



The Drought in West Africa

Part I: Evolution, Causes, and Physical Consequences

by Victor D. DuBois



GENERAL

Since 1968 the Sahel has suffered from a progressive decrease in rainfall. By 1972 the human and animal inhabitants faced widespread famine. In addition to the climatological changes, the catastrophe can be attributed to improper land use, increasing pressures on land resources, and the failure to develop adequate water control projects.

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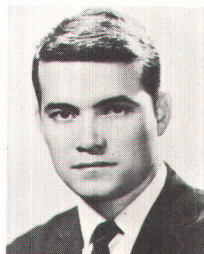
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THE DROUGHT IN WEST AFRICA

Part I: Evolution, Causes, and Physical Consequences

by Victor D. Du Bois

November 1973

Today, in the Sahelian-Sudanic zones of Africa, a terrible drama is being relentlessly performed. The actors—millions of people and tens of millions of animals—are captive participants enacting their roles against a background of seemingly endless sandy wastes and scrubland. By the sheer magnitude of the human suffering and economic loss involved, it is a major tragedy. In simplest terms, it turns on man's dependence on one of the basic natural elements—water—and the fearful consequences that befell him when, either because of natural calamity or because of his mishandling of the physical environment, he is suddenly deprived of its life-sustaining powers.

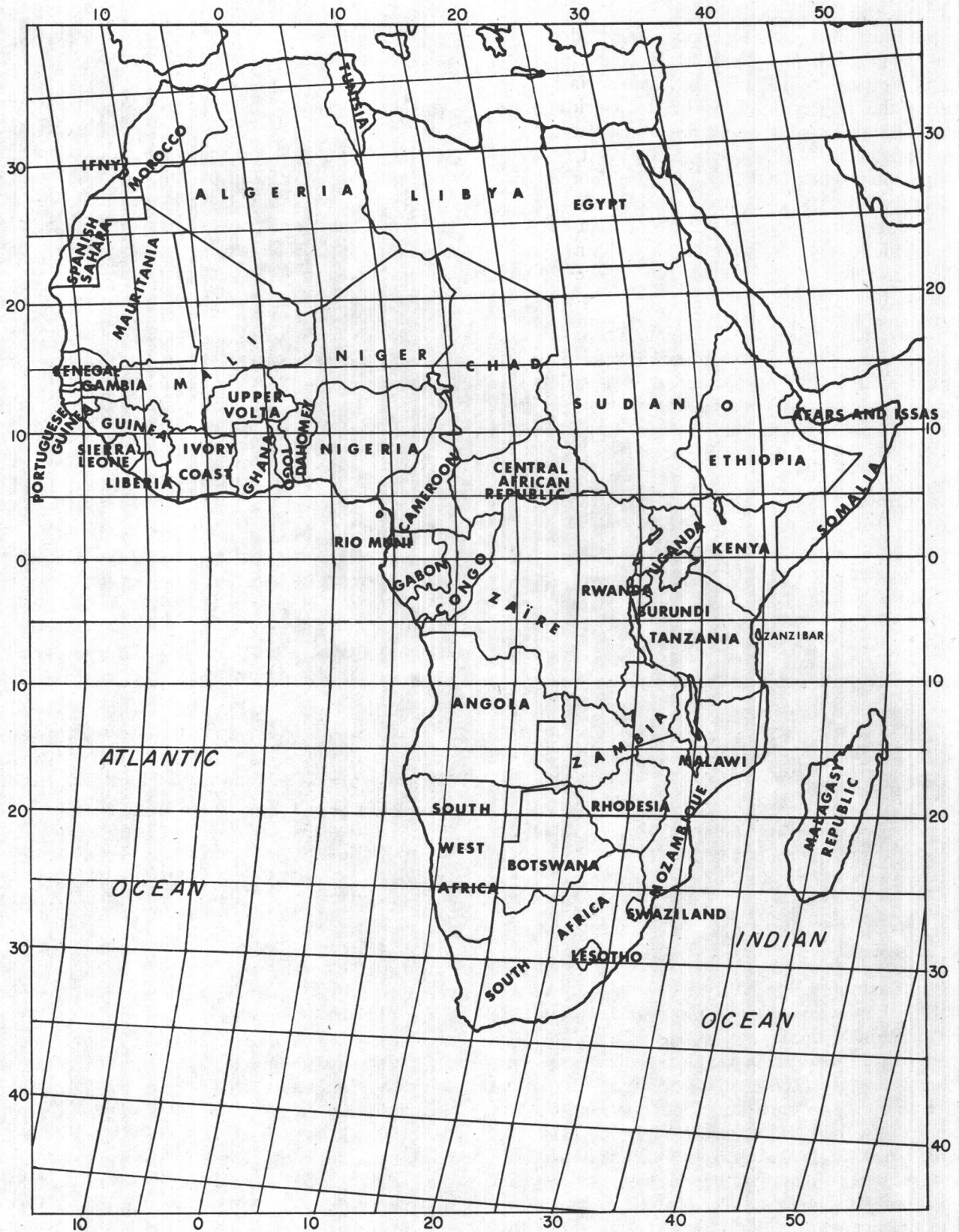
The Sahelian-Sudanic area is a vast, semi-arid bioclimatic region extending southward from the southern rim of the Sahara Desert roughly to the 14th degree north latitude, and eastward from the Atlantic Ocean to the Red Sea. It comprises nearly two million square miles of land, contains a population of over 60 million people (1972), and includes major portions of Senegal, Mauritania, Mali, Niger, and Chad, as well as the northern extremities of the Upper Volta, Dahomey, Nigeria, Cameroun, the Central African Republic, the central Sudan, and northern Ethiopia.

The Sahelian zone or "Sahel," as it is commonly called, is that part of the Sahelian-Sudanic area that lies immediately south of the Sahara. The rainfall in this zone averages less than 25 inches per year; the vegetation is semi-xerophytic. It is distinct from the Sudanic zone, a term properly applied to the area farther south, across West, Central, and East Africa where the annual rainfall is between 25 and 60 inches a year, and where vegetation can vary from tall grass and scattered trees to steppe and brush savannah. In this Report, as in those that

follow, the term Sahel will be used specifically to refer to the six former French colonies—Senegal, Mauritania, Mali, Niger, the Upper Volta, and Chad—that have been most seriously affected by the drought. These six states have an aggregate population of about 25 million (1973) and all have been sovereign nations since 1960.

Historically and culturally, the Sahel was once one of the most important regions in all Africa. Lying between the Arab and Berber areas of North Africa and the Negro regions of the Sahara, it comprised vast hinterlands of sand and savannah across which flowed and mingled the currents of these two major civilizations.

The Sahel enjoyed its greatest renown from the eleventh to the seventeenth centuries, when its major towns—Gao, Djenne, Timbuktu, to mention but three—rose in importance not only as entrepôts for the numerous caravans that wound their way across the Sahara, but as the centers of large, powerful and well-developed empires which enjoyed a high degree of civil administration, economic wealth, and cultural attainment. During this period, under the impact of a militant Islam, when empires rose and fell and new cultural influences in religion, education, law, and architecture flourished, the Sahel experienced its golden age. In the eighteenth century, due to such factors as the spreading of the slave trade and internecine tribal wars, the Sahel entered a period of decline. With the conquest of much of West and Equatorial Africa by the French and the British at the end of the nineteenth century and in the first decades of the twentieth, the countries of the Sahel were thrust into their first real contact with modern, western civilization.



Today, the countries that comprise the Sahel are, for the most part, extremely poor and underdeveloped. Four of them—Chad, Mali, Niger, and the Upper Volta—are listed by the United Nations as among the poorest nations in the world. Their known natural resources are few and are often too remote or costly to be exploited. The vast majority of their peoples are either nomadic pastoralists or sedentary subsistence farmers who barely manage to eke out a precarious existence from an environment which is by and large harsh and unyielding. One out of every four children born there dies before reaching the age of five. The average life span is 40 years. The literacy rate, even after more than a decade of independence, still has not risen much beyond 10 per cent.

Evolution of the Present Crisis

Since 1968 this area has suffered from a progressive decrease in rainfall. It was not until 1972, however, that the lack of rain became so acute as to raise the specter of widespread famine.

The first clues started to appear in September 1972, when a curious phenomenon began to be observed in many parts of the Sahel. Government authorities in hinterland regions reported the southward movement of unusually large numbers of nomads who normally inhabit the northern areas of their countries. There had always been a sizable migration of nomads with their herds of cattle, sheep, goats, camels, and other livestock to the agricultural lands farther south during the latter part of the year, after the rainy season had ended and the crops had been harvested. This time, however, the migrations not only were starting much earlier than usual, but were much more intense.

The influx of unusually large numbers of nomads at an unexpected time gave rise to anxiety among the governments of the six Sahelian countries. Their concern was heightened by the stories the nomads brought with them. These accounts described widespread suffering in the northern regions owing to the virtual absence of precipitation during the previous several months, when the rainy season (June-September) normally would have renewed northern rangelands in preparation for grazing livestock herds. The dearth of rainfall during the current year, added to that of the previous four years, had caused rivers and wells to run

dry, pasturelands to give way to desert, and men and animals to die from thirst and hunger in the Sahel's vast, remote northern reaches.

Other disquieting developments soon transpired. Also during September 1972, United Nations officials in the area reported an acute emergency developing as a result of poor harvests throughout large parts of the Sahel. This appraisal was substantiated shortly afterward by reports filtering into African capitals from outlying administrative centers. These reports confirmed widespread crop failures, dried-up water sources, dangerous declines in the water tables, and extensive suffering of people and livestock on a scale which far exceeded earlier estimates of the situation.

Cries of alarm were sounded not only in Africa but in other parts of the world as the extent of the disaster began to be understood. The world press reported that the drought had reached crisis proportions. Most seriously affected were the six former French territories mentioned above. But other countries, such as Dahomey, Nigeria, Cameroon, the Central African Republic, the Sudan and Ethiopia, lying at least peripherally within this zone, also felt the effects of the drought, though in varying and—with the notable exception of Ethiopia¹—lesser degrees.

By April 1973 representatives of the United Nations' Food and Agricultural Organization (FAO) headquarters in Rome and of the African governments concerned spoke of an impending disaster of truly staggering dimensions. The lack of rain had vastly diminished agricultural production throughout the Sahel, creating serious food shortages for the human and animal populations and dealing a crippling blow to the fragile economies of the young African nations.

An FAO fact-finding commission in May 1973 reported that at least five million and possibly as many as ten million people inhabiting the stricken area faced certain starvation within the next few months unless emergency food and medical supplies could be gotten to them without delay.² Foreign journalists dispatched to the scene confirmed the magnitude of the disaster: The drought had already destroyed 50 per cent of the livestock in Mauritania and 40 per cent in Mali. Vast regions throughout the Sahel were strewn with the carcasses of animals that had perished for lack of water and fodder.

Thousands of nomads, bereft of their herds—the mainstay of their existence—were fleeing to the already overcrowded towns and cities of the Sahel in search of food and water and the possibility, however remote, of finding a new livelihood. The refugees, by their sheer number, created serious urban problems with which local municipal authorities were ill prepared to cope. Their more fortunate brethren—those who still possessed a few animals—fled southward by the thousands in quest of water and whatever meager pastureland might still be left to sustain their famished herds. This sudden and massive invasion by human beings and animals into farmlands farther south, which, at their best, had themselves been only marginally productive, provoked new crises, as disputes arose between sedentary peoples and the newly arrived nomads over land and water rights. Not surprisingly, the potential for tribal and ethnic conflict rose sharply. (This potential is increasing, as will be discussed in a subsequent Report).

Even if emergency food, medical supplies, and animal fodder on the large scale sought could be found, governments and relief organizations were confronted with formidable problems in transporting these supplies to the stricken areas. Time was of crucial importance for not only had reserve supplies of food, grain, and seed for the next planting season been exhausted in the Sahelian countries, but within a few weeks—that is, by mid-June—the rainy season would arrive. The rainfall would be too meager to resolve the drought problem; yet it would be fierce enough to render impassable the few roads leading into the interior. This was bound to exacerbate the problems of moving relief supplies to the disaster areas.

Major Factors Contributing to the Drought

The catastrophic situation which at this moment grips the Sahel cannot be attributed to any single cause. Rather, it is the result of three major factors: (1) climatological changes; (2) disruptions in the ecological system caused by centuries of improper land use by man and ever-increasing pressures of both human and animal populations on available land resources; and (3) the failure of the countries concerned to develop adequate water control projects.

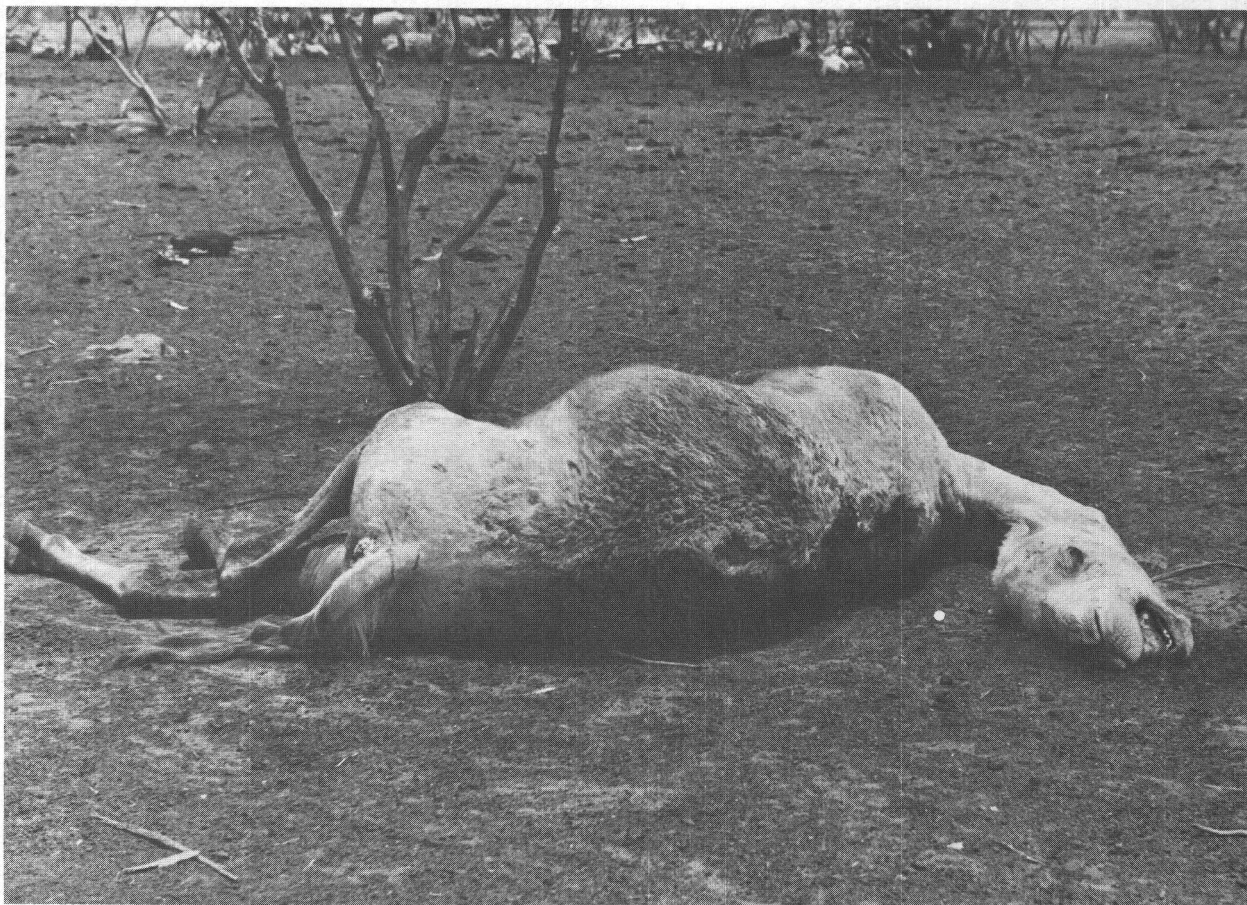
Climatological Changes. In recent years the Sahelian and Sudanic areas have been undergoing

subtle but important climatological changes. Occasionally this has meant that a vast area that had gone for years without any rainfall would suddenly be deluged by several major storms during a single rainy season. But more often, it has meant a serious decline in precipitation.

As in other areas of the world with extremely low precipitation, in the northernmost Sahel there is great fluctuation in the amount of rainfall (which can average anywhere from 5 to 20 inches per year). Moreover, such rainfall is apt to be received in a few major storms of great violence but of brief duration. Under such circumstances, most of the rain is lost in runoff and rapid evaporation. During the last five years, rainfall has progressively decreased in many parts of both the Sahelian and the Sudanic regions, and in 1973 it fell to the lowest point so far.

Many pasturelands which in normal times could expect an average of 25 inches of rain received in 1973 less than four inches. The Senegal, Niger, and Chari Rivers, whose overflow during the rainy season irrigates countless fields along their banks, this year never even reached their crests; indeed, the Niger and Senegal Rivers and Lake Chad were at their lowest level in recorded history. Many of their tributaries went almost completely dry. Lake Chad, 4-10,000 square miles in area (depending on seasonal variation), used to form one of the greatest natural reservoirs in Africa. But by May 1973 it had diminished to one-third its normal volume, and, in fact, had almost broken up into two much smaller bodies of water, barely connected, and replenished by the feeble inflow of the Chari River. Meanwhile, tens of thousands of human beings and their herd of livestock competed with wild animals for what was left of the great lake's waters.

Another indication of important climatological change is the growing irregularity of rainfall during the last five years. The rainy season normally runs from mid-June to September or October, coinciding more or less with the growing season. People planted seeds in June with some assurance that by October they would be able to harvest crops. But since 1968 this pattern has been gravely undermined. In region after region, peasants sowed their crops after an auspicious beginning of the rainy season only to find that their seeds did not sprout because the first rain was not followed soon enough by a second or a third. In the Upper Volta, particularly, local farmers' seed supplies became



Livestock perished by the millions throughout the Sahel for lack of sufficient water and pastureland.

depleted and food shortages in various parts of the country were severely aggravated. In the region of Koupéla, located about 75 miles from the capital city of Ouagadougou, the annual rainfall decreased from 30 inches in 1969 to 24 inches in 1970. In 1971 it increased to 33 inches, only to fall in 1972 to 22 inches.³

Another example of irregular rainfall can be observed in Niger. There, in the region of Agadès, for example, the annual rainfall over the last 30 years through 1968 has averaged seven inches during a 24-day rainy season. In 1969, however, the area received only three inches of rain, and in 1970 it decreased even further, to 1.5 inches. Although in 1971 rainfall increased to 3.6 inches, this was still only a little more than half of what the region had received during the previous three decades, and for reasons that still remain a mystery both to the local inhabitants and to meteorologists, the rainy season contracted from an average of 24 days to a mere 14 days.⁴

Some meteorologists have attributed the present drought to a general decline in rainfall discernible in many parts of the world; others link it with the unusually high pressure systems in the Arctic which are producing long-term climatic change as well. At a symposium held at the School of Oriental and African Studies at the University of London in July 1973 to discuss the crisis in the Sahel, Professor

H.H. Lamb of the Climatic Research Unit of the University of East Anglia presented a paper which suggested that over the first half of the twentieth century a high pressure belt surrounding the outer limits of the polar regions appears to have had the effect of displacing all other climatic zones a few degrees of latitude nearer the equator.⁵

If Professor Lamb's hypothesis is correct, then its implications for fundamental and long-range climatic changes in the Sahel are of vital importance. As another British meteorologist, Derek Winstanley, recently wrote, "Because of the low mean annual rainfall (80 to 250 mm.) and the strong north-south rainfall gradient in the Sahel, ... a southward shift of the climatic zones of only 1 per cent latitude in 100 years means a decrease in rainfall of some 40-50 per cent."⁶

In a recent monograph, Professor Reid A. Bryson of the Institute of Environmental Studies at the University of Wisconsin suggests that the drought in the Sahel may be due to changes in the world distribution of temperature. Professor Bryson attributes these climatic changes to an increase in the amount of carbon dioxide and particulate matter in the atmosphere resulting from the burning of fossil fuels as well as from polluting activities by industry, farming, and other human activities. If this interpretation is correct, then the monsoon rains are likely to be erratic for the remainder of the century.⁷

The harsh and unyielding land of the Sahel.
The Gorom-Gorom region in northern Upper Volta.



Although there is a paucity of pluviometric data for the Sahel prior to 1930, what data exist suggest that there is a cyclic pattern repeating at 30-40 year intervals.⁸ Thus the Sahel suffered from a serious drought during the period 1908-1913 and again in 1940-1943.⁹ But in neither of those instances was the overall impact of the drought so severe as at the present time.

Disruption of the Ecological System. A second major factor in the crisis in the Sahelian-Sudanic zones has been the disruption of the ecological system caused by (a) overgrazing and (b) improper land use. The latter, notably, may be attributed to (1) the widespread practice of slash and burn techniques for clearing land; and (2) uncontrolled and indiscriminate woodcutting and deforestation.

(a) *Overgrazing.* Overgrazing has been particularly destructive in the Sahel because excessive animal populations exert demands on land resources which cannot be satisfied. There used to be a rough equilibrium between the number of domestic animals—cattle, goats, sheep, camels, and others—and the support the land could offer them. Over a period of centuries the nomadic peoples had developed, through natural selection and cross-breeding, hardy strains of animals adapted to the Sahel's harsh climate and sparse rangelands. The nomads and their herds lived in a kind of symbiotic relationship with the sedentary populations farther south who cultivated millet and sorghum and other grains which are staples of the region. Over the centuries traditional migratory patterns had gradually evolved: the livestock herds moved at certain seasons from the sparse rangelands of the Sahel down into the pasturelands farther south in the less arid regions. Thus nomads would bring their herds down to graze in the agricultural lands after the crops had been harvested. The farmers welcomed the pastoralists because in exchange for the forage which their animals consumed (regarded by the farmers as a waste product) the animals deposited manure to fertilize the fields.

A problem emerged when this state of natural equilibrium began to be altered as a result of programs implemented by the Sahelian governments and various foreign aid groups. Immunizing and worming cattle and otherwise improving the health and quality of the animals, led to a marked increase in the livestock population. In Niger, for example, the cattle population is reported to have

doubled between 1960 and 1970, totaling nearly four million by the latter year.¹⁰

To a considerable extent, the increase in livestock among pastoral peoples such as the Tuareg, Peul, Berabiche, and others, was regarded by them as a form of economic security against the day when bad times would occur. Insofar as the African governments were concerned, larger numbers and healthier strains of livestock were understandably regarded as an important asset, and, increasingly, these came to represent a major element in the respective economies. In the Upper Volta, for example, livestock accounted for nearly one-third of the country's total exports by 1972.¹¹

At the same time that livestock populations were increasing, other variables were adding to this disequilibrium. The importance of these factors was not duly recognized either by the Sahelian governments themselves or by the well-intentioned foreign governments and international aid agencies whose financial and technical assistance had increased the livestock populations. Chief among these variables was the fact that while the total number of livestock increased, the amount of pastureland available to support them started to diminish owing to the sharp decrease in rainfall between 1968 and 1973.

There were other, intensifying factors. While the governments of the Sahelian states were often remarkably efficient at improving the health of their animals, they rarely gave sufficient attention to the problem of what to do with the surplus livestock. National development plans never failed to take into account projected revenues from increased meat exports; yet few of them actually spelled out with any degree of precision the means by which such surplus livestock was to be marketed. Even less attention was devoted to such indispensable measures as developing rural education programs and cooperatives so as to show the pastoralists how they could profit from marketing their added stock rather than simply keeping it as a traditional symbol of family wealth.¹²

The granting of independence in 1960 to the territories of the Federations of French West and French Equatorial Africa also contributed, indirectly, to this disequilibrium. The advent of independence converted into multiple separate sovereign states the vast areas that had until then been under the control of the metropolitan French government.

The governments of the different Sahelian states, after independence, moved quickly to establish controls along what they generally conceived to be their borders. (In many cases it was really impossible to establish where these borders were. They had always been vague and in many areas, even under the French, had never been clearly marked.) In a number of countries (notably Mali and Niger, and to a lesser degree Chad), programs were even drawn up whose implicit if not explicit aim was gradually to force the pastoral populations to become sedentarized in order that they might be more susceptible to political surveillance and to control for tax purposes. Inevitably, such measures first restricted, then diminished, the amount of land available to the pastoralists and their herds.

These developments brought in their wake a whole series of artificial restraints (national boundaries, different codes of laws, separate nationalities, *laissez-passer* requirements, etc.), which impeded what up until then had been the free movement of people and animals across lands which had few natural frontiers. The Tuareg, for example, had been as much at home in northern Mali as in southern Algeria, Mauritania, or Niger; they had moved freely with their herds among these territories, their patterns of transhumance dictated only by concern for finding adequate water and pasture for their animals. Now the Tuareg found that they were subject to constraints which were entirely foreign to their experience.

Another subtle but important change was occurring simultaneously. Many of the sedentary populations, which in times past had been occupied almost exclusively with agricultural pursuits, now started to acquire domestic animals and fowl in growing numbers in case of food shortages. This meant that local farmlands, formerly open to pastoralists after the harvest season, no longer were available to them or were available only in diminished amounts.

Thus the pressure of animal and human populations on the limited land resources gradually grew more intense. The situation reached a crisis level when, beginning in 1972 and continuing into 1973, the lack of rainfall throughout most of the Sahel dried up huge areas of range land that normally could have sustained large numbers of livestock. The result was a massive movement of nomads and their herds southward at a time when the farmers,

themselves seriously hurt by the lack of rain, were in no position to receive them.

(b) Improper Land Use. Another important cause of the damage to the ecosystem of the Sahel is the harmful land practices which are prevalent in this part of the world. Some of these practices have been carried on for centuries; others are of more recent origin, the result of population pressures on land resources.

(1) Slash and Burn Techniques. The age-old method of clearing land in Africa has been to cut vegetal cover with machetes or similar implements and then set fire to the accumulated debris. This practice has contributed significantly to erosion in the Sahel and elsewhere on the continent. The problem is less serious in the Sahelian zone than in the Sudanic zone, where the slash and burn technique is more widespread because the grass and other vegetal cover is thicker. Nevertheless, the method has been sufficiently prevalent, especially in the fertile areas adjacent to river banks, to cause concern to government authorities.

The principal danger is that brush fires, once started, usually are impossible for the individual to control. Hence they spread far beyond the limits the farmer himself envisaged and destroy vegetation on land which he is unable to utilize or on which other people's crops are planted. Moreover, it is necessary for land to remain fallow for a certain amount of time if its soil nutrients are to be regenerated. And African farmers sometimes burn their land over again before this process is allowed to complete its cycle.

African governments have been fully aware of the problem, but they have been virtually powerless to do anything about it. To enforce existing laws prohibiting the starting of brush fires as a means of land clearance would require monetary resources and vast surveillance systems and equipment which the African governments simply do not possess and cannot afford. Senegal, for example, is the richest and certainly the most developed of the six French-speaking Sahelian states most seriously affected by the drought. It has a total of only seven specially equipped fire-fighting trucks to patrol an area of more than 76,000 square miles.¹³

In the absence of the resources and equipment for enforcing the anti-brush fire laws, African governments have sought to teach the peasant populations (for example, through rural animation pro-

grams introducing new agricultural techniques, basic principles of hygiene, marketing, etc.), that it is in their own best interest not to employ such practices. But more often than not, efforts at dissuasion have failed utterly for the simple reason that the average African peasant is too poor to possess any but the most primitive tools for clearing land. Yet his survival depends on his ability to wrest a meager sustenance from a difficult environment. Somehow, using the means at hand, he must perform the back-breaking but indispensable task of clearing the land on which he grows food. Quite naturally, he resorts to what seems to him to be the cheapest and least laborious method of getting the job done: he burns off the land.

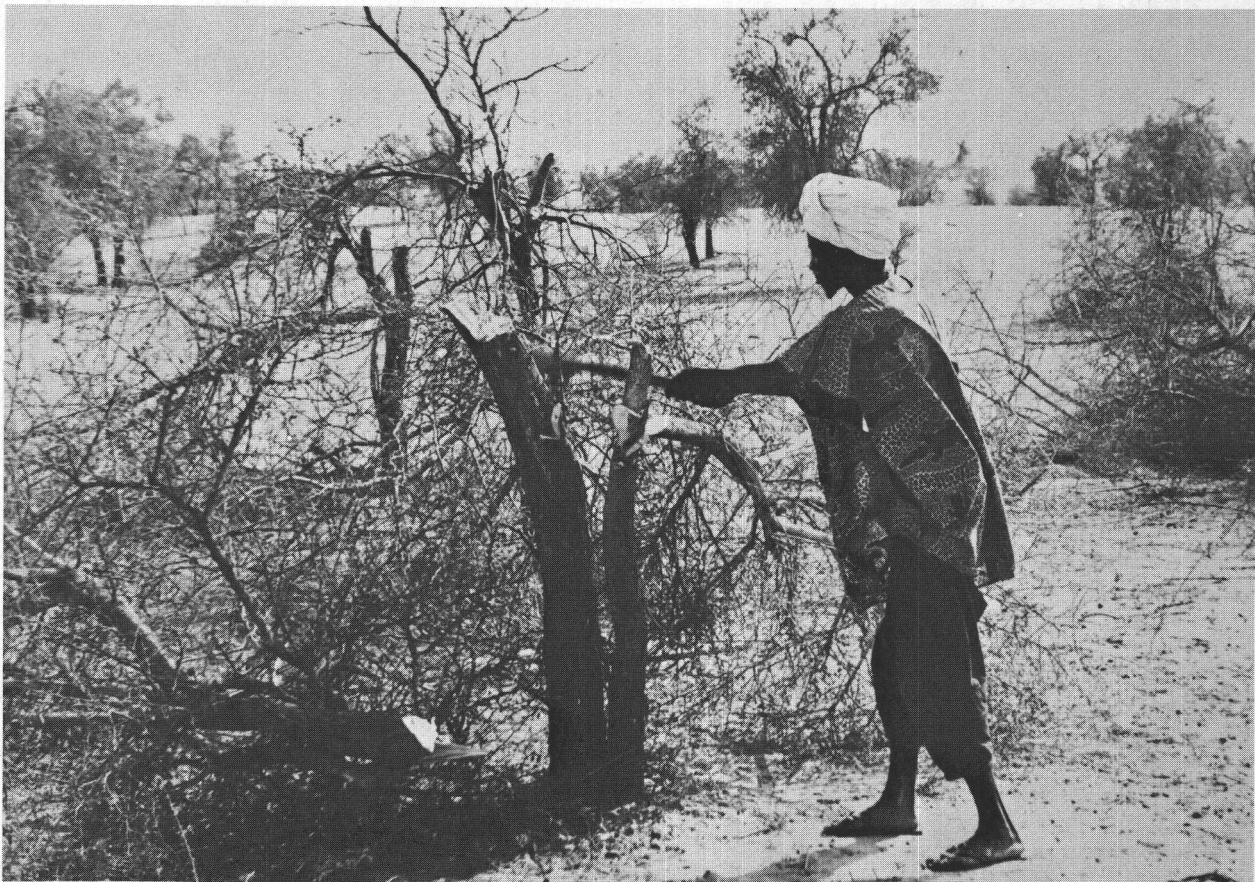
Another psychological barrier to the introduction of alternatives to slash and burn agriculture is that the peasant's universe is so limited: the parameters of his concern for the consequences of his actions rarely go beyond the interests of his own family, clan, or village. The state, with its broader

national concerns, is still too remote an entity with which to identify his own immediate interests.

(2) Woodcutting and Deforestation. A much more serious threat to the ecosystem of the Sahel comes from the uncontrolled cutting of wood, which has resulted in widespread destruction of the limited forest resources of the area. This problem is not unique to the Sahel but is common to many parts of the world with extremely limited wood and vegetal cover. In those areas of the Sahel where trees are found at all, they play an extremely important part in the conservation of national resources. Not only do they recycle nutrients which exist deep in the soil, but their foliage also provides a constant source of humus. Moreover, they play a key role in anchoring the limited amount of top soil to the ground and thereby act as a check against wind and water erosion.

In the Sahel, the threat to the wood resources, unlike that in the more humid coastal areas farther

The uncontrolled cutting of wood for fuel purposes has been one of the major causes of erosion and desertification in the Sahel.



south, does not arise from the massive cutting of trees for purposes of commercial exportation. Rather, it comes mainly from the use of wood as the principal cooking fuel.

The existence for centuries of relatively large agglomerations of people in urban centers, in many cases predating the colonial period, has over time resulted in the gradual depletion of wood supplies within a circle of ever-increasing radius centering on the towns and cities of the Sahel. This depletion has directly affected the lives and living standards of the inhabitants of these areas in two important ways: it has brought a gradual decline in fertility of arable lands, as erosion progressed; and it has caused a steady rise in the price the consumer has to pay for wood fuel. A study published in 1965 concerning the town of Kano in northern Nigeria estimated that almost three-quarters of that city's firewood, which totaled some 75,000 tons per year for a population of 300,000, had to be hauled in from a radius of about 20 kilometers.¹⁴ In Ouagadougou, Upper Volta, so intensive has the deforestation been that virtually all the timber stands within 70 kilometers of the city have been completely exhausted. According to a West German forestry expert who made a study of the deforestation problem in the Upper Volta, the average Voltaic household now has to spend 20-30 per cent of its total yearly budget for the purchase of fuel.¹⁵

This heavy pressure of human populations on the area's limited wood resources can only be expected to get worse. Over the last few years the towns of the Sahel have shown a rapid rate of growth—about the same as that of towns in the more humid countries along the coast—that is, an average of 10 per cent per annum. And with additional thousands of nomads streaming into the Sahelian towns and cities as a result of the present crisis, their rate of growth can be expected to shoot upward spectacularly.¹⁶

Water Control Projects

Though the Sahel contains some of Africa's most important bodies of water, including the Senegal and Niger Rivers and Lake Chad, there exist few water control projects such as dams, irrigation canals, and other water catchment and storage facilities. A few such facilities were built by colonial authorities before World War II in connection with

large-scale agricultural development schemes such as the Richard Toll project in Senegal or the Office du Niger project in Mali. But, according to one commentator, in the French-speaking Black African states of the Sahel no major dam or other large water control project has been built since that time.¹⁷ This is not surprising in view of the extremely limited financial resources available to the Sahelian countries. In the Upper Volta, for example, the government's total water resources budget for 1973 was only \$175,000.¹⁸

Such water control projects, one of whose principal uses would be to irrigate lands which are only semi-fertile at present, are all the more important because, unlike the Nile, neither the Senegal nor the Niger carries down from its tributaries great amounts of silt to add to the fertility of the soils adjacent to the river bank areas.¹⁹

Since World War II, governments in the six francophonic states of Sahel have initiated only minor water control projects. Sometimes alone, sometimes in conjunction with foreign governments and international aid agencies, they have dug deep bore wells, for example, in regions where there are oases or important settlements. Individuals have built small earthen dams, dug pits or shallow wells to catch surface runoff after rainstorms.

Both government and individual initiatives have advantages but also drawbacks. To the extent that they have supplied the local people with at least some water, however inadequate for their total needs, they have been a crucial factor in their survival. However, some critics allege that the sinking of too many such wells, particularly in areas of heavy population density, has resulted in a critical lowering of the water table and thus to the subsequent development first of greater aridity, then of desertification.

As to the water catchment devices built by individuals, most such projects are crudely built and inefficient, losing a major part of their water (from 50 to 70 per cent) through evaporation. Neither the minor water control projects built by the government nor the even smaller and cruder projects built by individuals are suitable for meeting the long-term needs of the agricultural development that is indispensable to genuine economic progress.

The problem of controlling water resources in the Sahel has been rendered more difficult by the

inability of the various African governments, until the present crisis descended on them, to cooperate effectively. In the past, a number of the Sahelian governments have tended to think of development in terms of a national rather than a regional context. Development priorities reflected this national bias. While lip service usually was paid to such laudable goals as promoting African unity and economic development on a regional or continental scale, rarely were the needs, resources, capabilities, and willingness to cooperate of neighboring countries taken into account in the conception, elaboration, and execution of national development plans.

In those instances where initiatives *were* taken to establish the basis for a broad cooperation, other obstacles soon appeared. A number of international commissions have been established for the purpose of developing water resources, but they have often been thwarted by impediments of a political nature, by the lack of trained personnel, or by the difficulty in obtaining adequate international financing for their projects.

A case in point is that of the Senegal River Basin Commission. This organization, first known by its French initials, OERS (*Organisation des états riverains du fleuve Sénégal*), was founded in 1964 by Senegal, Mauritania, Mali, and Guinea with the aim of jointly undertaking projects for the development of the Senegal River Basin. These projects included, among other things, the construction of four major dams: the Delta and Galougou Dams on the Senegal River, the Gourbassi Dam on the Falémé River, and the Manantali Dam on the Bafing River. These dams, if they could have been completed, not only would have augmented appreciably the water reserves of the four countries and increased the amounts of their arable land through irrigation, but would have provided them with new and important sources of cheap electrical power which would have laid the basis for subsequent industrialization projects in the areas they serve.

The organization never made any headway, mainly because of political differences between President Sékou Touré of Guinea, on the one hand, and the Presidents of Senegal, Mali, and Mauritania on the other. Interestingly, Touré's reluctance to make the OERS work never stemmed from a dispute concerning the allocation of water resources to the nations downstream, but from a series of

political quarrels between himself and his neighbors of which he was usually the instigator. He also felt that the OERS would become a vehicle for furthering French influence in West Africa.

Finally, in despair of ever being able to come to an understanding with Touré, the other leaders of the OERS decided to dissolve the organization and to form a new one without Guinea. Accordingly, in 1967, they formed a new group called the *Organisation pour la mise en valeur du fleuve Senegal* (OMVS), whose goals were essentially the same.

The new organization has made little more headway than its predecessor. Although the project for the new dams has been under study for more than ten years by various government groups and international organizations and is said to have given rise to dozens of documents relating to its feasibility and advantages, it has yet to be realized. Part of the problem has been financial. While certain African countries in more favored areas have been able to get assistance from internationally oriented aid institutions such as the World Bank, the *Fonds Europeen de Developpement*, AID, or from friendly foreign governments, this has generally not been true of the Sahelian states insofar as their major water control projects are concerned. Various reasons have been responsible for this difficulty in raising outside funds: the weakness of the natural resource base of the countries concerned; the relative underpopulation of the areas in which the dams would be built; the absence of infrastructure (especially transport and communications facilities) to complement the industrial base that would be laid by the construction of dams and electrical power installations, etc.

Given the extremely limited financial resources of the Sahelian states, new agricultural development and water control projects on the scale of the Office du Niger in Mali or of the Richard Toll scheme in Senegal, or those envisaged by the OMVS, no longer can be contemplated without massive financial assistance from external sources. In the past these great projects were financed entirely by the French government with occasional participation by private French capital. The Sahelian states, individually or in concert, have only the most meager resources. In view of the present drought crisis and its sympathetic coverage in the world press, however, financial assistance for the Sahel may at last be obtained.

Even then there will remain another serious obstacle to the successful development of water control projects in the Sahelian area. The source of the Senegal River, as of the Niger, lies in the Fouta-Djallon region of Guinea. Without the cooperation of Guinea's recalcitrant and unpredictable president, Sékou Touré, it is questionable whether the OMVS or any other regional river basin commission seeking to develop water resources in the area will ever be able to carry out its long-range projects.

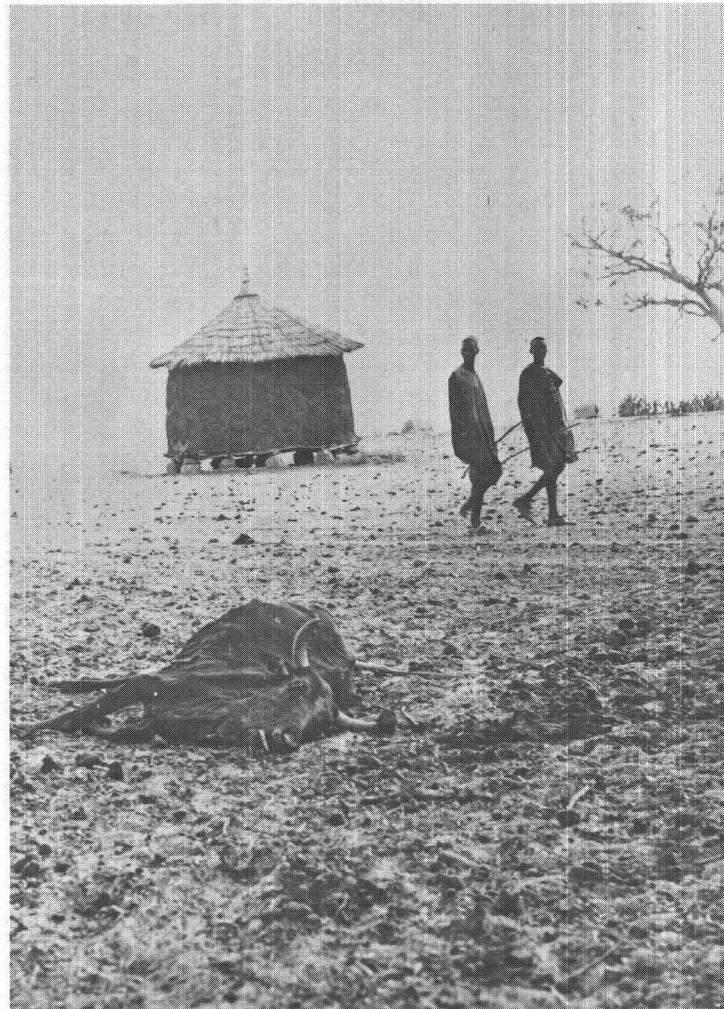
Whether large-scale outside financial assistance would be a sufficient incentive to induce Guinea to cooperate with the OMVS remains to be seen. Certainly Guinea would stand to benefit economically. Its agricultural sector has been in decline over the last 14 years. Tens of thousands of acres of irrigable land are only being partially cultivated because of the lack of adequate water resources, and Guinea's budding mining industry would surely prosper from the electrical energy produced by the new dams. But these inducements, compelling as they might seem to a disinterested observer, are not likely to be the decisive factor. Economic considerations in Guinea have rarely prevailed over political expediencies and, ultimately, it will probably be Sékou Touré's view of how such cooperation may contribute to or jeopardize the survival of his regime that will determine his decision.²⁰

The Physical Consequences of the Drought

The disruption of the ecosystem of the Sahel due to the conditions mentioned above has had disastrous consequences for the natural environment of the entire area. The most serious of these consequences have been the lowering of the water table, an increase in erosion, and the progressive desertification of many parts of the Sahel.

Lowering of the Water Table. It is not possible to speak in general terms of a uniform decline of the water table for the Sahel as a whole, as the area is much too vast and the situation may vary significantly from one subregion to the next. However, scattered investigations indicate that in some areas it has fallen by as much as 50 to 100 feet.

So scarce have the rains been in many parts of the Sahel over the last three years that even some of the region's greatest bodies of water have gone almost completely dry for protracted periods. During the first few months of 1973, the water level of the Niger at Bamako, capital of Mali, fell so low



A common sight in the Sahel: the death of cattle. Dori region, the Upper Volta.

that the city's hydroelectric works, which pump drinking water and furnish electricity to the city, were almost completely immobilized.²¹ In Niger, the once magnificent oases of the Telwa Valley in the region of Air are in a state of advanced desiccation owing to the virtual absence of rain over the last two years and the resulting lowering of the water table.²²

In Chad, the great lake of the same name has receded in places over 15 miles, leaving behind a vast sea of mud in which thousands of wild animals, desperately struggling to reach the ever more remote body of fresh water, got trapped and perished on the spot.²³ As Professor Edwin S. Munger of the California Institute of Technology has pointed out to this writer, however, Lake Chad

presents a highly complicated problem in hydrology. The shrinkage of the lake is not entirely due to low rainfall in recent years. There has gradually been occurring what geographers call a "river capture" by the Benué (Niger system) working back towards Lake Chad. This "capture" of the part of the southern and wetter basin of Lake Chad would have affected the level of the lake regardless of rainfall totals.

According to a recent study of the hydrology of the Sahel undertaken for the United Nations Development Fund by a French expert, M. Drouhin, even if the rains should return to normal (i.e., their pre-1968 figure), it would take between five and eight years for the water tables to return to pre-drought levels.²⁴

Erosion. Overgrazing, perpetuation of slash and burn methods, uncontrolled woodcutting and destruction of other vegetal cover, the virtual absence of extensive and effective water control projects, and a steady decline in the water table—all of these factors have exposed the Sahel to a relentless process of erosion. The Sahel is susceptible to infrequent but sudden rainstorms of great violence and to the continuous wearing effects of the *harmattan*, the searing wind that blows down from the Sahara Desert, and these natural phenomena render it all the more vulnerable to erosion.

Another major cause of erosion has been the intensive traffic in areas of limited vegetation. The problem is apt to be particularly acute in areas adjacent to or in the vicinity of water points where animal as well as human concentrations are heaviest. The constant passage of large numbers of people or livestock over a given area results in the destruction of the grass cover underfoot and in soil compaction. These in turn prevent the subsoil from retaining the rainwater needed to permit the renewal of plant growth, thus stripping away one of the last defenses against erosion.

A study recently prepared by AID dealing with the development and management of the steppe and brush-grass savannah in the Sahelian zone mentions that statistics on the extent and significance of soil erosion in the region are virtually nonexistent. The same document goes on to state, however, that "A study of a similar region in Algeria concluded that more than half the crop land and pasture land (in that country) have been seriously damaged by water or wind erosion. In the

Steppe area, the denudation was estimated to be about 1 mm. of soil per year where the soil is resistant, and 2 mm. where sandy."²⁵

The gravity of the problem has been recognized for years. But the limited resources of the governments concerned, the vastness of the area involved, the widespread dispersal of the populations, the lack of infrastructure and communications, a certain unconcern and even animosity toward some of the ethnic groups inhabiting the areas where it is most serious, and the absence of effective planning for and control of the area's natural resources by responsible authorities—all have impeded the implementation of programs to arrest erosion.

Desertification. The inevitable consequence of all these destructive factors has been the relentless expansion of the Sahara Desert southward into areas that were once at least semifertile. Today, a number of countries that lie immediately south of the Sahara (Senegal, Mali, Niger, Chad, and much of the Sudan, as well as the northern regions of the Upper Volta and Nigeria) are directly threatened by the expansion of the desert.

Although there is a paucity of reliable data regarding expansion of the Sahara along its entire southern perimeter of 3,500 miles, regional studies indicate that, at least in certain areas, the Sahara is advancing as fast as 30 miles a year.²⁶ The AID report cited above, which was published in 1972, states that approximately 250,000 square miles of arable land, previously suitable either for agriculture or for intensive grazing, have been forfeited to the Sahara in the last 50 years.²⁷

So massive a loss of land resources in countries which are already desperately poor has, of course, enormous economic and social implications for their future development. Vast parts of their territories gradually are becoming virtually uninhabitable by either man or beast. The human and animal populations which now inhabit these regions either will succumb to repeated cycles of drought and famine, or will have to move southward in ever greater numbers in search of new land and water resources on which to survive. Such a migration of large numbers of people and livestock into lands that are themselves only marginally productive will contribute to the deterioration of land resources in those areas, to a decline in their agricultural productivity, and consequently to a lower standard of living for the nation as a whole.



Nomads fleeing southward as the Sahara expands into the Sahel.

The picture grows even more somber when one considers that at present the population of most of the countries of the Sahel is growing at the rate of almost 2.5 per cent per annum. At the current rate of growth, the population of the region can be expected to double roughly every 28 years. The simultaneous development of these two factors—a steady diminution of land resources owing to an expansion of the desert, and an increasing pressure on these resources owing to an unchecked growth of the population—portends nothing short of disaster, barring extensive aid from the outside world.

While bearing in mind the ominous trends which today are evident in the Sahel, it is important also to achieve a broader perspective on the question. As Professor A.T. Grove of Cambridge pointed out in a paper delivered at the African Drought Symposium held at the University of London in July 1973, deserts are not expanding everywhere in Africa. Indeed, there are areas where irrigation and afforestation have been successful in converting what

were formerly desert lands into verdant crop lands for the use of man and his domesticated animals.²⁸ Therefore the process of desertification is not irreversible although any attempt to reclaim land from the desert is apt to be extremely costly.

Given proper management and a return to pre-drought pluviometric levels, it is quite probable that the Sahel could support a human population comparable in number to that which inhabited the region prior to 1968. What is *not* likely—and this is a factor of crucial importance—is that it could support the same animal population. And this important qualification clearly implies fundamental restructuring of the nomad economy—perhaps the establishment of state ranches, the imposition of stricter controls on livestock grazing, etc.—and this inevitably would have important social repercussions on the whole pattern and structure of nomadic life. Since neither of these conditions prevails at present, the question, for the time being at least, is an academic one.

Nevertheless, it is important to note that the Sahelian governments themselves have formulated a whole range of proposals not only for combatting desertification, but for buttressing their countries' defenses against the effects of future droughts. These plans range all the way from such ambitious schemes as the building of dams across their major rivers and the planting of a forest belt across the whole of the Sahel to protect against further desert encroachment, to more modest proposals of

digging village wells and providing better food storage facilities.

The successful implementation of these plans will require enormous self-sacrifice on the part of the peoples of the Sahel. It will also require an understanding of the Sahel's problems on the part of the outside world and a willingness to help resolve them.

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NOTES

1. The grave situation in Ethiopia has only recently come to public attention. Although reports concerning the drought in that country are still fragmentary, information which is available indicates that the drought there has already claimed 50-100,000 lives. There is no reliable estimate concerning the losses in livestock. This writer, while fully aware of the importance of the developments in Ethiopia, has not included discussion of them first, because of the paucity of information presently available, and secondly, because Ethiopia, like the Sudan, lies outside the West African Sahel.
2. United Nations. Food and Agricultural Organization. Inter-Departmental Working Group on Sahelian Problems. *Report of the Mission of Messrs. Scheyven, Mensah and Reyntjens (West Africa) April 7-20, 1973.* WS/D8795.
3. "Quand la sécheresse tue au Sahel. Haute Volta: un pays trop pauvre pour domestiquer l'eau," *Le Figaro*, April 17, 1973.
4. "Le drame de la sécheresse dans les pays du Sahel. Le cas du Niger," *Le Monde*, June 2, 1973.
5. H.H. Lamb, "Some Comments on Atmospheric Pressure Variations in the Northern Hemisphere," Report of the 1973 Symposium, *Drought in West Africa*. Edited by David Dalby and R.J. Harrison Church. Centre for African Studies. University of London (London, 1973), pp. 27-28. Hereafter referred to as *London African Drought Symposium Papers*.
6. Derek Winstanley, "Rainfall Patterns and General Atmospheric Circulation," *Nature*, Vol. 245, September 28, 1973, p. 194.
7. Reid A. Bryson, *Climatic Modification by Air Pollution, II: The Sahelian Effect*, Report No. 9, August 1973. The Institute for Environmental Studies. The University of Wisconsin (Madison).
8. Marcel Roche, "Note sur la sécheresse actuelle en Afrique de l'Ouest," D.J. Schove, "African Drought and Weather History." *London African Drought Symposium Papers*, pp. 53-61, pp. 33-45.
9. For a detailed description of the former, see A.T. Grove, "A Note on the Remarkably Low Rainfall in the Sudan Zone in 1913," *London African Drought Symposium Papers*.
10. Jean-Claude Luc, "L'économie du Niger depuis l'indépendance," *Revue française d'études politiques africaines*. No. 72, December 1972, p. 71.
11. U.S. Government. Department of Commerce. Bureau of International Commerce. *Foreign Economic Trends and Their Implications for the U.S.: The Upper Volta* (unclassified) Washington, D.C., July 28, 1972, p. 9.
12. In a perceptive article, Jeremy Swift of the University of Sussex, cautions, however, against too easily ascribing the nomads' predilection for allowing their herds to multiply without limit, to an irrational desire for prestige animals. Such herd accumulation, he points out, is part of a complicated but nonetheless rational strategy on the part of the nomads to protect themselves against future uncertainty. The surplus animals represent economic investments which can be traded for food products or other necessities in times of hardship. See Jeremy Swift, "Disaster and a Sahelian Nomad Economy," *London African Drought Symposium Papers*.
13. "Sénégal. Sécheresse et désertification: deux freins majeurs au développement," *Europe Outremer* (Paris) March 1973, p. 36.
14. K.J. Mortimer and J. Wilson, *Land and People in the Kano Close-Settled Zone*, Ahmadu Bello University. Department of Geography. Occasional Papers No. 1 (Zaria, Nigeria, 1965).

15. The study was conducted by Jurgen E. Raeder-Roitzsch for the FAO, and is cited in *Marchés Tropicaux et Méditerranéens* (Paris), September 21, 1973, p. 2792.
16. As of the time of this writing (November 1973), statistics concerning the rapid increase in size of the populations of towns in the Sahelian states can only be regarded as provisional and should be treated with the greatest caution. Bearing this caveat in mind, the population of Nouakchott, Mauritania is reported to have increased from 70,000 to 100,000 during the present crisis (1972-73), and that of Agadès, Niger from 7,000 to 15,000. For the Nouakchott estimate, see *Marchés Tropicaux et Méditerranéens*, October 26, 1973; for the Agadès estimate, see *Le Monde*, June 2, 1973.
17. J. Karst, "Le drame de l'Afrique sahélienne," *Marchés Tropicaux et Méditerranéens*, June 29, 1973, p. 2062.
18. Small as this sum is, the Voltaic government has been able to make it go far. To date, the government has built a number of small barrages and some 300 earthen dikes. Just how inadequate these budgetary resources are, however, is shown by the fact that when one of these small barrages, located in the region of Manga, developed a fissure in 1973, the government was unable to repair it because the cost of doing so would have absorbed one quarter of the total annual water resources budget! *Le Figaro*, April 17, 1973.
19. R.J. Harrison Church, "The Development of the Water Resources of the Dry Zone of West Africa," *London African Drought Symposium Papers*.
20. For further details concerning this view, see Raphael Saller, "La sécheresse dans le Sahel: quelques réalités," *Marchés Tropicaux et Méditerranéens*, June 1, 1973, pp. 1491-2.
21. *Marchés Tropicaux et Méditerranéens*, June 15, 1973, p. 1635.
22. *Le Monde*, *op. cit.*, June 2, 1973.
23. For the most complete assessment of the drought losses in Chad available to date, see *République du Tchad. Comité National Chargé des Problèmes de la Sécheresse et de Ravitaillement des Zones Sinistrées*, Décret No. 205 PR/Math du 3 août 1973, n.p., n.d. (Ndjemena? 1973?).
24. M. Drouhin cited in Karst, *Marchés Tropicaux*, *op. cit.*, p. 2063.
25. U.S. Government. Agency for International Development. *Development and Management of the Steppe and Brush-Grass Savannah Zone Immediately South of the Sahara*. In-House Report Prepared by the Agency for International Development (unclassified) (Washington, D.C., October 1972), p. 10.
26. U.S. Government. Agency for International Development. *Desert Encroachment on Arable Lands: Significance, Causes and Control*, OST/AID (Washington, D.C. 1972), cited in *ibid.*, p. 7.
27. AID report cited *supra* in Note 26, p. 6.
28. A.T. Grove, "Desertification in the African Environment," *London African Drought Symposium Papers*.



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