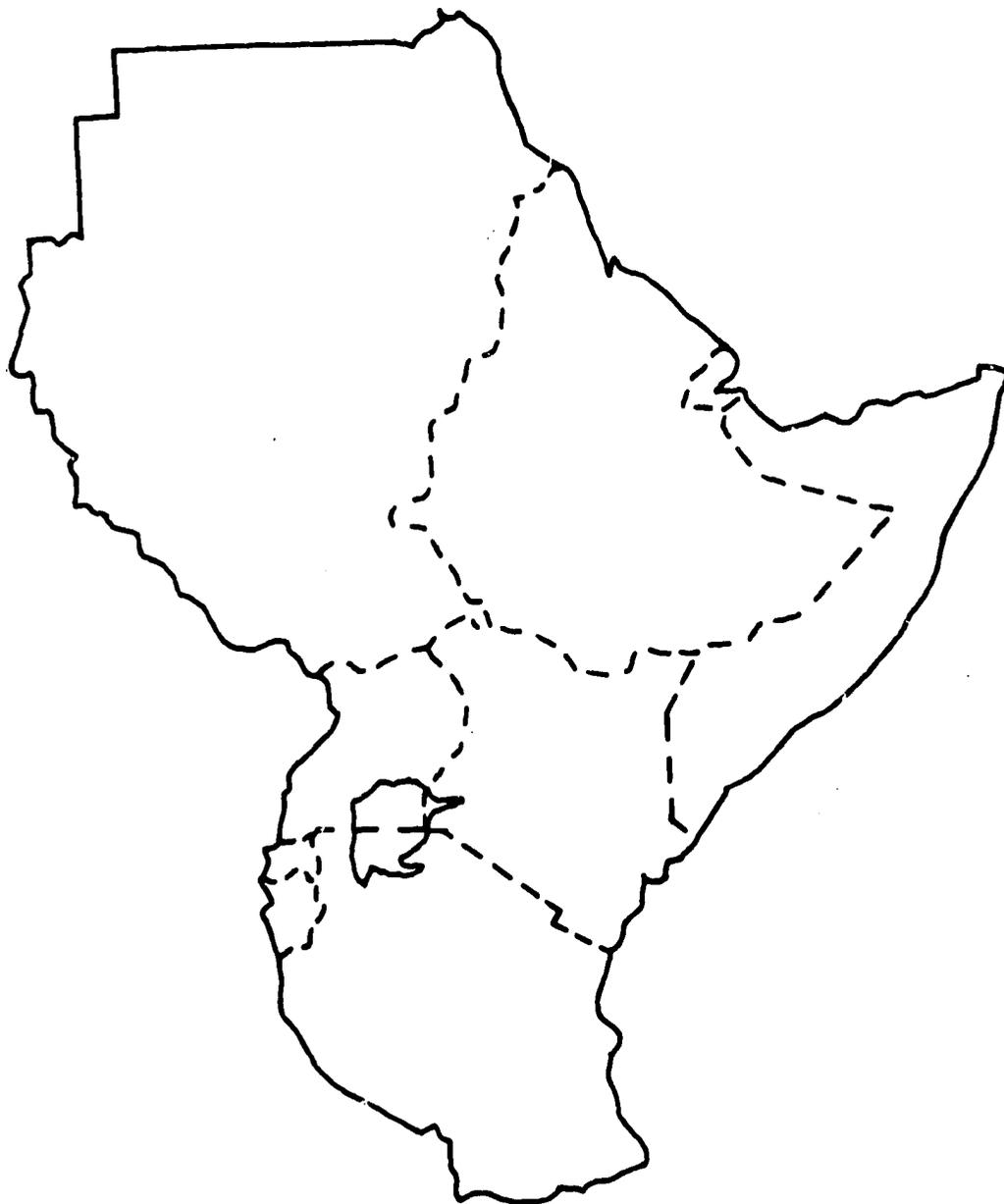


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# Eastern Africa Regional Studies

*Trends and Interrelationships in food,  
population, and energy in eastern Africa:  
A preliminary analysis*

*Volume 1: Executive Summary*



December, 1980

Program for International Development  
Clark University  
Worcester, Massachusetts 01610

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

A PRELIMINARY ANALYSIS

VOLUME I

O V E R V I E W

DECEMBER, 1980

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FOREWORD

This Executive Summary is the first of three volumes of working papers concerned with interrelationships of trends in food production, energy use, and population growth in Eastern Africa. Volume II will be the collected papers from which this summary is derived. Volume III will be an extended 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 have given 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.

## TABLE OF CONTENTS

## EXECUTIVE SUMMARY

	Foreword	i
	Table of Contents	ii
1.	Background	1
2.	The Process	3
3.	Key Trends and Issues in Eastern Africa	5
4.	State of Current Assessments of Food and Agriculture	11
5.	State of Current Assessment of Population	15
6.	State of Current Assessment of Energy in Food Production	17
7.	Population, Food, Energy Interrelations	19
8.	Preliminary Findings: Region	22
9.	Preliminary Findings: Country Summaries	26
10.	General Recommendations	36

## TABLES

I.	Rates of Growth of Population and Food: Agriculture and Cereal Production	46
II.	Estimated Urban Population	47
III.	Energy Imports as Percentage of Exports	48
IV.	East African Refugees	49
V.	Per Capita Food Production, 1970-1979	50
VI.	Energy Elements of the Food Cycle	51
VII.	Energy Use in Kilombero, Tanzania	52
VIII.	Eastern Africa Food Aid per Fiscal Year	53

EXECUTIVE SUMMARY1. Background

For the last eighteen months, East African mission directors have been meeting periodically to review development priorities in the region. The issue of food production in relation to continued population growth and rising energy costs has emerged as one of the critical development challenges facing East Africa. In recent months, the urgency of the situation has been highlighted by a series of regional tragedies, especially the extraordinary refugee problem in Somalia and other countries, death through starvation in Karomoja and unrest within and between countries. There are projections of major food production shortfalls in the region, over the next 12 months. Further, reliance on a continuing food surplus from the United States is increasingly being called into question, therefore, intensifying an already difficult situation (Batie and Healy, 1980).

The drastic nature of these events, coupled with a widespread professional concern over food supply in Africa in general and eastern Africa in particular, has resulted in a number of studies and other initiatives. The magnitude of the problem and the intensity of the resulting activity led mission directors to recommend, at their August 1980 meeting, a review of current literature, both of completed work as well as studies in progress, in order to: (1) synthesize the emerging results contained in the literature; (2) identify areas where information gaps exist; (3) explore linkages between and among trends in food production, population growth, and energy consumption, and (4) identify areas where further information was needed. Because of need for prompt action, the review was commissioned to be finished in three months, in time for the January/February 1981 meeting of mission directors.

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This report is a first response to that recommendation. It summarizes a much longer document which presents the results of a short but intense period of investigation, review, and analysis.

## 2. The Process

There is a huge literature on food, population, and energy in eastern Africa as well as a considerable variety of ongoing research and analysis. Given the extremely short period of time for this review, several parallel strategies were used to obtain the widest possible coverage including:

- .... a search of the most relevant computerized documentation systems;
- .... a thorough review of material in our own and other United States collections of East Africa research;
- .... collection of reports from USAID, World Bank, International Food Policy Research Institute, and other organizations;
- .... personal visits to international research centers in Africa and Europe, including FAO, WMO, and UNEP;
- .... visits to many of the countries and assistance and advice from USAID country missions;
- .... the commissioning of seven African professionals to review relevant material in their own countries;
- .... a multi-disciplinary working group at Clark involving directly six professionals, four graduate assistants and several support staff, and many others on an intermittent basis.

A multidisciplinary framework was used to analyze the material gathered. We placed particular emphasis on the availability and reliability of information on the three main themes as well as their interrelationships. The official data gathering systems of the countries concerned were examined and other documents were reviewed from the perspective of data generation and reliability.

In the review of research materials, we attempted to give priority to studies which provided new information at the production unit level or dealt with specifics of processing, marketing, local population changes, new

energy situations, etc. In the review of agency reports and ongoing activities, we gave priority to recent work which related directly to the East Africa situation. Many others relate in an indirect way.

There is certainly much that we have not been able to do in the time available, but in our judgment, we have been able to identify most of the major initiatives now under way, summarize the significant findings of these, and formulate recommendations of needed steps to arrive at policy formulations.

### 3. Key Trends and Issues in Eastern Africa

The past twenty years have witnessed dramatic changes in eastern Africa: the change over from colonial to independent rule; a consequent much greater involvement with the international market economy including development aid; an increase in population from 63 million to 113 million; and urban growth from 4.37 million to 17.27 million. The last five years have seen major changes also, including the break down of the East Africa community, conflict between Somalia and Ethiopia and between Tanzania and Uganda, massive dislocations of people, dramatic rises in energy costs, and persistent shortfalls in food supply.

In such a complex and fast changing situation, it is hard to pinpoint cause and effect or main themes and subthemes. Even so, the following seven topics provide a sense of the pattern and thread of change between 1960 and 1980, as one basis for assessing the current situation.

#### 3 (a) Population Growth

While the population of East Africa has nearly doubled in the past twenty years, the rate of growth has also increased (Tables 1 & 2). Growth rates of around 2 percent per annum in the 1960's have now accelerated to reach 4 percent in Kenya and nearly 3 percent for the rest of Eastern Africa. This is nearly 50 percent higher than the average for all low income countries and means that the population will double in the next 15-20 years.

While the process of development has led to substantial reduction in the crude death rate over the past two decades, there has been little impact on the crude birth rate. In contrast, the birth rate has fallen in many other low income areas of the world with an obvious moderating effect on population growth. Again, unlike many other low income countries, the nations of East Africa have not put in place effective population control

programs, a factor which may lead to an increased disparity between East Africa and population growth rates in the rest of the world.

Population growth appears to have different implications in different parts of eastern Africa. The Sudan is still regarded as under populated by most Sudanese and growth rates there are still low compared with other eastern African countries. Kenya with a high growth rate is also experiencing regional shortages of good arable land and there is considerable national concern about population growth in relation to agricultural and other resources. Rwanda and Burundi are also densely populated with little room for expansion of agricultural land. The remaining countries have varying degrees of apparent population pressure on resources.

### 3 (b) Urban Growth

While the percent of the East African population which live in cities is still small by global standards (Table 2), it has grown rapidly in the last 20 years and continues to grow at rates between 6 and 8 percent per annum. The cities are growing at over twice the rate of the overall population, placing great strain on the resources of the urban areas and an increasing food production burden on those left in the rural areas.

Much of the urban growth is concentrated in the capital cities. Khartoum, Dar es Salaam, Nairobi, and Addis Ababa are all around or over 1 million population; nearly half of the urban population in eastern Africa is concentrated in the major cities. All indications are that this trend will continue, possibly at an accelerated pace.

### 3 (c) Energy Costs and Export Imperatives

East Africa has faced the same pattern of dramatically increasing prices

for its imported energy sources as the rest of the world. With little in the way of fossil fuel resources available domestically, the financial burden has fallen directly on foreign exchange earnings. As a result there has been a sharp increase in the proportion of export earnings necessary to pay for energy imports. (Table 3). In several countries 25 to near 50 percent of earnings are needed to buy energy and recent price increases and other events can only serve to increase this percentage. This trend has in turn, put unbearable pressure on already meager export earnings and has led to an increased concentration on cash crops for export. At the same time there has been a similar although less visible increase in the cost of traditional rural energy sources such as firewood and charcoal. This is reflected both in market prices and the increased level of effort necessary to find and gather non commercial fuel. The combined effect of all these factors has been in the direction of lowering agricultural productivity in food production, a trend that shows no signs of reversing.

### 3 (d) Resource Depletion

It is hard to document resource depletion trends even in the U.S. Despite this difficulty, it is quite clear that the greatly increased pressure on resources in eastern Africa has had major impacts, particularly in three areas:

- .... forest land;
- .... productivity;
- .... wildlife.

While the latter has long range and international significance and an impact on the tourist trade, the others directly impact the food and energy situation in eastern Africa.

The reduction of rainforest areas is clearly shown on time series air

photos and satellite images; the reduction in land productivity is less obvious and not universal. There is, however, strong evidence from the mechanized agricultural areas of central Sudan, the drier areas of both Sudan and Kenya, the central region of Tanzania, and other areas, of major negative trends. Elsewhere cultivation of marginal lands and reduction of fallow periods provide warning indicators.

Perhaps the most pervasive trend is the growing shortage of fuelwood and charcoal in many semi arid areas and for a vast distance around the towns and cities of the area.

### 3 (e) International and National Disorders

There probably has never been a period of absolute tranquility in East African history, but compared with the present, most of the past looks like a quiet time.

In the past few years East Africa has seen:

- .... the break up of the East African Community
- .... closure of the border between Kenya and Tanzania;
- .... the Eritrean secession struggle
- .... war between Somalia and Ethiopia;
- .... the break down of law and order in Uganda.

The civil war in Sudan and the disorders in Rwanda and Burundi were devastating events of the sixties, but these appeared to have had a less traumatic impact on the whole region than the combination of the five events above in the 70's. There are several repercussions including:

- .... the vast number of refugees in the region (Table 4);
- .... the breakdown of formal and informal trading networks;
- .... the spread of smuggling and uncontrolled transfer of goods.

### 3 (f) Climatic Change

Much has been made of the possibility that climatic changes are or will cause a deterioration of our food supply through an increase in the number and severity of droughts or floods. While these views have been expressed by a number of professional climatologists on many continents, present day evidence is insufficient to make such a judgment. In eastern Africa, as elsewhere, weather events have been cited as one important cause of food shortages. The droughts of the 70's in Somalia, northern Sudan, and Ethiopia were real enough climatically. However, it is not at all clear how food shortages are related to these and other droughts or whether they result from drought or from a much more complex situation.

It may be that eastern African climate will be more variable in the next decade than in the recent past, but we have no evidence of a permanent or long range trend. The combined impact of such climatic uncertainty and the present capabilities of national and international response systems will undoubtedly be an area to be explored but sufficient data are not now available to come to any meaningful judgments.

### 3 (g) Recurrent food shortages

The frequency, persistency and biological impact of food shortages in Eastern Africa are apparently increasing. What used to be a recurrent but infrequent event now seems almost to be a permanent feature. Famine has become an everyday event in various parts of Ethiopia and occurs locally throughout much of the larger region, e.g., the Karamoja area. Food shortages in Kenya, Tanzania and Somalia have been a feature of the last 5 years.

In addition, mean per capita food consumption may be decreasing in the region because of decreasing per capita food production and the high cost of imported foods (Table 5). The result is a less than adequate diet for a

large segment of the region's population, especially the landless and unemployed. If these trends continue, Eastern Africa will continue to be marked by an increasing number and variety of food shortages.

#### 4. State of Current Assessments of Food and Agriculture

Recent research and theoretical appraisals display considerable concensus in regard to the rudiments of various food issues in and development approaches for Eastern Africa. Food issues are generally categorized as primarily production or consumption. Of the two, more interest and analysis has been given to production.

Most farmers and some pastoralists in Eastern Africa operate within two concurrent economic modes of production: subsistence and market. Food production is usually part of the traditional subsistence economy. Subsistence production employs tactics of minimization of risk, maximization of agricultural efficiency (input/output ratios), but does not emphasize maximization of output (Harwood, 1980). Subsistence is characterized by smallholder farms, female labor, minimal non-labor inputs, and low per capita production. Labor bottlenecks tend not to be a serious problem because of a variety of time-saving procedures, although labor shortage is increasingly identified as a recent problem. An undetermined percentage of production from subsistence finds it's way to non-farmers through sets of informal networks.

Market production is geared largely for international export crops, such as tea or coffee. In recent years, vegetable production for the region's urban markets is increasing. Although there are some large estates, much market production is characterized by small-and medium-holder farms, male labor, and low capital inputs. Farming behavior responds to the economics of the market, but within the constraints of the smallholder. Minimal attention has been given to spontaneous technological improvement. The evidence suggests that risk minimizing and cost-saving approaches, such as use of oxen and small-scale machinery, may have high likelihood of adoption. Yet detailed research on this issue has not yet been carried out. Labor

bottlenecks may affect market production. Significantly, disincentives to production, socio-political uncertainty, pricing policies, and urban attractions are important influences.

Large-scale production is predominantly for export crops. Although growing export crops may not directly affect local food production processes, planners often believe that the scale of organization and mechanization may be transferable to smallholders. This perspective implies that traditional farmers are capable of jumping into large-scale cultivation without an intermediate step. The implementation of this view of agricultural transfer in Eastern Africa has largely resulted in failure.

Pastoral economies are necessarily land extensive, but may provide the most efficient means of livestock production per unit of inputs within arid and semi-arid environments. Offtake can probably be improved, but a push from the subsistence-bound techniques to ranching probably requires an intermediate step as discussed for farmers. Pastoralists have shown sensitivity to "marketing" their products when it is advantageous to them. (Jacobs, 1980).

Environmental constraints are a key issue to food production (Porter, 1979). Micro-level environmental data throughout the region are sometimes sparse, inaccurate and not standardized. Nevertheless, the data are sufficient to demonstrate that Eastern Africa is marked by extreme diversities of habitat, each with special qualities and constraints for production. Major constraints include aridity and rainfall fluctuations, hillslopes vulnerable to soil erosion, maintenance of soil fertility, soil inundation, tsetse infestation, and pest/vermin problems. Major assets are suitable year round temperatures for cultivation, some good soils, few lateritic tendencies and several well-watered zones.

Consumption issues are numerous but poorly documented. Food loss during

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high (N.A.S., 1978). Food preparation of non-indigenous crops is not necessarily superior. Urbanization has created demands for non-indigenous foods, many of which are costly substitutes for local products, including shifts to wheat and to infant bottle feeding. Access to foods is not equal by area or economic class.

A brief but intensive search of food issues/problems and projects in Eastern Africa has revealed a paucity of "recent" research efforts which offer conceptually new or micro-level data. Most conceptual work has resulted from assessments of the materials gathered during the 1960s and early 70s. The recent U.S.D.A. (1980) report of food problems in sub-Saharan Africa and the subsequent assessments and summaries of it by A.I.D. have established the basic overview of the food problem from which future research efforts will probably draw inspiration. The emphasis on food may lead to numerous national level food policies, such as the effort currently underway in Kenya.

Research is another important component of food issues. For the most part, USAID has been the premier supporter of food related research in eastern Africa. FAO, IFO, and other international agencies have not initiated a large number of research efforts in the region. Some of the more significant research projects or projects with a research component are:

Kenya - Major Cereal and Legume Improvement Project; Arid, Semi-Arid Land Development Project; Marginal Semi Arid Lands Development Project; and Design Assessment R & D Pre-Investment Study;

Tanzania - Seed Multiplication Project; Agricultural Research Project; The Maize Project; and Arusha Planning and Village Development Project;

Somalia - Agricultural Extension, Training, and Research Project;

Sudan - ABYEI Integrated Rural Development Project; Southern Region  
Agricultural Rehabilitation Development Project;

Uganda - N.S.F. Karamoja and Livestock Study (Dyson-Hudson);

Ethiopia - Pulse Diversification and Improvement Project.

These projects exemplify the research trends in food production for the area. Information is concentrated by ecological and political areas. For example, comparatively good quantities of data are available for Arusha and other high output zones of Tanzania, highland Kenya, Gezira (Sudan) and various dryland zones primed for irrigation. Minimal information is available for large segments of Ethiopia, Sudan, Somalia, Djibouti, Rwanda, and Burundi, and for wetlands (inundated zones). Despite the recent research emphasis on smallholders, there has not been a measurable increase in micro-level data on production, consumption and environment, and little work has integrated various micro-level data.

Finally it should be noted that small-scale, low risk programs of development geared toward a bottom-up, local involvement format have been more successful in sustaining long-term output, particularly of food crops, that have large-scale, mechanized projects planned from the top down (Development Alternatives, 1975). For example, the "paysanut" approach in Burundi and Rwanda has resulted in the highest levels of food per capita food output in Eastern Africa, despite the high levels of environmental constraint and crowded conditions in those countries (Table 1).

### 5. State of Current Assessment of Population

Although detailed knowledge of the population situation is cloudy, it is clear that population in Eastern Africa is growing rapidly. Depending on biases, there may be some question concerning the accuracy of the growth rate figures. However, no doubt exists that the rates are high relative to the rest of the developing world (Table 1). The data generally confirm that population increase is real, not merely a technical aberration. Unfortunately, lack of sufficient resources and, perhaps, some political sensitivity have led to a rather slow processing of the latest national censuses. This lag has, in turn, impeded the subsequent availability and analysis of the data.

Besides determining the rate of population growth, a number of other important population related questions persist. The process of development seemingly has not reduced birth rates throughout the region as suggested by the Demographic Transition Model, or conversely, development has been so slow that the transition to an economic circumstance proving a drop in birth rates has not occurred. Also, pronatalist impact of development is significant in an Eastern African context (Nag 1980), particularly the issue of the relative timing of the various pro and antinatalist effects. Eastern Africa seems to have had a mix of culture and development that has so far emphasized the pronatalist impacts. More work needs to be done in this area. Another question in need of study is the large variation in sub-regional growth rates within the context of high overall national growth rates. Analysis of census data is needed to illuminate other population aspects such as age-sex composition, trends in fertility and mortality, and migration patterns.

Beyond census data, further research is called for in socioeconomic areas, including attitudes toward children as a source of agricultural

labor, large families as a means of social security and social status, and traditional beliefs about family composition. Preliminary hypotheses suggest that development policies have helped reduce the death rate but have had little or no impact on the traditionally high birth rates in the region (Myers, 1980).

Increased urbanization of the population is another area of concern. Table 2 shows that the urban population of Eastern Africa has been growing much more rapidly than the total population. This necessarily causes some problems. A smaller proportion of the population is directly producing food or export crops. The urban population's food needs must be supplied directly by the remaining rural producers or through imports. This creates pressure on the balance of payments in a number of ways. Fewer resources are available for non-food production for export, transportation of food to the cities uses precious gasoline, trucks, and so forth, and the urban lifestyle may be relatively more dependent on imported goods.

In addition the increasing size of the urban population increases the political pressure to keep government established food prices at artificially low levels, reducing production incentives (and perhaps encouraging urban migration).

Regardless of the issues, the fundamental question to be addressed continues to be whether rapid rates of population growth are a problem. Apparently some governments explicitly or implicitly feel it is not; the western donors feel that it is. One senses that little dialogue is underway between the two. Without some clarification the whole context for population research remains unclear.

## 6. State of Current Assessment of Energy in Food Production

Energy is fundamental to food production and consumption. It is required for planting, crop growth, harvesting, storage, processing, distributing, and food preparation. Energy is obtained from many sources, including the sun, minerals stored in the soil, fossil fuels, water, human and animal labor, and vegetation. Uses include consumption in natural states or in processed forms such as chemical pesticides and fertilizers, farming and irrigation equipment, petroleum to run equipment or for transport. For example, due to the large size of many of the countries in the region, energy costs to distribute foods on a national level are high. Recent attempts to shift agricultural practices, particularly to a marketing emphasis, combined with massive increases in energy costs, has a potentially serious impact or disruption on food production. Yet projections of the precise impact and nature of food/energy relationships are not well documented for Eastern Africa, nor are major efforts underway to rectify the problems (Devres 1980; O'Keefe 1979).

Numerous authors (Odum 1971, '73, '76; Turk & Wittes, 1978, et al) have developed models of energy flows through food production systems. Data from elsewhere indicate that small farms can produce on par with larger farms but at reduced energy inputs; other data indicate that larger farms use energy better than small farms (Johnson et al, 1977). Beyond these conceptual approaches, detailed knowledge of the actual quantities and quantitative relationships is extremely limited, especially for Eastern Africa. Existing studies of the food/energy interface in the region either concentrate on individual specific farms or discuss broadly aggregated national data. Our literature search has unearthed only about 10 or 12 publications specifically dealing with the food/energy problem. Much of agricultural research in Eastern Africa deals with human labor input (Collinson 1969:

Rald 1975); little has been produced on animal and organic energy input used on the farm, and in food distribution, marketing and preparation. For example, an increased urban population necessitates a qualitative and probably quantitative change in energy for the processing and distribution of foods to that population.

The most promising ongoing investigations directly applicable to the food/energy problems are being conducted by FAO in cooperation with IIASA and the Stanford Food Research Institute. These studies, using Kenya and Sudan data, respectively, are modeling the agricultural economy emphasizing the commercial energy input in the form of fuels, machinery, fertilizers, and transportation. Equally important, though specialized, are the fuelwood studies. They are in relatively early stages of development, but some results should be available in August 1981 at the UNEP conference on woodfuel and energy

In sum, major gaps exist in data and understanding of energy issues in Eastern Africa. Knowledge is most deficient on the level of aggregation--the intermediate level between individual farms, small villages, and national -- that would be most valuable for policy formulation. Individual farm data may be too site specific and the national data is too blurred by broad averages to yield the insights needed. To analyze these intermediate sub-national aggregations, data are required that are not available. Specific energy data, reasonably accurate and reliable, for the various elements of the food system (as outlined in Table 6) are not available and should be obtained before relevant policy decisions on allocation of scarce resources can be made adequately.

## 7. Population, Food, Energy Interrelations

Although there is a substantial literature and some ongoing studies in each of the fields represented in this review, there are very few analyses that attempt to interrelate them. It is the purpose of this section to explore these interrelationships.

### 7 (a) Population/Food

The relationship between population and food is twofold. Population affects the demand for food and also its supply. The first effect appears obvious, yet our knowledge base is deficient because food demands vary with geographic locations, urban or rural location and cultural differences. Studies exist on nutrition and nutritional needs and these form the basis for all demand prejections. Much national data on nutrition and the food supply that provides it is contained in a compilation prepared by the WHO regional office in Brazzaville "Apercus sur L'Alimentation et la Nutrition dans les pays de la Region Africaine" (1976).

The relationship between population growth and food supply is the subject of a number of studies at national levels. Further, one or two case studies from the 1950's tackle this issue in its local context. But significantly there is little that we have identified that substantiates the more general assumptions on, for example, population density or over-extended carrying capacity and food production. Documents on Kenya (e.g. Statistical Abstract) point to the scarcity of land in high density areas; the Commonwealth Report on Uganda states that land is becoming short in Uganda in relation to the increasing population; several BRALUP analyses of parts of Tanzania indicate that population levels in some regions and districts are estimated to be above the most effective levels for those environments. But there is little direct documentation on the impact of these population densities on specific food production and distribution systems.

In the midst of uncertainties, at least three points are clear. First, responses of food production to increased population vary, depending on the ecological and cultural setting. Initial impressions suggests that humid and arid zones suffer the least negative impact while subhumid and semi-arid zones experience the greatest. For example, in Tanzania, Kenya, Uganda, Rwanda, and Burundi -- all countries which have regions or districts experiencing accelerated growth -- the ecological extremes seem to be less adversely affected than the middle moisture zones

Second, it is also clear that there are major national differences in relationship of population and arable land. Sudan has the greatest land resource potential in relation to its population, Uganda and Tanzania are in a middle group. The greatest pressure on land resources is in Kenya, Ethiopia, Somalia, Rwanda, and Burundi.

Third, the area of greatest change in the population/food relationships are the towns and immediate surrounding areas. The urban population of Eastern Africa has grown in twenty years from 4.3 million to 17 million. We do not have a clear picture of how the towns are being fed or of the net impact of this change in the food production and marketing system in the rural areas. Furthermore, the effect of government policy and the growing unofficial (black) market on food production and the regional availability of foods must be considered in the population/food interrelationship.

#### 7 (b) Food/Energy

There are very few studies which examine the food/energy relationship. The few include some preliminary work in Tanzania and Sudan on wood/charcoal in rural areas and cooking/heating in urban Sudan; some work in Kenya on general rural and national energy needs in relation to food preparation. Very little seems to be known on the impacts of new energy costs on, for example, the whole process of agricultural production, the increased real

costs of irrigation projects, or transportation and marketing.

7 (c) Population/Food/Energy

We identified only two studies addressing this field: (1) a Ph.D. dissertation by W. T. Hill (University of Massachusetts) addressing the population/food/energy policies in a number of countries, including Tanzania, which outlines recent governmental responses, by sectors, to these issues; and (2) news of ongoing studies by and in cooperation with FAO. These latter studies, undertaken by the International Institute for Applied Systems Analysis (IIASA) in Vienna, use a preliminary model developed by FAO to measure the impact of commercial energy in Kenya in the agricultural sector and attempt to integrate the energy sector into an agricultural economic model and to measure its sensitivity. Similar work using FAO's Sudan data will soon be initiated at the Stanford Research Institute in California. Other important initiatives are the preparation for a national food policy by Kenya (materials currently not being released); projects such as the small Wadi Halfa project in Sudan (USAID) which seeks to combine a range of initiatives; the Blue Nile project; and continued analysis by the FAO. In our understanding, no other major efforts currently underway focus directly on the interrelationship in Eastern Africa.

This interrelation between Food/Population/Energy is a major gap in our understanding of the East Africa situation. Among the unknowns are:

- .... how are the cities to be economically fed now and in the future;
- .... what are the "new economics" of food production (high technology inputs) in relation to moderate/low technology inputs;
- .... what are the energy costs of food processing, storage, and transportation?

## 8. Preliminary Findings: Region

This section presents a limited number of findings from our studies to date. They are based on our collective judgment. Confirmation and specific documentation will be necessary to validate them.

### 8 (a) Population

1. The countries of Eastern Africa are among the fastest growing in the world;
2. Unlike many of the problems facing developing countries, the rapid population growth and the many consequences associated with it have not been universally viewed as a problem. While from the perspective of some observers, such as western donors, population growth is one of the central problems facing many of the countries of Eastern Africa, other observers, typically from East African governments, see it as relatively small a problem at all;
3. This difference in perception leads to rather different and in fact opposing policy options;
4. The provision of additional land, social services, energy and other necessities for a population doubling in size in less than 20 years will create a massive strain on economies that are already highly stressed. Furthermore, even if some additional population growth were seen to be necessary and desirable, the economy cannot sustain high current rates indefinitely.
5. Further, "population control" is viewed in a negative light by many in East Africa. A very successful population control program would take generations to bring the Eastern African growth rate down to manageable numbers.

### 8 (b) Food/Agriculture

1. Eastern Africa is characterized by diversity of national habitats with varying capabilities for food production.
2. Much of the land has high constraints or surface water deficiencies, tsetse, vermin/pest and so forth.
3. Micro-level, standardized environmental data throughout the region is absent.
4. Wetlands have been relatively ignored for production.
5. Micro-level data on all facets of food/agriculture throughout the region are sparse and tend to lack sufficient time depth.
6. Understanding of the nature of smallholder farming and of pastoralism

is essential to understanding food issues.

- (a) food production is largely subsistence-oriented while market production is for export crops.
  - (b) traditional pastoral procedures are probably the most efficient means of livestock production in arid/semi-arid zones.
  - (c) risk and uncertainty of risk are basic elements influencing smallholder production.
  - (d) traditional economies in Eastern Africa are sensitive to rewards and to disincentives.
7. Consumption factors are not given adequate consideration in the assessment of food issues, including diet shifts.
  8. Increased food production does not necessarily correlate with increased quantity/quality of consumption.
  9. Development projects lack sufficient identifications of goals/purpose, interest in alternative strategies, and inter-doner integration.
  10. Large-scale mechanization and other high capital input projects have not worked well.
  11. Highly planned, trickle-down development and communal production projects have not been successful.
  12. Education/research efforts have been too narrow in focus, and lacked sufficient on-the-site, village involvement by agents and attention given to women.
  13. The growth of the underground (black) market that has reached huge proportions in most East African countries affects the production and distribution of food.

8 (c) Food/Energy

1. Energy is needed in the food production/food distribution/utilization system, a system that must be considered as a whole.
2. Energy costs are going up and energy inputs are and will continue to be limited in Eastern Africa in the foreseeable future.
3. 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 anecdotal comments, inadequate to assess the energy need and energy allocation requirements of the food system in Eastern Africa.
4. Data on input of fuels, implements/machinery, fertilizers, pesticides, transport equipment and infrastructure development is needed in all

stages of the food system to document present energy uses. Such data collection should be on a sample basis as far as geographic areas and agricultural, distribution, marketing and food utilization varieties are concerned.

5. A food system/energy model will be needed to utilize the data collected as per finding #4 and to develop allocation formulas that can test the effects of energy and other system constraints.
6. Based on the foregoing, a formula for energy allocation to the food system and its components will be needed. This formula must be tested in practice and adjusted, as needed, from time to time.
7. Decisions that are likely to be needed may not fit the social or political outlook of the country concerned. Social and political equity may force different allocations. Yet it must be said that equity, adherence to political system, and social justice do not necessarily put food on the table and that if there is not sufficient food on the table, social justice, political systems and equity go out the window. To steer a pragmatic course between the conflicting demands of production maximization, energy minimization and political reality will be the major task of the 1980's.

#### SUMMARY FINDINGS

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 also apparent that consumption patterns change over time and there are corresponding changes in energy needs. It will be necessary to have information on these food consumption and energy use trends. Therefore, research begins with the identification of consumption patterns and considers how needs are met. As a preliminary assessment the following food systems appear to be pertinent:

#### A. Supply Systems

Home production  
Local markets (and regional)

National markets both official and clandestine  
 International markets

B. Processing and Storage

On farm (in house)	Both are low technology
Local	and use local labor
National	Generally higher technology
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 there are two discrete energy production systems, one with low level technology and the other using petroleum products. 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.

## 9. Preliminary Findings - Country Summaries

This chapter presents preliminary summaries of the population/food/energy problems in the larger countries of eastern Africa. Although there are trends common to the region as a whole, it is important to note considerable variation within the region.

### 9 (a) Burundi

Burundi's situation can be summarized by the term rural, densely populated and land-locked. Ninety-five percent of the population live in rural areas. However, the growth in production in the agriculture sector of 1.6 percent per annum, since 1970, has lagged seriously behind the population growth rate, which nationally averages an estimated 2.2 to 2.7 percent. The lagging agricultural production is mainly due to the high population densities in rural areas (averaging 160 persons/km with a high of 260 persons/km in some areas). As a result, the traditional, largely subsistence agricultural system is not now coping with the increasing pressure on the land.

Malnutrition results and is part of the complex problem of poverty in the rural communities. The perennial food shortages have been greatly aggravated by global and national inflation resulting in soaring food and other commodity prices. These together have further weakened the food purchasing capacity of the Burundian people.

Burundi now has a population estimated at 4.4 million and the population is growing at the rate of 2.7 percent per annum. It is expected to reach 7.8 million by the year 2000. The expectation from this high rate of population increase is that by 2000 there will be more than 1,000,000 people

for whom adequate food supplies will not be available, present trends continuing. To meet that requirement, food production must increase at least by 3.5 percent annually. This figure is far from being achieved in Burundi.

Burundi is equally concerned about deforestation. Although generally a moist environment which supports adequate vegetation and tree cover, the dense population pressures in rural areas have resulted in massive land clearing for agriculture. The combination of land-locked, dense population, and soaring fuel costs have placed heavy pressure on woodfuel sources. However no national quantitative assessment seems to be available.

#### 9 (b) Kenya

Kenya's national trends in population growth, energy shortages, and food deficits, especially in maize and wheat flour, are a growing concern to planners. Recent population growth is soaring at 4 percent per annum; food production is off with varying figures suggesting that \$75 million worth of cereals were imported from South Africa and 400,000 tons requested from the United States government; fuel costs are approaching crisis proportions with more than 25 percent of Kenya's export earnings going to pay for petroleum imports.

An article in the November 22, 1980 issue of The Economist aptly summarized the situation by noting that drought had severely reduced maize production in the Rift Valley that normally grows 62% of Kenya's maize. As a result, only 1.9 million metric tons of maize will be produced -- not enough to feed the nation. Drought is expected to reduce production of other food crops including wheat, barley, rice and livestock.

The cash crop outlook is equally bleak. Coffee harvests are predicted to

be 20% lower than last year with coffee prices on the world market down 40% from last year. Tea is also expected to be lower by 20% from last year's production. Sugar production is bucking the downward trend with yields expected to be up by 25% over last year. Yet the industry is in trouble because bad roads, poor transport capacity in sugar producing areas, and faulty planning have led to sugar cane rotting in the fields. Further, the capacity of sugar factories to process cane is lower in some areas than the amount being produced.

Difficulty prevails in the energy sector as well. Fuel costs are becoming prohibitive. Village energy sources now rely more heavily on wood and charcoal for cooking and heating, thereby placing increased pressure on woodlands and forests. The Gulf war has placed all of Eastern Africa in a vulnerable energy situation although Kenya is not as directly affected as Tanzania and Somalia. Lowered hydropower supply because of both river siltation and reduced rainfall, has led to power rationing in some areas although the situation has improved in recent months.

Food and energy shortfalls might be manageable if the basic balance of trade permitted increased imports. Yet such is not the case. Last year's trade deficit of \$530 million is expected to rise to \$950 million this year. Agricultural exports, for reasons cited above, do not promise huge increases in the near future; increased air fares and other factors have taken the glow off tourism as a source of revenue with tourist income up only 8 percent from last year.

Kenya is a sophisticated society with great potential and with good resources in the agricultural sector. However, the above mentioned problems will require very careful management in food, population, and energy in the decades ahead.

9 (c) Somalia

Somalia is a society dominated by a pastoral economy but with good potential for expansion of irrigation and some prospects for improved rainfed grain production. As many as 200,000 to 250,000 ha. are judged suitable for irrigation. Like Sudan, a significant proportion of the national skilled manpower is working overseas, but unlike Sudan, Somalia has fewer current or potential energy sources. Thus, the loss of personnel which Sudan may be able to offset through potential energy sales is not an option available to Somalia.

Even with these concerns, Somalia's most important food/population interface is the refugee situation, created by the massive influx of homeless from Ethiopia. The refugee movement has increased Somalia's national population by roughly 25 percent and created a new situation in food and energy needs. Any medium or longer term assessment will depend heavily on a judgment of what will happen to the refugees.

Should they remain in Somalia, the already marginal capability of the nation to feed itself, even in good rainfall years, will be compromised for a long time to come. Even if many return to their original means of livelihood, such a return may not happen for several years with a consequent major impact on the food production and consumption system in the area.

Although there are longer run prospects of considerably increased food production from newly irrigated land, ironically, labor shortages and/or labor costs in relation to productivity may provide a significant limitation on the impact on food production. The best prospects for Somalia may include improved efficiency of animal production and improved use of the considerable offshore fish resources.

Without significant energy resources (including woodfuel) and given the

XS-FPE 30

current low levels of land productivity (300 kg. to 500 kg. per ha.), Somalia will continue to have difficulty increasing the level of well being, even among the current population. Significant population growth and/or a long continuation of the refugee problem will make this task all the more difficult.

9 (d) Sudan

The Sudan has been characterized as a potential "bread basket of Africa," is identified as a provider of manpower for the oil rich, Arabic speaking nations, and has good, long run potential for substantial oil and gas production. However, present problems weigh more heavily than future potential. These problems include:

- ...the difficulties of maintaining food production in many areas of traditional cultivation due to drought and environmental deterioration;
- ...poor transportation infrastructure making movement of food crops expensive and inefficient;
- ...management and production difficulties in the irrigated areas both for food and other crops;
- ...difficulties of energy supply to the major cities due to technical maintenance problems and major increases in demand;
- ...a high demand for imported fuel at high cost;
- ...major problems in supply of traditional fuels over most of the northern two-thirds of the country.

In general, the Sudan, one of the largest countries in Africa, does not have the same kind of population problems as most other Eastern African countries. Many are concerned by the twin impact of the export of manpower of all kinds, but most especially skilled manpower and by the influx of large numbers of refugees. The population problem in Sudan is complex and ill defined, but may be the clue to solving the other problems of food and energy.

9 (e) Tanzania

At first assessment, Tanzania could be characterized as a country with an abundance of agricultural land, good energy resources of coal and hydro-power, and low to moderate population densities. A closer look finds a nation with severe energy problems, recurrent food shortages, and regional if not national problems of rapid population expansion.

The "food-problem" is a major domestic issue and self-sufficiency in the basic food crops emerges in government policy pronouncements as a cornerstone of its development strategy. In an extensive critique of his government's food policy to date, Nyerere suggests three primary causes for the food sector's poor performance:

1. the government's failure to adjust price levels for food products,
2. the inefficient transportatin system, and most importantly,
3. a real failure in political leadership and technical understanding at the village level, where the peasant farmer's interests and needs are largely ignored. (The Ujamaa program was not having the desired results on the country's food production capabilities.)

Although this assessment was made three years ago its validity still holds.

With regard to population, the age structure is skewed to the lower age brackets and the situation appears to be getting worse. Two other factors are the highly unbalanced distribution of the population within the country and the variations in the important demographic characteristics which occur from region to region. Population growth is becoming more a major concern for government, especially as it impacts the need for educational and health facilities, but there is no clearly stated national policy on population.

The energy resources most important to everyday living are hydropower, which is the nation's chief source of electricity, and wood, which is the

primary energy resource consumed to meet the basic energy needs at the village level. The country depends crucially on imported oil which plays a very critical role in the country's industrial and transport sectors. A key problem in Tanzania has been the failure of the energy producing sector to grow adequately to meet essential needs over the past decade. Coal is the only solid energy resource which the country possesses in quantity but it is not an important factor in Tanzania's current energy picture. The government has recently undertaken an organized effort to deal with the deforestation problem, but as most of the population use wood or charcoal as their main energy source, it is difficult to implement effective control measures.

Tanzania's picture is far from bleak. However, basic errors in planning and management combine with several factors outside of Tanzania (Gulf War, Zimbabwe fighting, unrest in Uganda, drought, fall in coffee price) have placed the nation in a precarious situation. Tanzania has the skilled manpower, the leadership, and the national will to prevail. Whether these resources can be combined to meet the current need is the challenge now facing the nation.

9 (f) Uganda

Uganda has good hydropower resources, a history of food self-sufficiency and a higher per capita level of good agricultural land than most other Eastern African countries. Yet, the last ten years of disorder and misrule, together with changes in the demographic and ecological balance may have marked a fundamental turning point in the country's history.

The hydropower resources remain to be developed, but the food production and distribution system is in disarray and population growth has drastically reduced the availability of agricultural land.

In summary, the salient factors relating to the food/population/energy issue are:

1. Uganda's population is increasing at about three percent per annum.

The most recent estimates of population for 1980 are between 12 and 13 million, compared with 9.5 million in 1969. This growth rate, while not uncommon in Eastern Africa, worsens the critical food situation.

2. Uganda had a tradition of self-sufficiency in food production and it is unclear what the current situation is. Some sources indicate that there is not a country wide food shortage. Bananas continue to be the staple food but do not provide adequate nutrition. The north, particularly the Karamajo district, has currently a severe malnutrition problem caused by the breakdown in law and order, the destruction in infrastructure, the breakdown of the pastoralist system and drought. Supply of short-term food aid as well as long-term assistance towards rehabilitation in this area is not working. The last ten years have seen Uganda's relatively sophisticated agrarian market economy retreat into subsistence agriculture with serious effects on the main cash crops of the country

eg. coffee production down from 251,000 tons in 1969 to 180,000 tons in 1978/79 and tea production halved. The prevalence of black market 'magendo' makes it impossible to get a truly accurate picture - it is probable that much of the production that used to show in official figures is now in the informal economy.

3. Uganda has tremendous potential for hydropower energy and could be the provider for other countries such as Kenya, given a stable political situation. Uganda also does not have a severe wood fuel problem as 30% of the country is forested. However, the recent increases in the cost of oil together with both the lowering of international coffee prices and Uganda's formal production have led to a severe balance of payments problem. Current estimates indicate that Uganda spends \$12 million on oil imports per month - which is \$2 million dollars less than is earned per month on coffee exports.

For Uganda, then, the key to improving the level of national well being is to resolve the current political uncertainty. As politics become stable, the marketing, transport, distribution, and communication sectors will improve and hopefully regain the sound agricultural footing which prevailed a decade ago. Food, population, and energy situations are all manageable in Uganda, once the governance issue is determined.

## 10. Recommendations

Obviously this is a preliminary analysis. These recommendations are generally oriented towards an improvement of our understanding of the problem rather than as direct remedial measures. However some steps are suggested which might help to deal with the Population, Food, and Energy situation in a direct way. These recommendations are presented at this time as issues for discussion at the February mission directors meeting.

It is possible at this point to recount in sweeping terms the improvements that need to be made in a whole range of food production and support areas with priority on such issues as pricing, marketing, rural infrastructure, agricultural research and food storage, modern inputs, and the like. All of these things can and should go forward but a more focused approach to each of these initiatives is necessary, given the very modest level of resources available. That more focused approach demands a better and more directed information base.

### INFORMATION SYSTEMS

#### Recommendation #1 - FOOD DATA

Every effort should be made to improve our information on food production and consumption in Eastern Africa.

At present there is very imperfect information on all aspects of the food production/consumption systems. The recent USDA study of food systems in sub-Saharan Africa made a significant beginning. Yet much more needs to be done. If governments can be helped in improving and systematizing estimates of food production, processing, and consumption, it should significantly help to identify areas where recent problems have been

concentrated and lead to more effective short and longer term remedial measures.

Summary discussion: In view of the crucial need to have development policy decisions based on information which is 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 UN and FAO.

Food Data - 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, hard-core 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/agricultural adaptations to it. It is doubtful, for example, that

input/output data for pastoralists in northern Sudan will be applicable in northern Tanzania.

More micro-level examinations of all facets of food/agriculture are needed throughout the zone.

Comment from data paper (Volume 2) - 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 more aggregated data at the national and regional level. Almost all micro-studies are 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.

Environmental Information - Eastern Africa has many varied environments and for most countries there is, surprisingly perhaps, a lack of detailed useful information on environmental parameters vital to agriculture. Few good resource surveys or resource data systems are available.

Yet 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 #2 - ENERGY DATA

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 the 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 special-

ized, 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 inter-relationships.

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

#### FOOD POLICIES AND FOOD AID

##### Recommendation #3 - ASSESSMENTS OF FOOD SHORTAGES

There is an urgent need to develop better formal and informal means to assess the location, nature and severity of periodic food shortages.

At present, as food shortages develop, allocations of emergency food supplies are provided on an ad hoc and individual basis. There is not now a systematic set of indicators, either at national or sub-national levels, to measure need for food aid. It is necessary that both recipient and donor countries develop the means of assessing the continually shifting need for emergency assistance while at the same time not eroding local incentives to be self-sufficient in food production.

Summary discussion: 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 #4 - ENCOURAGEMENT OF NATIONAL FOOD POLICIES

Eastern African countries 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 systems more efficient.

Food production has been relatively absent from the national policies of most Eastern African countries with emphasis in agricultural policy being given to export crops. The current discussion on a Kenyan National Food Policy may be a useful model for others to examine.

Summary discussion: National interests 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 sub-regions in which it is consumed.

APPROACHES TO PROJECT DESIGN AND IMPLEMENTATION

## Recommendation #5 - POPULATION CHANGE AND PROJECT DESIGN

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

There is obviously a need for this perspective at the national and regional levels. But as a beginning, it may be possible to start in specific project areas. Here especially, particular development activity needs to be set in the context of the changing relationship of land/people/resources. Current changes in both population and energy costs are so rapid that even within a five year project life term, these parameters have dramatically changed.

Summary Discussion: 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 Ujama 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 group? 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 #6 - PROJECT FOCUS ON FOOD PRODUCTION AND CONSUMPTION

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

There has been a general lack of clearly defined objectives by donors and governments alike in respect to projects aimed at increasing food production. As production objectives become better defined, a more coherent philosophy for reaching these objectives may be possible.

Summary Discussion: 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. Gemmill 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.

There is thus a 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.

Perhaps no single issue is as paramount to improved agricultural development and production as a thorough understanding of the behavior/objectives of smallholder 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.

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 #7 - PROJECT FOCUS ON TRADITIONAL SCHEMES OF PRODUCTION

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

The various studies indicate that, with the exception of certain circumstances, large-scale, mechanized projects and the "trickle-down" technological/capital approaches do not work well among the farmer/pastoralists of Eastern Africa. Traditional production and large-scale production occupy the polar extremes of an organizational technological production continuum. The expectation that farmers can move from one pole to the other in one jump, rather than to move along the continuum incrementally, is naive. Those approaches that tend to work emphasize local involvement -- bottom up approaches geared toward small moves along the continuum.

Summary Discussion: 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 unwise 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.

KEY INFORMATION GAPS

Recommendation #8 - PRIORITY STUDY QUESTIONS

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.

The key information gaps which seem essential to a practical assessment of the population, food and energy problems and a preliminary to selected investment programs by host country and donors alike are:

- ... How do the towns get fed now and in the future?
- ... What are trends in population, food, energy in key food production systems?
- ... Where can new initiatives/systems provide the greatest impact and greatest short term effectiveness?
- ... What is the impact of new levels of energy costs on agriculture and especially food production? How can these impacts be minimized?
- ... Can a systems analysis of food production/processing/marketing alleviate this?
- ... What are the most viable food exchange patterns:
  - a. within countries?
  - b. between countries?
  - c. within and outside the region?

Summary Discussion: 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 systems 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 #9 - HOST COUNTRY INSTITUTIONAL CO-OPERATION

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

Some of the issues involved in such a review are very sensitive. Yet the need is obvious. The right kind of joint approach to the work could relieve some of the sensitivities and enable all parties to gain more effective understanding of the issues.

Summary Discussion: 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 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, 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.

TABLE I

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

<u>Country</u>	<u>Time Span</u>	<u>Population %</u>	<u>Per Caput Production</u>		
			<u>Food</u>	<u>Agriculture</u>	<u>Cereals</u>
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 <sup>1</sup> (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
<b>TOTALS</b>	<b>4,373</b>	<b>17,272</b>	<b>7,412</b>			<b>113,100</b>

<sup>1</sup>Cities 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 <sup>w1</sup>	16 <sup>w</sup>
Ethiopia	11%	27%
Somalia	4	13
Burundi	NA	7
Rwanda	NA	11
Tanzania	NA	22
Uganda	5	4
Sudan	8	26
Kenya	18	24

<sup>1</sup>"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

## ENERGY USE PER ANNUM

FOR

KILOMBERO, TANZANIA

(10<sup>4</sup> 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.

TABLE VIII

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

Country	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
<b>Burundi</b>											
I	---	---	---	---	---	---	---	---	---	---	---
II	.015	.128	.154	.487	.283	.259	.557	1.129	1.061	1.822	2.076
<b>Djibouti</b>											
I	---	---	---	---	---	---	---	---	---	---	---
II	---	---	---	---	---	---	---	---	---	.776	.369
<b>Ethiopia</b>											
I	---	---	---	---	---	---	---	3.6	---	10.	---
II	.250	1.151	.359	.811	.247	7.497	2.335	2.819	4.686	3.832	9.081
<b>Kenya</b>											
I	---	---	---	---	---	---	---	---	---	11.8	---
II	.135	.869	1.156	.878	.431	.468	.968	2.133	1.540	.744	1.274
<b>Rwanda</b>											
I	---	---	---	---	---	---	---	---	---	---	---
II	---	.612	.653	.496	.227	.356	1.633	1.202	1.250	1.596	.996
<b>Somalia</b>											
I	---	---	---	---	---	---	---	---	---	7.5	10.583
II	.076	.26	.117	---	---	---	3.769	1.351	.575	6.334	5.520
<b>Sudan</b>											
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
<b>Tanzania</b>											
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 480I = Title I, PL 480 (sales)  
II = Title II, PL 480 (gifts and grants)