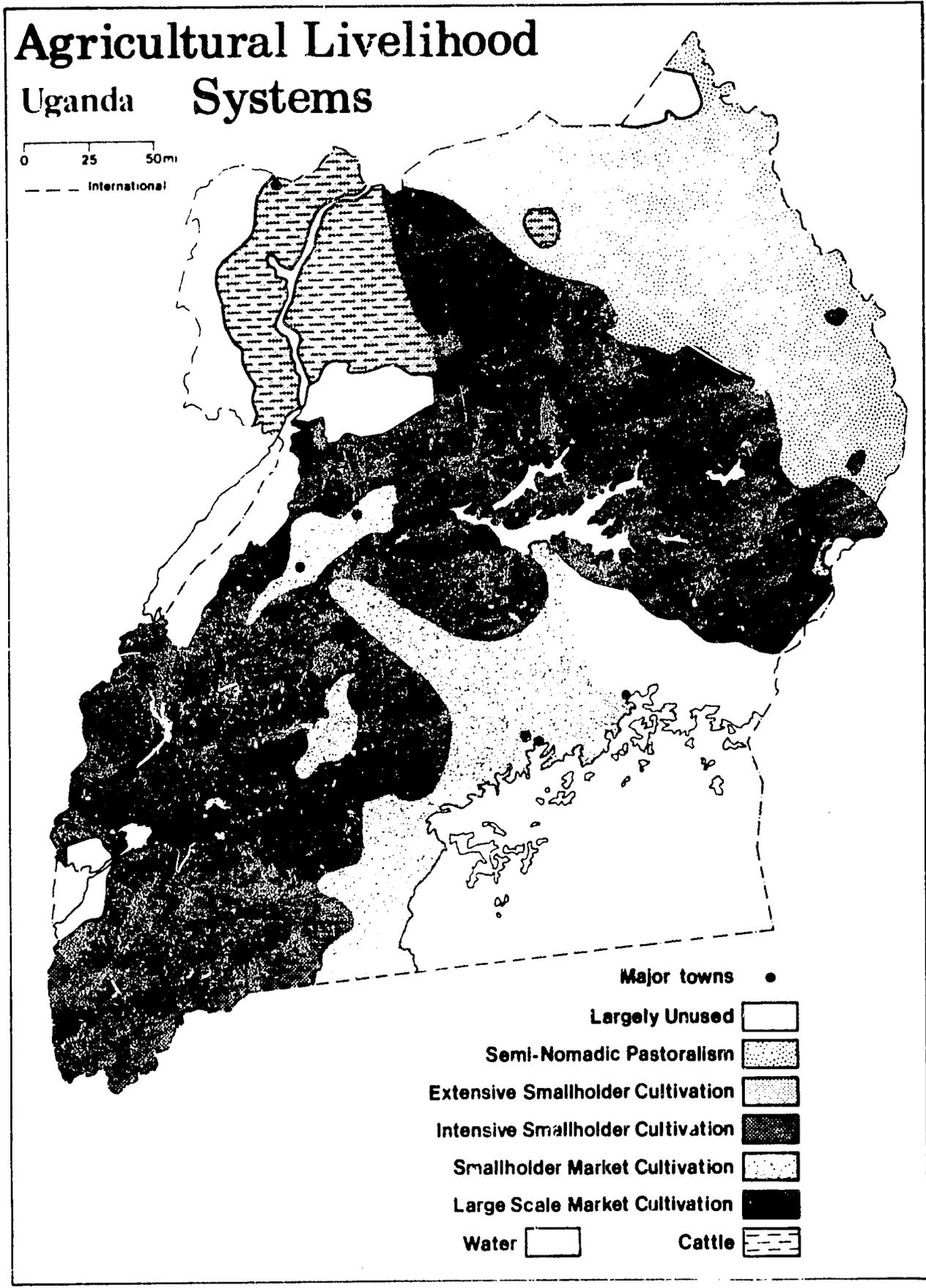
ANNEX FIGURE IV - KENYA



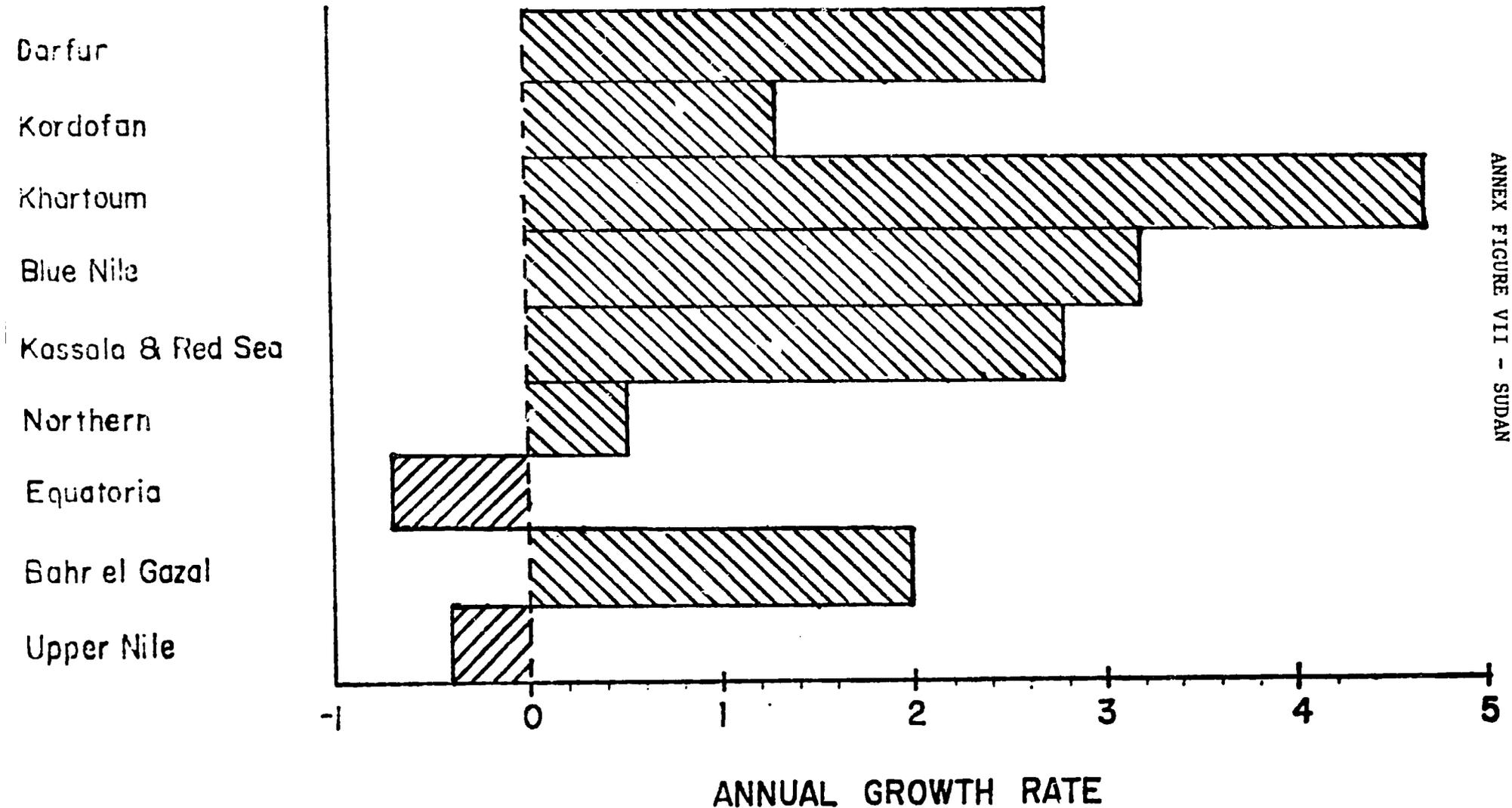
ANNEX FIGURE V - SOMALIA



ANNEX FIGURE VI



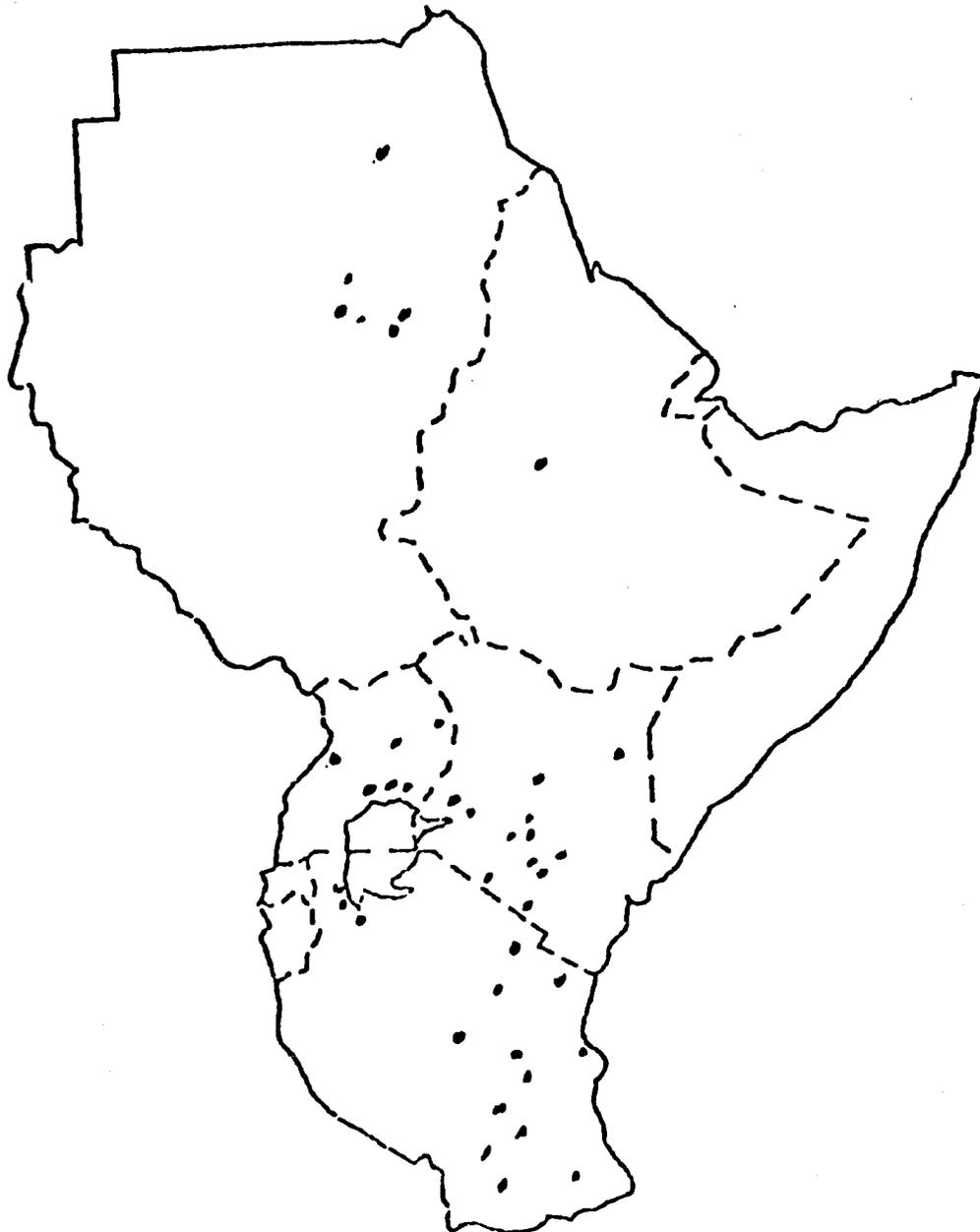
POPULATION GROWTH BY PROVINCE 1955 - 1973



ANNEX FIGURE VII - SUDAN

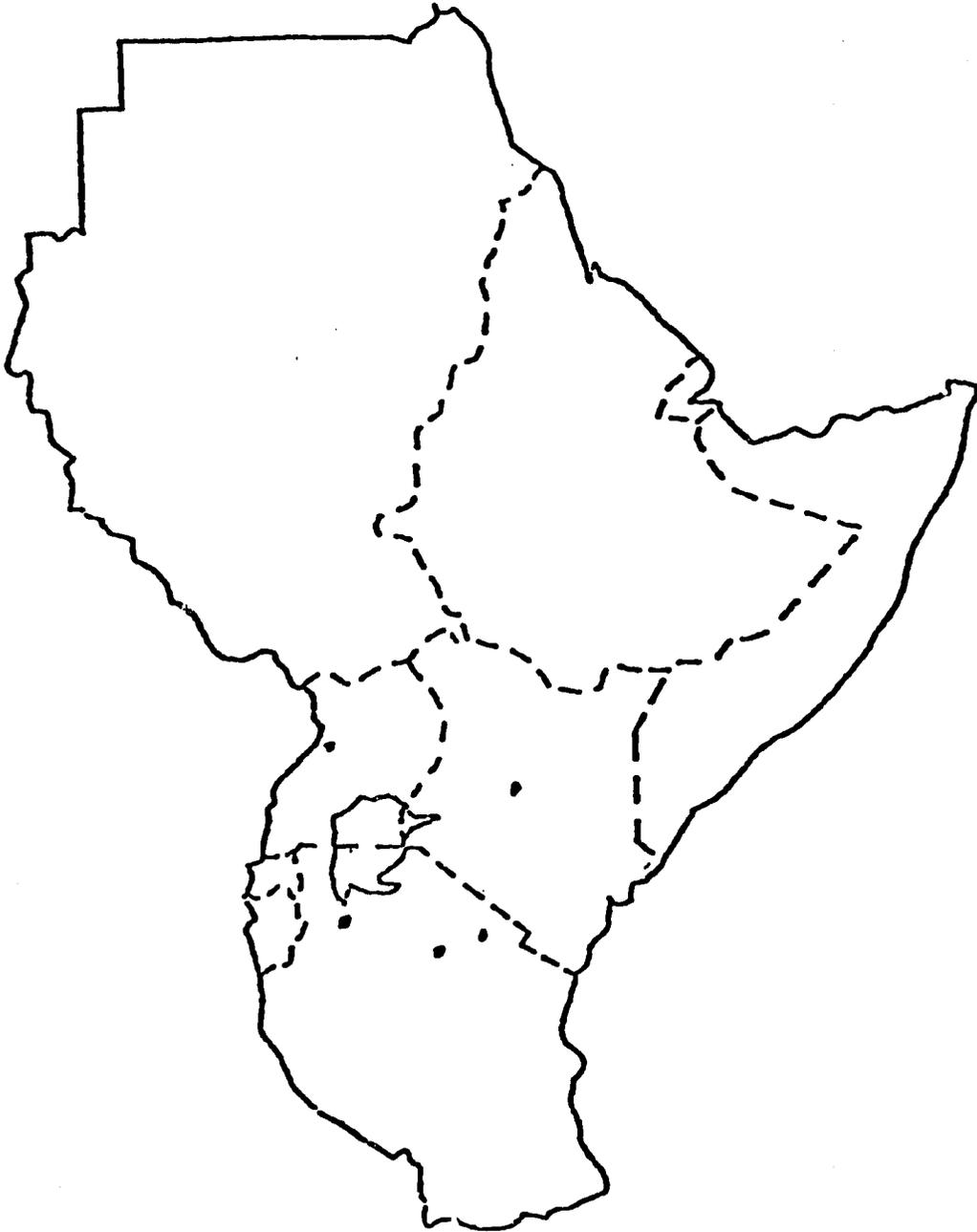
Source: 1955-56 Census of Population; Department of Statistics, 1975.

ANNEX FIGURE VIII
REGIONAL MAP OF EAST AFRICA
LOCATION OF MICRO-LEVEL STUDIES*



*FOR ACTUAL STUDIES SEE ACCOMPANYING BIBLIOGRAPHY

ANNEX FIGURE IX
REGIONAL MAP OF EAST AFRICA
LOCATION OF STUDIES WHICH EXAMINE CHANGES OVER A TIME PERIOD*



*FOR ACTUAL TABLES SEE ACCOMPANYING BIBLIOGRAPHY

BIBLIOGRAPHY

Samples of Micro Level Studies on Food Population Energy in East Africa.

Locations of these studies are identified in a generalized manner on accompanying map. Studies which examine changes over a time period are identified by an asterisk.

LOCATION & SCOPE

UGANDA

- Baker, P. Randall. 1971. "Agricultural Changes in Bunyoro 1954-68" in Studies in East African Geography and Development, edited by S.H. Ominde. pp. 123-36. Berkeley: University of California at Berkeley Press. BUNYORO - FOOD
- Baker, P. Randall. 1967. Environmental Influences on Cattle Marketing in Karamoja. Kampala: Makerere University, Department of Geography. Occasional Paper no. 5. KARAMOJA - FOOD
- Oloya, J. J. and T. T. Poleman. The Food Supply of Kampala: a Study in the Marketing of Basic Foodstuffs in an African Metropolitan Area. Kampala: Makerere University Institute of Social Research. KAMPALA - FOOD
- Richards, A., Sturrock, F., & Fortt, J. 1973. Subsistence to Commercial Farming in Present-day Buganda. Cambridge: University Press. BUGANDA - FOOD
- Schere, Friede 1969. The Development of Small Holder Vegetable Production in Kigezi, Uganda. I.F.O. Forschungs Berichte Der Afrika Studien Stell. 23. Munich: Weltforum Verlag. KIGEZI - FOOD
- Tindimwebwa, D. 1972. Diffusion of Cattle Farming in Igara County West Anokole. Makerere: Makerere University, Department of Geography. Occasional Paper no. 45. IGARA - FOOD
- Tinditua, R., Kateete, B. 1971. Essays on Land Fragmentation in Kigezi District. Makerere: Makerere University. Department of Geography. Occasional Paper no. 22. KIGEZI - POPULATION
- Will, A. G. K. 1972. Performance of a Small Vegetable Market Garden in Uganda. East African Agricultural and Forestry Journal 38 (1): 8-15. KAWANDA - FOOD

TANZANIA

- Datoo, B. A. 1973. Population Density and Agricultural Systems in the Uluguru Mountains, Morogoro District. Bureau of Resource Assessment and Land Use Planning. Research Paper no. 26. Dar es Salaam: University of Dar es Salaam. ULUGURU MTS. - POPULATION

LOCATION & SCOPE

- Abrahams, R. G. 1977. Time and Village Structure in Northern Unyamwezi: an Examination of Social and Ecological Factors Affecting the Development and Decline of Local Communities. Africa (U.K.) 47 (4): 372-85. NORTHERN UNYAMWEI - POPULATION
- Datoo, B. A. 1976. Relationships between Population Density and Agricultural Systems in Uluguru Mountains, Tanzania. Journal of Tropical Geography 42: 1-12. ULUGURU MTS. - FOOD POPULATION
- Jacobs, Alan J. 1978. Development in Tanzania Masailand: the Perspective Over Twenty Years, 1957-77 Final Report to United States Agency for International Development Mission in Tanzania, Contract no. AID afr-C-1279. MASAILAND - FOOD
- Kamuzora, C. L. 1978. "The Dynamics of Labor in African Smallholder Agriculture; the Sources of Labor for a New Cash Crop, Tea in Bukoba District, Tanzania." Ph.d. Dissertation, Pennsylvania University. BUKOBA - FOOD
- Kreysler, J. and Mndeme, M. 1975. The Nutritional Status of Preschool Village Children in Tanzania: Observations in Lushoto District. Ecology of Food and Nutrition. 4: 15-26. LUSHOTO - FOOD
- Lord, R. F. 1963. Economic Aspects of Mechanized Farming at Nachingwe in the Southern Province of Tanganyika. London: Her Majesty's Stationary Office. NACHINGWE - FOOD
- Maro, P.S. 1975. "Population Growth and Agricultural Change in Kilimanjaro 1920-1970" BRALUP Research Paper no. 40. KILIMANJARO - POPULATION
- Mascarenhas, Adolpho. 1971. "The Orange Trade of Dar es Salaam: A Case Study of Risk Taking Among Peasant Food Producers." Journal of Rural Development 4(1): 1-21. DAR ES SALAAM - FOOD
- Mascarenhas, Adolpho. 1977. Resettlement and Desertification: the Wagago of Dodoma District, Tanzania. Economic Geography 53(4): 376-80. DODOMA - POPULATION
- Fipping, Knut. 1976. Land Holding in the Usangu Plain: A Survey of Two Villages in the Southern Highlands of Tanzania Scandinavian Institute of African Studies Research Report no. 33. Uppsala: Scandinavian Institute of African Studies. USANGU PLAIN - FOOD POPULATION
- Rald, J. 1969. Land Use in a Buhaya Village Bureau of Resource Assessment and Land Use Planning. Research Paper no. 5 Dar es Salaam: University of Dar es Salaam. BUHAYA - FOOD POPULATION
- Robson, J. R. K. 1974. The Ecology of Malnutrition in a Rural Community in Tanzania. Ecology of Food and Nutrition 3: 61-72. MAPOSENI-SONGEEA DISTRICT - FOOD

LOCATION & SCOPE

- Thomas, I. D. 1970. Some Notes on Population and Land Use in the More Densely Populated Parts of the Uluguru Mountains of Morogoro District. Bureau of Resource Assessment and Land Use Planning. Research Notes no. 8. Dar es Salaam: University of Dar es Salaam. ULUGURU MTS. (MOROGORO) - POPULATION
- Uchendu, V. C. and Anthony, K. R. N. 1974. Agricultural Change in Geita District, Tanzania. Dar es Salaam: East African Literature Bureau. GEITA - FOOD POPULATION
- University of East Anglia. Overseas Development Group. 1976. Iringa Region Tanzania: Integrated Rural Development Proposals for the Third Five-Year Plan 1976-81. Vols. 1 & 2. Rome: United Nations Development Programme. Food and Agriculture Organization of the United Nations. IRRINGA - FOOD
- SUDAN
- Abbadi, Karar and Salam, Mohamed Mirghani A. 1976. Some Aspects of Production and Marketing of Fruits and Vegetables in the Khartoum Province. Occasional Paper no. 7. Khartoum: Economic and Social Research Council, National Council for Research. KHARTOUM - FOOD
- Briggs, John A. 1978. Farmers Responses to Planned Agricultural Development in the Sudan. Transactions I.B. 6 New Series 3: 464-75. (Case Study of Southern Gummaya area of Central Sudan) SOUTHERN GUMMAYIA - FOOD
- Gader, Ali, Ali Abder. 1977. Some Aspects of Productivity in Sudanese Traditional Agriculture: the Case of the Northern Province. Khartoum: Economic and Social Research Council, Bulletin no. 59. NORTHERN PROVINCE - FOOD - POPULATION
- Hadari, A.M. 1971. Occupational Inmobility of Tenants of the Gezira Scheme, the Sudan. East African Journal of Rural Development 4(20). GEZIRA - POPULATION
- Sirbim, Gunnar M. 1977. How to Survive Development: The Story of New Halfa University of Khartoum. Faculty of Economic and Social Studies, Development Studies and Research Center. Monograph Series no. 6. Khartoum: University of Khartoum Press. NEW HALFA - FOOD POPULATION
- Taha, S. A. A. 1977. Society, Food and Nutrition in the Gezira. Khartoum: Khartoum University Press. GEZIRA - FOOD
- Tenneco Inc. 1977. Proposal: A Comprehensive Plan for a Food System in Wadi El Khawi (Northern Sudan) WADI EL KHOWI - FOOD
- Gunter, H. 1978. "Social Geographic Problems in the Khashm el Girba Project Sudan." Land Reform Land Settlement and Co-operatives Rome: UN.FAO. KHASHM EL GIRBA - FOOD - POPULATION

LOCATION & SCOPE

KENYA

- Bernard, Frank E. 1972. East of Mount Kenya: Meru Agriculture in Transition IFO Institut fur Wirtschaftsforschung Munshen. Afrika Studien no. 75. Munich: Weltforum Verlag. MERU - FOOD
- Vernard, Frank. 1969. Recent Agricultural Change East of Mount Kenya Ohio University, Center for International Studies. Papers in International Studies. Africa Series no. 4. Athens: Ohio University Press. MERU - FOOD
- Bullock, Ronald A. 1974. Subsistence to Cash: Economic Change in Rural Kiambu. Cahiers d'Etudes Africaines 56: 699-714. KIAMBU - FOOD
- Campbell, David J. and Mbugua, E. S. 1978. "Survey of Land Use Problems in Kajiado District: A Review of Methodology: Institute of Development Studies, University of Nairobi, Working Paper no. 334. KAJIADO - FOOD
- Hunt, Diana. "Poverty and Agricultural Development Policy in a Semi-Arid Area of Eastern Kenya." (Date and Publication information not known - post 1975) MBERE - FOOD
- Jatzold, Ralph I. and Baum, E. 1968. The Kilombero Valley IFO-Institut fur Wirtschaftsforschung Muncken, Afrika Studien no. 28. Munich: Weltforum Verlag. KILOMBERO VALLEY - FOOD
- Kenya. Central Bureau of Statistics. Ministry of Finance and Planning. 1972. Results of Aerial Livestock Surveys of Kaputei Division, Sambura District and North Easter Province Nairobi: Government of Kenya Publications. KAPUTE, SAMBURA, N.E. PROVINCE - FOOD
- Klemens, Hubert (ed) et al. 1972. Agricultural Production in Kisii District Kenya and Proposals for its Development Post Graduate Training Center for Agricultural Development, Institute for Overseas Agriculture. Technical University of Berlin. KISII - FOOD
- McGranahan, G. Chubb, S., Nathans, F., and Mbeche, O. 1979. "Patterns of Urban Household Energy Use in Developing Countries: The Case of Nairobi." Paper read at Kenya Academy of Science-Beijer Institute Workshop on Rural Energy in East Africa, 5-11 May, 1979 at Nairobi. Mimeographed. NAIROBI - ENERGY
- Munglala, P. M. 1978. The Estimation of Present Consumption and Future Demands for Wood Fuel in Machakos District of Kenya. MSC Thesis. Dept. of Forestry. University of Dar es Salaam. Morogoro. MACHAKOS - ENERGY

LOCATION & SCOPE

- Murita, Rukandema. 1977. Resource Availability, Utilization and Production of Small Scale Farms in Kakamega District Western Kenya. Ph.d. Dissertation. Cornell University. KAKAMEGA - FOOD
- Odingo, R. S. "Post Independence Agricultural Changes in the Kenya Highlands." Mimeographed paper (date and source unknown - post 1966) KENYA HIGHLANDS - FOOD
- O'Laughlin, Agnes Addai. 1976. Nutrition Intervention Program in the Drought Affected Areas of Kenya (Kijiado, Kitui and Machakos Districts) Nairobi: Catholic Relief Services. KIJADO, KITUI & MACHAKOS - FOOD
- Ostberg, Willhelm and Lilljecuist, Ann. 1973. The Social Impact of Population Growth: A Study of Social Changes in Marakwet Division. University of Nairobi. Institute for Development Studies. Working Paper no. 99. University of Nairobi: Nairobi. MARAKWET - POPULATION
- Owako, Frederick. 1971. "Machakos Land and Population Problems" in Studies in East African Geography and Development edited by S.H. Ominde pp. 177-192. Berkeley: University of California at Berkeley Press. MACHAKOS - POPULATION
- Segall, Marshall H. 1978. Nutrition and Family Planning Attitudes Among the Gusii and Meru of Kenya NSF Grant no. 76-10464. GUSII & MERU - FOOD
- Strobel, Herbert - ed. et al. 1973. An Economic Analysis of Smallholder Agriculture in Kericho District (Kenya) Post Graduate Training Center for Agricultural Development. Institute of Socio-Economics of Agricultural Development, Technical Institute of Berlin. KERICHO - FOOD
- United States. Agency for International Development. 1979. Kenya - Dryland Cropping Systems Research Project Project Paper 615-0180. Washington: United States Agency for International Development. MACHAKOS-KITU - FOOD
- Waller, Richard 1976. "Changes and Variation in the Pastoral Economy: Maasi of Kenya." ASAUK MAASI - FOOD - POPULATION
- ETHIOPIA
- Bellete, Solomon. 1979. An Economic Analysis of Smallholders Agriculture in the Central Highlands of Ethiopia: A System Simulation Approach. Ph.D. Dissertation. Oregon State University. CENTRAL HIGHLAND - FOOD

TABLE I

RATES OF GROWTH OF POPULATION AND FOOD, AGRICULTURE AND CEREAL PRODUCTION

Country	Time Span	Population %	Per Caput Production		
			Food	Agriculture	Cereals
Burundi	Period 1*	1.1	1.1	1.3	1.9
	Period 2**	2.4	-0.4	-0.6	1.5
Ethiopia	Period 1	2.2	-0.1	---	0.2
	Period 2	2.4	-3.7	-3.1	-5.6
Kenya	Period 1	3.3	0.2	0.4	2.1
	Period 2	3.3	-3.1	-2.2	-4.0
Rwanda	Period 1	2.9	2.6	2.8	-0.9
	Period 2	2.7	0.1	0.5	-2.9
Somalia	Period 1	2.2	0.5	0.5	-2.0
	Period 2	2.6	-3.2	-3.1	-2.3
Sudan	Period 1	2.9	0.9	1.3	1.5
	Period 2	3.1	2.2	1.0	2.2
Tanzania	Period 1	2.8	0.6	0.2	0.6
	Period 2	3.1	2.8	1.4	11.3
Uganda	Period 1	2.7	---	1.1	4.9
	Period 2	3.0	-1.7	-2.3	0.6

* Period 1: 1961/65 - 1970.

** Period 2: 1970-1976.

SOURCE: Fourth World Food Survey, F.A.O., Rome, 1977 p. 69-76.

TABLE II

ESTIMATED URBAN POPULATION IN EASTERN AFRICA

COUNTRY	URBAN POPULATION (in 000's)		POPULATION OF MAJOR CITIES ¹ (in 000's)	TOTAL URBAN AS PERCENTAGE OF TOTAL POPULATION		TOTAL POPULATION (in 000's)
	1960	1980	1980	1960	1980	1980
Kenya	561	2,226	1,404	7%	14%	15,900
Tanzania	510	2,263	760	5	12	18,600
Rwanda	110	204	11	2	4	5,100
Sudan	1,126	4,675	1,754	10	25	18,700
Burundi	57	90	204	2	2	4,500
Ethiopia	1,206	4,890	1,678	6	15	32,600
Somalia	417	1,080	630	17	30	3,600
Uganda	340	1,644	771	5	12	13,700
Djibouti	46	200	200	NA	NA	400
TOTALS	4,373	17,272	7,412			113,100

¹Cities over 100,000 or capital cities rounded to the nearest 000.

SOURCES: Derived from (1) World Bank, World Development Indicators, 1980; World Bank, World Tables, 1980; Africa South of the Sahara, 1979-80.

TABLE III
ENERGY IMPORTS AS PERCENTAGE OF EXPORTS

<u>COUNTRY</u>	<u>1960</u>	<u>1977</u>
Low Income Countries	9 ^w ¹	16 ^w
Ethiopia	11%	27%
Somalia	4	13
Burundi	NA	7
Rwanda	NA	11
Tanzania	NA	22
Uganda	5	4
Sudan	8	26
Kenya	18	24

¹"w" after a summary measure indicates that it is a weighted average.

SOURCE: World Development Report, 1980, Table 7.

TABLE IVEast African Refugees

(Latest official statistics from the UN High Commissioner for Refugees. Figures rounded to the nearest 100)

<u>COUNTRY</u>	<u>NUMBERS</u>	<u>ORIGIN</u>
Burundi	50,000	Rwanda
Djibouti	28,000	Ethiopia, others
Ethiopia	11,000	Sudan
Kenya	5,800	Uganda, Ethiopia, others
Rwanda	7,800	Burundi
Somalia	1,500,000	Ethiopia
Tanzania	156,000	Burundi, 129,500, Rwanda
Uganda	112,000	Rwanda 78,000 Zaire 34,000
Sudan	441,000	Ethiopia 300,000 Uganda 39,000 Zaire 3,000 Chad 7,000
TOTAL	2,311,600	

Displaced persons: Ethiopia 750,000
Uganda 265,000
Zimbabwe 660,000

SOURCE: Africa, No. 108 August 1980.

TABLE VINDICES OF PER CAPITA FOOD PRODUCTION, 1970-1979(1961-1965 = 100)

<u>Country</u>	<u>1970</u>	<u>1972</u>	<u>1974</u>	<u>1976</u>	<u>1978</u>	<u>1979*</u>
Burundi	117	119	98	110	108	109
Ethiopia	99	91	84	63	52	54
Kenya	96	99	96	113	111	110
Rwanda	123	115	112	119	119	119
Sudan	110	107	114	122	129	123
Tanzania	102	100	114	99	100	105
Uganda	95	87	79	77	76	68

* Preliminary

SOURCE: Food Problems and Prospects in Sub-Saharan Africa, The Decade of the 1980's, U.S.D.A./A.I.D. 1980.

TABLE VIENERGY ELEMENTS OF THE FOOD CYCLE

<u>Location of Input</u>	<u>Element of Energy Input</u>	<u>Source of Energy</u>	
On Farm	Sunlight	Nature	
	Rain	Nature	
	Soil nutrients	Nature	
	Labor	Human	
	Animal Power	Farm animals	
	Natural fertilizers	Animal, human and plant wastes	
	Seeds	Nature/commercial	
	Manufacture of implements	Commercial	
	Manufacture of farm machinery	Commercial	
	Manufacture of fertilizers	Commercial	
	Manufacture of vehicles	Commercial	
	Fuel for machinery and vehicles	Commercial	
	Fuel for irrigation	Commercial	
	Food Distribution, processing and storage	Construction of farm to market roads	Commercial/human
		Manufacture of transportation equipment	Commercial
Fuel for transportation		Commercial/animal	
Manufacture of containers		Commercial	
Construction of storage facilities		Commercial	
Manufacture of food processing equipment		Commercial	
Fuel for processing industry		Commercial	
Commercial and Home	Commercial refrigeration and cooking	Commercial	
	Home refrigeration	Commercial	
	Home cooking	Wood/charcoal/commercial	
	Commercial and home refrigeration and cooking equipment	Commercial/homemade	

TABLE VII

EAST AFRICAN COUNTRY COMPARISONS

	(1) Population Mid 1978 (million)	(2) Per Cap. GNP 1976 (\$)	(3) POLI	(4) Per Cap. Growth Rate (%) 1970-75	(5) Birth Rate Per 1000	(6) Death Rate 1000	(7) Infant Mortality per 1000 live births
Ethiopia	30.2	100	22	0.4	49	25	162
Kenya	14.8	240	39	2.4	48	15	119
Somalia	3.4	110	19	-0.2	48	21	177
Sudan	17.1	290	34	3.8	48	16	141
Tanzania	16.5	180	30	2.9	47	22	167
Uganda	12.7	240	40	4.15	45	15	160
Burundi	4.0	120	25	-1.1	48	22	150
Rwanda	4.5	110	27	0.2	51	22	133

SOURCE: Extracted from the US and World Development Agenda, 1979 ODC 1979.

TABLE VIII
EASTERN AFRICA FOOD AID PER FISCAL YEAR
(in millions of dollars)

<u>Country</u>	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>
Burundi											
I	---	---	---	---	---	---	---	---	---	---	---
II	.015	.128	.154	.487	.283	.259	.557	1.129	1.061	1.822	2.076
Djibouti											
I	---	---	---	---	---	---	---	---	---	---	---
II	---	---	---	---	---	---	---	---	---	.776	.369
Ethiopia											
I	---	---	---	---	---	---	---	3.6	---	10.	---
II	.250	1.151	.359	.811	.247	7.497	2.335	2.819	4.686	3.832	9.081
Kenya											
I	---	---	---	---	---	---	---	---	---	11.8	---
II	.135	.869	1.156	.878	.431	.468	.968	2.133	1.540	.744	1.274
Rwanda											
I	---	---	---	---	---	---	---	---	---	---	---
II	---	.612	.653	.496	.227	.356	1.633	1.202	1.250	1.596	.996
Somalia											
I	---	---	---	---	---	---	---	---	---	7.5	10.583
II	.076	.26	.117	---	---	---	3.769	1.351	.575	6.334	5.520
Sudan											
I	---	---	---	---	2.2	3.	---	---	4.8	43.8	19.9
II	.059	.04	.103	.091	2.2	1.871	7.593	1.191	1.836	1.924	1.284
Tanzania											
I	---	---	---	---	---	---	8.	4.5	8.	26.6	---
II	1.433	1.683	2.342	1.515	1.459	2.379	11.797	15.803	8.354	1.75	2.464

SOURCE: Annual Reports, PL 480

I = Title I, PL 480 (sales)
II = Title II, PL 480 (gifts and grants)

TABLE IXKENYA POPULATION DENSITY CHANGES BY REGION

Province	Area in Sq. Km.	Population	Population Density Per Sq. Km. 1969	Population Density Per Sq. Km. 1979	% Change '69-'79
Western Province	8,223	1,836,000	162	223	37.65
Nyanza	12,525	2,634,000	169	210	24.26
Central	13,173	2,348,000	127	178	40.15
Rift Valley	170,162	3,240,000	13	19	46.15
Eastern	154,540	2,717,000	12	18	50
Coast	83,041	1,339,000	11	16	45.45
North East	126,902	373,000	2	3	50
<u>Kenya</u>	569,249	15,322,000	19	27	42.1

SOURCE: 1. Derived from Kenya Statistical Abstract
 2. Preliminary information from Kenya Population Census, 1979.

TABLE X

KENYA WOODFUEL CONSUMPTION PER ANNUM

PROVINCE	FUELWOOD/ HOUSEHOLD M. TONS	CHARCOAL PER HOUSEHOLD IN M. TONS	NUMBER OF HOUSEHOLDS	TOTAL FUELWOOD M. TONS	TOTAL CHARCOAL
Central	5,145	.716	335,428	1,725,777	240,160
Coast	3,667	.706	131,428	481,946	92,788
Eastern	5,580	.795	388,142	2,165,832	308,572
Nyanza	4,576	.636	440,000	2,013,440	279,840
Rift Valley	5,159	1.061	462,857	2,387,879	491,091
Western	3,844	.774	262,285	1,008,223	203,008
Nairobi	2,076	.779	119,285	247,635	42,923
NATIONAL				10,030,732	1,708,382

Total Fuelwood Consumption = 10,030,732 Metric Tons

Total Charcoal Consumption = 1,708,382 Metric Tons

Total Woodfuel Consumption (M^3 roundwood equivalent)

Fuelwood	14,043,024 M^3	
Charcoal	21,542,697 M^3	(roundwood equivalent)
TOTAL	35,585,721 M^3	

SOURCE: Tuschak, 1979

TABLE XI

ENERGY USE PER ANNUM

FOR

KILOMBERO, TANZANIA

(10⁴ kilocalories)

Domestic Use	504 per capita
Production Use (agriculture)	58 per capita 96 per hectare
Consumption Use (agriculture)	18 per capita
TOTAL	630 per capita

SOURCE: Makhijan, A. and Alan Poole (1975), Energy and Agriculture in the Third World, Cambridge, Ballinger, p. 168.