Food Production Systems and Environmental Rehabilitation in Somalia

CONTRIBUTIONS TO A DISCUSSION SEMINAR
JUNE 3-4, 1981

Somali Research Group
Arlington, Virginia

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Sponsored by
Somali Research Group
Arlington, Virginia

With support from

Board on Science and Technology for International Development
Office of International Affairs
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Somali Research Group
Arlington, Virginia

NOTICE: This seminar was sponsored by the Somali Research Group, an organization composed of Somali students and scholars in the United States concerned with development issues relevant to Somalia and the Horn of Africa. It was organized and hosted by the Board on Science and Technology for International Development, Office of International Affairs, National Research Council. The proceedings have been prepared by the Board for the Bureau for Science and Technology, U.S. Agency for International Development, under Grant No. DAN-5538-G-SS-1023-00. The views expressed are those of the seminar participants and not necessarily those of the Board on Science and Technology for International Development.

While these proceedings were being prepared, we learned of the untimely death of Dr. Frederik Bang. His knowledge of the medical and ecological aspects of famine and his profound concern for its tragic human consequences will be greatly missed.

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SUMMARY

The seminar was organized jointly by the Board on Science and Technology for International Development (BOSTID) and the Somali Research Group, following discussions among the organizers and officials of the U.S. Agency for International Development (AID), the Embassy of Somalia, and other organizations. The discussions concerned the urgency of reviewing the potential of technology combined with an understanding of the ecological and socioeconomic factors contributing to environmental degradation, in order to arrest this degradation and to increase the stability and productivity of Somali agro-sylvo-pastoral systems.

During the seminar, the ecology of famine in Somalia, the health implications of famine, and the traditional agricultural and pastoral base of food production were reviewed. Since the enormous refugee population has placed a tremendous strain on Somalia's ability to support its population, and because the refugees' traditional grazing lands are now closed, the role of the refugees was emphasized. A speedy resolution of the conflict in the Ogaden was recognized to be of paramount importance. However, it was felt that planning for increased food production would have to assume that repatriation of the refugees would be a long-term process and that problems of food production and environmental degradation would continue unless a concerted effort was made to reverse existing trends.

Somalia's problems of environmental degradation have been exacerbated, not created, by the refugees. Two important observations made were 1) that the refugees, when provided the opportunity, have shown great adaptability and ingenuity in organizing productive systems, and 2) that the past history of introducing technology-based

development activities, for instance, tube-wells and livestock production schemes for export, indicates that such activities have generally contributed to subsequent environmental problems. It was recognized that methods of environmental rehabilitation and food production are limited, and that research is needed to determine how available resources could best be used. Because the resources are bound together in an ecological context, it was agreed that methods should be found by which these diverse elements could support each other.

The ecological processes involved (by extrapolating from experience in similar ecological zones elsewhere in Africa) and the social context in which additional technical resources might be made available to rural people and refugees in Somalia were taken into account. The seminar considered a range of suggestions for technologies applicable to increasing food production, restoring the environment, and defining those research and information needs for rural areas and around which increased external support could be organized. These included:

- Collection (within and outside the country) and distribution of a wide range of seeds and seedlings of tree, grass, and food-crop species to support revegetation. Objectives would cover: erosion control; windbreaks and living fences for livestock and fodder; wood for fuel and construction materials; increased moisture retention; and production of food from drought-resistant species.

- Assistance in rationalizing the numbers and types of livestock in relation to grazing and browse resources.

- Management of water resources.

- Research on oral history and traditions before it is lost through social dislocation.

The seminar finally concluded that there is a potential role to be played by the U.S. intellectual community and Somali students and scholars in the United States in identifying ways of assisting the Government of Somalia and national and international assistance agencies, such as AID, in finding solutions to the pressing problems of food production and environmental degradation. It was agreed that the organizers should contact AID and the Somali Government to pursue this end.

THE SEMINAR

The seminar opened with an address by the Ambassador of Somalia to the United States, His Excellency Mohamoud Haji Nur. The Ambassador expressed his deep concern over the plight of the refugees in Somalia, a situation which he described as his country's major problem. Ambassador Nur said that efforts toward environmental rehabilitation are worthless if the refugee situation continues as it has. He voiced the need to apply innovative and established technologies to minimize or reverse environmental degradation, urged the seminar participants to couple their suggestions with plans for their implementation, and asserted the willingness of the Somali Embassy to work with the seminar participants in the necessary follow-up activities.

The seminar presentations were led by Dwain Parrack, of Johns Hopkins University, who examined the ecological background of famine and reviewed the major environmental, biological, and social factors such as droughts, floods, plagues, blights, wars, and poor agricultural and economic development planning. Components of ecological systems were described in terms of species groups and carrying capacity. It was noted that the carrying capacity of the ecological community comprising most of Somalia is low because of the environmental severity of the area, the recurrence of droughts and sometimes floods, and the demands imposed by the influx of refugees. The features of subsistence farming were emphasized because of their applicability to the food systems of nomads. Both subsistence farmers and nomads have little surplus food and, in consequence, have few reserves to draw upon when food becomes scarce. Thus, factors negatively affecting productivity, crop plants, food prices, and carrying capacity can produce famine very quickly.

Frederik Bang, also of Johns Hopkins University, continued the presentations by considering health problems in relation to Somalia. He examined diseases that have occurred in the refugee camps and those that might occur in the camps or elsewhere because of food shortages and the refugee situation. Nutrition, infection, and immunity were discussed in this context. Dr. Bang emphasized the importance of anticipatory research to avoid emergency situations or to facilitate dealing with them. Specifically, he said that "epidemic disease in Africa is wasteful of energy, is a problem in ecology, and needs to be studied by medical ecologists" and that "a few percentage points of the amount we spend on 'treating' famines must be allocated to studying them, in all phases, so that eventually we can prevent them."

Robert Bement's presentation concerned biological response curves for balancing livestock with vegetation. He stressed the importance, particularly in the Sahel where the opportunity for plant growth is restricted, of allowing enough leaf material ungrazed to permit the

most rapid growth possible when moisture is available. Dr. Bement explained how this calculation is made through curves showing livestock-vegetation relationships. Use of these curves, he said, has eliminated the need for long-term grazing trials.

Lee Cassanelli, of the University of Pennsylvania, spoke on traditional pastoral coping strategies that Somali nomads have used over the last 60 years. These strategies, which include dispersal and sale of herds, dispatch of dependents to refuge areas, and temporary employment outside the pastoral sector, have helped alleviate some of the consequences of the recent drought and political problems. Dr. Cassanelli then looked at possibilities for future development strategies.

An analysis of the refugee crisis was made by Husain Bulhan, Daniel Connell, and Ahmed Said Farah. The political conflict and the living conditions of the refugees, both within and outside the refugee camps, were examined and recommendations for short-term remedies and long-term development were made.

OVERVIEW

Ahmed H. Esa

For the Somali people the past decade was one of crisis. The drought of 1974-75, a serious drought between 1978 and 1980, and the massive influx of refugees from the "Ogaden" have created a potential famine situation in all parts of the country. Essential food items and most other commodities are in very short supply and are so prohibitively expensive that the great majority of the population cannot obtain them. The present circumstances are such that slight disturbances (anthropogenic or meteorologic) could create serious famine even outside the refugee camps.

Drought-associated famines are not new to the Horn of Africa. I.M. Boothman has documented at least eight famines and droughts of various magnitudes in northern Somalia alone between 1918 and 1960. These are summarized chronologically in Table 1. Frequent droughts seem to be associated with pastoralism. An estimated 60-70 percent of the Somali people are active pastoralists, and the economy of the whole country is dependent on the pastoral sector. The pastoral ecosystem as exploited in the semiarid Horn is both simple and fragile. Rainfall, the major limiting factor, is unreliable, variable from year to year, and spotty. The pastoralist's sole means of production is his livestock. His perceived need is to maximize his herd size during favorable seasons both as convertible wealth and as a security factor. Unfortunately, during drought, large herds are difficult to manage, use available resources quickly, and cause extensive environmental damage that impairs the regenerative capacity of vegetation.

In addition to the inherent shortcomings noted above, extraneous variables have been imposed on the Somali pastoral ecosystem. Traditionally, Somali pastoralism has been a subsistence occupation. Recently, however, pastoral production was transformed into a profitable commercial sector. Livestock is now produced for the subsistence of the pastoralist, for consumption within the country, and as an export commodity. Indeed, Somalia obtains 58 percent of its foreign currency earnings from the export of live animals. Table 2 compares numbers of animals exported from northern Somalia between 1919 and 1959, and from Somalia as a whole between 1950 and 1975. The increase in livestock exported undoubtedly reflects an actual increase in the absolute number of animals, although it is difficult to surmise from the data what the actual increases were.

As mentioned earlier, rainfall in most of the Horn is variable and spotty. Even in good seasons some regions may not receive adequate rainfall. This necessitates the constant movement of the pastoralist. This movement within traditional nomadic zones has been curtailed by the colonial partition of Africa and by the development of the modern states. The pastoralist is confronted with international treaties that place portions of his traditional rangelands out of reach. The result is a concentration of large numbers of people and animals in small areas during both the dry and rainy seasons.

It is difficult to discern the impact of any of these variables on the Somali pastoral ecosystem. Two facts, however, emerge clearly:

1. Ecologically, the rangelands are badly degraded. K. Curry-Lindahl, who visited Somalia in 1972, wrote: "Somalia is badly devastated and on the verge of disaster. . . . Enormous areas have become deserts or semi-deserts in less than a century."

2. There have been frequent famines and hardships in Somalia. The 1974-75 drought was exceptionally harsh, and events since 1977 may produce a situation that is even more severe.

What is to be done? It was the purpose of the seminar to explore whether innovative technology can be used to reverse environmental degradation and increase food production. Can the acacia woodlands be restocked? Can the establishment of firewood crops reduce the stress on the environment? Can the felling of trees for human shelter be lessened by the introduction of other forms of shelter? Is it possible to increase the yield of farmlands by the use of fast-growing, drought-resistant species? One of the difficulties in formulating plans to deal with these problems is a lack of data. Most of the census data (human and animal) is unreliable. The pastoralist's

TABLE 1 Droughts in Northern Somalia, 1918-1960

1918	Drought-induced shortage of food; 1,210 people in relief camps in Berbera alone
1924	Severe drought
1927-1928	Famine; 80 percent of livestock lost; 4,000 at Bulahar camp
1928	Locust plague
by 1929	Camp population peaked at 15,288
1933-1934	Drought; camps operated in Erigavo (3,000) and Berbera (6,000)
1945?-1947	Famine
1950-1951	Famine similar in magnitude to the 1927-1928 famine
1956-1957	Drought in Borama/Zeila area; camp opened at Abduloqadir
1959	Failure of winter rains in Hargeisa region

Source: I.M. Boothman

TABLE 2 Exports of Live Animals from Northern Somalia, 1919 and 1959, and from Somalia as a Whole, 1950 and 1975

	NORTHERN SOMALIA	
	1919	1959
Sheep and goats	61,483	440,054
Cattle	1.675	5,629
Camels	18 (1927)	3,613

	SOMALIA AS A WHOLE	
	1950	1975
Sheep and goats	120,875	1,536,361
Cattle	2,651	38,883
Camels	174	34,223

Source: J. Swift

constant migration and his reluctance to reveal the extent of his livestock holdings are difficult to circumvent. It is necessary, therefore, to devise innovative census-taking methods. It was our intention to open independent discussion on these points in the hope that solutions to some of the problems will eventually be realized.

Two salient features of the seminar should be brought up now. First, Somalia at present is the home of 1.3 million refugees. It would have been unrealistic and shortsighted not to discuss the refugee crisis. It was necessary to examine the problems of the refugees and discuss possibilities for short-term relief aid and long-range prospects. Second, droughts, famines, and the refugee situation necessitate aggregation of large numbers of people. The sanitary conditions and nutritive status of these people create a situation fertile for the propagation of disease. It is, therefore, imperative that we know the types of diseases likely to occur. (See Dr. Bang's presentation.)

In conclusion, the Somali Research Group would like to thank the participants who brought to the seminar valuable and varied expertise, and particularly Dr. Bang, Dr. Parrack, and Dr. Bulhan for chairing the different sessions and providing excellent presentations. Last, but certainly not least, the Somali Research Group gratefully acknowledges the help of the National Academy of Sciences' Board on Science and Technology for International Development in organizing and hosting the seminar.

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APPENDIX A

AGENDA

JUNE 4, 1981

9:00 a.m. Welcome	Michael G. C. McDonald Dow Deputy Director, BOSTID
	Ambassador Mohamoud Haji Nur Somalia
9:30 a.m.	ECOLOGY OF FAMINE
	Ahmed Esa (Introduction to Seminar The Somali Research Group
	Dwain Parrack Johns Hopkins University
	Frederik Bang (Chairman) Johns Hopkins University
10:45 a.m.	Coffee Break
	Lee Cassanelli University of Pennsylvania

11:30 a.m.	Discussion
12:30 p.m.	Lunch
1:30 p.m.	THE REFUGEE CRISIS
	Hussein Bulhan (Chairman) Boston University
	Daniel Connell Free-lance journalist
2:45 p.m.	Coffee Break
3:00 p.m.	Film: Somalia: The Silent Tragedy
	Ahmed Farah Oxfam-America
4:50 p.m.	Discussion
5:00 p.m.	Adjournment

JUNE 5, 1981

9:00 a.m.	Workshop: Management of Natural Resources and Innovative Approaches to Food Production
	Dwain Parrack (Chairman)
	Robert Bement (Principal Discussant)
10:30 a.m.	Coffee Break
10:45 a.m.	Discussion
12:00 p.m.	Lunch
1:00 p.m.	Concluding Session: Identification of Priorities and Recommendations for National and International Action
	Dwain Parrack (Chairman)
4:30 p.m.	Adjournment

APPENDIX B

REMARKS, His Excellency Mohamoud Haji Nur,
Ambassador of Somalia

Thank you, Dr. Dow. I would like to extend my thanks to the National Academy of Sciences and the Somali Research Group for this timely conference and for inviting me here.

I am sure the participants in this conference are aware of the major problem facing Somalia today. We are confronted with the world's largest refugee population of one-and-a-half million people in a young nation of less than five million. The reasons for the influx of the refugees are well known and need not be explained.

Suffice to say that the one thing these people strive for (and the source of all their misery) is the one thing every human being is supposed to have in the world--the right to self-determination. They are running from all the problems of oppression and negligence associated with the rule of an alien power.

The world may be aware of the plight of the refugees in the Horn of Africa momentarily--as pictures of marasmic children flash across television screens. To us the problem is of such magnitude that it overshadows all others. There is an old and well-known Somali proverb that says that to untangle a heap of fallen branches one must start at the top. Development programs, whether in agriculture, industry, or environmental rehabilitation, will be worthless if the refugee situation continues as it has.

With all good will of the international community, we believe that it is neither desirable nor feasible to keep these refugees in camps indefinitely. They should go back to their homes. The root cause of this worsening crisis needs to be studied and a just and lasting solution acceptable to all peoples involved has to be found.

There is no doubt that this conference will discuss many issues important to our development. Sixty to seventy percent of our population are pastoral nomads whose existence depends on a stable environment. Thus, we need to apply both innovative and established technologies to minimize or reverse environmental degradation.

It is for this reason that I think this conference is very appropriate. I am sure that the participants will make constructive suggestions. That is, however, only the first part of the task. I urge you to couple your suggestions with plans for their implementation. Follow-up activities are necessary, and the Somali Embassy is ready and willing to work with you.

APPENDIX C-1

BACKGROUND AND OBJECTIVES
Ahmed N. Abdi

The Somali Democratic Republic lies in the extreme northeastern corner of the Horn of Africa. In the east and northeast, it stretches for 1,600 miles along the Gulf of Aden and the Indian Ocean. (1) On the west and southwest, it is bordered by Ethiopia and Kenya, respectively. To the northwest lies the Republic of Djibouti. (2)

There are four climatic zones, each containing minor variations. In the southeastern coastal zone, there is high humidity and relatively high rainfall, which maintain good vegetative growth. In the northern mountain zone of the Hargiesa region, there is also relatively high precipitation and low monthly winter and summer temperatures, which significantly reduce potential evapotranspiration. This climatic zone extends to the de facto border with Ethiopia and to the northern and eastern regions. With proper land management there is good potential for some limited cropping and livestock grazing. (3) The remaining climatic zones experience relatively high temperatures, low humidity, and often unusually high evapotranspiration, resulting in low vegetative growth.

It is our understanding that fundamental principles of conservation and harmony between man's resource requirements and available resources depend on basic conservation principles, the most important of which are:

- the sense of individual responsibility;
- the role of government;

- inventories and projections of resource use; and
- the recognition of the basic principle of interlocking resource relationships, which states that man cannot degrade one part of his environment without simultaneously affecting other parts of the environment.

George Perkins Marsh, over one hundred years ago, observed that abused agricultural lands in Europe and Asia ultimately resulted in the deterioration of national economies and well-being. (4)

There is also an intimate relationship between soil, water, plants, and animals. Therefore, it is impossible to separate the conservation of one from the conservation of the others. (5) For example, it had been observed that the removal of a block of Douglas fir had a severe effect on surrounding resources such as wildlife, fish, soil, water, rangeland, and even the atmosphere and climate. (6)

The history of land abuse is ancient. The early civilizations of Asia, Africa, and Mediterranean Europe pioneered not only in such fields as science and agricultural engineering, but also in the degradation of their environments. The soils in these regions once supported flourishing agricultural economies, where villages grew into powerful and prosperous cities and empires. However, an appalling misuse of land led to production decline, starvation, and the subsequent fall of powerful empires. For example, Mesopotamia, which had contributed substantially to the advancement of civilization, fell because of environmental degradation resulting from deforestation and heavy grazing pressures exerted by large flocks of sheep, goats, and cattle in the Armenian uplands, the source of the Tigris and Euphrates.

Land use problems are not confined to developing countries nor are they associated only with ancient civilizations. In the United States, it is common knowledge that prolonged land abuse--continuous cultivation and the absence of sound soil conservation principles--brought about the infamous Dust Bowl of the 1930s in the American plains. (6) Similar processes are still occurring in the southwestern United States; for example, in the Rio Puerco basin in New Mexico. (7) In recent years, the world has witnessed devastating environmental changes, accompanied by a virtual collapse of ecosystems across Africa. The Sahelian drought, which affected a large portion of Africa, might well have been triggered by human impact on the land.

Clearly, climatic fluctuations and declining rainfall are not the sole cause of degradation. Available records of rainfall in the Middle East indicate that rainfall has remained relatively constant over the past 5,000 years, and similar records in North Africa show that rainfall there has not tapered off for the last 100 years. (8) What matters most is the nature of the rain and the condition of the land

receiving the rain, not the amount of rainfall. In other words, rain falling on barren, compacted, and/or sparsely vegetated ground is more likely to run off the surface than to soak into the soil. As the soil loses organic matter and structure, its capacity to retain moisture is also lost. All ecosystems have a threshold--a breaking point--beyond which recovery is difficult, if not impossible. Regardless of whether the enviroment in question is semi-arid, grassland, or forest, the underlying principle is that "production should not exceed the capacity to renew or replace." (5)

Complications increase as the amount of land available for grazing shrinks and the number of grazing animals swells; a snowball effect occurs, which begins with overgrazing and wind erosion, and ultimately leads to desertification. It has been reported that in a central Sudan province the biotic communities of grasses and shrubs have been undergoing intensive and rapid changes owing to an increase in livestock (sixfold) since 1957. (8) The report states further that the quality and quantity of rangeland vegetation have declined as the more palatable and productive species are replaced by less desirable species. Similar changes have occurred elsewhere. For example, in the North American Chihuahuan Desert, animal populations have diminished greatly, perennial grasses have declined, and invader species, such as tamarisk and Russian thistle, have multiplied.

In Somalia the traditional cropping cycle is breaking down, resulting in a decline in productivity and loss of cultivated lands. The human population has been growing rapidly, without appreciable change in agricultural technologies. This is a common problem in the Middle East and many parts of the developing world.

The indiscriminate application of agricultural technologies and practices, originally designed for temperate humid soils, is also taking a toll on soils of the semiarid regions. For instance, tillage, which is a common farming practice for humid soils, is used 1) to aid in the removal of excess water and weeds that shade the soil, 2) to increase soil temperature, and 3) to decrease plant competition for nutrients. While tillage practices, when carefully applied to appropriate land, are an acceptable and useful technique, their application to fragile environments, such as those in the Middle East and North Africa, is likely to cause irreversible harm to the land. It is commonly believed that unnecessary tillage wastes soil moisture. On a clear day, soil temperatures can increase by as much as 4 degrees a few hours after the soil is broken. Field studies show that compaction caused by tractors significantly reduces water infiltration into the soil. The decrease in infiltration capacity also decreases underground exchange and increases flooding after a torrential rainfall. (5) Tillage also affects important soil conditions such as soil temperature, soil moisture, bulk density, and porosity.

CURRENT STATUS OF FARMING

In Somalia, traditional nomadic movements closely followed seasonal rhythms of climate and plant life. Animals often found enough forage in the new areas. Although many traditional nomadic practices may no longer be viable, adoption of some modernized version of the nomadic way of life may be considered. There is evidence that the cultivation of Somali lands has resulted in the exploitation of marginal lands that are unable to stand continuous cultivation. The result has been a decline in soil productivity and an increase in soil erosion and nutrient loss and, above all, in a loss of badly needed grazing areas. (8)

It is unfortunate that national boundaries now artificially divide natural ecological zones and restrict the traditional movements of nomadic groups in many parts of the world. (8) The Somali situation is a good example. The "reserve" area is the grassland that straddles the de facto border between Somalia and Ethiopia. This region is known as the Ogaden. Nomads would move across this region as the seasons changed, allowing time for rejuvenation of the plant communities on either side of the border, thus ensuring a continuous supply of grass for their herds. This reserve area was set aside for this purpose by Britain during its involvement in the division of the Somali land. To the nomads, the land was always theirs because no national or natural boundaries existed. When Ethiopia enforced its current national boundaries, the natural ecological systems were disrupted because the Ethiopians limited nomadic movement and grazing to one side of the border. This created an ecological imbalance.

It is believed that Somalia once had a rich flora and fauna. However, as in many other parts of the world, continuous pressure from the expansion of human and livestock populations has significantly reduced natural resources. Grasslands, which under normal circumstances provide forage and soil stabilization, have been pushed far beyond their carrying capacity. (3) Because of overgrazing and the absence of soil and water conservation practices, some areas may have been devastated beyond recovery.

POSSIBLE LAND MANAGEMENT ALTERNATIVES

The total area of rain-fed farms in Somalia is estimated at 4,200 square kilometers. However, soils suitable for irrigation along the Shebelle and Juba Rivers is estimated at 52,520 square kilometers. Only one-half of this land is currently under cultivation. (3) If and when cultivation expands to this undeveloped land, the existing vast stretches of vegetation along these relatively fertile alluvial soils

could be cleared. This process would have a substantial impact on the soil and on plant and animal communities. Therefore, any future development plans for this area should require caution and the experience of qualified land use planners.

Since more than 75 percent of the Somali people are still pastoral nomads who migrate in search of grass and water for their herds, those Somalis trained in range management should advise the herdsmen--with the help of local leaders--and enforce measures where needed to ensure that land use is kept to its appropriate carrying capacity. (9) The education of the public in this matter must precede any enforcement efforts.

Improved seeds with short life spans should be tried where rainfall would allow cultivation. Cultivation of leguminous plants, which are known to be nutritionally rich and which grow well in the tropics, must be introduced. These plants are known to significantly increase the nitrogen content of the soil. (9)

Improvement in tillage methods to save energy and reduce erosion is important. It has been suggested that agronomists should know enough meteorology and climatology to communicate with specialists in these fields to handle the problems of food production under the constraints of the local climates. (10)

As a result of a three-year study by hundreds of international scientists on the state of the world's environments and resources, a world conservation committee concluded that "peoples of developing countries are. . .compelled to destroy the resources necessary to free themselves from starvation and poverty." The committee set out three broad objectives:

1. "to maintain essential ecological processes and life-support systems (such as soil regeneration and protection, the recycling of nutrients, and the cleansing of waters), on which human survival and development depend;

2. "to preserve genetic diversity (the range of genetic material found in the world's organisms), on which depend the functioning of many of the above processes and life-support systems, the breeding programmes necessary for the protection and improvement of cultivated plants, domesticated animals, and microorganisms, as well as much scientific and medical advance, technical innovation, and the security of the many industries that use living resources; and

3. "to ensure the sustainable utilization of species and ecosystems (notably fish and other wildlife, forests, and grazing lands), which support millions of rural communities as well as major industries." (11)

The committee also listed the following as priority requirements for meeting the principal goals:

- Reserve good cropland for crops
- Manage cropland using ecologically sound methods
- Manage watershed forests and pasture to protect the watershed
- Manage coastal wetlands and shallows to maintain the processes that support fisheries
- Manage land and water uses to prevent extinction of species
- Preserve as many varieties of crop and forage plants, timber trees, livestock, and undomesticated species as possible
- Determine the productive capacity of exploited species and ecosystems and maintain yields at sustainable levels
- Regulate stocking of grazing land
- Allocate timber concessions prudently and manage them using environmentally sound methods. (11)

To ensure that the right lands and soils are used for the right purposes, extensive land capability evaluations and soil classifications must be undertaken in Somalia. Meteorological, climatic, and other important data should be collected at local and regional levels. It has been reported that a substantial amount of data, dating from the beginning of the colonial period, exists but is widely dispersed. This information is vital and must be collected and maintained by agencies, colleges, and universities for further analysis by trained specialists. There is a dire need for continuous and accurate data collection for the elaboration and implementation of sustainable programs in resource development.

Additional information must be collected concerning the status and trends of the existing local and regional vegetation, surface and underground water resources, population density, distribution of plants, and human and animal diseases. Where nature has provided little or no suitable soil and water for agriculture in the traditional sense, we must be extremely careful to maintain that gift of God--our natural environment.

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APPENDIX C-2

THE ECOLOGICAL BACKGROUND OF FAMINE

Dwain Parrack

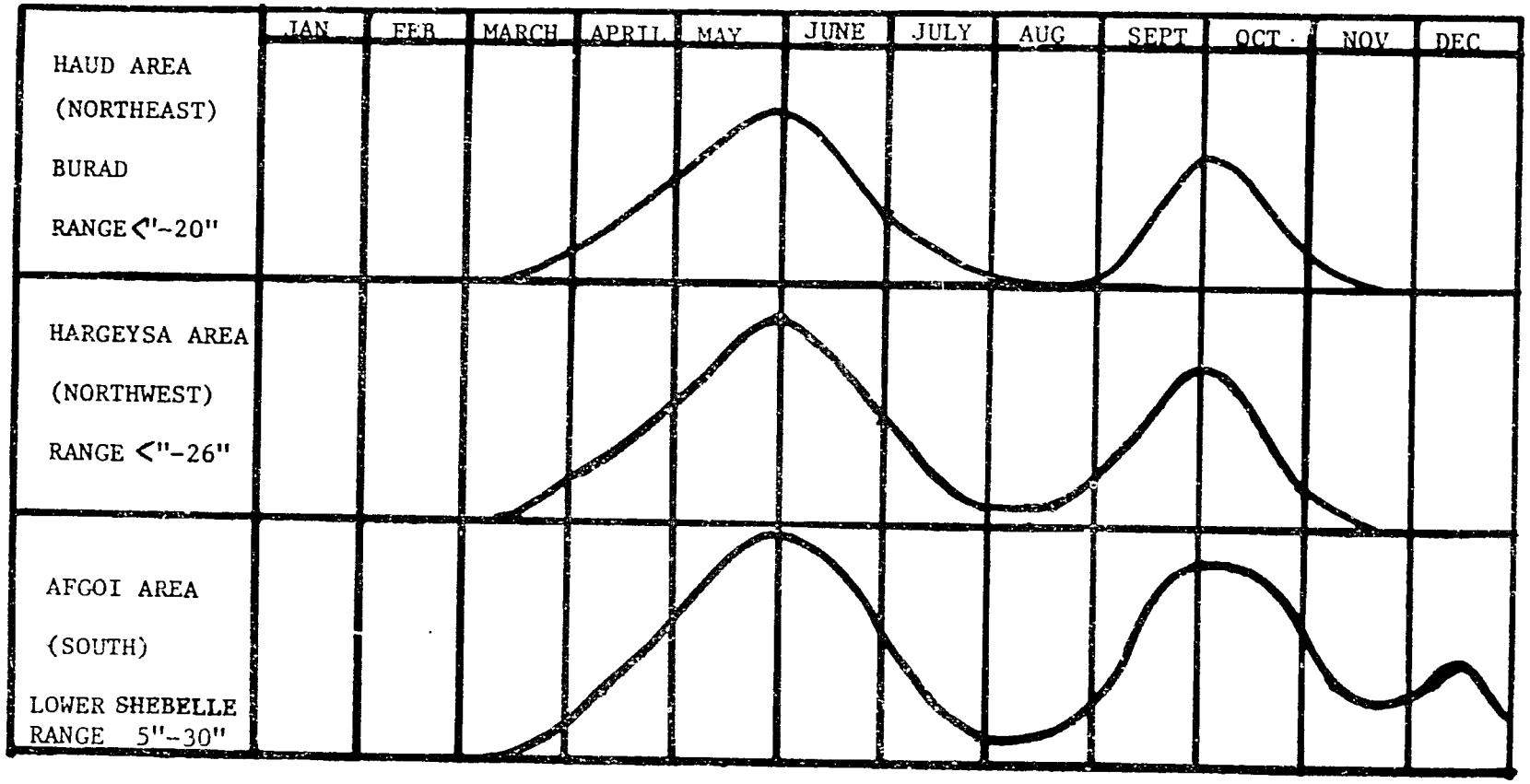
(The writer wishes to thank Messrs. Mohamed Mirreh and Mohamud Osman for the information contained in Tables 1 and 2.)

Famine is difficult to define. At best, our definitions are vague and tend to describe rather than to define, and they tend to confuse causes with effects. Imprecise as they may be, each definition has the virtue of emphasizing certain points, as shown in the following two definitions:

(1) Famine is a serious shortage of food affecting a population (or a part of a population) in a geographical area. This emphasizes two worthwhile points: that famine may affect only parts of a population and, the more obvious fact, that a famine occurs in a geographical area, thereby directing our attention to geographical factors. There is no strong line separating geography from ecology, and that brings us to the second definition, a more ecological one.

(2) A famine is a sudden decrease in the carrying capacity of an area. The chief value of this definition is that by using the ecologist's term carrying capacity it puts famine in an

TABLE 1 Somali Rainfall Patterns



Season	Jillal--dry	Gu--wet	Haga (Xagaa)--dry	Dair (Dayr, Deyr)--wet
	Northeast monsoon; hot, dry; very stressful; livestock die; humans in danger.	Major rains; lull between monsoons; hottest season in south; cool in north.	Southwest monsoon; pleasant in south; very hot in north.	Lull between monsoons; hot, humid; about 30% rain.

TABLE 2 The Somali Agricultural Year

MONTH	BORAMA AREA (NORTH) FARM WORK	BORAMA AREA (NORTH) RAINFALL	SHEBELLE AREA (SOUTH) FARM WORK	SHEBELLE AREA (SOUTH) RAINFALL
JAN	NONE		NONE	
FEB	NONE		NONE	
MARCH	TILLAGE, LAND PREPARATION, AND SOWING		TILLAGE, LAND PREPARATION, AND SOWING	
APRIL	WEEDING		WEEDING	
MAY	BIRD AND RODENT CONTROL		BIRD AND RODENT CONTROL	
JUNE	BIRD AND RODENT CONTROL		HARVESTING	
JULY	UNDEREMPLOYED		NONE	
AUG	UNDEREMPLOYED			
SEPT				
OCT				
NOV				
DEC			NONE	

CYCLE REPEATS

ecological context. The purpose of this talk is to do just that, to examine famine in terms of the environment and changes in the environment, or to build a theoretical framework which may serve as a background for some of the following talks.

I will give a quick review of some ecological concepts and try to relate them to famine in the hope that some of the features of subsistence farming, which I will discuss later, can be applied to the food systems of sedentary farmers and the nomads who make up most of the population of Somalia.

From the thousands of famines, large and small, that have affected man, certain generalities emerge: (1) famines are almost always the result of several causes rather than a single cause, and (2) famines do not affect all of the people in the stricken area equally. We will examine both of these generalities.

Major causes of famine. Figure 1 gives a broad, overall view of the causation of famine, emphasizing that sets of precipitating factors (most of which can be lumped under the headings ecological, social, or economic) act upon a set of pre-famine conditions (ecological, physiological, social, and economic). The result is a set of famine conditions and, later, post famine conditions which can, again, be examined from the standpoints of their ecological, physiological, psychological, social, and economic factors.

We can say that the pre-famine conditions of famine-prone areas are generally bad; that is, even in "good times" there is little

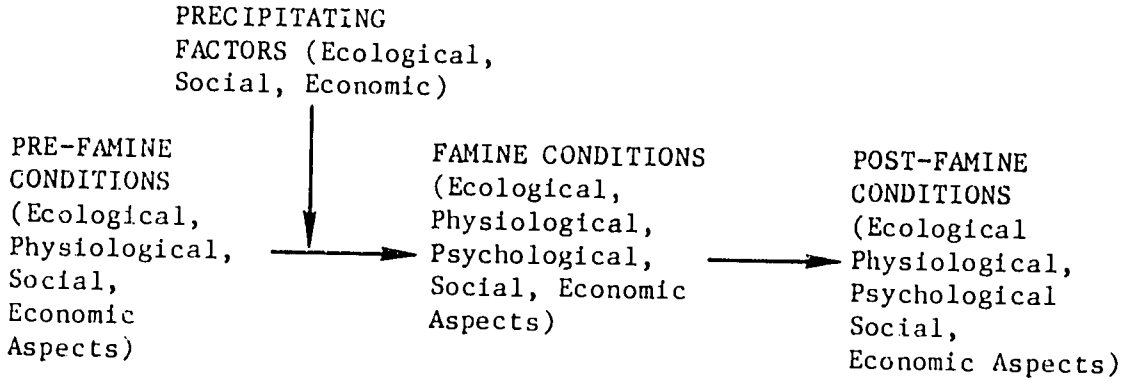


FIGURE 1 Factors involved in famines. Famines are usually the result of combinations of factors and they, in turn, produce myriad effects, some of which last for many years.

reserve in the form of food, body fat, money, or credit to buffer the ill effects of the precipitating factors when they do occur.

Weather is the main ecological cause among the precipitating factors, and of droughts and floods, droughts are the most important. The time of occurrence of a drought is important in determining the severity of the drought. If, for instance, the summer rains, needed for planting of crops, as in monsoon Asia, are delayed for a few weeks, the results can be serious. Droughts are usually difficult to delineate geographically with any degree of sharpness. In contrast to floods, droughts often affect very large areas, as in the Sahel drought, and they are insidious in their development.

Drought results from a reduction in the normal amount of rain. The Sahel drought, which began in the late sixties and lasted well into the seventies and which affected an immense area across Africa from the Cape Verde islands in the west to Somalia in the east, was apparently only one of a cycle of droughts in the Sahel (Figure 2). The lack of rain in the area was due to changes in the flow of air in the northern hemisphere, causing the suppression of monsoonal rains in a large area of Africa and a part of India (Figure 3). This drought and the ensuing famine resulted in the suffering and death of very large numbers of people and livestock, although the reports at the time were probably exaggerated and was made even worse by social factors, such as inefficiency in relief programs and human greed.

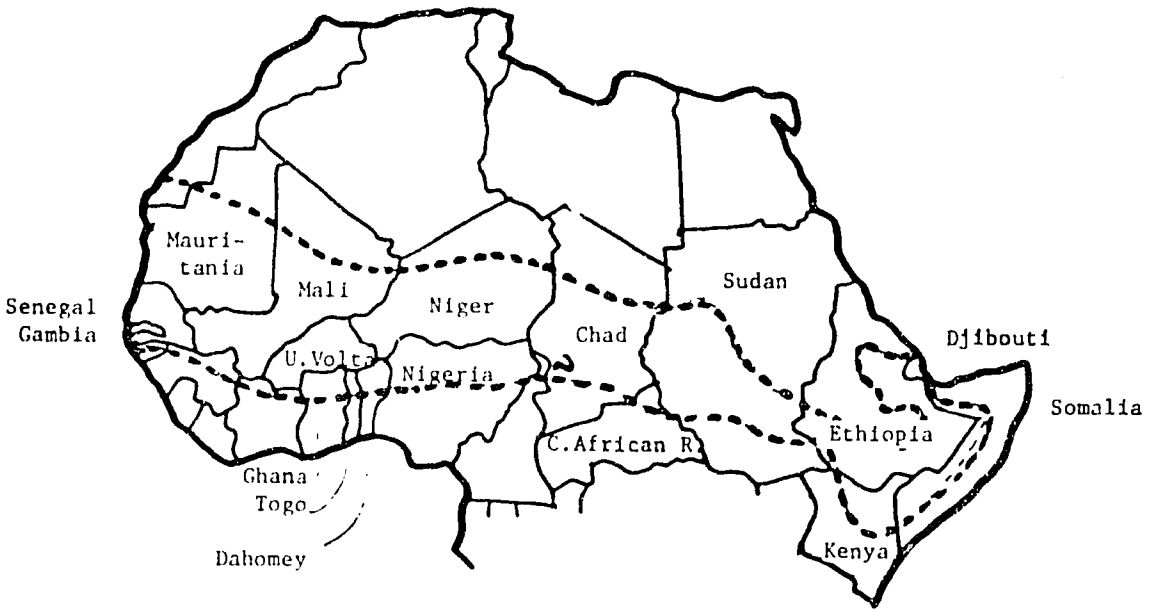


FIGURE 2 Area affected by the Sahel drought in 1974.

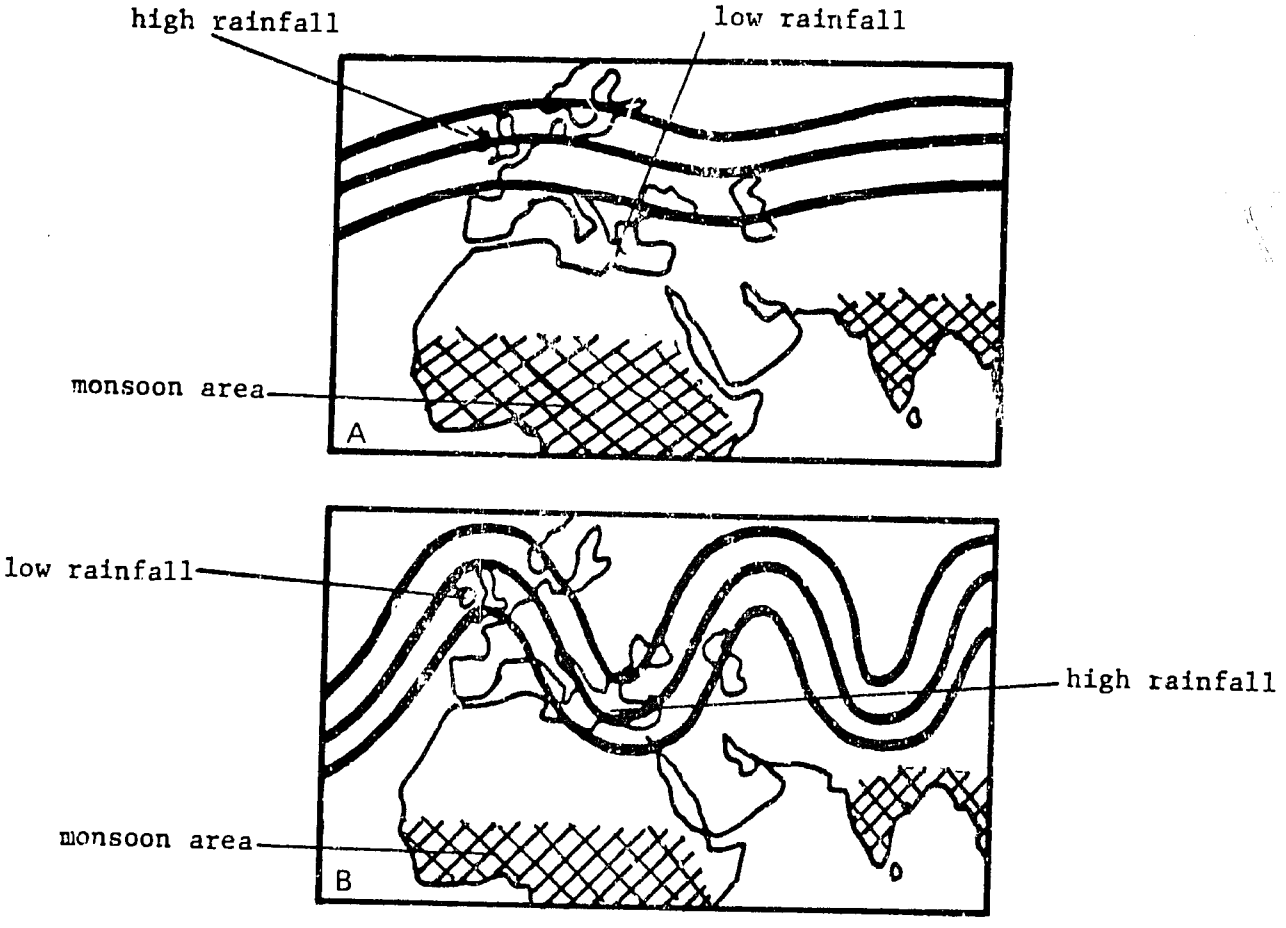


FIGURE 3 Variation in circulation patterns and associated rainfall patterns. (A) High rainfall in northern Europe, low in Mediterranean. (B) Low rainfall in England, high in Mediterranean. Note that the monsoon region (crosshatched) has retreated to the south in B. (Modified from Winstanley, 1973).

Floods. Unlike droughts, which rarely, if ever, have dramatic beginnings, floods usually begin in a spectacular fashion. The currents of river floods, such as those of the Yangtze and the Brahmaputra, are often very destructive, washing away the crops in the fields and the very fields themselves, as well as livestock and humans,

villages and cities. Rain floods, in flatlands such as the Ganges delta, produce little in the way of destructive currents but can delay the planting of crops, due to water logging of the soil, or interfere with the normal growth of crops.

It is ironic that destructive floods are apt to occur during periods of drought. This is because droughts kill off many plants, thus reducing the groundcover and increasing the speed of water flow. The unhindered flow of water, in turn, produces more erosion, thereby reducing the productive capacity of the area.

There are other meteorological precipitating factors of famine such as frost, as in northern Europe, and lack of a protective layer of snow necessary for winter wheat, such as in the USSR in 1973. Cold weather can kill crops outright or can slow their growth so that they do not reach full development during the growing season.

A second major class of ecological precipitating factors are those under the heading of biological, which includes plagues and blights. Plagues are population explosions of crop pests, and the most widely known of these are the locust plagues of Africa and western Asia. Less well known are plagues of their North American cousins, the grasshoppers, which from time to time do considerable damage in the drier regions of the Great Plains. Quelea birds exist in very large numbers in parts of Africa and do severe damage to crops. In 1979, newspaper reports said that they consumed 30 percent of Kenya's wheat crop.

Rodents and insects are also major crop pests. They feed on crops in the fields and on harvested crops in homes and warehouses, thereby increasing the likelihood and/or the severity of famine. During the Sahel famine, rodents were said to be a problem in parts of Mali. Less important on a global level, but very important to the individual farmer, are the depredations of such mammals as elephants and monkeys as in some parts of Africa and Asia.

Blights are diseases of crop plants. The most famous was the great potato blight of the mid-nineteenth century in northwest Europe, where large numbers of people depended almost exclusively on potatoes for food. Ireland, where farmers commonly ate from 8 to 10 pounds of potatoes per day, and often little else, was particularly vulnerable to crop failure, and in about four years lost about one half of its population by death and emigration. (Woodham-Smith, 1962) In the 1970s, there was a corn blight in the United States. While no famine was even suggested by this blight, its occurrence points out the fact that crop failures are to be expected even in countries with highly developed agriculture.

However primitive or advanced our food systems are, they are all "leaky" to some extent or other, suffering losses in the fields, in storage places, and even in the human gut where various pathological conditions interfere with normal digestion and absorption (Figure 4).

Social precipitating factors. War sometimes precipitates famine by deliberate destruction of crops and stores and by cordoning off areas such as the Warsaw ghetto (Winick, 1979) and western Holland in World War II. (Stein, 1975) Traditionally, armies have lived off the country side. Like locusts they ate and moved on, leaving the local people with little or nothing. Inequality in distribution of food within a society during war or peacetime contributes to the likelihood of famine in the vulnerable classes. The very young and the old are more vulnerable than other age groups. Generally, the rural population is more likely to suffer than the urban population; likewise, civilians are less likely to survive than military personnel, the poor less likely than the rich. Nomads are more severely hurt by famine than sedentary people because their reserves are in the form of domestic animals, which must be fed and watered. The farmer, on the other hand, has his reserves in baskets of grain, which, despite rodents and insect pests, requires no moving from place to place in search of food and water.

Other social factors contributing to the precipitation of famine include poor planning for agricultural and economic development, economic exploitation of classes and nations, and the lack of adequate systems of transport. Important as these factors are, they lie outside the area of this talk.

ECOLOGICAL SYSTEMS

Biological communities are made up of individual plants and animals representing many different species. The species can be lumped together in groups according to their energy relationships. As shown in Figure 5, most communities consist of three such groups or trophic levels: the producers (the green plants); the primary consumers (grazing and browsing animals), and the secondary consumers (carnivores preying upon the primary consumers). (In some communities there is a third level of consumer, predators that prey upon predators.) Because of their chlorophyll, plants that make up the producer level can convert solar energy into chemical energy in the form of sugars and starches. These plants include, of course, not only man's crop plants but also the wild plants that feed his herds. Some of the chemical energy of this level becomes available to the next trophic level, the consumers, the vegetarians. These include most of man's domestic animals, cattle, camels, goats, and sheep and many wildlife species,

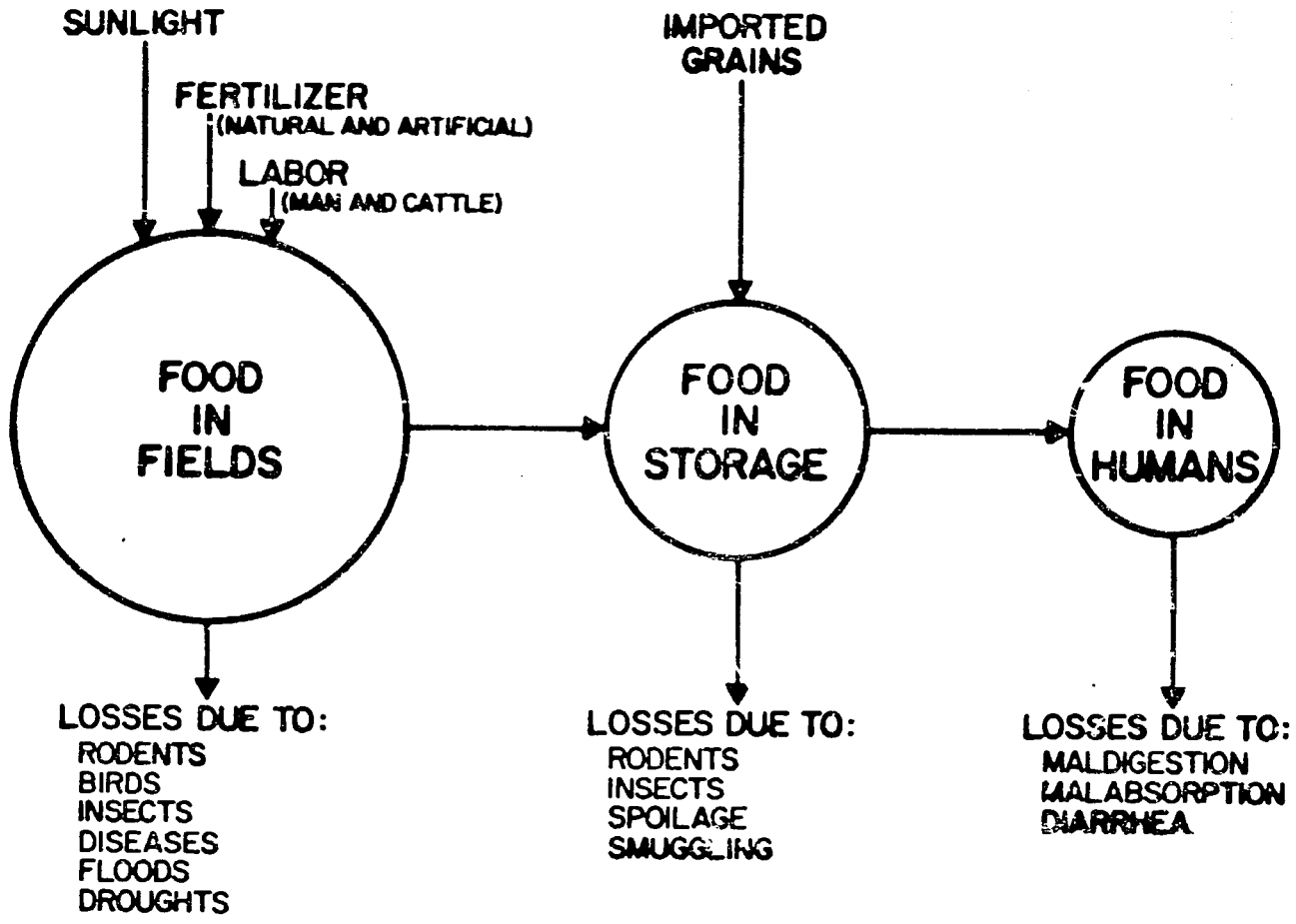


FIGURE 4 Energy inputs and outputs into agricultural systems. Although this diagram was originally made to describe the situation in Bangladesh, its basic features are almost universal. (From Parrack, 1981)

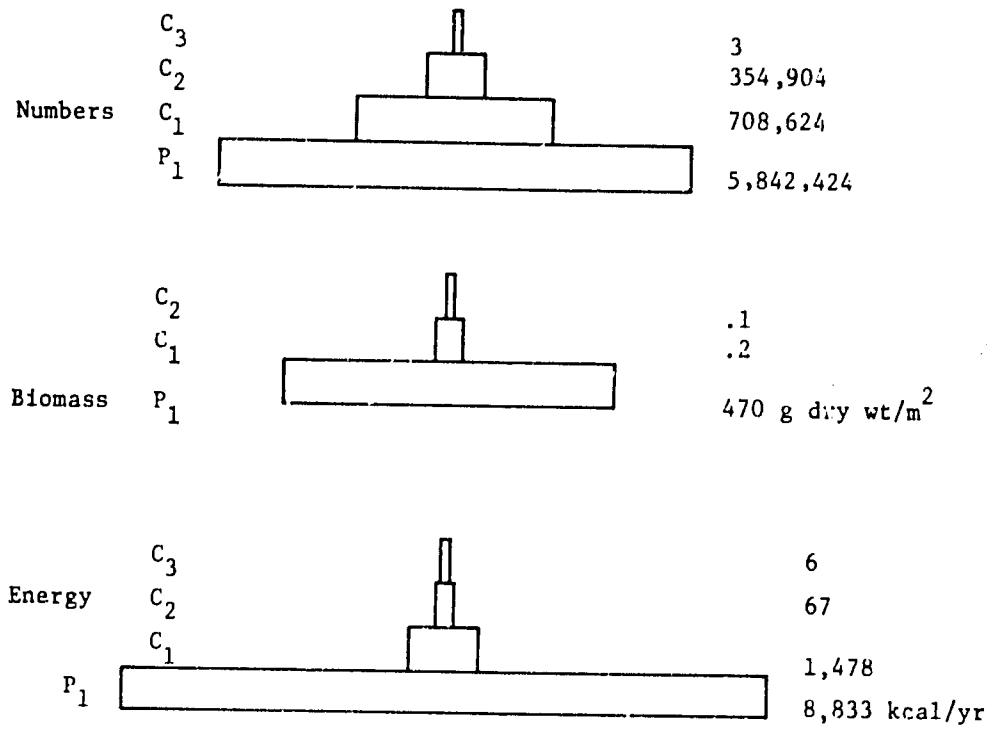


FIGURE 5 Pyramids of numbers, biomass, and energy. (After Odum, 1959)

some of which compete with the domestic animals. The plant energy consumed by these vegetarians is used in the routine metabolic processes, in growth and reproduction and some of that energy is, in turn, available to the next trophic level, consumer$_2$, the carnivores that expend the incoming energy in respiration and in growth and reproduction just as do the two lower levels. Some animals, such as man and bears, are omnivorous and fit into both the herbivorous and the carnivorous levels. Although there are exceptions, something on the order of 10 percent of the energy taken into one trophic level ends up as tissue of that level (Figure 6).

These three major trophic levels are thought of as forming pyramids of individuals in which there are large numbers of individual plants, which are fed upon by smaller numbers of herbivores which, in turn, are preyed upon by still smaller numbers of carnivores. This pyramidal arrangement holds true when the amount of living material, the protoplasm (or biomass), is considered, and is likewise true when the amount of energy in each level is considered.

The energetic relationships of man, his crops, and his cattle in an advanced agricultural system are summarized in Figure 7. About 93 percent of the solar energy reaching the earth returns to the atmosphere. Under favorable agricultural conditions about 7 percent of the solar energy is used by the plants in photosynthesis, of which about 2 percent goes for the plant's respiration and about 5 percent

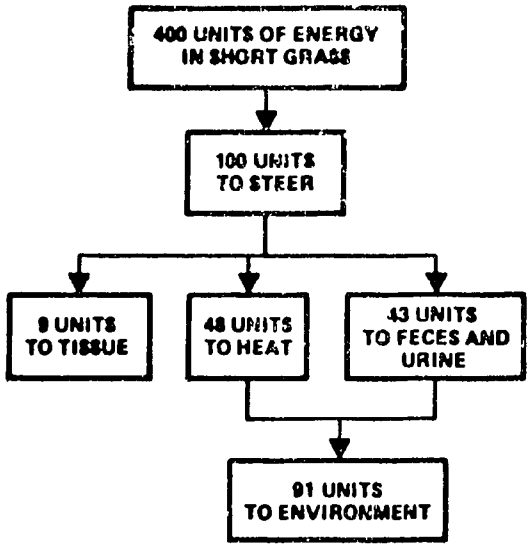


FIGURE 6 Energy utilization by steer feeding on short grass. (Hyder, 1969)

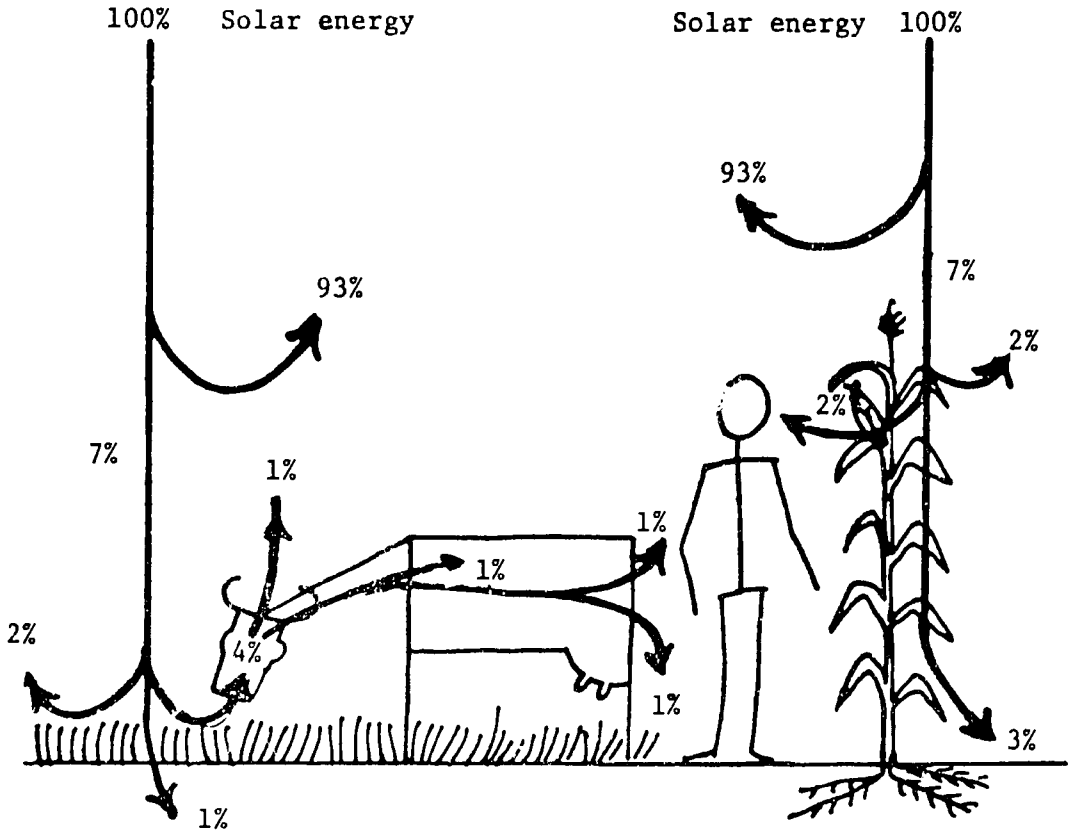


FIGURE 7 Energetic relationships of man, corn, and cattle. (See text for explanation.)

goes for growth and reproduction. About 2 percent of the solar energy reaching the corn plant ends up as a source of food for humans. As much as 4 percent of the grass may be consumed by cattle, which, in turn, use the energy for respiration and growth.

The trophic levels are dynamic and they are dependent upon each other: changes in the numbers of individuals, the biomass, or the energy in one level will result in readjustments in the others. In "normal times" when there is relatively little change in environment, these adjustments are relatively minor, but when the changes are severe the adjustments are dramatic. A classic example is the case of the deer population of the Kaibab Plateau in Arizona (Figure 8). This population, normally held by predators to about 4000 animals was released in the early decades of this century by man's removal of large numbers of cougars, wolves and coyotes. By the early 1920s the deer had reproduced so rapidly that their population had reached about 100,000, roughly a 25-fold increase. Such a dense population of herbivores soon ate up its food supply, and within two years had lost 60 percent of its members to starvation. The crash was followed by a slower continued decrease for several more decades.

Biological communities are not equal in their ability to produce biomass. Severe environments, such as polar areas, have a much lower productivity than, say, tropical rainforests (Figure 9). The standing crop (the biomass, or the number of individuals) of a species in a given community at a given time is dependent upon two sets of factors, the severity of the environment, already mentioned, and the severity and frequency of disturbances (such as droughts or floods) as shown in Figure 10. According to this model the maximum biomass is found in an environment that is least severe and that has the least severe and least frequent disturbances (point a in the figure). An example of this would be a tropical rainforest. Conversely, the lowest amount of biomass would be found at point b, where a severe environment is subject to frequent and severe disturbances. Arid lands with frequent droughts would be in the vicinity of this point.

Rather than speaking of biomass or standing crops of an area, it is sometimes useful to speak of the carrying capacity of an area, meaning that under a certain combination of conditions an area can support a certain number of individuals (humans or otherwise). This concept brings us back to one of the definitions of famine given earlier: a sudden decrease in the carrying capacity. The carrying capacity of the ecological community comprising most of Somalia is low because of the severity of the area, and is further reduced by the recurrence of droughts (and sometimes floods). The situation in present-day Somalia is made still worse by the fact that just at a time when the carrying capacity is already low, the demands upon it are made even more intense by the influx of refugees from the Ogaden.

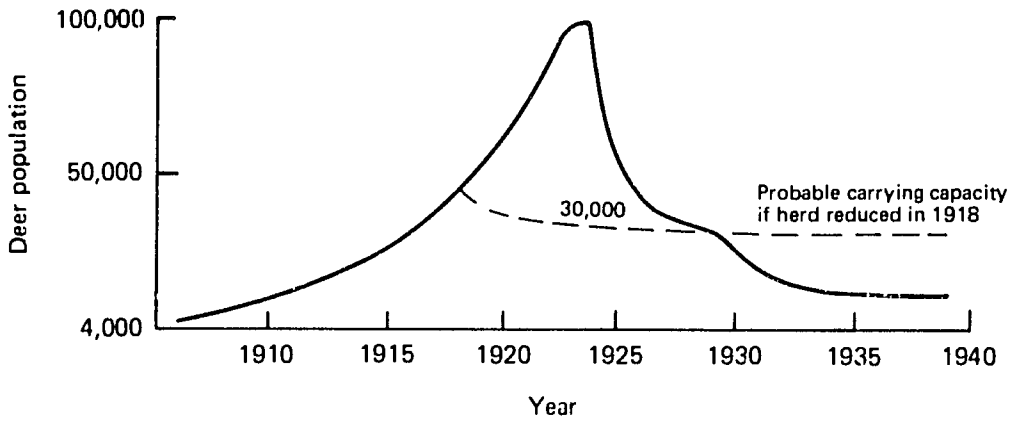


FIGURE 8 The rise and fall of the deer population in the Kaibab Plateau. (After Kormondy, 1969)

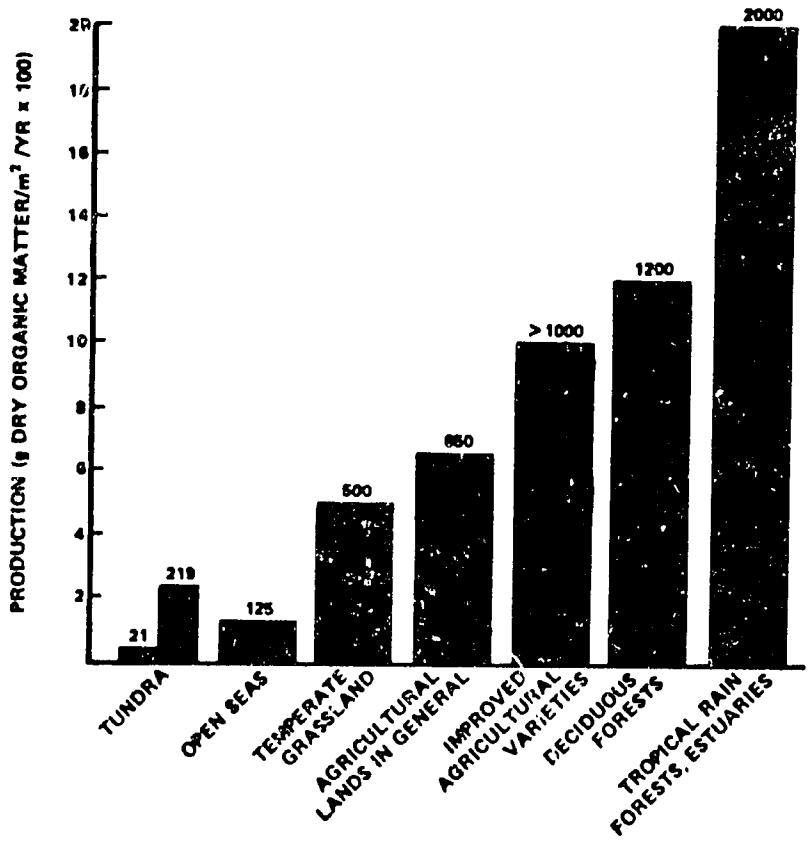


FIGURE 9 Comparison of productivity of various ecological systems. (From several authors)

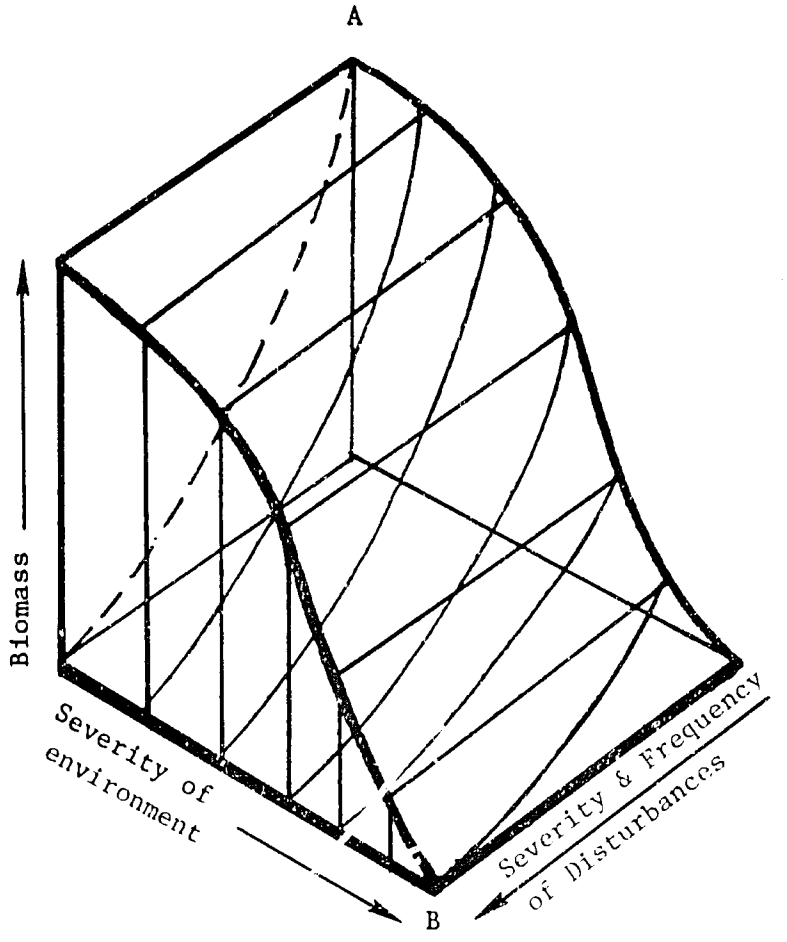


FIGURE 10 Diagrammatic representation of relationship of biomass, normal severity of the environment, and frequency and severity of disturbances of environment. (Adapted from Reichle, D.E., et al., 1975)

THE DEVELOPMENT OF FAMINE

Although these comments were written with sedentary village farmers in mind, most of the observations on the development of a famine also apply to famines affecting nomadic people.

One of the early indicators that a famine is likely to occur is a large increase in the cost of food. The decreasing availability of food is usually due to a real, objective decrease in productivity, but this is often made more severe by the practice of hoarding by consumers and by deliberate withholding of food from the market by merchants. To meet the rising costs, the ordinary person is forced to borrow from relatives and friends. Networks of mutual help among relatives can,

under some circumstances, hide an incipient famine from observers by distributing the food of the more fortunate members of the group, creating a false appearance of well-being until the whole group has exhausted its supplies. (Hays, 1981) Suddenly, calamity strikes: the whole group is starving. Generally, however, the traditional networks of help are not so successful in obscuring the development of a famine. In most cases the victims seek to raise money to buy food by selling personal property--first the luxuries, such as the wife's jewelry. But the selling price of these gets lower and lower. After the luxuries are sold the victim sells the necessities, the pots and pans of the kitchen, the livestock, the tools of trade, the land itself, all of which have decreasing monetary value. People, mostly men, also migrate from the villages to the towns and cities in the hope of finding work or relief. (Rahaman, 1981)

The influx of refugees to cities brings about crowding in slums and in relief camps, both of which usually have poor sanitation. (Currey, 1981) The weakened physical and psychological condition of the refugees in these situations makes them more susceptible to infection and less physiologically able to withstand it. These effects are by no means limited to the refugees coming to the cities, even though they are more pronounced among them. The refugees themselves are a sort of mobile famine, for they decrease the amount of food available in the cities and lower wages through competition. Social and moral patterns of all the victimized levels are affected. Traditions erode; thievery, beggary, and prostitution increase.

Thus there is a system of positive feedback, the worst of all possible worlds. As a result, the death rates go far above the normal. Large numbers suffer, many die, and many of the survivors, especially the children, are physically and psychologically scarred, perhaps for life, by the experience. The famine peters out and the population of the nation drops a bit, but in many cases, such as in Bangladesh in 1974, that loss is made up within a matter of months. Conditions have gone full circle--from bad pre-famine conditions, to famine, to bad post-famine conditions, which, given a few years, are all too often the next pre-famine conditions.

SUBSISTENCE FARMING

Subsistence agriculture produces little surplus beyond the needs of the farmer and his family. Subsistence farmers, then, have few reserves to draw upon during bad times. The energetics of such farms are illustrated in Figure 11, which shows in an oversimplified way the hypothetical energy costs and benefits during the agricultural year. In this figure everything below the zero line represents an expenditure

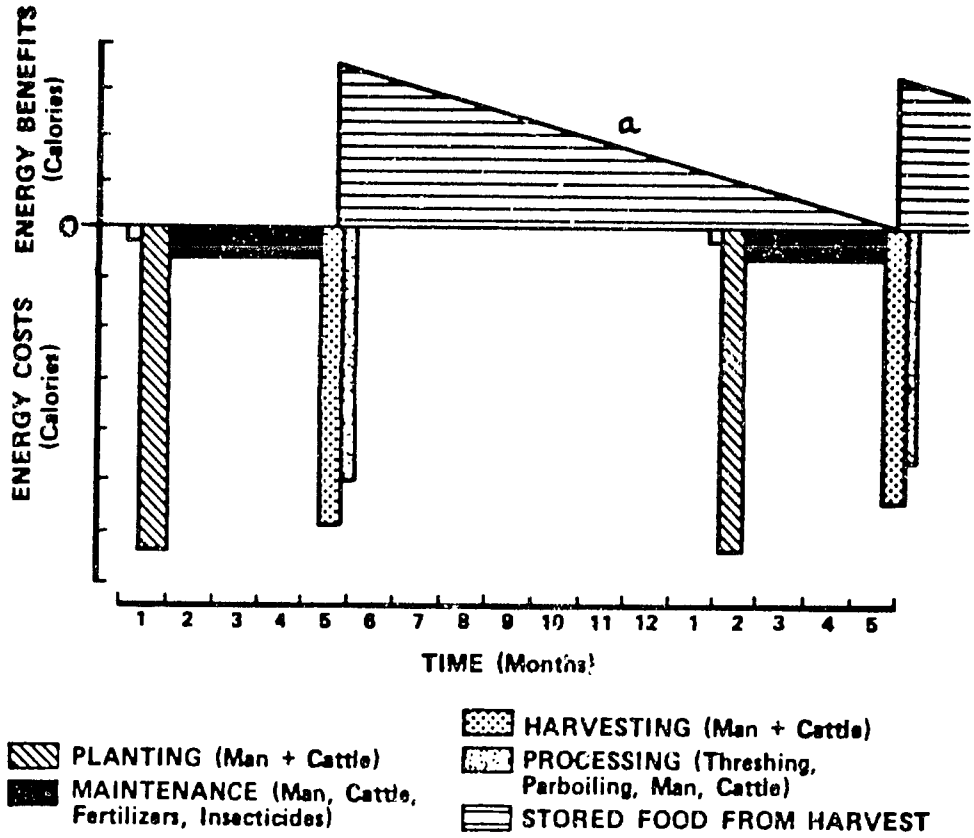


FIGURE 11 Diagrammatic representation of energy cost-benefits in a hypothetical South Asian subsistence farm. (See text for explanation.)

of calories of energy by human laborers and domestic animals (for instance, oxen) in planting, tending, harvesting, and processing the crop. The benefits of these labors are shown above the zero line, also as calories of energy. After the harvest, the accumulated food in the forms of grain and straw decreases with the passage of time because of the consumption by man, his cattle, and pests such as rodents and insects. The decrease is indicated by the slope of line a. If this line slopes at a gentle angle, the farm may have some food left over from last year's harvest even after the harvesting of this year's crop. Generally, such surpluses are small if they exist at all. If the slope of line a is acute, the farmer, his family, and his animals run out of food before the current crop is mature. Whether or not they survive this period of privation depends upon the length of the period and presence or absence of reserves such as saleables.

Figure 11 represents an ordinary year in which the energy requirements of the subsistence farmer, his family, and his animals are met, but barely; these are the normal conditions for much of the

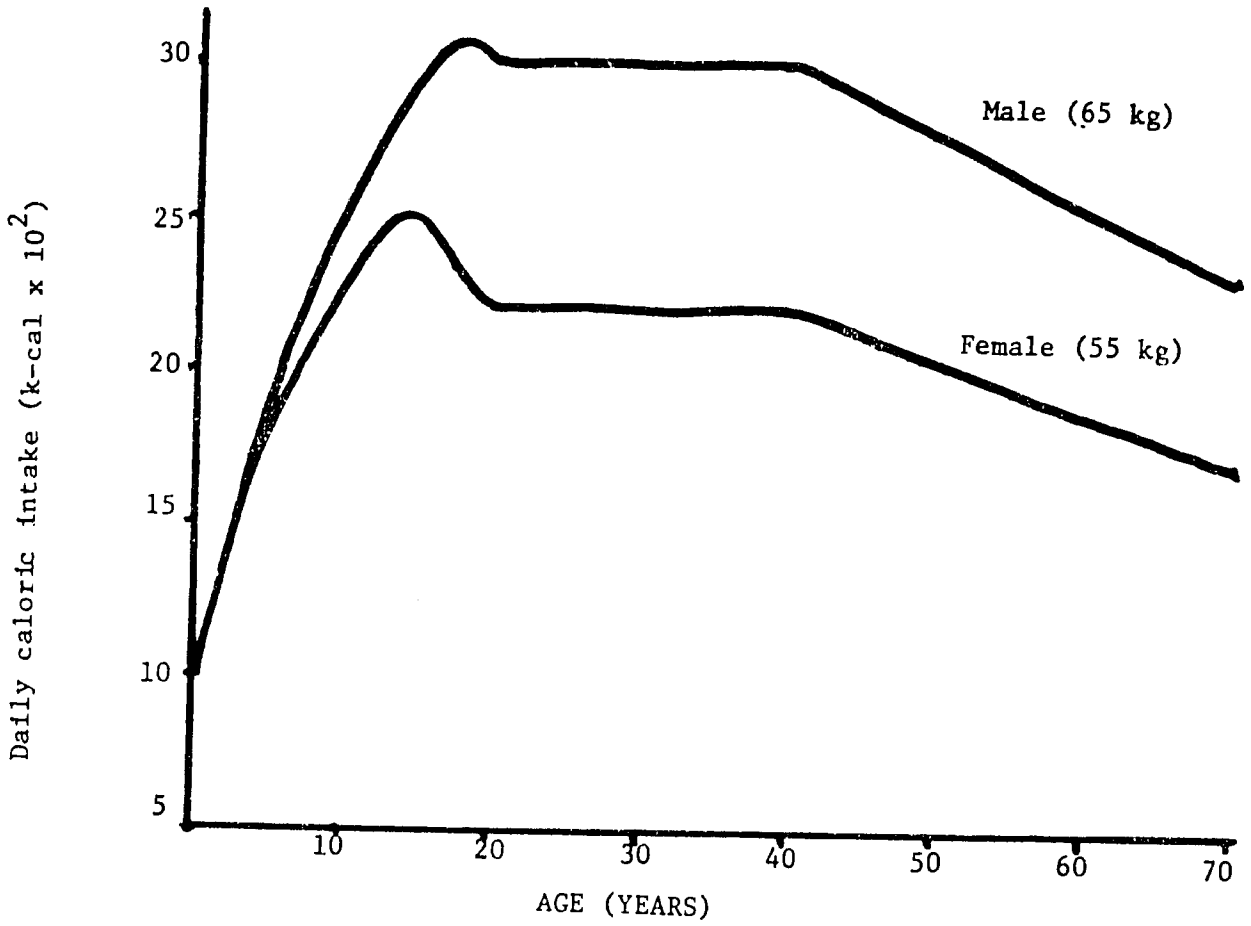


FIGURE 12 Daily caloric intake and age of "moderately active" males and females. (Based on FAO/WHO, 1973)

world. The following several figures examine more closely the demands put on the subsistence farm by its human inhabitants. Although again oversimplified and hypothetical and based largely upon conditions in Bangladesh, the basic relationships bear some similarity to those of nomads. Daily caloric requirements of an individual change through the lifetime of an individual because of the person's growth and type of work (Figure 12). Females usually require fewer calories than males because females are smaller. Figure 12 shows this difference, but does not show the female's need for increased intake during pregnancy and the even higher needs during lactation. Since women in much of the world are either pregnant or lactating (or both) through much of their reproductive life, these added requirements are important.

A model can be made of a hypothetical subsistence farm in Bangladesh, expressing in terms of calories its production and the demands put upon it by its inhabitants. Most subsistence farms in that country consist of about one hectare (2.5 acres) of land and produce

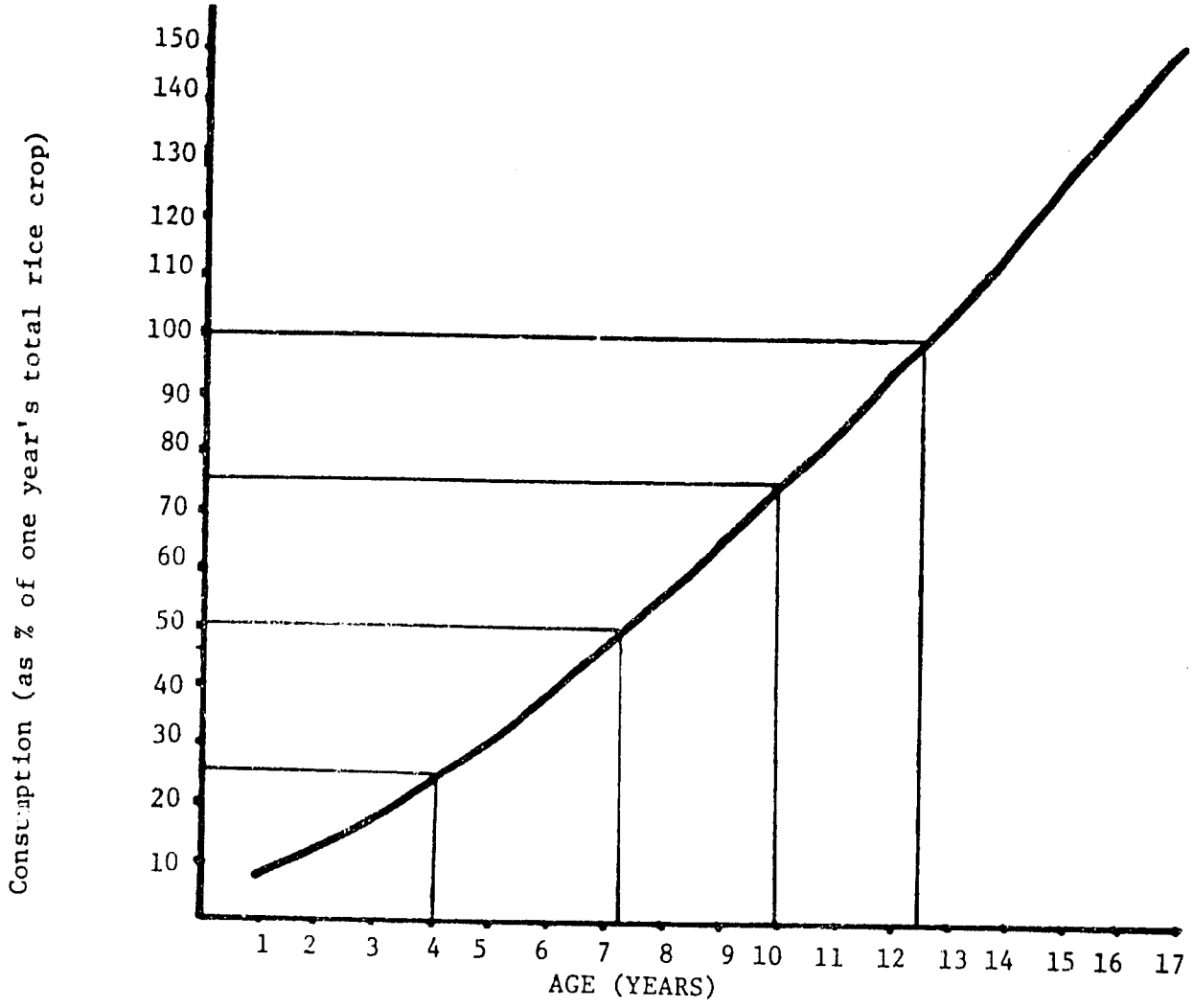


FIGURE 13 The caloric investment in offspring--the cumulative total of annual rice consumption expressed as percent of the total average rice crop on an average Indian farm.

rice as the major food crop. A child born on such a farm will consume over the years an increasing amount of rice, the cumulative total of which can be expressed in terms of the percent of the farm's average annual caloric production. As shown in Figure 13, by the time a child is four years old he will have consumed a total of about 25 percent of a year's crop and before the end of his 13th year he will have consumed the entirety of one year's harvest. This presentation is a way of stressing the point that children represent an investment by the farm family. By the time the child has reached the mid-teens he (or she) is likely to be doing an adult's labor and is thereby repaying the family, which in many cases will consist of at least three generations and varying numbers of individuals who are primarily dependent on the production of the farm. Figure 14 illustrates the changing demands on such a farm with the passage of years and the changes in the size of

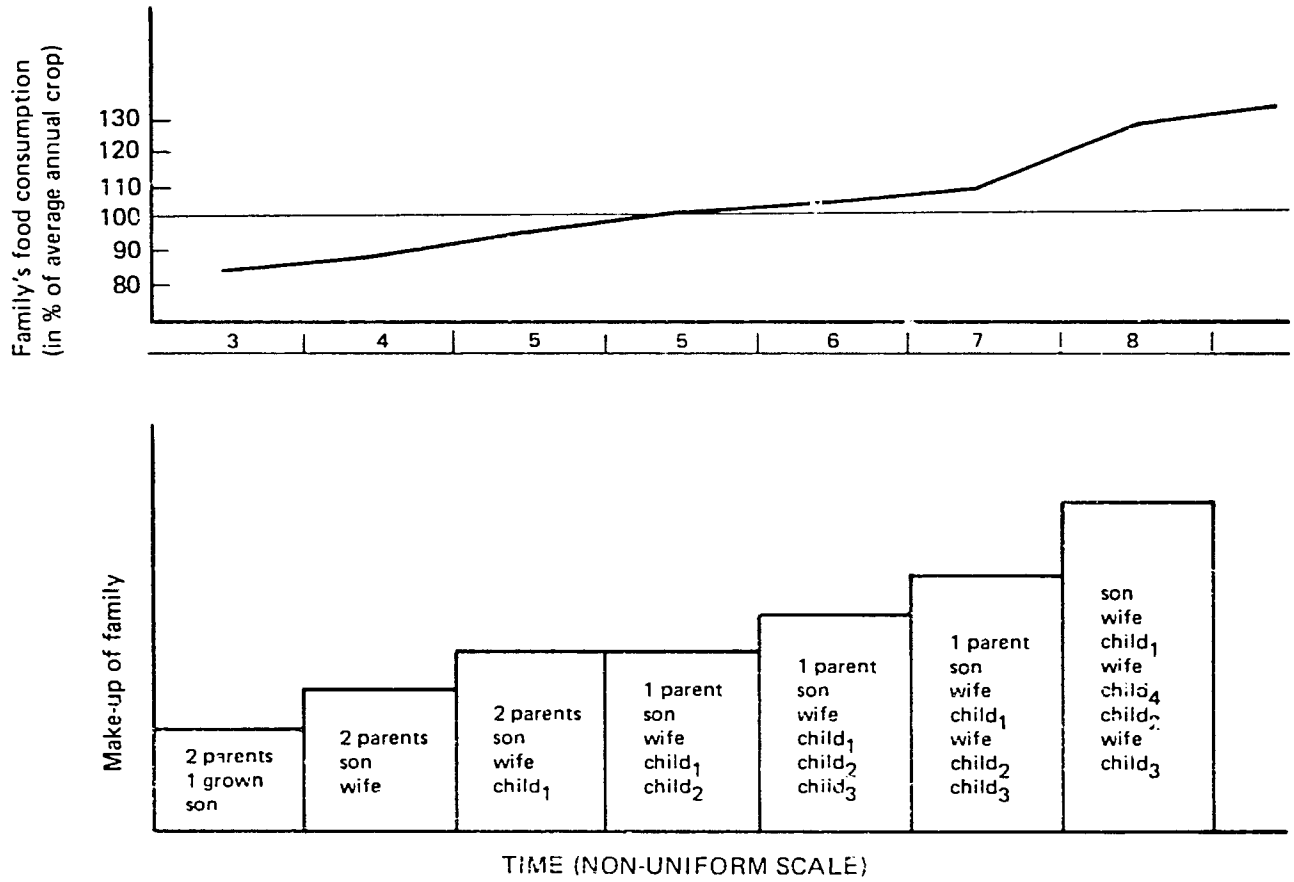


FIGURE 14 The demands put upon a farm by a typical, growing farm family over a period of time. As the family grows, it reaches a point where its consumption is greater than the farm's production. Outside employment, indebtedness, migration, or starvation result.

the family brought on by additions (due to births, bringing in brides) and losses (due to deaths, to losses of daughters through marriage, and to emigration). In this hypothetical family, which begins with two aging parents and their grown son, the number of dependents on the farm grows from an initial three to a peak of eight and their consumption of food rises from a low of 85 percent of the farm's crop to a high of almost 130 percent of the crop, when the family must either eat less, gain income from outside, or migrate.

These spartan conditions represent more or less normal times. So keenly balanced is the system, shown in Figures 12 and 14, that even a slight change in any of the factors affecting the productivity of the primary producers, the crop plants, or consumption by the primary and secondary consumers (man, cattle, etc.) reverberates throughout the system. A flood, which delays planting, or a drought, which reduces the yield, can quickly result in a famine.

SOMALIA

The hot, dry climate is the dominating factor in the ecosystems of all of Somalia's three climatic regions (desert, steppe, and tropical savanna). (de Vos, 1975) Rainfall in these regions is characterized by its scarcity throughout the country (varying from a maximum of about 24 inches per year in the south to about 4 inches/yr in the north), its spottiness (weather stations a few miles apart report rains differing by 30-40 percent), its seasonality (there are two wet and two dry seasons in a year), (Table 1, Figure 15), its variability in time of beginning of the wet seasons (the beginning of the gu rains vary by about one month) and its high variability from year to year (resulting in droughts of different degrees of severity every three to four years). (Swift, 1977) When rains do fall, they often result in disruptive floods.

Because of the severity of the environment and the high frequency of environmental disturbances, Somalia would be expected to have a low carrying capacity and to support a low biomass (Figure 10) and have a low human population density. And that is certainly the case. If the population is assumed to be 3.6 million, the density is 14.6 humans per square mile (compared to 418.7 per square mile in Burundi, 522 in India, and 1,618 in Bangladesh). (Environmental Fund's 1980 estimates)

The vast majority of Somalis are pastoral. Very little land is under cultivation. Only those species adapted morphologically, physiologically, and/or behaviorally can survive. The major plants are shrubs and trees (junipers, and most important, several species of Acacia) and several species of grasses are the chief producers in the

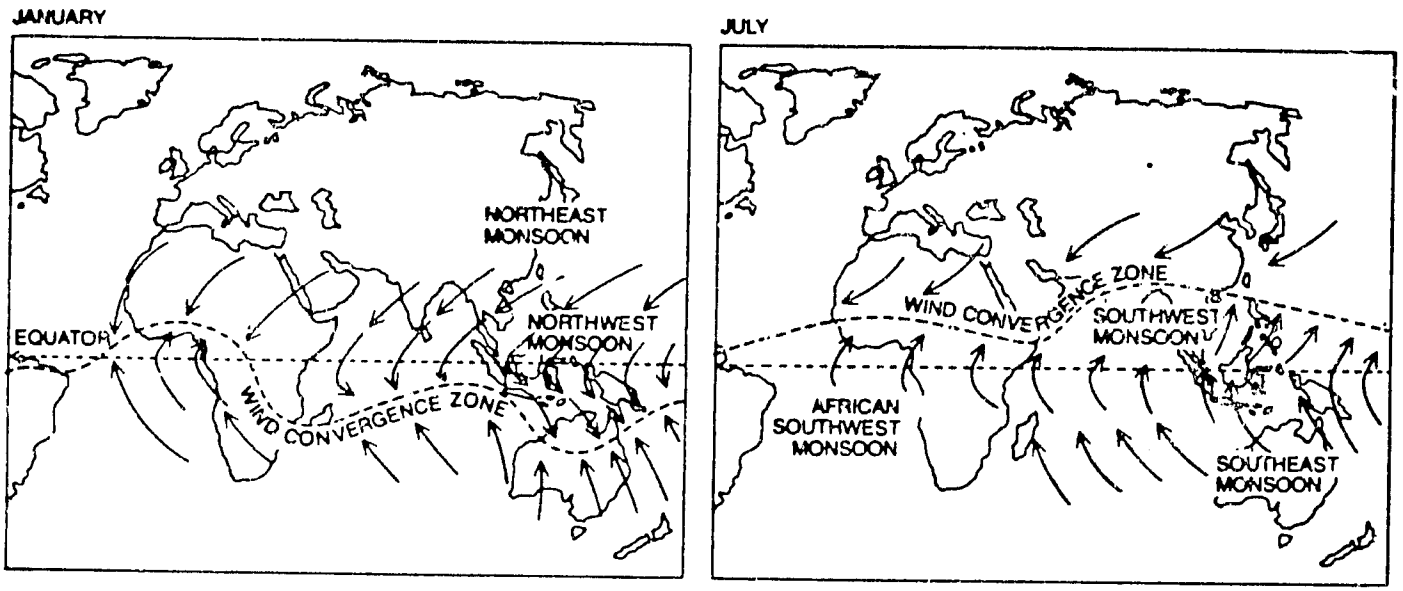


FIGURE 15 The monsoons and Somalia. The weather of Somalia is determined by the winter (northeast) monsoon bringing in the severe dry Jillal season and the summer (southwest) monsoon bringing in the Haga (Xagaa) dry season. The two rainy seasons, Gu and Dair, occur in the lulls between the monsoons. (The map is from Webster, 1981.)

ecological pyramids and vary in significance from one region to another. Much of the wildlife has been killed off so that in many areas man and his domestic animals are the major consumers. His domestic animals, camels, sheep, and goats, for the most part, are well adapted for water conservation and are not strong competitors with each other, as the camels, sheep, and goats tend to specialize in feeding on certain forms of plants. (Yagil, 1981; Schmid-Neilsen, 1981) This allows a maximum use of the scanty plant resources. But even with these adaptive traits the livestock (and their owners) are, even in normal years, put under severe physiological stress during the dry jillal season (Table 1). If there is a delay in the onset of the gu rains by a few weeks, even so magnificently adaptive animals as camels (which can with no ill effects lose 25 percent of this body weight and can go many days without drinking water) succumb to the rigors of the climate. (Schmidt-Neilsen, 1981) Goats and sheep are less well adapted than camels, and cattle even less so.

The nomadic existence of most Somalis is a highly evolved behavioral adaptation to the arid environment and is determined by two physiological factors: camels, under certain conditions, can go without water for more than 20 days, while sheep and goats must be watered every few days. The differences in these water requirements leads to division of human labor by sex and age, and separate members of families during certain seasons. (Lewis, 1961) During the dry seasons the herd boys are said to drink no water until after the camels are

finished and to live almost entirely off camel milk. (For a detailed discussion of camel milk, see Yagil, 1981.) If more data were available it would be possible to build an energetic model of Somali nomadic life.

With the rise of commercial export of livestock, the size of the herds has steadily increased over the decades (Swift, 1977; Europa Publications, 1980) and this has predictably put heavier burdens on the ecosystem, making it still more vulnerable to droughts.

Only about 15 percent of Somalia's population are sedentary farmers (ILO/JASPA, 1976 sited by Swift, 1977), and these are mostly in the south, between the Juba and Shebelle rivers, the only rivers in the country.

Although figures on the total amount of arable land and land under cultivation are confusing and sometimes contradictory, it is clear that very little of Somalia's quarter million square miles is under cultivation. Bananas, sugarcane, and cotton are the chief agricultural exports (along with livestock), while maize (corn) and sorghum are the chief domestic food crops. In the north there is a single crop per year, but in the south, because of the two rivers, two crops per year are grown. Quelea birds and locusts are major pests for the crops in the field. Figures for losses are not available. However, in Egypt on the order of 10 percent of the grains are consumed by sparrows. (USDA, 1976) Likewise, figures for Somalia's postharvest loss of maize and sorghum can only be roughly approximated from figures of nearby countries. In Kenya between 10 and 23 percent of the maize is lost after harvest and in Sudan from 6 to 20 percent of the sorghum is lost. (NAS, 1978)

Just as in the rest of the world, the Somali farmer's year is dictated by the seasons, as shown in Table 2. Earlier, a model of calorie cost and benefits of an "average" Bangladesh farm was presented (Figure 11). In that figure the horizontally hatched triangle represented the accumulation of calories derived from sedentary farming. A comparable diagram might be drawn for the Somali farmer. In both cases the rate of use of those calories (the slope of line a) is of paramount importance, and in both there are, from time to time, foodless gaps between harvests. As in the case of the nomads, a model for the farmer is possible with the accumulation of more data.

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APPENDIX C-3

EPIDEMIC DISEASE AND DISTURBED ECOSYSTEMS

Frederik Bang
(Completed by Ahmed Esa after the death of Dr. Bang)

The association of epidemic disease with disasters (sudden distortions of the ecosystem) is so commonplace that disasters inevitably call forth a rush of effort to prevent the epidemic in the making. Thus, little thought is given to, and practically no study has been made of, the question of which diseases are likely to occur and what are the best methods of preventing them. The idea that "research" should be done during an emergency is so contrary to the usual humanitarian instincts that we frequently have no information, or even satisfactory theories, as to how to proceed. The purpose of this essay is to examine the diseases that have occurred in the refugee camps during the current Somali famine and to discuss other diseases that might occur there as a result of both the earlier acute food shortage and the present refugee encampment.

First, we need to define a famine in the ecological terms of energy utilization (Figure 1). As Kormandy (1) points out, energy conversions and sequential dependencies are at once both elementary in conception and fundamental to the energetics of organisms and ecosystems. If those humans who live at the end of the sequential conversions no longer receive sufficient calories for food or the energy necessary to the processing of food, malnutrition or starvation

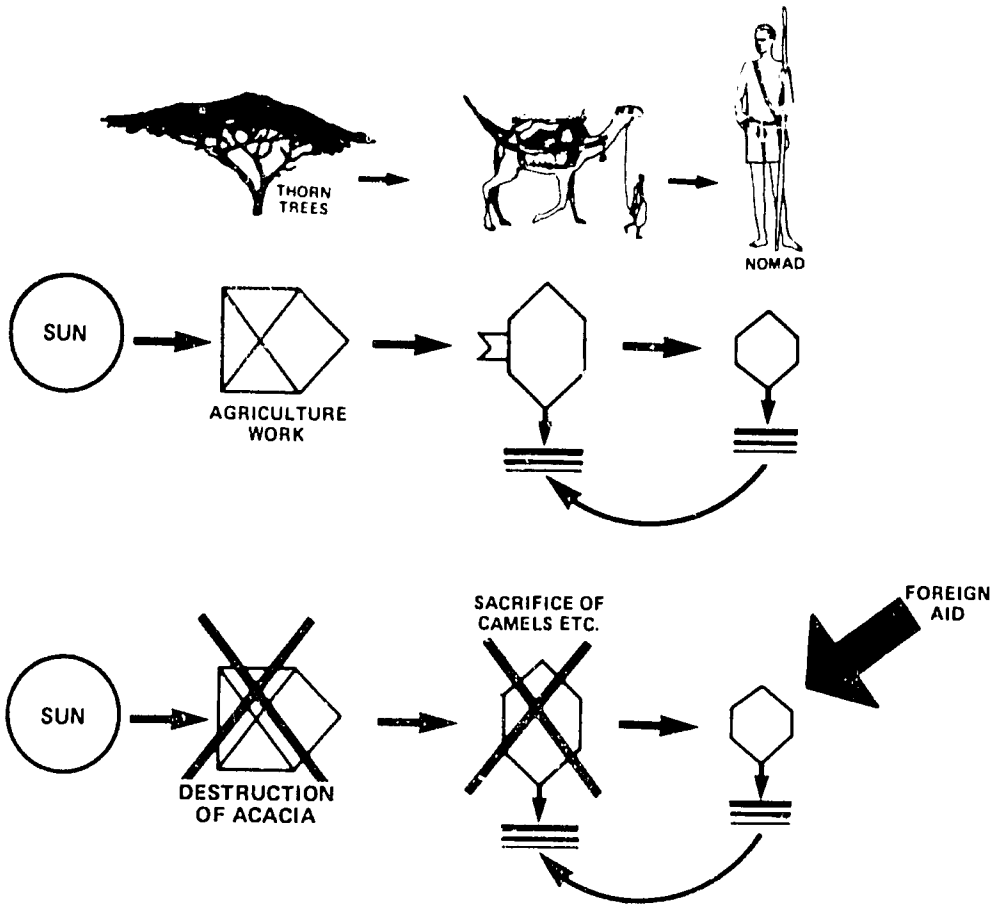

FIGURE 1 Energy utilization and famine.

results (Figure 2). Cutting off the energy supply is exactly like cutting off the blood supply within the human body: death of humans or of cells occurs. Short of death, the general defenses are weakened in the particular organ affected or in the terminal ecosystem. The invasion of the tissue by bacteria, the insertion of infectious agents into the ecosystem, causes further imbalance, and a positive feedback favoring futher disruption is set up. Thus, disease itself is both the result of, and a participant in, the disturbed ecosystem. How rapidly a particular disease may appear as an epidemic disease depends upon the intrinsic rate of multiplication of the disease. Measles or acute viral diseases may appear rapidly. Tuberculosis, which may be just as significant, may take years before a great increase is noticed. (2) The spectrum of interactions has at one end the individual whose resistance is decreased by malnutrition, and at the other end the resistance of the community, which depends, in addition, on all of the sanitary protective mechanisms that are part of that group's culture. These are broken by the change in living arrangements and the new crowding necessitated by camp life (Figure 3).

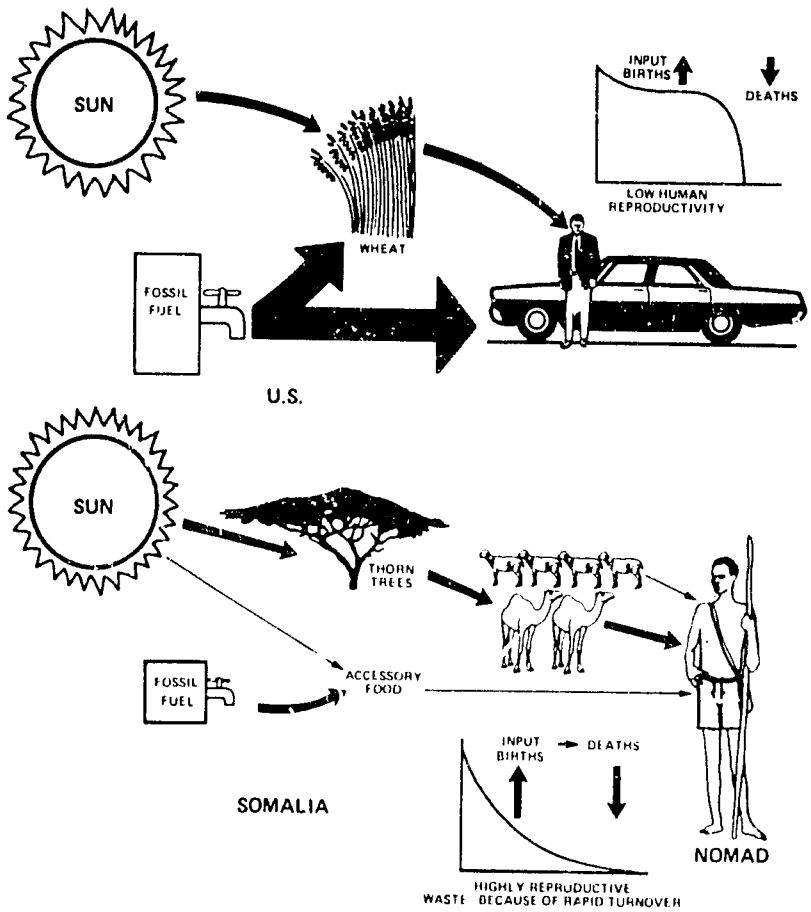

FIGURE 2 The ecosystem: Somalia vs. the United States.

SPECIFIC ENDEMIC DISEASES

Kevin Cahill (3), who has had the most continuous interest in disease problems in Somalia, lists eight specific endemic diseases (see Table 1). In this table, we have indicated those diseases in which it is believed that individual resistance is lowered by malnutrition. It is striking that the same three diseases, or disease complexes, which are affected in terms of individual susceptibility, are also greatly increased simply because of crowding. We should add to this list scabies and subsequent staphylococcal and streptococcal skin disease occurring in times of disaster and as a result of poor sanitation. We will return to this table again. No data comparable to that listed by Pankhurst in his studies of Ethiopian history (4) seems to be available in the English literature on Somalia.

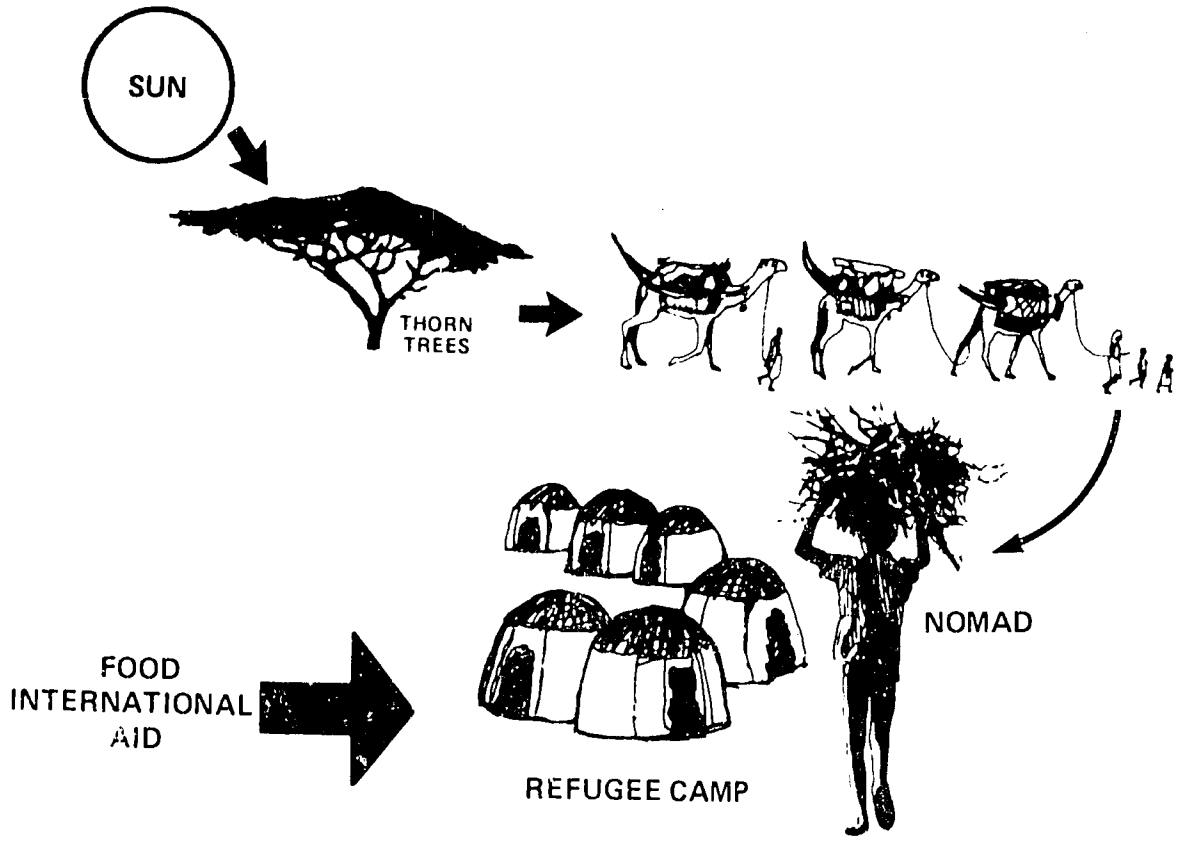

FIGURE 3 The disturbed ecosystem.

The complex interaction that is called the effect of nutrition on immunity to infectious disease has been studied by many people, but since the immune system is now recognized as a complex interaction of helping and suppressing immune cells, which regulate the immune response, we can hardly expect that there will be a single way in which nutrition affects disease susceptibility. Indeed, for each of the three diseases that may be considered here, there seems to be three different parts of the immune system that are affected. These will be discussed later.

RATE OF DEVELOPMENT OF DISEASE

The basics of the epidemiology of contagious disease are as simple as those of energy transfer. To place them in ecological terms: the

TABLE 1 Potential Effect of Famine on Diseases in Somalia

Prevalent Diseases*	Change in Individual Susceptibility	Increase Due To Camp Life	Countermeasures
Malaria	0		-
Tuberculosis	++++	++++	BCG? Isoniazid?
Dysentery	++++	++++	Sanitation Clean Water
Bilharzia	0	0	
Hookworm	+		0
Venereal disease	0	?	
Tropical ulcers	0	0	
Respiratory infection (measles)	++++	++++	Measles vaccination

* Cahill, 1969

reproductive rate (r) of a disease is dependent upon: (1) the rate of multiplication of the agent--tubercle bacilli are slow and respiratory viruses are fast; (2) the rapidity of transfer of the infection from one subject to another--close contact speeds this up; (3) the susceptibility factor--how many non-immune people are there, and what is their contact with each other?--obviously, camp life increases rates of contact; this, then, is a density-dependent regulatory factor, for, as susceptibles are exhausted, the rate of transfer slows down; and (4) the latency and chronicity of the agent--is it available for infection of newly arriving or newborn susceptibles who have lost their passive immunity?

Changed susceptibility of the individual may cause a greater production of the agent, thereby not only increasing mortality, but

increasing the infectiousness of an individual case. Much more important is the effect of crowding on non-immune populations. Much of the basic knowledge of these latter factors has come about through warfare that has caused the mobilization of young non-immune individuals into camps and that has led to outbreaks of measles and, under inadequate sanitation, dysentery and tuberculosis.

It is now time to discuss the effects of nutrition on the pathogenesis of specific disease. In all of this, we can only observe what happens in the uncontrolled human situation, then set up animal models, which, we hope, simulate those of the human, and then fit the irregular pieces together and attempt conclusions and predictions.

In a study of the interaction of nutrition, infection, and immunity, we are increasingly aware of the complexity of the situation. During the course of the revolution in knowledge of the immune system that has taken place in the last two decades, we have come to recognize that the immune response is regulated. Thus, a major problem in the study of the effect of malnutrition on the immune system is: "At what stage of immune regulation does a particular nutritional defect have its effect?" We now know that certain deficient diets cause for a time an increase in the B cell response (by decreasing the suppressor cell population). Furthermore, lack of some of the B vitamins may cause an increase in this resident B cell population. This seems anomalous. In contrast is the major decrease in numbers of immune cells (shrinkage of spleen, thymus, and lymph nodes), which occurs routinely in the malnutrition of humans. Thus the mass of immune cells ready to respond to invaders is greatly decreased in the malnourished individual. How does this work with different diseases?

I will start with measles. This is a plague of the malnourished of sub-Saharan Africa. It kills at 100 times the rate that it does in industrialized temperate countries. It is an infection of the respiratory tract which must have a selective effect on the T cells, for it has been known since the time of von Pirquet that after measles, there is a loss of response to tuberculin (a T cell-mediated response) and that this lasts for some weeks. If, then, the immune system is depressed in malnutrition of the kwashiorkor type so that T cells are reduced, (5) and if measles, which has a marked effect on the thymus, occurs on top of this, one may well expect a severe disease. This is often followed by intense diarrhea, perhaps due to destruction of the immune system of the intestine. On the other hand, there is no evidence that acquired immunity is broken down by malnutrition, and indeed vaccination with the current live vaccine is strongly recommended if one is faced with a devastating epidemic of measles. Measles is well known to cause mortality in Africa, especially in the malnourished. (6, 7) But does it do so because of the kwashiorkor type of diet or for other reasons? In a detailed continuous study of children within a poor village of West Bengal, Sinha showed a very high

mortality among children who were recovering from kwashiorkor illness, but no mortality among children who had or had had marasmus. (8) In this connection, I am told it was judged unnecessary to administer measles vaccine to the Cambodian refugees, but it has been used in Somalia. If we know to what the difference in mortality is due, perhaps we would have an even better way of protecting the malnourished child.

From the epidemiological standpoint, the size of measles epidemics has long been known to depend upon the number of susceptible children. This is clearly related to the age at which they get their first attack. If intensity of transmission is high, then only the young are available. Thus, there is a density-dependent regulatory mechanism operating, in addition to the mechanisms controlling the severity of the disease. One would suppose that under nomadic conditions, transmission might be postponed, but that in refugee camps transmission would be increased. While talking about measles, it is well to emphasize that respiratory disease seems here as elsewhere to be the dominant problem (Figure 4).

Tuberculosis is known to be aggravated by poor nutrition. Following each period of poor nutrition, which comes with war and devastation, there is an increase in tuberculosis. However, these epidemics are slow to develop and the effects may not be seen for years. (9, 10) Thus, the question as to the long-term damage caused by the insidious development of chronic cough is often ignored. How does

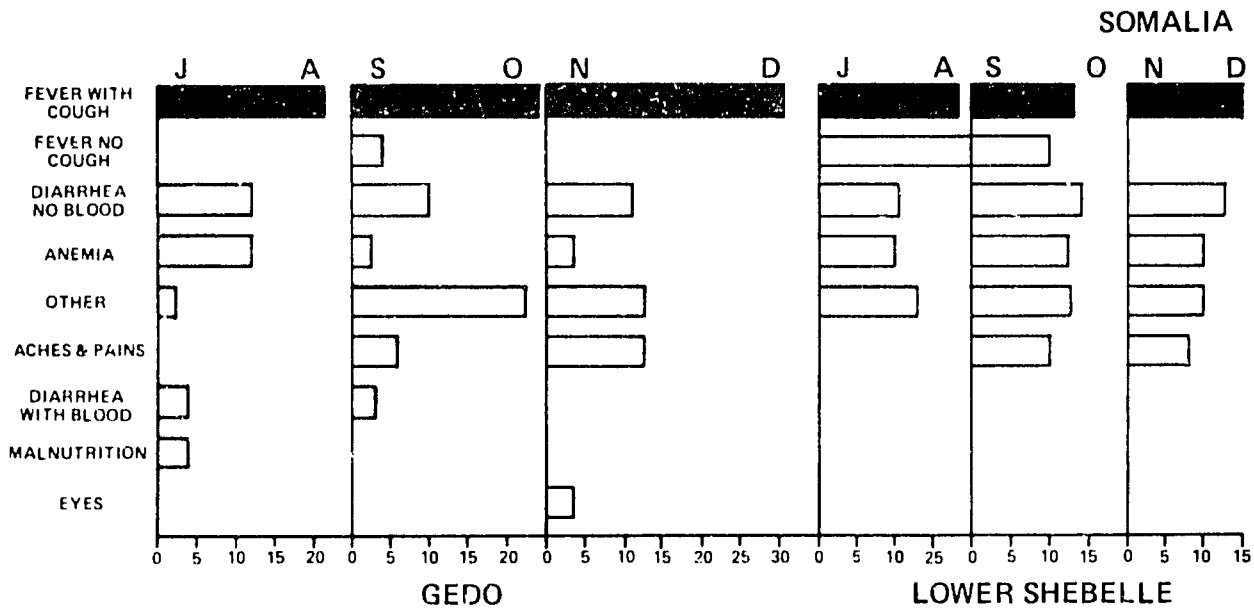

FIGURE 4 Clinical complaints in two camps, July-December 1980. (Source: Centers for Disease Control, Atlanta, Georgia, 1980).

nutrition affect susceptibililty? In the Minnesota study on voluntary starvation (9), the disease appeared during the course of food restriction. A major difficulty is that we are not yet clear about the mechanism of immunity. One school started by A.R. Rich (9) and continued by Youmans (10) says that the allergic or hypersensitivity response is separate from immunity. On the other hand, the excellent studies of Mackaness and associates at the Trudeau Research Laboratories, Saranac Lake, (11) have shown that the hypersensitive reaction set off with specific T cell reaction against tuberculin causes the macrophage to be activated and thereby to digest the intracellular bacteria, Listeria monocytogenes, much faster than would occur normally. Thus, a specific "hypersensitive" reaction causes a nonspecific protective reaction. However, few studies of this nature have been done with the etiologic agent, Mycobacterium tuberculosis, and thus, the incomplete state of our knowledge. It is true that histochemical studies on the digestion of tubercle bacilli by Dannenberg (12) support this concept. On top of this, the experimental work on the effect of diet in animals on susceptibility to mycobacteria is contradictory.

Now to the practical side. If tuberculosis does become a problem in the camps, what should be done? Should BCG vaccination be carried out? The recent failure of this vaccination in a very carefully controlled study in India (13) indicates that we do not have a definite answer, despite the earlier successful studies. (14) One conservative expert with whom I consulted said, "Yes, give it; it won't do any harm!" (15) But this is hardly the kind of basis we need. Should one advise isoniazid prophylaxis and, if so, to whom? The answer is less clear than in the case of BCG. It would seem to me that if it looks at all likely that the refugee camps are going to last, then studies of this question are necesary.

The practical aspects of the control of dysentery are much simpler. Adequate, clean water supply is central to control. With adequate camp sanitation, it should remain at a low level. Yet, because of the very nature of refugee camps, this is not easy to accomplish. Both camp life and the malnutrition of the individual before he enters the camp lead to epidemics in which the virulent Shiga bacillus comes to the fore. (16) The effect of nutritional status on susceptibilility to dysentery was recognized by Fletcher and Jepps in their 1927 study of Dysentery in the Malay States (17) and seen again in the epidemics that occurred in Bangladesh following the war of liberation and the famine that took place there. The careful studies of Pierce et al. (18) on the effect of nutrition on immunity to experimental cholera show a great decrease in the number of antibody-producing B cells circulating in the lymphatic duct, and in the tissues themselves, of the intestine. Thus, if the same type of immunity holds for dysentery, one would wonder whether when a vaccine is ready for this disease, it will be able to work if the clones of

specific B cells are greatly reduced. As S. Formal, who is working on a dysentery vaccine, says, "This would be one of the problems that would have to be studied." (19)

A threatening disease must be thought about to be prevented. I have listed four that concern me (Table 2). There is a well-known belt of meningococcal meningitis that stretches over the sub-Sahel area, apparently related to life in close quarters during the cold weather when people live in smoky huts close to each other to remain warm. (20-22) Meningococcal meningitis is reported as recently epidemic in neighboring Ethiopia. (23, 24) Will the life in the refugee camps, especially those of the north, be so different from that of the rest of this belt, so that epidemics will not occur? (25) I doubt it, but surely none of us can tell how many cases will occur. There is a new

TABLE 2 Diseases that May Threaten during Camp Life in Somalia

Diseases	What to Do
Typhus	Testing of louse resistance to insecticide
Meningococcal Meningitis	Surveillance
Trypanosomiasis	1. Difficult to predict; unlikely in cleared area 2. Surveillance
Rift Valley Fever	1. Check on all unexplained acute fevers for retinal hemorrhage 2. Serology
Trachoma	1% Tetracycline ointment to sticky eyes

vaccine against some of the strains of meningococci that has been and is being tested. (26-28) Again, we cannot give adequate advice from afar.

Typhus and relapsing fever. Many investigators of the subject think that this part of Africa is the home for typhus. Well, you say, simply apply insecticide in the camps. But C. Wisseman of the University of Maryland School of Medicine, an expert on typhus, tells me that the makeup of the louse population differs from one person to the next. They may be resistant to DDT on one person, and resistant to malathion on another person. (29) So, again, investigations of what is happening are necessary. The camps in the colder climates will have to be watched more closely.

Trypanosomiasis caused huge epidemics in Africa in the past. One of the worst was in nearby Uganda following a severe famine. (31) Tsetse flies are present in Somalia. The creation of camps is an open invitation to disease, but the very need that the people have for firewood has caused great areas of the south to be cleared away, and thus for miles around the camps there is no shelter for the tsetse fly. (32) I suspect that it will not be a problem within the camps.

Another zoonosis, the viral disease Rift Valley fever, is a much more likely possibility. In 1977, it caused countless thousands of infections in Egypt, both in humans and animals. Its transmission seems to have been through mosquitoes. It infects all kinds of animals, including sheep and goats. It can produce a viremia in camels, and there are reports of its presence in Somalia. (33) However, its sudden predominance in the last few years in Egypt is a warning. Is it there among all the thousands of aches and pains, fevers, and fevers with cough that are seen in the different camps? One way to find out would be to do serology. One cannot do this in 40 different camps with 30,000 people, including children, in each of them. Rift Valley fever causes hemorrhages in the skin and, characteristically, in the retina. Thus, an M.D. with an opthalmoscope can look for it, and then perhaps alert the virologist. But all of this takes time and the disease can become explosive.

Trachoma, a destructive scarring disease of the eye, has been reported in 27 percent of the population of one of the camps. (33) It is an infection that thrives in dry places, perhaps partly related to the lack of clean water for washing. We have no vaccine against it. Opthalmologic consultants in Afghanistan recommended 1 percent tetracycline ointments for sticky eyes, so that bacterial complications will be kept down. This treatment will not cure, but it can slow down its transfer from person to person. No doubt much of this is done through various consulting agencies, but can such imperfect chemotherapy cope with tens of thousands of cases? It emphasizes again the need for studies of how to prevent.

Two incidental consequences of famine are locust plagues and ergotism. Plagues of locusts (a disease of the ecosystem) have invaded the Horn of Africa. The latest one was in full strength in 1968. (34) Both the Food and Agriculture Organization of the United Nations (35) and the Centre for Overseas Pest Research in London, England, (36) assure me that the plague of locusts is not significant now, but George Popov (36) says, "...the Horn of Africa, which is of special interest, is a key area in the build-up and the subsequent maintenance of Desert Locust plagues. It is certain that the war in Somalia and Ethiopia, by preventing and handicapping the detection and subsequently the preventive control of locusts in the Ogaden and on the Red Sea Coast, contributed to the escalation of the 1977-78 upsurge," and "...it is very difficult to forecast the time, the place and the scale of attacks, but the vulnerability of the Horn of Africa is among the highest. Particularly susceptible are the crops of the Eritrean coast and the pastures of Ogaden, which cannot be protected at present."

A result of a fungus disease of plants is ergotism. (37) The toxin elaborated on the grain gets into the flour that is used. Normally such infected grain is left alone, but when there is no other food, ingestion of this is necessary. The resultant closure of blood vessels of the limbs results in tissue sloughing, central nervous system symptoms, and death. A recent outbreak in Ethiopia, caused by the use of wild oats, serves as a warning. (38) It is not something that is likely to occur in camps, but what about those on the edge of the camp?

This conference must not limit itself to the refugees, but look forward. Availability of water is essential for new farm land. If this water is transmitted in open ditches, then schistosomiasis becomes a major consideration. An estimated two million new cases of this helminthic infection occurred following the extension of irrigation from the Nile River when the Aswan Dam was built. Schistosomiasis is endemic in Somalia. (39) Its vector snail will surely be spread with new irrigation. This is an ecological problem of specific interest in relation to renewal of land. Perhaps in some happier day, Ethiopia's contribution of the molluscicide "Endod" would be of value in Somalia.

Malaria is not simply a disease to be treated when it occurs, nor simply a fever against which we hope there will one day be a vaccine. It is a disease of places, an endemic killer that is transmitted by different species of anopheline mosquitoes, whose individual ecology must be studied on the spot to determine how to keep it down. It is a problem that needs the attention of Somali entomologists, engineers, and other subsidiary medical people. It is a challenge to the practical and practicing ecologist.

I suggested in the discussion of the threat of trypanosomiasis that this will not be a problem in camps. But if reforestation were to occur, if restocking were to take place, would it appear in large numbers? Ford's beautiful book on trypanosomiasis and African ecology (40) needs to be studied again, and biological methods used to control this threat.

We humans have a peculiar, but probably necessary, desire to classify and then to refer the question to a person who has specialized in a particular area. In Africa, prevention of much endemic disease, of most parasitic diseases, is the province of the zoologist who can understand the countryside, the animals and the population of parasites. I wish to emphasize two things: (1) epidemic disease in Africa is wasteful of energy, is a problem in ecology, and needs to be studied by medical ecologists; and (2) a few percentage points of the amount we spend on "treating" famines must be allocated to studying them, in all phases, so that eventually we can prevent them.

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APPENDIX C-4

BIOLOGICAL RESPONSE CURVES FOR BALANCING LIVESTOCK WITH VEGETATION

Robert E. Bement

Harvesting rangelands with livestock is one of the more difficult forms of agriculture. In most agriculture everything is done to favor the growth of the crop until growth is completed, and then the plants are harvested. With grazing, many of the plants are being harvested at the same time they are expected to make growth. The balance of livestock with vegetation is a delicate one, particularly in arid regions such as the Sahel where the opportunity for plant growth is restricted. When an opportunity for plant growth does occur, it is important that enough leaf material be left ungrazed for the plant to make the most rapid growth possible while moisture is available. This is the point where animals are in balance with vegetation.

Biological response curves that make it possible to determine the amount of forage that should be left ungrazed on a given type of vegetation were developed at the Central Plains Experimental Range in eastern Colorado, USA. (1) The curves showing the livestock-vegetation relationship were developed, refined, and tested with over thirty years of data from the Experimental Range. They have been used on many vegetative types from Africa to Iceland.

Animals from pastures stocked at different levels were weighed in and out of the pastures and standing forage was measured on each pasture at the beginning and end of the grazing period. Animal gain

FIGURE 1

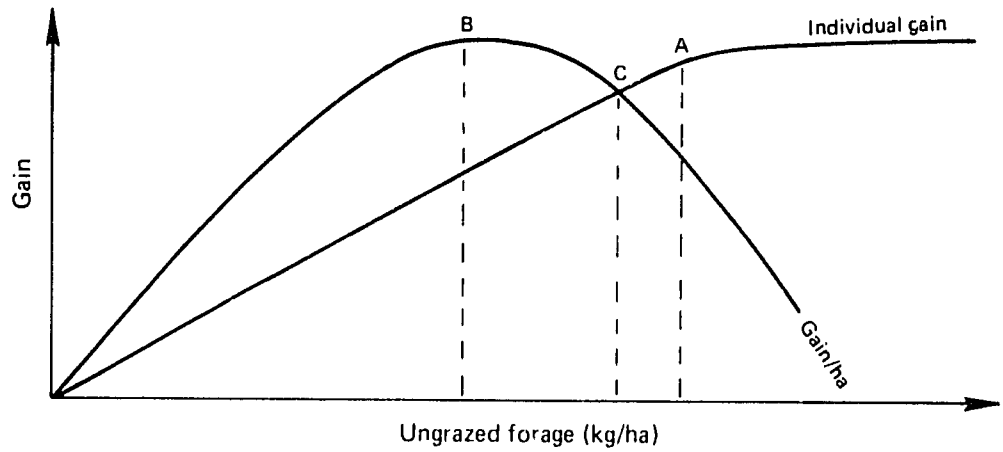


FIGURE 1 Individual animal gain and gain per hectare.

per hectare was calculated and both individual animal gain and gain per hectare were plotted over the quantity of forage that was left ungrazed at the end of the grazing period. An example of the resulting chart is shown in Figure 1.

The left side of the chart represents heavy grazing where there is little forage left ungrazed and the amount of feed available to each individual animal is so low that no gain is made. As the number of animals is reduced, more feed is available to each animal and the individuals gain more and more as the right side of the chart is approached where there are few animals and much forage remaining ungrazed.

For any given type of vegetation there is a point (A on the chart) where no matter how much more the animal numbers are reduced or how much more feed becomes available to each individual, the individual gain or animal response remains at the same level.

When gain per hectare is plotted, the maximum occurs at point B. If the chart is prepared so the maximum gain per hectare and the maximum individual gain are plotted at the same level, the lines will intersect at point C. This is where the animals are in balance with the vegetation and optimum livestock and vegetation production can be maintained.

Stocking heavily enough to make maximum gain per hectare, point B, is too heavy and results in decreased forage production, followed by decreased livestock production. Stocking at point A will give the highest individual animal gains but will result in lower animal production per hectare than is made by stocking at the balance point.

Knowing this key amount of forage that should be left ungrazed provides a standard for answering the basic range management questions of when livestock should be put into an area, how many should be grazed, when they should be moved, and where they should be moved.

Animals should be put into an area only when there is more forage available than the key amount. A calculation of the number of animal days of grazing provided by the forage in excess of the key amount serves as a guide to the number of animals and the length of time that grazing in the areas should be permitted.

As an animal eats about 3 percent of its body weight in dry forage per day, the number of animal days of grazing can be estimated for the area being considered. The pastoralist can then decide whether to put many animals in for a short period or fewer animals in for a longer period. The livestock should be moved when forage is grazed down to the key amount, regardless of the calculated time. They should be moved to an area that has more than the key amount of forage for its vegetation type.

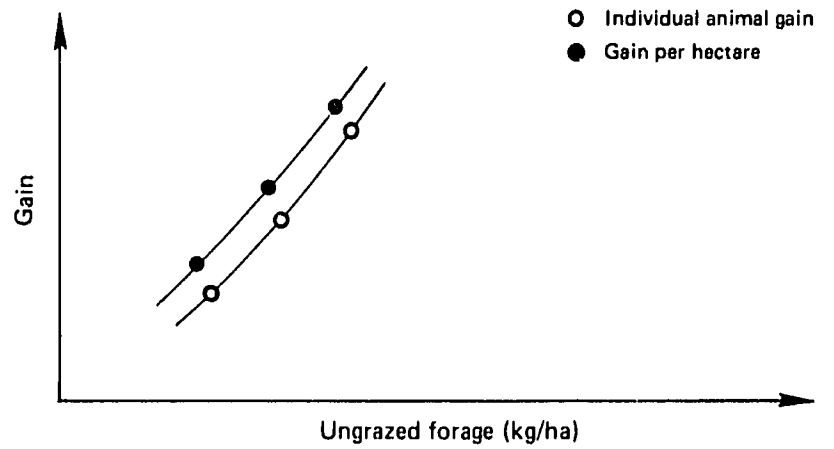
Use of the biological response curves has eliminated the need for long-term grazing trials. Short-term grazing trials using three or more grazing intensities are sufficient to establish the intersection. Each grazing intensity will determine one point on the individual animal response curve and one point on the gain per hectare curve.

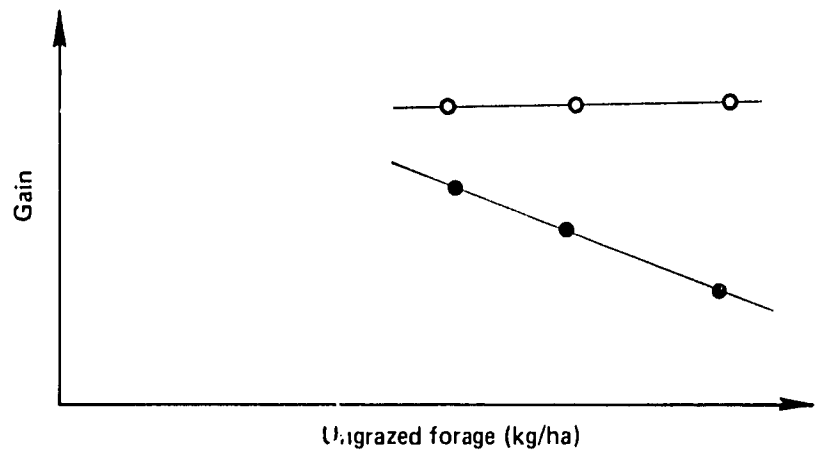
Examination of the plotted points will show quickly if and how stocking levels need to be changed to include the intersection. Figure 2 is an example of a trial where the grazing intensities are too heavy. Animal numbers should be reduced to locate the intersection.

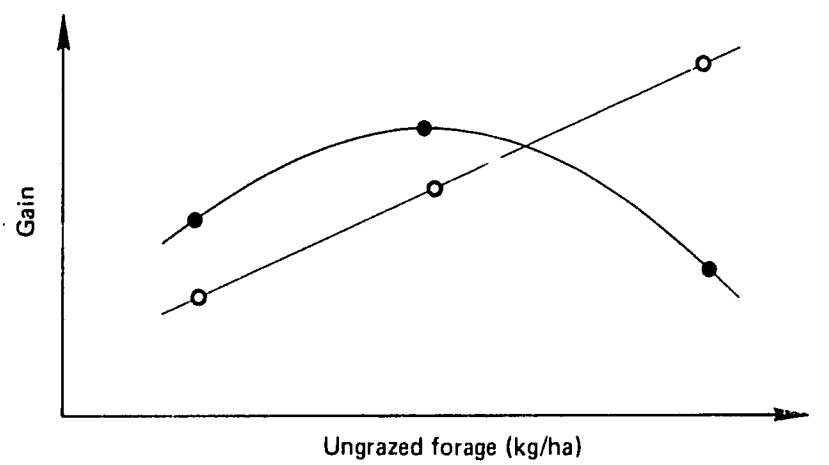
In Figure 3 the pastures have been stocked too lightly to include the intersection, and when the trials are repeated, additional animals should be used.

Figure 4 is an example of a trial where the stocking levels have included the intersection. In this case, the trials should be continued until points A, B, and C have been located. This usually takes from two to five years, with only three grazing intensities. With a situation similar to that in Figure 4, an extremely good estimate of the key amount of ungrazed forage can be made in one year.

In addition to the animal measurements and the measure of ungrazed forage, plant species composition of the vegetation should be measured at least once a year. This is necessary to define the plant community being studied, as the curves are only valid for the type of vegetation upon which the trials were conducted.







FIGURES 2, 3, and 4 X = individual animal gain; ● = gain per hectare.

In some cases the plant composition will change with differences in grazing intensity, and the changes need to be defined. Either light or heavy grazing can change the vegetation to a more productive type than that on which the trials were started. When this happens, trials need to be conducted on the resulting vegetation type.

Priority for trials should be given to the vegetation type most important to the region, and trials should be conducted during the growing season and the dormant season.

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APPENDIX C-5

DROUGHT AND FAMINE IN SOMALIA
PASTORAL STRATEGIES THROUGH THE TWENTIETH CENTURY

Lee V. Cassanelli

INTRODUCTION

I come to this seminar not as a natural scientist but as a social and cultural historian. As such, I thought I could best contribute to our deliberations by reviewing some of the historical and ethnographical literature on Somalia as it bears on the human response to recurrent drought and famine. In the first part of the presentation, I describe some of the strategies that Somalia's pastoralists have employed to cope with drought and famine in the past. Then I call attention to some of the recent trends that render these traditional strategies less effective than they once were. It is hoped that this historical survey will serve to set our discussion of the current crisis into some kind of context and help us to assess the viability of alternative strategies for coping with environmental deterioration and food shortages in the Horn of Africa.

THE INCIDENCE OF DROUGHT

Based on meteorological records and Somali oral recollections going back to the early twentieth century, it appears that the Somali

Peninsula is visited by serious drought at least once every 20-25 years, while less severe or briefer periods of drought can be expected to occur once or twice in the interim. (1) In my definition, a serious drought is one that is both prolonged (two or more rainy seasons with no or completely inadequate rainfall) and widespread (preventing herding groups from exploiting pasture reserves in districts immediately adjacent to their customary grazing grounds). Serious drought typically produces livestock losses in excess of 40 percent of a clan's or lineage's composite holdings, and individual families may lose much more. (2) Such losses not only curtail the production of milk and meat, which are consumed directly by the nomad and hence affect nutrition; they also reduce his ability to obtain non-pastoral products through exchange. Moreover, poor rainfall is only one of the factors that contributes to periodic food crises in the Horn: other natural disasters such as locust invasions or animal epidemics may produce near famine conditions even in years when rainfall is perfectly adequate. (3)

In the present century--the only one for which we have reasonably detailed evidence--drought-induced famines occurred in the area formerly known as Italian Somaliland in 1910-12, 1920-21, 1931-33, 1943-44, 1951-52, and 1963-65. For the part of Somalia formerly known as British Somaliland, where even in good years the average rainfall is much lower, the incidence of reported drought is greater: 1911-12, 1914, 1918, 1925, 1927-29, 1933-34, 1938, 1943, 1950-51, 1955, 1959, 1968-69, 1973-75. (4) Though the nature of the evidence makes it difficult to determine the full geographical extent of any given drought, it appears that in this century only the drought of 1910-12 affected the entire range of latitudes in the Peninsula. (It is still remembered with a variety of local names in the oral history of many clans throughout the country.) On the other hand, the terrible drought and famine of 1931-33 seems to have been confined to the central and southern regions of Somalia, while the widely reported drought of 1973-75 did its greatest damage in the northern two-thirds of the Horn.

TRADITIONAL SOMALI STRATEGIES FOR COPING WITH DROUGHT

Given the fact that drought is a recurrent phenomenon, it is not surprising that Somalia's pastoralists have devised a number of strategies to anticipate its coming and to help mitigate its actual effects. Many of these strategies are built right into the annual cycles of pastoral transhumance pursued by almost all of the country's nomads. In the course of its members' seasonal migrations, each clan acquires an intimate knowledge of the regional ecology, natural resources, and potential human allies of its area. A vast quantity of local weather lore and pastoral medicine is transmitted from generation to generation by specialists known as <u>climi curraaf</u> (bush-lore experts). (5) But it is in times of drought and potential famine that

the nomads' adaptive strategies stand out in boldest relief. By examining colonial records and reports during several of the drought years listed above, it is possible to detect certain "typical" responses on the part of the country's nomads to the threat posed by drought. Without going into all the details here, (6) I will simply outline some of the salient strategies that emerge from the scattered evidence of the past 60 years. While resort to these strategies clearly varied in time and intensity from district to district within any drought-afflicted area, they were generally taken up by the nomads in a predictable sequence which tended to correspond with progressively worsening conditions on the ground.

- Whenever anticipated rains were scanty, herding units tended to abandon their seasonal grazing grounds sooner and return to their dry season wells earlier than they normally would. If the rains failed altogether, the initial movement out to rainy season pastures might itself be curtailed. In either case, the result was a concentration of people and livestock around permanent groundwater reserves, with a corresponding deterioration of grasslands in the vicinity of the wells.

- To help cope with the situation created by the conditions noted above, the family herds were frequently divided into smaller, more specialized units. Camels or cattle were separated from sheep and goats and taken out to graze at some distance from the wells according to their differing capacities to go without water. This dispersal of livestock under the care of Somali men and boys was a means of more efficiently exploiting every possible ecological niche in the drought-afflicted area. At such times, herdsmen often sought access to the grazing lands of neighboring and allied lineages, lands that might not have been as severely affected by the drought.

- As the drought persisted, women, children, and the elderly were often sent to stay with kinsmen or allies in the towns or (in the south) farming villages. This process of "sloughing off" dependents into refuge areas allowed the young men to move more quickly with the livestock from pasture to pasture in search of whatever nourishment the parched land could still offer. It also reduced the demand for milk from the animals, which could be used to keep some of the calves alive.

- The slaughter or sale of large numbers of animals was an almost certain indication that the nomads perceived the drought to be serious. The available evidence suggests that the sale of livestock and of animal hides in urban markets almost invariably increased in times of drought, despite declining prices caused by the deteriorating condition of the animals. The rationale behind this strategy of selective

depletion of the herds appears to have been twofold: it reduced the pressure on the land by removing substantial numbers of animals from it and increasing the forage available to the remainder, and it provided the nomads with the means of obtaining food substitutes--rice, dates, and grain.

- There is also evidence to indicate that some nomads confronted with drought sought temporary employment outside the pastoral sector. Traditionally, this involved incense gathering, petty trade, and temporary cultivation in areas where this was possible. Colonial records show that in most periods of drought there was a sizable movement of nomads into the towns and agricultural regions of the south. Here again the aim seems to have been to reduce the number of individuals directly dependent on the herds for the duration of the drought. As officials in Italian Somaliland discovered, most of the "refugees" began to filter back into the pastoral sector once conditions in the rangelands returned to normal. With the possible exception of the Somali cultivators in the Borama region of northwest Somalia, there is little evidence to suggest that drought induced many nomads to settle down permanently during the colonial period. (7)

From this brief outline of the Somali nomads' responses to drought, all of which can be documented in the colonial literature, several points ought to be emphasized. First, the ability of drought-stricken pastoralists to call on allies, kinsmen, and town dwellers for assistance depended on the existence of well-established networks of mutual support. While such support networks were most fully utilized in times of crisis, they had to be built up over the years through a variety of marriage, commercial, and patron/client ties. Under normal envrionmental conditions, a pastoral family might have little need to resort to these support systems; but with the onset of drought, they could be activated. Indeed, the willingness of nomadic families within Somalia to absorb refugees from across the Ethiopian border since 1978 can only be understood, I think, by assuming that ties of kinship and mutual assistance between Somalis on both sides of the boundary predated the recent crisis.

Moreover, the strategies outlined above suggest one reason why most Somali pastoralists strive to accumulate livestock in numbers generally estimated to be far in excess of their basic subsistence needs. (8) This strategy of "hoarding" animals was once commonly interpreted by scholars in sociocultural terms: livestock conferred prestige on the owners and gave them status within the community. However, without denying the social value that Somalis clearly place on large herds, there is an important economic rationale behind the strategy of accumulation. Large herds can be seen as a form of disaster insurance. The reasoning here is that by building up large

numbers of animals during the good years, the herdsman insures that at least some will survive the bad. Moreover, in good times, surplus animals are lent to clients and friends, used to contract favorable marriage alliances, and generally distributed in such a way as to create and cement social relationships that can be called upon in a crisis. Thus, when a family seeks access to the grazing lands of a neighboring lineage, or asks help in rebuildiing its depleted herds following a drought, it is cashing in its insurance policy. Both individually and collectively the accumulation of livestock was a way of preparing for the inevitable onset of hard times. (9)

Finally, it should be emphasized that most of these traditional strategies for coping with drought were conceived of as short-term expedients--that is, as ways of weathering the crisis. The dispersal of livestock among kinsmen and allies, the sloughing off of dependents to refuge areas, and the adoption of temporary work outside the pastoral sector were strategies pursued on the assumption that the crisis would pass and that normal pastoral operations could soon be resumed. The strategies were viable, in other words, precisely because they were short-term, placing only limited burdens on the herdsman's allies and on the refuge zones. The idea was that any assistance rendered to the victims of drought might well need to be reciprocated should the fortunes of the allies be reversed in future disasters.

TRADITIONAL STRATEGIES AND CONTEMPORARY REALITIES

In my opinion, the pastoral strategies outlined above worked remarkably well in sustaining the pastoral enterprise through the first half of the twentieth century Despite several severe droughts, with their human casualties and loss of livestock, the overall human population of Somalia has increased since the turn of the century, the total livestock population of the country has at least doubled, and the absolute number of pastoralists in the Somali population has probably remained constant since 1900. (10) The resiliency of Somali pastoralism is all the more remarkable if one realizes that no central government until the present one intervened in any but a marginal way to alleviate the consequences of drought in the pastoral sector.

Nevertheless, the situation confronting Somali pastoralism in the 1980s is critical. It is not simply the recent refugee crisis that threatens the viability of pastoralism in the Horn, although that crisis places a staggering burden on Somalia's human and natural resources. In fact, it is possible to see a series of historical trends operating since about 1950 that have contributed to the transformation of pastoralism in Somalia, and that have now begun to threaten its survival as the central means of livelihood for the

majority of the country's inhabitants. In the remainder of this paper, I want to try to summarize the most important of these historical trends and then to indicate why I think they, together with the refugee crisis, have rendered the nomads' traditional adaptive strategies if not obsolete, at least far less effective in maintaining the long-term viability of pastoralism.

- Commercialization of the livestock sector. While the sale of livestock on a small scale to obtain non-pastoral products has long been a part of the Somali rural economy, the level of commercial activity in the pastoral sector since the 1950s seems to have increased dramatically. The export of large numbers of Somali goats, camels, and cattle occurred largely as a response to the rising demand for meat in the oil-producing countries of the Arabian Peninsula. By the mid-1960s, livestock and livestock products had replaced bananas as Somalia's major source of export earnings. (11)

  The rearing of large numbers of animals for export since 1950 might have had a minimal effect on patterns of land use in Somalia had it been accompanied by a reduction in the numbers of livestock held for domestic use. But what appears to have happened is that Somali herdsmen continued to maintain large herds as a form of disaster insurance; there is little evidence that the introduction of new marketing operations fundamentally altered the nomads' perception of the need to maintain large domestic reserves. The result has been a dramatic increase in the size of the total livestock population, which obviously poses a potential threat to the fragile rangelands.

- Expansion of the modern sector into traditional rangelands. This involves not only the growth of urban areas, which has been modest by African standards, but also the extension of modern infrastructures (roads, reservoirs, commercial farms) into the countryside. The commercialization of the livestock sector has contributed in a significant way to the fencing off of private grazing reserves, (12) while urban expansion has denuded many areas of building and fuel woods. While some scholars have seen embryonic class formation as the most significant consequence of the expansion of the modern sector, I would argue that just as important is the continuing overexploitation of the environment. For example, the sinking of new wells and the construction of water tanks in the Hawd and Mudug regions in the 1950s and 1960s were aimed at making these rich pasturelands more accessible to the nomads. Whereas previously they could only be grazed during the rainy season, the availability of groundwater opened them up to

> year-round use. Unfortunately, the result in many cases was to eliminate the opportunity for the seasonal grasses to regenerate themselves, leading to overgrazing and erosion in many once-fertile rangelands. (13)

These historical trends, coupled with an annual population growth rate estimated at between 2.3 and 2.8 percent, contribute to a situation where recovery from each successive period of drought and famine can be expected to become more difficult. Large regions of the country are clearly being overgrazed and deforested, and while in good times the herds seem capable of providing the country's 3 million nomads and semi-nomads with their basic subsistence, the long-term prospects are far less promising. In spite of these realities, the majority of Somalia's pastoralists contine to opt for a nomadic existence. Perhaps the tradition of independence and self-reliance dies hard; more probably, the perceived alternatives--settled agriculture, fishing--are still seen as less-secure, less-flexible options for surviving in a harsh environment.

The recent influx of refugees into Somalia will in all likelihood force the government into a consideration of the long-range prospects for pastoral production in the Horn. For while the nomadic response to the refugee crisis reveals several continuities with traditional crisis management strategies, the magnitude and duration of this crisis will probably irreversibly alter the options open for the future. Thus, while it is possible to see the refugee camps as providing shelter for nomadic dependents much as traditional refuge areas did in times of drought, the camps of the 1980s appear to be far more permanent than the temporary shelters of the past. There are today serious military and political obstacles to the return of nomadic families to their previous pastoral existence in the Ogaden.

Moreover, while traditional refuge areas were based on reciprocal ties of kinship, marriage, or alliance, the camps of today are internationally supported institutions, which means there is less pressure on the victimized nomads to move their dependents back into the subsistence sector, even if they could. Finally, the existence of th refugee camps, populated largely by women and children, clearly enables the Somali men to pursue as best they can their traditional grazing rounds. It also frees many of them to go overseas for short periods of time to earn additional income for their families. While there are no hard figures, my impression is that tens of thousands of Somalis are engaged in short- and medium-term work in the oil fields of Arabia and the Persian Gulf. This is an aspect of "nomadic" adaptation that goes back at least a century, but the scale of the present exodus in search of alternative employment clearly marks a transition from the strategies of the past. It suggests that while Somalis may view the current crisis in traditional terms--one that needs to be weathered by securing access to other sources of income--they are acting in huge numbers to find alternatives to pastoral production.

CONCLUSION

If I have strayed a bit from my initial topic of drought-management strategies, it is partly to show that continued Somali resourcefulness during the current crisis has its roots in the pastoral way of life. The need to cope with recurrent drought, famine, and environmental stress has conditioned Somalis to rely on proven networks of kinship, commerce, and cooperation. Despite the many changes that have occurred in the pastoral sector over the past thirty years, there is evidence to suggest that Somalis still resort to traditional strategies even in the face of a refugee crisis of immense proportion. There is little doubt that these traditional strategies--dispersal and sale of herds, dispatch of dependents to refuge areas, and temporary employment outside the pastoral sector--have been operating alongside international relief efforts and have helped to mitigate the worst consequences of the recent drought and political conflict.

In thinking about future development strategies and food-production systems, we would do well to keep in mind the resourcefulness and resiliency of the pastoral mode of production. It is a mode well-suited to the environment of the Horn; and as I have tried to show, its recent troubles have resulted more from the intrusion of external factors than from any inherent lack of viability. It might then be worth asking whether a development strategy that seeks to minimize these intrusions into the pastoral system and allows the nomads to make maximum use of their proven mechanisms of survival might be a better way of increasing self-sufficiency in food production than a strategy that seeks to transform the whole of Somali rural society. The alternative would be to introduce technologies--for food and fuel production, housing construction, etc.--to assist the nonpastoral sectors (towns, farms, and, nowadays, refugee camps) to achieve their own self-sufficiency and, therefore, not draw so heavily on the land and resources that underpin the pastoral system.

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useful is J.F. Griffiths and C.F. Hemming, A Rainfall Map of Eastern Africa and Southern Arabia, East African Meteorological Department Memoir, vol. 3, no. 10 (Nairobi, 1963).

(2) Brief descriptions of the major Somali droughts in the twentieth century, including that of 1973-75, can be found in I.M. Lewis ed., Abaar: The Somali Drought (London, 1975), esp. pp. 1-2, 11-14, 20-22, and 26-29.

(3) Major locust invasions during the colonial period were reported for 1905, 1912-13, 1927, 1938, 1942, and 1949. Following the initial invasion, the locusts typically remained to do damage for an additional two to three years.

(4) Information on droughts in the former Italian colony can be found in a number of official publications, notably the Bulletino d'Informazione (1913-21), Bulletino d'Informazione economiche (1922-26), and the Rassegna Economica delle Colonie (1927-1941). Dates for the northern (British) Somaliland droughts can be found in Lewis, ed., Abaar, 26-29.

(5) There are a number of excellent regional studies of pastoral transhumance in the Horn. For the north, there is I.M. Lewis, A Pastoral Democracy (London, 1961), esp. chps. 2 and 3; and John A. Hunt, A General survey of the Somaliland Protectorate 1944-1950 (Hargeisa, 1951), esp. pp. 121-175. For the rest of the country the best studies are in Italian. The northeast is covered by T.M. Bettini, L'Allevamento del Bestiame in Migiurtina (Florence, 1941), while there is still much to be learned from the classic study of cattle nomadism by Francesco Provenzale, L'Allevamento del Bestiame nella nostra Somalia (Rome, 1914).

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(6) Examples from the colonial literature are provided in Chapter Two of my forthcoming book, The Shaping of Somali Society (University of Pennsylvania Press, Philadelphia, 1982).

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(8) Estimates on basic subsistence requirements and actual herd sizes can be found in Lewis, A Pastoral Democracy, 56-59; Leo Silberman, Scmali Nomads, International Social Science Journal 11/4 (1959), 570-71; Z.A. Konczacki, Nomadism and Economic Development of Somalia, Candian Journal of African Studies 1/2 (1967), 170ff.

In general, it seems that an average Somali family--a man, his wife, and three children--requires 10-20 camels, 50-60 sheep and goats, or 15-20 head of cattle for subsistence, though many family herds are three to four times this size.

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(10) Statistics on the human and animal populations of Somalia are notoriously unreliable. Some discussion of the problems associated with the Somali data in general can be found in Karp, 19-38. Also helpful is Irving Kaplan, et al., Area Handbook for Somalia, 2nd edition (Washington, 1977), esp. pp. 57-59, 235-37, and 267-70.

For some recent estimates on the size of the livestock population, see UNFAO Agricultural and Water Surveys: Somalia, Livestock Development Survey (Rome, 1967), p. 50; ILO Regular Program of Technical Assistance Report to the Government of the Somali Democratic Republic on the Integrated Develoopment of the Nomadic Zones (Geneva, 1972), pp. 4-6. Before the 1974 drought, there were probably between 15 and 20 million animals in country, with sheep and goats making up perhaps two-thirds of the total, and cattle and camels the remainder.

(11) See Kaplan, I., et al., 1971. Area Handbook for Somalia, American University, Washington, D.C., 283ff.

(12) Box, T.W. 1971. Nomadism and land use in Somalia. Economic Development and Cultural Change 19(2): 226-227.

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APPENDIX C-6

THE WRETCHED OF THE HORN: HISTORICAL CAUSES FOR SOMALI REFUGEES

Hussein A. Bulhan

In this paper I will outline the historical causes for Somali refugees. A humanitarian and nonpartisan aid to the refugee crisis in Somalia is obviously critical at this stage of massive dislocation, hunger, and disease. But a long-term solution to the problem requires a grasp of and grappling with thorny and complex political concerns. Before outlining the historical background of the refugee crisis, I will discuss issues of crucial significance for this conference.

First and foremost, the question of land is fundamental to 11 aspects of a people's predicament. Our discussion of ecology, economics, health, culture, social existence, or psychology must perforce take into account the question of land. Second, a people whose land is dismembered is a people whose economic life, culture, and psyche are dismembered. Third, the external environment, the ecology surrounding us, in time becomes an environment within us, an ecology internalized. Moreover, an environment assaulted, an ecology abused, brings forth a humanity assaulted, abused, and tormented. Finally, a refugee is a remarkable barometer. He is a gauge of political repression in a country: "He votes with his feet." He tests the limits of a host country's economy, health system, and collective patience. In addition, a refugee tests the carrying capacity of the land as he reveals the carrying capacity of the human will. The now massive agony of Somalis offers a telling testimony to these general remarks.

Before colonialism, the Somali faced one primary enemy--namely, a harsh ecology. His elaborate social nexus and human-centered outlook constituted a cultural bulwark, a collective defense, against this barren ecology. But when Europe unleashed upon the world that historic avarice for colonies, the Somali fell victim in a way little appreciated. The colonial scramble and subsequent colonial rule introduced to Somali life a havoc of catastrophic proportion. The cultural bulwark gradually weakened and the Somali found himself defenseless to disasters first from without, later from within.

It was during the late nineteenth and twentieth centuries that Somaliland became an arena for colonial competition. Four expanding empires had their own designs on Somalis and their land. Three of the contending powers were the European countries Britain, France, and Italy. The fourth was the burgeoning kingdom of Ethiopia, which was detemined to share the loot. Its emperor, Menelik II, was an astute and ambitious powerbroker who, having decimated local rivals, set out to fashion an expansive empire of his own. The European avarice for colony found a ready and willing accomplice in the intrigues and ruthlessness of Menelik II. Somaliland was subsequently partitioned into five separate colonies and the homogeneous Somali were subjected to all forms of colonial atrocities and manipulation.

Britain's initial interest in Somaliland centered on a desire to secure the flow of trade from the hinterland, which also supplied fresh meat to its garrison in Aden. From 1884 to 1889, Britain concluded several treaties on trade and protection with various Somali elders. Somali elders entered into these treaties because of their alarm at the many forays and raids that the better-armed Ethiopians were making on their communities.

The precipitous withdrawal of the Egyptians from the coast led Britain to establish a Somaliland Protectorate in 1887. The Anglo-Somali treaties, which culminated in the establishment of the Protectorate, were, in the view of Somali elders (who entered into these treaties in good faith and for reasons of self-preservation), contractual alliances much like those concluded in traditional society. The preambles of these treaties left no ambiguity as to their purpose. They were explicitly concluded "for the maintenance of our independence, the preservation of order, and other good and sufficient reasons." Britain also pledged that no portion of Somali land was ever to be ceded, sold, or mortgaged to a third party. Similar treaties were also signed with France and Italy.

Britain gradually gained ascendancy as a colonial power in the Horn. The three European powers subsequently concluded initial agreements on spheres of influence and boundary demarcation. The Anglo-French Treaty of 1887 fixed the present boundary between Somalia and the Republic of Djibouti. From 1889 to 1925, a series of

Anglo-Italian treaties divided and redivided colonial spoils in Somaliland. Somalis were neither informed nor consulted on the partition of their land, and their consent became as irrelevant as those of the plants and animals in the land. This pattern was to give a fundmental twist to the history of the Horn. Vestiges of that pattern are obvious in the practice of those leaders in the Horn who inherited the colonial machine. Today, as then, the consent of the people remains irrelevant.

Meanwhile, as Europeans engaged in secret negotiations to share the spoils, the subterfuges of Menelik and a heavy infusion of European munitions to his army were catapulting Ethiopia into a junior partnership in the partition of Somaliland. The Brussels General Act of 1890 exempted Ethiopia from the prohibition of firearms to all Africans. This prohibition was calculated to hasten colonization and reduce African resistance. The provision of munitions to Menelik's army and the simultaneous "pacification" of other nationalities further destabilized the Horn. Other developments also strengthened Menelik's bargaining power. European concerns about the Mahdist insurrection in Sudan and the Italian defeat at Adowa in 1896 also bolstered Ethiopia's position as a favored partner in the colonial partition. Menelik had by then unabashedly pronounced his expansionist ambition in his now-famous statement: "...If powers at a distance come forward to partition Africa between them, I do not intend to be an indifferent spectator." By 1897, within a few days of each other, representatives of Britain, France, and Italy struck separate deals with him.

In the Anglo-Ethiopian Treaty of 1897, Britain ceded a significant portion of Somaliland to Ethiopia. The secret treaty was not published, and the boundary agreed upon was not marked until the early 1930s. Somalis fell under Ethiopian authority. The Franco-Ethiopian Treaty of 1897 ceded a considerable portion of what was formerly called French Somaliland. The Italo-Ethiopian Agreements of 1897 attempted to define the boundary between Ethiopia and Somaliland. A second agreement in 1908 attempted to define a precise boundary, but to no avail. In the end, after decades of colonial bayonets and barter, Somaliland was effectively partitioned into five colonies: British Somaliland, French Somaliland with a substantial Afar population, Italian Somaliland, the Northern Frontier Districts (NFD) now with Kenya, and the so-called Ogaden under Ethiopian rule.

Somaliland was thus dismembered, and so was Somali society. If colonization and partition were consummated without the people's consent, the actualization of both was nevertheless intensely resisted by all means at hand. The early and heroic resistance of Sayyid Mohamed Abdulle Hassan kept the British at bay for twenty years (1899-1920). His movement was later crushed by air bombardments. This event marked the first time airplanes were used to subjugate a colonial people. With the defeat of the Sayyid, colonization and partition were

effectively realized. Somalis were at once faced with a confluence of formidable and better-armed foes. The active and long resistence of the Sayyid gave way to sporadic and passive resistance.

When partition of the land could not be avoided, salvaging the integrity of Somali culture and psyche became the ultimate hope. Partition and colonization inevitably dislocated the mode of production and free movement of the nomadic Somali. When at last the culture and psyche were assaulted, since neither can survive erosion of the material base, the Somali lost hope and his world became utterly disrupted. The old, human-centered culture gradually gave way to an obsession with death and doom. Earlier generations of Somalis regarded the alien assault and partition not only as an end of an era but a proof that the last days of the world were imminent. Farah Nur, the famous poet and leader who died in the early 1930s, had captured the emerging Somali mood in the following words: The British, the Ethiopians, and the Italians are squabbling,/The country is snatched and divided by whosoever is stronger,/The country is sold piece by piece without our knowledge,/And for me, all this is the teeth of the last days of the world. (1)

Somaliland was nevertheless colonized and partitioned. For a short period, World War II brought virtually all Somalis under a single colonial administration. The British Military Administration (BMA) took control of Somaliland, including those portions under Italian and Ethiopian rule. The BMA was established in 1941 and ended by the late 1940s. During 1946, Ernest Bevin, the British Foreign Secretary, articulated the injustice of the partition. At last, it seemed, the plight and right of Somalis were to be recognized. Bevin proposed a united Somaliland under one colonial power:

> ...In all innocence, therefore, we propose that British Somaliland, Italian Somaliland, and the adjacent part of Ethiopia, if Ethiopia agreed, should be lumped together as a trust territory, so that the nomads should lead their frugal existence with the least possible hinderance and there might be a chance of a decent economic life, as understood in that territory. (2)

Bevin added: "All I wanted to do is to give those poor nomads a chance to live....It is to nobody's interest to stop the poor people and cattle there getting a decent living." (2) This plea, if at all sincere, was indeed unacceptable to imperial powers. The British government itself, and of course Ethiopia, rejected the proposal. Representatives of the United States, the USSR, and France also took a cynical view of Bevin's proposal. The flicker of hope and possibility of free movement were once again drawn by conflicting ambitions of imperial hegemony. Thus, Somaliland was repartitioned and the fate of its people sealed again by dint of superior arms. The material

foundation of his life dislocated, the Somali once again fell prey to new and old indignities. The avalanche of torment and deception that colonization and partition had entailed for Somalis cannot be fully recounted. We will provide some examples, however.

When the British took initial control of their Somali colony, they embarked on punitive raids further inland where resistance interfered with trade caravans serving their garrisons in Berbera and Aden. The British fanned clan conflicts and conducted expeditionary raids among the Somali. Elders and religious leaders were bribed and appointed to nominal positions of authority to forestall national resistance. This bribing and coopting began to undermine the old trust and respect for traditional leaders. Moreover, nomads from the interior were initially prohibited from coming to urban centers until they brought with them two boulders needed for building colonial offices and mansions. They were, in addition, required to deposit their arms in the police station. When two were caught fighting, their arms were temporarily confiscated. Both were then ordered to dig a grave. The British knack for 'divide and conquer' found ruthless application in interpersonal conflict once the grave was dug. The grave dug "to the satisfaction of the police, their arms were returned and they were urged to resume their fight on the understanding that the victor would bury his adversary." (3)

The indignities and compulsory labor ordinance of Italian fascism is too well known. What is often little appreciated is the boiler that Ethiopia has been for Somalia in the Ogaden. The costly tax levied, the constant raids, the pillage and rape defenselessly suffered are too many to enumerate. I will give one example of the many torments of Somalis I myself had witnessed as I lived and grew under the feudal fist of Ethiopia. I was only a child when Somalis in Jigjiga were forced to watch the spectacle of ten Somalis being hanged in five central locations of the city. An Ethiopian tax collector was killed in the environs of Jigjiga, my home town. The killer was neither known nor apprehended. But for revenge and mass intimidation, the Ethiopian authorities decided to execute ten innocent Somali men. On the day of the execution, every Somali in town--child or adult--was forced to watch the terrifying spectacle. Each victim was made to stand on an open pick-up truck with hands tied behind his back. A noose of rope, suspended from a horizontal pole, was then placed around each victim. After a speech of intimidation and warnings to distressed observers, the driver was ordered to quickly move the truck, leaving behind a writhing humanity in mid-air, gasping to death.

I shall never forget the plea of one bearded elder who was being executed. With a remarkable calm and dignity, he uttered one and only one request: "If my son and I must die, please let me go first and on a different pole." That plea never granted, the grisly execution proceeded as planned. When each pair was hanged, we were then herded

to the next location. On three separate occasions, the rope broke, unable to withstand the weight of the victims. Each time, the victim was picked up, put in the truck, and hanged again. The ten men were left hanging for several days for all in the city to see. Nightmares and repressed rage had subsequently become part of our colonial heritage. When later I came to the United States, I comprehended the profound terror and rage Black America had experienced during the long history of lynching.

World War II marked a watershed in the history of colonial peoples. A resurgence of national resistance had also swept over Somaliland. By the late 1950s, a new day seemed to dawn for the wretched of the Horn. Independence for portions of Somaliland appeared close at hand. The upsurge of nationalism gained a distinct tempo and intensity. The former Italian colony was scheduled to gain its independence in 1960. Developments in one of the British colonies, the so-called Protectorate, were quite promising. Hopeful prospects also seemed afoot in the French colony and the NFD. Somalis under Ethiopian rule, brutally tormented and humiliated, began to sense new possibilities as they vicariously relished news of victory in Mogadishu and Hargeisa. Radios were almost banned and certain stations intentionally jammed. But they huddled around, glued to transistor radios in secrecy. On July 1, 1960, the former Italian and British colonies spontaneously united to form the new, independent Somali Republic. Aspiration and hope were rekindled everywhere, and Somalis, burdened by decades of indignities, sensed that the hour of national and psychic reconstitution was indeed imminent.

But the partitioning had taken its toll. Unity became ever elusive. The birth of the new was but a miscarriage. Disillusionment soon set in in the new republic. Colonial structures remained very much intact. The captive intelligentsia soon revealed its bankruptcy and indigence of heart. The long-cherished dreams of liberation in the remaining three colonies were no longer tenable. The relapse to familiar despair was once again evident.

As for Ogaden Somalis, their lot had become more dismal under Haile Selassie. The levying of exorbitant taxes, the sacking of communities unable to pay them, the frequent plunder of nomads seeking modest existence, the execution and life imprisonment of suspected nationalists--all these continued to torment Somalis without respite. American weaponry and undisguised uniforms were everywhere. By the early 1960s, Haile Selassie enjoyed a political bonanza from years of propaganda unleashed in UN corridors and international platforms. The history of complicity in colonial rule in Africa was reaping its returns both in kind and arms. The fascist adventure in Ethiopia had given the ruthless emperor all the pretensions of a liberator. Blacks in the Diaspora, submerged under debilitating oppression, needed a hero and dreams of deliverance in the Promised Land. For some of them,

particularly in Jamaica, Haile Selassie was not only a hero but indeed a god. But the oppressed of the Horn knew that mythical Ethiopia was one thing, historical Ethiopia quite another. Then Haile Selassie was hailed as the father of African Unity. Only the oppressed nationalities of Ethiopia could chuckle at the absurdity of this title. It is as if a wolf were honored as the guardian of lambs. Nkrumah's emphasis on a people's right of self-determination also lost favor. The Organization of African Unity soon accepted Addis Ababa, Ethiopia's capital, as the home base of the new organization. The OAU then adopted the colonial borders as sacrosanct. The import of all these developments became quite clear: the ruthless oppression of Ogaden Somalis is sacrosanct and internationally condoned.

The question no longer entails a struggle against specific, though formidable, oppressors. The tormentors of Ogaden Somalis became more global, their plight more intractable. A duped international opinion and a chain of colonial complicity had also to be confronted. Then the long-awaited occasion presented itself. The empire began to crumble of its own internal rot. By 1978, the Ogaden Somalis hastened to reclaim and liberate their land. Other Somalis across the border gave to the effort all they had--blood and brawn. But the victory and emerging psychic reconstitution was short lived. The Soviet Union and Cuba, previously masquerading as champions of justice, intervened on behalf of Ethiopia with sophisticated arms never before seen in the Horn. They subsequently restored the empire and sealed the lid on the Ethiopian border.

Today, there are almost two million refugees in Somalia. These people have been forced out of their land by systematic pillage, napalm, and poisoning of their wells. A UN document (1979) reported that camp population was increasing at the rate of 1,500 per day during the last quarter of 1979. A total of 474,000 were then in camps and the rest temporarily settled among the local population. Children comprised 61 percent and women, 30 percent. (4) A detailed report by the Center for Disease Control in Atlanta indicated that by August 1980, there were 28 refugee camps in Somalia. Many of the camps had each contained an estimated population of 40,000-50,000. The problems of overcrowding, sanitation, malnutrition, and mortality in these camps are appalling. Most affected are, of course, children, lactating mothers, and the elderly. The CDC survey reported that child mortality in certain camps was nearly 47 percent and more than 60 percent of diagnosed camp residents suffered from diarrheal diseases, malnutrition, and respiratory infections. (5) The massive agony of two million refugees also aggravates the ecological, economic, and health conditions of Somalia. The net effect of these developments on the Horn are yet to be assayed. But the Somali is convinced of one thing: this campaign of terror and dislocation is nothing short of genocide.

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APPENDIX C-7

SESSION ON THE REFUGEE CRISIS

SUMMARY OF PRESENTATIONS
Hussein Bulhan, Daniel Connell, and Ahmed Said Farah

INTRODUCTION

Since late 1977, armed conflict in eastern and northeastern Ethiopia has forced the inhabitants of those areas to seek refuge elsewhere in the region. Most of those fleeing the area trekked into Somalia, one of the world's poorest nations. The influx of refugees into Somalia continued for the next three years, at times reaching the unprecedented rate of 4,000 persons daily. By February 1981, there were 1.3 million destitute refugees interned in some 35 camps. The conditions in the squalid encampments, some of which housed 60,000-70,000 people, were unbearable. The Somali government was unable to provide for the refugees, while the rest of the world, for the most part, remained oblivious to their plight.

The result was Africa's most severe refugee crisis. In April 1980, a team of epidemiologists from the United States Center for Disease Control found the nutritional status of the Somali refugees to be worse than that observed during the major Sahel famine of 1974. (Morbidity and Mortality Weekly Report 29(36): 429-430, 1980) Extreme malnutrition, overcrowding, poor sanitation, and the lack of even the most elementary health care caused mortality within the camps to reach astronomic levels.

At the time of this seminar, 28 international voluntary organizations, the United Nations High Commissioner for Refugees (UNHCR), and the Somali government were coordinating the relief effort, and the acute phase of the crisis was apparently under control. In spite of the containment of the immediate crisis, the underlying problems still remain. It has been four years since the first refugees fled their homeland, yet a solution to the conflict remains as elusive as ever. Also, the presence of over one million refugees in Somalia has overwhelmed an already precarious economy and hastened the environmental and ecological decline of the area. One person out of four in Somalia is now a refugee, presenting insurmountable hurdles to the development process. The immediate burden of caring for the refugees has become justifiably paramount, but for Somalia to utilize the innovative technologies considered here, or to engage in any long-term development programs, a durable solution to the underlying conflict must be found. It was, therefore, deemed necessary that the seminar include a session devoted to the refugees.

SUMMARY

Hussein A. Bulhan chaired the session on refugees, beginning with a description of the historical and political nature of the conflict. He explained that the current unrest in the Horn of Africa is a legacy from the nineteenth century colonial rulers' indiscriminate partitioning of the African continent. This is nowhere more evident than in the case of the Somali people, who were divided among four different administrations: British, Italian, French, and Ethiopian.

Dr. Bulhan went on to describe the evolution of the current conflict. Somalis in eastern and northeastern Ethiopia have always felt persecuted and oppressed by the central Ethiopian government and have engaged for many decades in guerrilla warfare against it. In 1977, the low-key conflict escalated into a major war, involving superpower rivalry over access to strategic Red Sea and Indian Ocean routes.

Daniel Connell, a free-lance journalist, described how political conflict stemming from the colonial period has also caused 500,000 Eritreans to flee to refugee camps in the Sudan. Eritrea was first colonized by Italy in 1890, then by Britain, and finally was made a trusteeship of Haile Selassie. Selassie unilaterally annexed the territory in 1952, and ever since, groups of Eritrean nationalists have sought independence from the Central Ethiopian government. Mr. Connell proposed that a regional perspective be taken on the refugee crisis.

After Mr. Connell's presentation, the documentary film "Somalia: The Silent Tragedy," by J.C. Hayward of WDVM, Channel 9, Washington, D.C., was viewed. The film was then updated by Ahmed Said Farah, an Oxfam-America field representative who had just returned from Somalia. Mr. Farah spoke of conditions in the 35 permanent refugee camps, where over 90 percent of the population consists of women and children. Mr. Farah indicated that a large number of refugees did not enter the camps, but were living with their relatives in Somalia, adding to problems of food shortage in Somalia proper.

Mr. Farah described how innovative technologies are being utilized to solve some camp problems. Scarcity of cooking fuel led to the use of solar cookers distributed by relief organizations. Water shortages were alleviated by boring wells near the camps.

The presence of large numbers of people in the camps has exerted tremendous pressure on the vegetation of the area, leaving sections of the countryside completely denuded. Revegetation strategies are also being considered by the relief agencies.

An important observation made by Mr. Farah was that refugees usually flee to areas that are too impoverished to support them.

From the presentations and the discussion that followed, the group recognized that the crisis is principally a product of political and military conflicts and that a durable solution lies only in the resolution of these conflicts. However, the following recommendations were made toward alleviating the current difficulties and promoting the long-term development of the area:

- Short-term relief projects should be designed around technologies appropriate for existing levels of economic development, drawing wherever possible on traditional knowledge.
- Emphasis should be placed on transferable skills that the refugees can utilize upon returning to their homes.
- Existing literacy projects should be expanded.
- Somalia should be encouraged to develop on a wider base with rural development as an integral part.
- Somalia should establish grain reserves to meet drought contingencies.
- Primary health care programs should be expanded, emphasizing training in preventive medicine, hygiene, and sanitation.

- Water resources and food production are crucial project areas for the survival of refugee and nonrefugee populations. Self-sufficiency in both should be the primary goal.

APPENDIX D

BIOGRAPHICAL SKETCHES OF PANEL MEMBERS

FREDERIK B. BANG (deceased) was Professor and Chairman of Pathobiology at the Johns Hopkins University School of Hygiene and Public Health, Baltimore, Maryland, and Instructor-in-Charge, Annual Course on Comparative Pathology of Marine Invertebrates, Marine Biological Laboratory, Woods Hole, Massachusetts. He received his B.A. in 1935 and his M.D. in 1939 from the Johns Hopkins University. Before joining the Johns Hopkins faculty, Dr. Bang was associated with the U.S. Public Health Service, was a National Research Council Fellow in Medicine at Vanderbilt University School of Medicine, Nashville, Tennessee, and worked at the Rockefeller Institute, Princeton, New Jersey. At the time of his death, Dr. Bang was active in twenty-five professional societies and held editorial appointments with Advances in Virus Research and Cahiers de biologie marine.

ROBERT E. BEMENT ranches near Mancos, Colorado. He received his B.Sc. in Forestry in 1940; his M.F. in 1947; and his Ph.D. in 1968 from Colorado State University. Before returning to his ranch in retirement, Dr. Bement was a member of the Graduate Faculty of Colorado State University. In addition to his long association with Colorado State, he has worked with the U.S. Soil and Conservation Service and was Scientist-in-Charge of the Agricultural Research Service's Central Plains Experimental Range in northern Colorado. He was also Scientist-in-Charge of the

Agricultural Research Service Forage and Range Branch in Colorado and Crops Research Laboratory on the Colorado State University campus. He has served as a consultant for the Food and Agriculture Organization of the United Nations in Iceland and has been involved in U.S. Agency for International Development projects in Kenya, Ethiopia, Niger, and Somalia. As a researcher, Dr. Bement is perhaps best known for his development of biological response curves for balancing animal numbers with the vegetation available to them and the development of methods of range reseeding and matching seeded plants with the soil and climate. Dr. Bement is the author of some twenty-five technical publications.

HUSSEIN ABDILLAHI BULHAN is Assistant Professor in the Psychology Department of Boston University. He received his B.A. in Psychology and Anthropology from Wesleyan University, Middletown, Connecticut in 1970; his M.A. in Psychology from Boston University in 1973; his Ph.D. in Clinical Psychology from Boston University in 1976; and his M.P.H. from the Harvard School of Public Health in 1979. Dr. Bulhan is also Founder and Chairman of the Fanon-DuBois Institute of Research and Training and was Director of Education and Clinical Training of the Fuller Mental Health Center. He is currently on the editorial board of The Horn of Africa Journal and has published extensively on the psychological implications of social change in Africa.

LEE V. CASSANELLI is Associate Professor of History at the University of Pennsylvania. He received his B.A. in History from Boston College in 1967; his M.A. in African History in 1969; and his Ph.D. in African History in 1973 from the University of Wisconsin at Madison. Before joining the University of Pennsylvania faculty, Dr. Cassanelli was a Lecturer in History at Harvard University. He serves at present as Editor of the Newsletter of the Somali Studies International Association, and is an active member of the African Studies Association and the International African Institute (London). Dr. Cassanelli has published and lectured frequently on themes related to Somali history and society.

DANIEL CONNELL is a freelance writer, lecturer, and photographer. He received his B.A. in English Literature in 1966 from Hobart College, Geneva, New York, and his M.A. in English literature in 1968 from the State University of New York at Buffalo. Mr. Connell has contributed news and opinion releases to Africa News, Aftenposten, Associated Press, Boston Globe, British Broadcasting Corporation, The Christian Science Monitor, Financial

Times (London), Guardian (London), Guardian (New York), Irish Times, Miami Herald, The Nation, The Observer, La Repubblica, Reuters, Toronto Globe and Mail, Trouw, and Voice of America, and is currently completing two volumes, Coming of Age in Africa and Myth and Merry-Go-Round: Six Million Homeless in the Horn of Africa, concerned with current events in the Horn of Africa. He serves as a member of the Advisory Council of the International Somali Studies Association, is an advisor to the Eritrean Relief Committee, and is contributing editor to the Horn of Africa Journal.

AHMED H. ESA is a Ph.D. candidate in Immunology and Infectious Diseases at the Johns Hopkins University School of Hygiene and Public Health. He received his B.A. in Microbiology and Chemistry in 1978 from Miami University, Oxford, Ohio, and his M.S. in Microbiology and Immunology in 1980 from Wright State University, Dayton, Ohio. Mr. Esa is currently working as a histopathologist in the Johns Hopkins University Department of Pathobiology, where he is responsible for studying the pathogenesis of murine hepatitis virus by histochemical techniques employing both light and electron microscopes. In addition to his academic responsibilities, Mr. Esa is chairman of the Somali Research Group.

DWAIN W. PARRACK is an Associate Professor in the Department of Pathobiology at the Johns Hopkins University School of Hygiene and Public Health. He received his B.A. in 1950 from Texas Technological College, Lubbock, Texas; his M.S. in 1956 from the University of New Mexico; and his Ph.D. in 1963 from the University of Illinois at Champaign-Urbana. In addition to his responsibilities on the Baltimore campus of Johns Hopkins, Dr. Parrack was for several years associated with the Johns Hopkins International Center for Medical Research and Training (JH-CMR) in Calcutta, India. While in India, he established and directed the JH-CMR ecological field station in Singur, Bengal, where his research included work on the ecology and behavior of rodents that were a problem to growing crops and stored foods. Dr. Parrack has also served as a Senior Staff Officer for the National Academy of Sciences' Committee for Federally Funded Research on Biological Effects of Ionizing Radiation. He is active in several professional societies concerned with the biological sciences.

APPENDIX E

SOMALI RESEARCH GROUP

The Somali Research Group is an independent organization of Somali students and scholars in the United States. The group was established to take advantage of the many resources available in the United States for the study of socioeconomic, cultural, and scientific issues pertinent to the development of Somalia and the Horn of Africa.

Current committee members of the organization are:

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