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DROUGHT IMPACT IN THE SAHELIAN-SUDANIC ZONE
OF WEST AFRICA: A COMPARATIVE
ANALYSIS OF 1910-15 AND 1968-74

By

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SUMMARY

At the southern edge of the Sahara begins an area transitional between the desert edge and the woodland to the south. This Sahelian-Sudanic climate and vegetation zone is the home of some 30 million West African people primarily dwelling in Chad, Mali, Mauritania, Niger, and Senegal with perhaps an equal number resident in Northern Nigeria. Between 1968 and 1974, the area experienced a series of low rainfall years that led to significant drought, famine and worldwide interest in these thinly-populated, remote and landlocked African nations. Following on the drought, international interest in the region has remained high with an international consortium of rich nations working with the nations of the Sahel in planning a long-term development aid effort.

Competing Views

The experience of the Sahelian-Sudanic drought is continually cited as evidence in support of varying and contradictory theories about the relationship between climate, society and technology. In the first and seemingly dominant view among scholars, the Sahelian-Sudanic drought found the affected population more vulnerable to its impacts than they would have been in the past. The Sahelian people were the victims of a colonial and neo-colonial international economic and technical order that had increased their dependency and reduced their self-sufficiency by decreasing the area devoted to food crops, by draining off the agriculturally

important labor supply by migration, by creating technical conditions for a rapid increase in population and livestock numbers, and by adopting policies that favored the small urban elites. Variants of this position may emphasize one or another element. Thus, Malthusians emphasize the growth in human and livestock numbers and the degradation of the land resource, underdevelopment theorists emphasize neo-colonialism, and ecodevelopment advocates emphasize inappropriate technology, particularly deep well drilling.

The competing view, the still-prevailing theory of development, holds that the recent Sahelian drought, despite all its attendant difficulties, actually saw a reduced vulnerability to drought than in past periods. Sahelian nations were able to prevail upon the conscience of the world for assistance, extended families with urban labor were not entirely dependent on vulnerable crops or herds, medical care restrained the childhood disease epidemics that often accompanied famine in the past, and a rudimentary infrastructure and national organization was available along with international aid to assist great numbers of people. Only where governments failed to act, as in Ethiopia, or in especially remote areas was there great loss of life.

Depending on which view summarizes the actual Sahelian experience, strongly contrasting policy implications follow. The latter view, essentially the "modernization" thesis, appears to still dominate the development policies of the Sahelian countries. However, if the "underdevelopment" thesis is correct many of the current and future programs, well-intended as they may be, will only increase vulnerability to the next climatic fluctuation.

If one is interested in evidence rather than ideological debate, an estimate of the Sahelian experience, particularly as it compares to previous climatic fluctuations, is critical. This paper attempts to bring together what is known about the comparative impacts of the drought of 1968-74 and the drought of 1910-15. The latter period was chosen because it was the last great Sahelian-Sudanic drought of comparable magnitude prior to the more recent one (there were lesser droughts in 1931 and 1941-49) and took place in the early years of colonial conquest.

The review attempts to resolve the contradictory interpretations through a systematic analysis of published and unpublished reports of the two great droughts supplemented by limited archival research in the colonial records of the French and British Administrations. For the period 1910-15 it draws upon scattered reports from the oral history of Sahelian dwellers, reports of foreign residents and travellers, and colonial reports of the French administration of French West Africa and the British administration of northern Nigeria. For the more recent period extensive bibliographies, documentation centers, and scholar-reviewers have been utilized to identify the relevant materials.

Comparable Droughts

The great droughts of the Twentieth Century, 1910-15 and 1968-74 (with a lesser drought period in 1941-9), are not exceptional in Sahelian-Sudanic history. In both droughts rainfall deficiencies persisted over a six year period interspersed with average or even good rainfalls and with great spatial and

seasonal variability within any given year. There is some suggestion of greater total shortfall of precipitation in the more recent drought with a more serious single "worst" year of 1913. But taking into consideration the sparseness of the data for the earlier drought and the corroboration from other sources, it is concluded that the two droughts are reasonably comparable except for their distribution. Drought-impacted sedentary farmers in the southern Sahel and Sudan zones were somewhat more seriously affected in 1910-15, whereas in 1968-74, the nomadic pastoralists of the sub-desert and northern Sahel were more seriously affected.

Differing Livelihoods

Comparable meteorological events may impact livelihood systems differently. At least five distinctive rural livelihood systems are found in the Sahel-Sudanic region, each with potentially different vulnerabilities. They include: (1) two systems that are primarily agricultural, small-holder dry-farm cultivation and surface-flow recession irrigation; (2) one system of combined agro-pastoral activity that includes dry farming and cattle-keeping; and (3) two systems of primarily diversified pastoralism, one emphasizing cattle and one including camels. About five-sixths of the peoples of the six Sahelian countries are engaged in these livelihood systems.

Changing Social Systems

In contrast to the recurrence of meteorological drought, the social systems of the Sahelian-Sudanic zone have experienced

profound changes in the Twentieth Century. But social change, like climatic fluctuation, is not anomalous in the region. The Sahel has been parent to some of Africa's most extensive empires dominating the region until about 1600. Invasion from the north and the advent of the European slave trade led to a 300 year period of disruption and uncertainty marked by a new set of unification attempts under the banner of Islam. On the eve of the French invasion just before 1900, the region diverse in livelihood and social organization was politically and economically decentralized, factors favorable to French protection. The major objectives of colonial policy can be described in terms of pacification, cost-minimization, export production, supply of cheap labor, and administrative control. The effects of these changes were profound. They heavily impacted the resource base of both the agricultural and pastoral livelihoods, and diminished traditional ways of coping with drought. At the same time, there was an enlargement of populations of people and animals, a reduced reliance on local resources, and greater integration into a partly monetized and commercial world. But the changes also enlarged possibilities for coping with drought. How was the balance of benefit and losses struck?

Crop and Animal Losses

With the exception of Senegal and Nigeria, the Sahelian countries are among the poorest in the world and their statistical reporting services for crop production are limited to certain export crops, particularly peanuts and cotton. Similarly, the actual size and composition of the national herds is not really known.

In the most recent drought, there was some urgency in developing estimates of crop losses, for these were used to estimate anticipated shortfalls of the staple grains, millet and sorghum, that required replacement by the international relief effort. With such an end in mind, there is surely some tendency to inflate the size of losses. Nonetheless, an examination of the types of estimates made, suggests that overall losses of one-third to one-half of food crops and herds in the worst years of the drought are reasonable and conservative estimates. Nor does a very different picture emerge of crop and animal losses in 1910-15 compared to 1968-74, although the data are skimpier and non-quantitative. There is little basis for inferring different impact patterns in the respective droughts.

Malnutrition

The diminution of the food supply in the form of grains and milk products immediately impacts the health and well-being of the population, particularly the very young and very old. Thus, the efforts that were made to document the impact of food shortage on human nutrition focussed primarily on children. Beginning in 1973 and continuing through 1975, a variety of surveys were undertaken to document the degree of undernutrition. Overall, these suggest that the already high rates of acute malnutrition among young children (5-10%) doubled during the worst years of the drought and in the severely-affected areas. No similar data were available for the earlier period. Malnutrition, especially among children, does not appear in the colonial reports except in passing anecdotal references.

Mortality

The death toll for the famine and the migrations that accompanied the Sahelian drought will never be known. The commonest estimate of the death toll from the recent drought, 100,000 persons, is cited in various ways, depending on the analyst's commitment to one of the competing views. In actuality, this oft-repeated estimate is almost always used out of context. When it first appeared in a report, it was limited to the nomadic population and to the year 1973.

In addition some localized estimates of mortality were found. Reviewing the scattered evidence, the conclusion is drawn that death rates increased significantly but not enormously (25-200%) in selected years over the relatively high pre-drought death rates of 25-40 per thousand. The aggregate effect of such increases is to make the widely quoted figure of 100,000 deaths conservative. Premature deaths, particularly of young children, accruing from a population at risk of 10-15 million over several years could easily number two or more times the widely cited estimate, or upwards of 250,000.

A variety of data or more appropriately observations are recorded in the colonial record, oral history and traveller's accounts for 1910-15. They are often unreliable, spatially inconsistent, and non-quantitative. Yet when they are quantitative they cite figures considerably higher than similar figures for 1968-74 in comparable areas. The indicated differential mortality is especially great if one considers the population changes that occurred over 60 years and the much smaller population being discussed in 1910-15. Thus the evidence, while somewhat sparse

for 1910-15, suggests heightened human mortality for that period compared to 1968-74 even though deaths in 1972-73 were probably underestimated.

Socio-economic Impacts

The chain of drought-related impacts, the losses in crops and animals, the hunger, sickness and death that ensues, the major human movements that are generated, filter upwards and outwards into the realms of government and economy, nation and region. The more distant these impacts from the primary ones of reduced crops and pasture, the more difficult the chain of causality. The larger aggregate socio-political and socio-economic impacts are not really comparable between the two periods although acceleration of on-going trends seem characteristic of both periods. Similar accelerated trends suggested by various authors in each period include greater rural inequality, participation in seasonal migration, trends toward urbanization and increased international connectivity and dependence.

Coping with Drought

Drought persists over a six year period, a third or more of a vast region's food supply is lost; malnutrition doubles and death rates rise. Yet, as Caldwell (1975) observes: "the real lesson was not how easily man succumbed to the drought but how tenacious he was in managing his survival." Such tenaciousness is a function of both the everyday and the exceptional, the resilience of the differing livelihood systems and the extraordinary means employed in coping once a major drought ensues.

All five of the major livelihood systems contain numerous social and ecological adjustments designed to reduce or mitigate the effects of drought. The twentieth Century, during both the colonial and independence periods, saw a marked decline in the efficacy of many of these traditional strategies. But the traditional ways persisted, and the response to a major drought once it ensued included similar elements both in 1910-15 and 1968-74. However, the emphases on particular responses shifted dramatically. Thus, in the face of drought, all the Sahelian-Sudanic peoples resorted to some combination of three major actions: they suffered, they sought alternative food supplies in their locale, or they moved to where they hoped to find food or opportunities to earn money to acquire food.

Storing commonly up to a two year supply, the granaries of the Sahelian-Sudanic region were the first recourse during the crop shortfalls of 1968. Yet in a large, although unknown number, of Sahelian-Sudanic agricultural villages, the ability to feed itself even in good years had been lost for some time. In others the various demands for cash convert an actual biological surplus into a shortage as debt-ridden farmers sell crops at harvest only to purchase them back at exorbitant prices during the rains. The consumption of stored grain is accompanied by a search for wild foods, and references are persistent to their use both in 1910-15 and 1968-74.

Even in the most severe of droughts food is usually available for purchase. The drought may be locally ineffective, pockets of

good harvests being interspersed with failure. Merchants and moneylenders who capitalize on seasonal hunger may have large stocks. Imports may find their way into an area or relief supplies may be sold (to recoup transportation costs as in Niger) or be diverted illegally to local markets.

In any event, there is some food and prices rise. One reconstruction of that rise found that prices rose thirty-fold in the earlier drought compared to a fourfold increase in the more recent drought.

How were these purchases made? Essentially there were three sources of funds: (1) savings, accumulated as cash, animals, household possessions or jewelry; (2) sales of labor, crafts, or commercial crops raised on moisture-favored land; and (3) gifts or loans. The terms of trade in these exchanges of savings, income, or loans for grain were unfavorable in the extreme and the net effect was probably pauperization of the already poorest quarter of agricultural livelihoods and perhaps a half to two-thirds of pastoral peoples.

Between 1972 and 1974, 600,000 tons of grain were shipped to the Sahelian region from the U.S., about half of the world-wide total of relief supplies. In addition, Nigeria distributed some 15,000 tons of grain in its northern areas. These amounts, if they consisted of palatable grain and were distributed where and when needed, would have been almost sufficient to make up the drought-induced shortfall in production. Unfortunately the palatability of the grain, most of it sorghum, was less-than-desired by the populace; the relief came late; it was distributed with great difficulty and with considerable inequity. Nonetheless,

village surveys in five countries found a high percentage of villages reporting receiving some supplies in 1973 and 1974 although supplies may have been small and for most limited to one or at best two deliveries. This is in marked contrast to 1910-1915 when no significant relief was provided by the colonial administration, but levies on the society in the form of taxes and animals continued unabated.

Competing Views: Weighing the Evidence

On balance, for the majority of the Sahelian peoples, particularly the 13-15 million whose equivalent numbers did not exist in 1910, a comparable recurring great drought saw a lessening in the grim toll of human mortality and morbidity. This is less clear for the 2½ million nomadic peoples whose political, social and subsistence position worsened in the 60 year interim, and whose suffering probably was reflective of that worsening.

But there should really be naught for our comfort in this relative improvement. For even with lessening, the toll of mortality was large and the morbidity great, stunting and wasting the youth of the region, and impoverishing the poorest of the poor.

Implications for Current Development Policy

The Sahelian nations and associated donors have undertaken to plan the comprehensive development of the Sahel and provide sustained support over a 20-year period. Central to the Sahel Development Program is the goal of normal-year food self-sufficiency for the region and a reversal of the precipitate decline in the ability of the region to feed itself in the face of recurrent dry years much

less serious than those of 1910-1915 or 1968-74. A great deal of debate and uncertainty centers around this still evolving program both as to the aims and the methods of this ambitious development program. In general, it is misleading to invoke the drought as justification for development efforts as the problems towards which these efforts should be addressed are not unique to drought periods in these poorest countries. Nonetheless, to the extent that a legitimate goal of the program is to reduce the toll of human misery when drought recurs, then some implications follow from this review:

1. Food self-sufficiency are attractive catch-words with varying meanings. In terms of reducing the toll of drought, development activities that increase self-sufficiency at the family-household and village level are clearly the most significant. It is the family granery, and the herd that can be evacuated safely, that is the first-line of drought protection for Sahelian peoples. To make choices on the basis of this principle often involves foregoing some economy of scale, greater increase of production, or promising production "package". So these are not easy decisions. But a development effort that depends on the equitable distribution of food resources to the poorest quarter of the society will imperil this group when drought recurs unless they control the food themselves.

2. External knowledge of the riverine-based peoples dependent on recessional flood cultivation, of riverine and lacustrian populations directly dependent on stream flow and lake levels, and

of agro-pastoralists dependent on wet-land grazing resources is limited. The dearth of material during the drought dealing with these groups is matched by the apparent insensitivity of current discussions of irrigated development. It is quite possible that major river basin development will actually imperil the life and livelihood of hundreds of thousands of Sahelian peoples by drastically reducing the recessional flood cultivation, seasonal grazing areas and basic fish stocks as well as increase their drought vulnerability without any direct benefits.

3. The impact of the drought experience on road construction and transport is uncertain. On the one hand rapid distribution of late-arriving food supplies was hampered by road conditions, but on the other hand massive and successful movements of people took place and are taking place in the Sahelian-Sudanic region within the rudimentary road transport system. Serious drought is always multi-year, thus a responsive system of local storage, livestock evacuation routes and rapid international aid (utilizing the long dry season for transport) could provide the required emergency assistance even with current levels of road infrastructure.

When Drought Recurs

Three times (1910-15, 1941-48, 1968-74) in this century major droughts occurred over all or most of the Sahelian-Sudanic region and thus it should not be surprising when drought recurs again, perhaps before the end of the century. Would a retrospective comparison at that future time find significant reduction in the toll of death and poverty?

Recall first the major judgments of this comparative study of the two major droughts of 1910-15 and 1968-74: similar droughts, similar crop and animal losses, unquantified impacts for 1910-15 and underestimated death toll for 1968-74, but proportionately smaller impacts in 1968-74 given the 2-3 fold increase in population, and change in the most heavily impacted livelihood system from dry-land farmers to pastoralists. On balance, there is no evidence for increased vulnerability except for nomadic peoples. There is some evidence for reduced vulnerability for agriculturalists. And there is overall concern for the stresses in Sahelian-Sudanic livelihood systems glaringly exposed in the aftermath of the drought but endemic to everyday life: loss of control of resources, growing dependence for food supplies, serious ecological pressures, localized competition for land-resources, and monetary demands outpacing income opportunities.

These are likely to continue and it is not at all clear that the development activities being planned and implemented will seriously decrease the drought vulnerability of pastoralists and poor farmers. Some projects being discussed will surely increase their vulnerability (e.g. river basin development without provision for maintaining current recessional flood agriculture). Even with the most sensitive of programs and with productivity increases equitably distributed, these may not be able to compensate for short-run population pressures. Thus, are the people of the Sahel-Sudan region condemned to a repetition of 1968-74, two, twelve or twenty years hence?

Perhaps surprisingly, the answer is not necessarily dismal. Drought will surely recur again, but there is nothing necessary about its human impacts. There is enough experience from many parts of the world to argue that loss-of-life from natural hazard can be diminished even in the absence of needed development or social reconstruction, although the task is made much harder in societies indifferent to marginal groups. Clearly this is an argument, not a demonstration. But to assert that reduction in the toll of drought is dependent only on fundamental social change may be to condemn many of the 700,000,000 inhabitants of the world's dry lands to repeated cycles of death and pauperization. It is necessary to work for amelioration, while mindful of the limits of such efforts in the face of economic and social injustice or in the absence of meaningful development. It is still possible to support and reinforce the drought strategy elements of Sahel-Sudanic livelihood systems in such a way as to reinforce rather than undermine their ability to cope with drought. This combined with a regional mutual aid system and a responsive global assistance program could at least halve the death toll of 1968-74 even in the face of significant population increases. At the very least, a greater measure of disaster security could become the first universally attainable basic need and human right.

I. CLIMATE, SOCIETY AND LIVELIHOOD

At the southern edge of the Sahara begins an area transitional between the desert edge and the woodland to the south. This Sahelian-Sudanic climate and vegetation zone is the home of some 30 million West African people primarily dwelling in Chad, Mali, Mauritania, Niger, and Senegal with perhaps an equal number resident in Northern Nigeria. As with most transition zones, scientific views differ as to where specific boundaries should be placed. Two such zonations used in planning are displayed in Figure 1 along with estimates of area and 1965 population (exclusive of Nigeria).

Between 1968 and 1974, the area experienced a series of low rainfall years that led to significant drought, famine and worldwide interest in these thinly-populated, remote and landlocked African nations. Following on the drought, international interest in the region has remained high with an international consortium of rich nations working with the nations of the Sahel in planning a long-term development aid effort.

Attempts were made to interest international and national agencies in moving rapidly to document the recent drought experience knowing full well how rapidly the fund of experience diminishes and how easily the lessons would be lost.

Figure 1

SAHEL-SUDAN CLIMATE/VEGETATION ZONES
AREA AND POPULATION ESTIMATES

Average Annual Rainfall (MM.)	Climatic Zone	Area (KM ²)	Area (KM ²)	%	Population ¹ (1965)	%	Zone	Average Annual Rainfall (MM.)
0 -	Desert	1,919,250	2,150,000	40.9	330,000	1.6	Deserts	- 0
100 -								- 100
200 -	Sub-desert	1,516,360	1,400,000	26.6	1,600,000	7.9	Sahel des Nomades	- 200
300 -								- 300
400 -	Sahel	887,270	650,000	12.3	5,800,000	28.8	Sahel des Sedentaires	- 400
500 -								- 500
600 -	Sudan	502,568	500,000	9.5	6,500,000	32.3	Soudano Sahelienne	- 600
700 -								- 700
800 -	Woodland	453,122	400,000	7.6	2,900,000	14.4	Soudanienne	- 800
900 -								- 900
Various	Irrigable Urban	12,550	150,000	2.8	2,000,000	9.9	Fleuves Urban	Various
					-	1,000,000		
Total		5,291,120	5,250,000	99.7	20,130,000	99.8	Total	

Source: Matlock and Cockrum, 1974

Source: Fauchon, 1976

¹Probably excludes Nigeria

At that time the issue was expressed as follows in letters to agencies: "It is green around Bamako, the drought persists in Timbuctoo. Slowly, hopefully, the six-year drought in the Sahelian-Sudanic zone of sub-Saharan Africa comes to an end. This drought, as all droughts, can be seen from at least three perspectives. There is meteorological and climatological drought, an extreme but "normal" event of a variable climate measured by the diminution in rainfall and the spatial shift of critical isohyets. There is the drought hazard or disaster, a joint product of meteorological drought and the life and livelihood system of the region, measured in terms of the serious impact on persons and institutions, plants and animals. And there is the drought as a social and natural laboratory testing the behavior of persons and institutions, plants and animals under conditions of severe stress. We need to learn from this experience, to better deal with future situations. Judging by the record of other droughts and natural hazards, climatological drought will be well-reported, the drought hazard or disaster partly so, and the behavioral characteristics poorly or not at all." (Berry and Kates, letter, 1974).

As is common in such cases, there was only a limited response. A conference of 12 national and international research centers was held in Dakar in 1976 to identify drought-related issues and to organize collective research and sharing of data. That effort also has had only limited success, more so in eastern and southern Africa (Botswana Society, 1979) than in the Sahel proper.

More than ever, it is to be regretted that more systematic study was not organized. The experience of the Sahelian-Sudanic drought is continually cited as evidence in support of varying and contradictory theories about the relationship between climate, society and technology. While important details differ, it is now clear that there are two major competing interpretations of the Sahelian-Sudanic drought experience, that the evidence to support either view is sparse at best, and that the policy judgments that follow from each are of great significance both for the Sahelian-Sudanic countries and for least-developed nations everywhere.

Competing Views

A recent summary volume (Dalby, Church and Bezzaz, 1977) reviews the competing views. In the first and seemingly dominant view among scholars, the Sahelian-Sudanic drought found the affected population more vulnerable to its impacts than they would have been in the past. The Sahelian people were the victims of a colonial and neo-colonial international economic and technical order that had increased their dependency and reduced their self-sufficiency by decreasing the area devoted to food crops, by draining off the agriculturally important labor supply by migration, by creating technical conditions for a rapid increase in population and livestock numbers, and by adopting policies that favored the small urban elites. Variants of this position may emphasize one or another element. Thus, Malthusians emphasize the growth in human and livestock numbers and the degradation of the land resource,

underdevelopment theorists emphasize neo-colonialism, and ecodevelopment advocates emphasize inappropriate technology, particularly deep well drilling.

The competing view, the still-prevailing theory of development, holds that the recent Sahelian drought, despite all its attendant difficulties, actually saw a reduced vulnerability to drought than in past periods. Sahelian nations were able to prevail upon the conscience of the world for assistance, extended families with urban labor were not entirely dependent on vulnerable crops or herds, medical care restrained the childhood disease epidemics that often accompanied famine in the past, and a rudimentary infrastructure and national organization was available along with international aid to assist great numbers of people. Only where governments failed to act, as in Ethiopia, or in especially remote areas was there great loss of life.

These competing views lead to differing interpretations of the magnitude of drought impacts. In the same volume one finds in a paper by Berry, Campbell and Emker (1977) the following assessment:

While deaths of people and animals and displacement of people were features of previous droughts, the magnitude of the disaster of the recent drought appears to be greater.

But in the paper by Caldwell (1977):

However, the evidence from the testimony of the older population is that the demographic impact of the present drought, or at least its effect on mortality, was much less than that of the 1913 drought.

Depending on which view summarizes the actual Sahelian experience, strongly contrasting policy implications follow. The latter view, essentially the "modernization" thesis, appears to still dominate the development policies of the Sahelian countries. Despite some effort in food self-sufficiency, much if not most of the development effort is oriented towards improving the accessibility of rural areas and towards land and water development at a cost that makes a significant effort in export crops a necessity. At the same time the structural dependency of the nations involved has, if anything, increased over time and supplemental labor incomes are increasingly important. However, if the "underdevelopment" thesis is correct many of the current and future programs, well-intended as they may be, will only increase vulnerability to the next climatic fluctuation.

The debate as to the meaning of the Sahelian experience is mirrored by similar analyses in other parts of the developing world and similar views as to the nature of development or underdevelopment. If one is interested in evidence rather than ideological debate, an estimate of the Sahelian experience, particularly as it compares to previous climatic fluctuations, is critical. Thus, this paper attempts to bring together what is known about the comparative impacts of the drought of 1968-74 and the drought of 1910-15. The latter period was chosen because it was the last great Sahelian-Sudanic drought of comparable magnitude prior to the more recent one (there were lesser droughts in 1931 and 1941-49) and took place in the early years

of colonial conquest.

In making such a comparison, the opportunities provided by extreme natural and social events to observe human society under stress are utilized to test theories of social behavior and development. As with all "natural" experiments, the data are sparse, the controls are inadequate and the explanations are distorted by hindsight. The chance for first-hand collection of new data is passed, yet what is now known has been mostly recorded. The literature, in effect, is now almost as complete as it probably will ever be, but it has not yet been systematically evaluated, except selectively, by partisans of the competing views.

This review attempts to resolve such contradictory interpretations through a systematic analysis of published and unpublished reports of the two great droughts supplemented by limited archival research in the colonial records of the French and British administrations. For the period 1910-15, it draws upon scattered reports from the oral history of Sahelian dwellers, reports of foreign residents and travellers, and colonial reports of the French administration of French West Africa and the British administration of northern Nigeria.¹

¹All of the material on northern Nigeria was assembled by Michael Watts of the University of California, Berkeley, in a report entitled "Famine over Northern Nigeria in 1913-14 and 1972-74" based on extensive field work and archival research. For the former French Colonies of West Africa, Haleh Pourafzal searched the Reports of the Governor-General for the years 1910-15 in Dakar and examined recent reports in Bamako and Ouagadougou. I am deeply grateful for their assistance, but they are not responsible for my interpretation of their data, and indeed may differ in interpretation (see commentary, appendix I).

Comparable Droughts

The great droughts of the Twentieth Century, 1910-15 and 1968-74 (with a lesser drought period in 1941-9), are not exceptional in Sahelian-Sudanic history. Nicholson (1979) finds from lake levels and observations that the 1820's and 1830's were even drier and the 1860's or 1870's wetter than the comparable periods in the present century. Within this century her assemblage of records (Nicholson, n.d.) for 118 stations by latitudinal zones provides a basis for comparing the two droughts although her zonation (Table 1) differs from that of Matlock and Cockrum (1974) and Fauchon (1976).

TABLE 1

SAHELIAN-SUDANIC RAINFALL ZONE CHARACTERISTICS

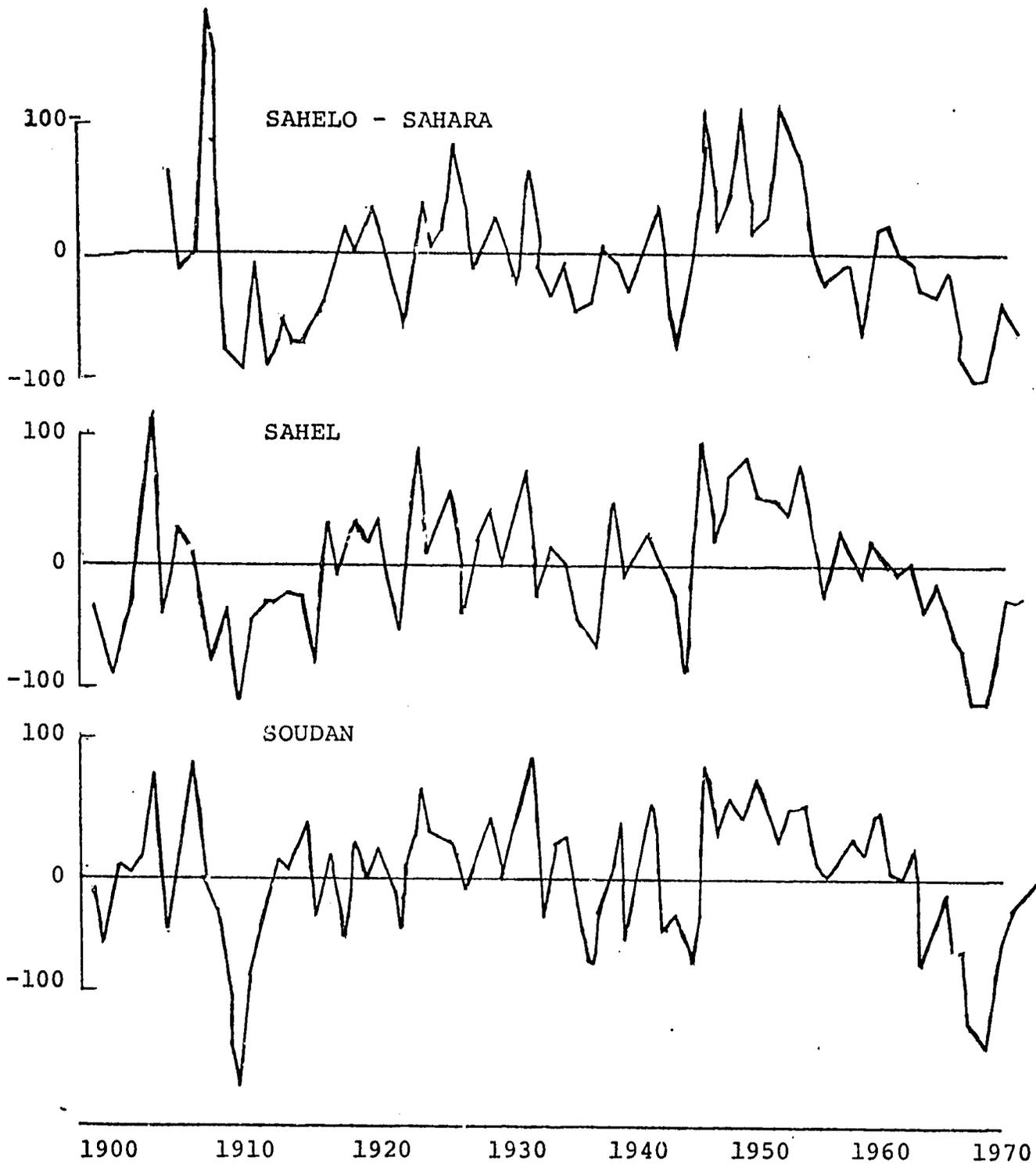
<u>Zone</u>	<u>Lat.</u>	<u>Mean Annual Rainfall (mm)</u>	<u>Coeff. of Variab. (%)</u>	<u>Rainy Season (mos.)</u>	<u>Station (#)</u>	
					1910-15	1968-74
Sahel-Sahara	18°-20°N	50-100	50	1-2	2	7-13
Sahel	15°-18°N	100-400	30-50	2-3	6-9	18-32
Sudan	12°-15°N	400-1200	20-30	3-5	13-18	30-70

Source: Nicholson, n.d.

The annual rainfall series, normalized to control for greater variability in the more arid zone, is shown in Figure 2. All three series exhibit marked similarity, with the drought periods of 1910-15 and 1968-74 outstanding. Both drought periods followed epochs of above-average rainfall which may have exacerbated their impact.

Sircoulon (1976) provides the data for a more detailed

Figure 2. Normalized Mean Annual Rainfall
in the Sahelian-Sudanic Zone, 1900-1975



Source: Nicholson, n.d.

comparison of the two drought periods. These data are limited, for within the Sahelian-Sudanic zone (defined in Figure 3, following Matlock and Cockrum, 1974) there are only 20 long-term rainfall stations in a vast area equivalent to three-fifths of the area of the United States. Expressing the annual rainfall of the worst of the paired years 1912-13 and 1972-73 as a percentage of 1931-60 rainfall, a rough comparison of the magnitude and areal extent of the rainfall deficiencies emerges, shown in Figure 4. Some very large deficiencies from the 1931-60 averages were experienced in both droughts. The larger deficiencies experienced in 1912-13 were concentrated in the east and south, while 1972-73 was more serious in the sub-desert, north and west. This pattern is corroborated by reports of crop and animal loss and human impact.

In both droughts rainfall deficiencies persisted over a six year period interspersed with average or even good rainfalls and with great spatial and seasonal variability within any given year. There is some suggestion of greater total shortfall of precipitation in the more recent drought with a more serious single "worse" year of 1913 (Sircoulon, 1976). But taking into consideration the sparseness of the data for the earlier drought and the corroboration from other sources, we conclude that the two droughts are reasonably comparable except for their distribution. Drought-impacted sedentary farmers in the southern Sahel and Sudan zones were somewhat more seriously affected in 1910-15, whereas in 1968-74, the nomadic pastoralists of the sub-desert and northern Sahel were more seriously affected.

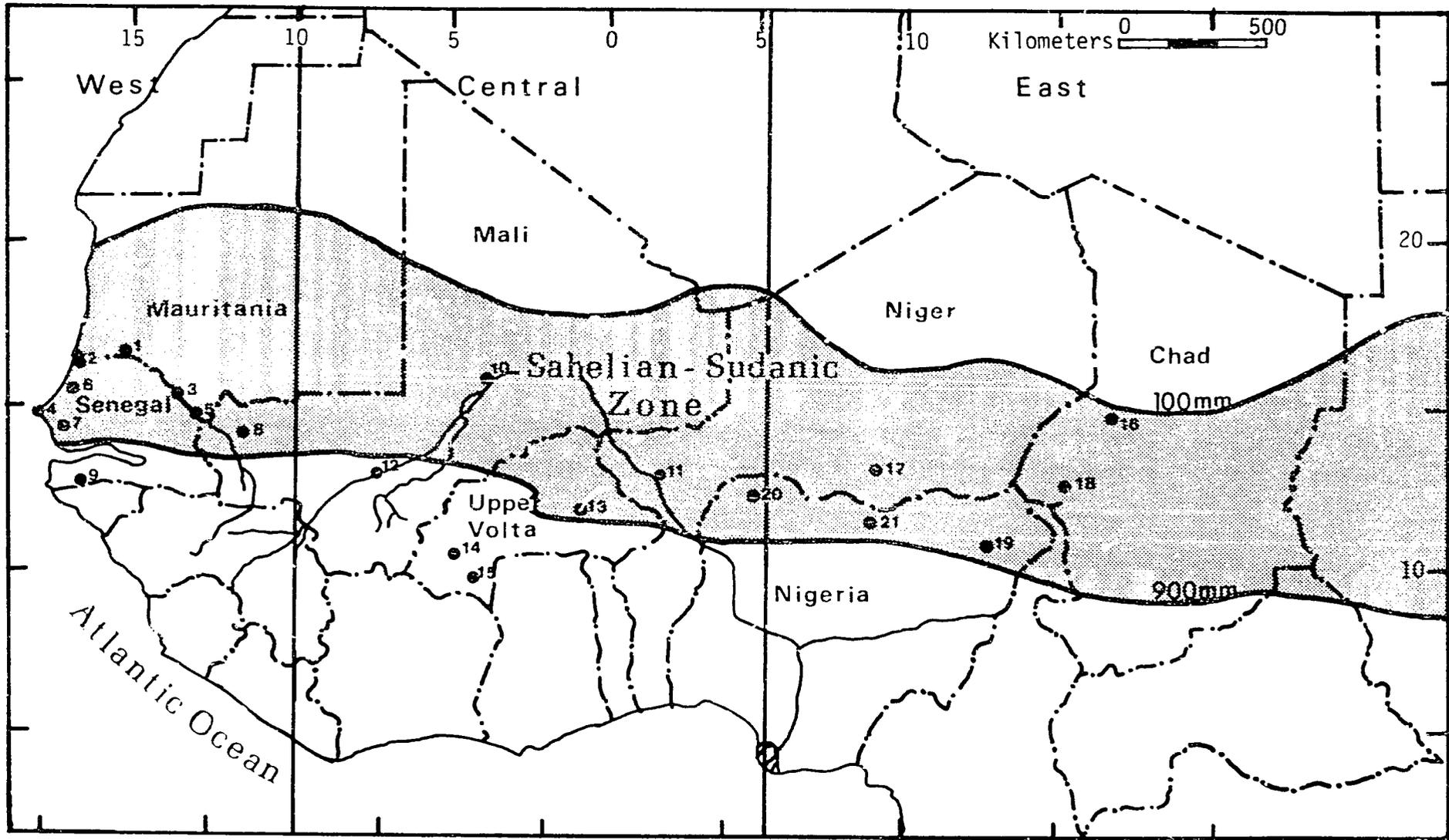


Figure 3. The Sahelian-Sudanic Zone in West Africa. See Table 2 for rainfall station names. After Sircoulon 1976, Matlock and Cockrum 1974.

Figure 4
DROUGHT IN THE SAHEL
Rainfall Deficiencies 1912-13 and 1972-73

		WEST			CENTRAL			EAST		
		Stations	1912-13	1972-73	Stations	1912-13	1972-73	Stations	1912-13	1972-73
SUBDESERT 100-300mm					10 Tombourton- Kahera 220mm	58	47			
SAHEL 300-650mm		1 Podor 326mm	38	33	11 Niamey 575mm	58	64	16 Bol 341mm	13	18
		2 St. Louis 347mm	43	43				17 Zinder 508mm	42	58
		3 Kaedi 410mm	66	32				18 N'Djamena 639mm	48	49
		4 Dakar 578mm	53	20				19 Maidiguri 650mm	54	66
		5 Tivaouane 615mm	39	24						
		6 Rufisque 620mm	54	20						
SUDAN 650-900mm		7 Thies 694mm	34	32	12 Segou 730mm	76	69	20 Sokoto 719mm	57	54
		8 Kayes 743mm	89	66	13 Ouagadougou 872mm	46	81	21 Kano 843mm	57	49
WOODLAND > 900mm		9 Sedhiou 1379mm	66	61	14 Bobo-Dioulasso 1170mm	69	75			
					15 Gaoua 1190mm	64	73			

 Percentage of Mean Annual Rainfall (1931-1960) in Worst Year Either of 1912 or 1913 and 1972 or 1973

Larger deficiency shown in grey

Differing Livelihoods

Natural borders are inherently attractive and hazardous to mankind. The borderlands of land and sea, mountain and plain have always attracted settlement, providing access to multiple resources as well as the multiple climatological and geophysical hazards that accompany such zones. Climatic and vegetational borderlands provide similar attractions and hazard, but the environmental cues are more subtle and less defined, the borders shifting by season and year. The Sahelian-Sudanic zone of West Africa is such a borderland between desert and woodland, and the lives and well-being of some 30 million people who live and work within that borderland are affected by and affect its movements. The movements of the border, or more precisely the zones within that transitional area, are not only defined by climate (See Figure 1), but by the livelihood of its inhabitants and the forces that encourage their ways of life.

In this analysis we will consider five types of livelihood systems with both current and historic interest. They include: (1) two systems that are primarily agricultural, small-holder dry-farm cultivation and surface-flow recessional irrigation; (2) one system of combined agro-pastoral activity that includes dry farming and cattle-keeping; and (3) two systems of primarily diversified pastoralism, one emphasizing cattle and one including camels. About five-sixths of the peoples of the six Sahelian countries are engaged in these livelihood systems, and their approximate range and comparative numbers

are shown in Figure 5.

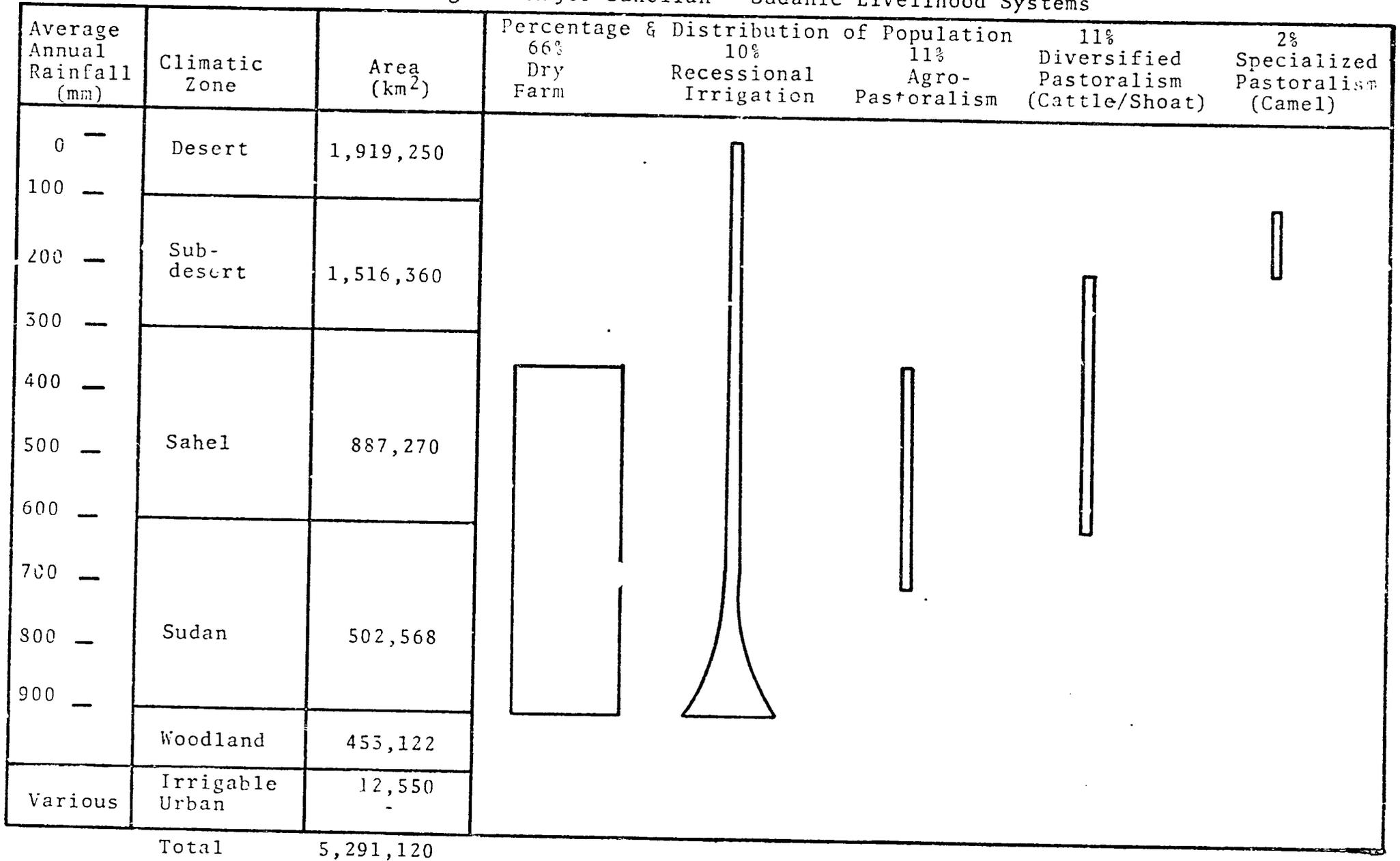
Smallholder dry farm cultivation. Smallholder farming systems are quite complex and are adapted to a variety of soil resources, labor requirements and household needs. But several major common characteristics mark the Sahelian-Sudanic dry-farm systems: (1) staple production of millet or sorghum, often mixed with legumes; (2) cash crop production of peanuts or cotton; (3) a sharply delimited rainfall season of three to five months; (4) minimal tillage; and (5) limited cultivation which is often constrained by labor availability.

In a seven-nation region (including northern Nigeria), three-fifths the size of the U.S., only 8% of the land is classified as arable and less than 30% of that is estimated to be cultivated. In the pre-drought year of 1969, using the crude indicator of FAO statistics, perhaps 80% of this cultivated acreage was in food crops: (1) millet (47%); (2) sorghum (13%); (3) legumes (14%, often intermixed); (4) corn (2%); and (5) rice (3%). The remaining 20% was planted in export crops, primarily peanuts (14%) and cotton (4%). About 66% of the population are primarily dry farm cultivators, and this includes such major ethnic groups as the Hausa of Niger and Nigeria, the Mossi of Upper Volta and the Wolof of Senegal.

Surface flow recessive irrigation. Most of this acreage is solely in dryland cultivation but a significant portion, and almost all the rice, is in flood recessional agriculture along the floodplains of the Niger, Senegal, and Chari rivers, as well as along the shores of lakes (particularly Lake Chad) and in

Figure 5

Range of Major Sahelian - Sudanic Livelihood Systems



the many small wadis or ephemeral channels. One estimate (SCET cited by Fauchon, 1976) of the extent of these floodplains in the six Sahelian nations is 150,000 km² or between 2-3% of the total area. About 2,000,000 or 10% of the estimated 1965 population was thought to live and work along these rivers. Using the estimated population and assuming a ratio of three persons per hectare, about 5-6% of the cultivated area would be in such agriculture. In addition, there is a small amount (less than 1% of cultivated land) actually under irrigation. Closely linked to these small-scale irrigation agriculturalists are fishing folk scattered along the region's permanent streams and seacoast and around the shores of fluctuating waterbodies such as Lake Chad. Full time fisherman of all types are estimated to number 160,000 (CAS, 1977), three-fourths of whom are inland freshwater fishing folk. Although small in numbers, these fishermen are important regional producers of protein for local diet and account for 75% of all fish caught in the zone.

Agro-pastoral activity. There is generally no sharp division between agricultural and pastoral peoples in the Sahelian-Sudanic zone. Small numbers of domestic animals are owned by most farmers, and some garden crops are raised by almost all pastoralists. Moreover, a lively interchange of animal products, manure and grain takes place among all livelihood systems. The agro-pastoralists raise a significant portion of their own grain and at the same time a portion of the family-household engages in seasonal transhumance over short distances. Their

major cash crop is in animals rather than peanuts or cotton. Many of this group are Fulani (Peul), but others, such as the Haiballah of Mauritania and the Teda (Tibbu) of Chad's Tibesti Massif, have long successfully combined agricultural and pastoral pursuits. Perhaps 2.8 million of the area's inhabitants engage in this dual livelihood.

Diversified pastoralism. In the period just prior to the drought, the animal population (in standard livestock units) exceeded the human population by about 25% and provided the sole or major livelihood for some 3.4 million people. Animals and people move behind the shifting climatic belt, the Intertropical Convergence Zone, moving northward with the rains to the desert fringe to crop effectively the seasonal herbaceous biomass, and southward during the dry season to feed on floodplain vegetation, crop stubble and savannah grazing. The northern-most herders have significant number of camels and fewer cattle, as well as more sheep and goats, than do southern herdsmen who are more specialized in cattle. Perhaps a quarter of a million pastoralists base their livelihood on camels, including sections of the Reguibat of Mauritania and the Tuareg of northern Niger. The remainder are cattle specialists and include the widespread Bororo (Wodaabe) Fulani of Niger and Nigeria.

Changing Social Systems

In contrast to the recurrence of meteorological drought, the social systems of the Sahelian-Sudanic zone have experi-

enced profound changes in the Twentieth Century. But social change, like climatic fluctuation, is not anomalous in the region. The Sahel has been parent to some of Africa's most extensive empires. From roughly A.D. 900 to 1100 ancient Ghana controlled much of what is now Mali and Mauritania. Between 1200 and 1450, ancient Mali ruled from Cape Verde in the west to approximately Niamey in the east. For the next 150 years, the empire of Songhai, the largest of the three, collected taxes and maintained order in a territory which encompassed about two-thirds of the present Sahelian-Sudanic countries.

These Sahelian empires were many things. They were trading states, conducting substantial exchange with their neighbors to the north of the Sahara Desert. In their later years, they were Muslim states, in part because of the success of the trans-Saharan trade. They were states with large and apparently diversified urban centers. They were military states with well-equipped cavalry, good logistical support, and even the rudiments of a navy which patrolled the waters of the Niger River. They were orderly states--with a few exceptional disruptions--in which trade seemed to be the most important activity to maintain and expand, but with agriculture and animal husbandry equally important. They were wealthy states with a number of well-documented examples of luxurious courts and gold-laden, royal pilgrimages to Mecca. They were self-sufficient states that satisfied their own needs in food, shelter, water, and livestock forage. If one can accept the uneven but suggestive evidence of Sekene-Mody Cissoko (1968), they

were states without serious famine from 900 to 1591, the year when Moroccan troops marched south across the desert and destroyed the once potent Songhai army.

Moroccan soldiers were not the only force to weaken the Sahelian empires. Whereas Sahelians enjoyed monopoly control over all West African external trade until about 1600, their influence waned with the advent of European presence to the south. Europe first touched West Africa in the mid-15th century. Trade in slaves began almost immediately and quickly accelerated. Conservative estimates of annual average numbers of slaves imported into the Americas clearly demonstrates this upward rise, reaching a peak annual average of about 50,000 between 1750 and 1800. (Curtin, 1969).

Trade in flesh led, eventually, to European trade in goods. Of particular value were gold, ivory, timber, dye-woods, gum, beeswax, leather, and spices (Hopkins, 1973). By the 19th century, under heavy pressure from abolitionists, European nations began to shift from trade in slaves to the "legitimate trade," mostly in palm oil and cocoa. As an example, in 1892, at least 15 million palm trees were in production in Yorubaland (Hopkins, 1973). The European trade drained energy and markets away from the Sahel. Forest empires in modern day Ghana, Ivory Coast, Benin, and Nigeria emerged as trading powers equal to and eventually stronger than the Sahelian states.

From 1600 to 1900, these factors made the Sahel a region of disruption and uncertainty. Although the trans-Saharan trade continued, it did not maintain the volume or consistency of the 15th

and 16th centuries. With the exception of northern Nigeria and some of the Hausa areas in Niger and Chad, Sahelian cities withered. For these 300 years, the Sahel was without central coordination. Individual groups, including Arab, Bambara, Berber, Fulani, Hausa, Mossi, Soninke, Tuareg, and Tucolor, competed for grazing land, water rights, floodplain farmland, and trade. These same groups also competed for political control. Most successful were the Fulani who were an expanding and evangelical group, upwardly mobile and religiously inspired. They spread both political consolidation and a purified version of Islam across the Sahel in a series of jihads or holy wars.

The first Jihad came about 1650 in Senegal. One of the best known took place in the early 1800s in northern Nigeria and southern Niger, under the leadership of Usman dan Fodio. The result was the creation of a Muslim state in northern Nigeria of 10,000,000 people and 180,000 square miles of land. For the early nineteenth century, this state was a massive accomplishment by any national standard. Nonetheless, it did not approach the longevity, number of people, or amount of territory of the early Sahelian empires.

Other important jihads followed, particularly that of Ahmadu bin Hammadi Boubou, who led a holy war against the Niger inland delta cities, and that of 'Umar bin Sa'id, who actually overthrew Ahmadu's grandson. These theocratic states, although conceived on a scale comparable with the empires of old, were never realized. Yet the 19th century empires were not without lasting significance. Fulani leader Ahmadu bin Hammadi not only brought order to the

inland delta but also introduced a set of codified regulations for pastoral land use. Known as the Dina, these codes survived to about 1960 although their enforcement was considerably weakened by the French colonial administration. The Dina made possible harmonious relations between pastoralists, fishermen, and farmers in the Delta. They also established rules of organization for the transhumance as well as use of the burgu, the annual grazing lands created by the receding flood waters of the Niger river (Gallais, 1975).

Such was the Sahel just before 1900 when the French arrived. Conditions of very dry years in the 1820's and 1830's seemed to have given way to a wet cycle which persisted until about 1900. The region, diverse in livelihood and social organization, was politically and economically decentralized, factors favorable to French penetration.

The professed explanations of French imperial motivation are mixed, varying from a desire to suppress the slave trade or to encourage religious conversion to the development of markets for new investments in an effort to cure a European recession which extended from 1874 to 1896. Regardless of motivation, by 1900 French forces had marched all the way from Senegal to Lake Chad and had gained nominal control of the entire Sahel. Yet full French control of the Sahelian-Sudanic region was not achieved until the 1920's. Thus on the eve of the 1910-15 drought, a rudimentary network of colonial control was in place but a significant change in livelihood systems had only begun.

Campbell (1977) has summarized the major objectives of colonial

Table 2

THE IMPACT OF MAJOR OBJECTIVES OF COLONIAL POLICY

OBJECTIVE	REASON	EFFECTS OF IMPLEMENTATION
PEACE	Ensure control. Ensure climate for trade and production of crops and export products. Reduce cost of military occupation	Change in balance of power. Attempts to reduce power and mobility of Tuareg. Favored policy of sedentarisation. Allowed movement in trade. Reduced need for nucleated settlement for defense.
COST MINIMIZATION	Reduce costs of colonial administration to France by internalizing them.	Taxation of people, animals and trade. Encouragement of trade in commodities needed in Europe. Costs of infrastructure paid by taxes and forced labor.
EXPORT PRODUCTION	Groundnut, cotton, palm oil needed in Europe. Cattle needed for meat in towns.	Groundnut and cotton growing encouraged and if necessary forced. Change in land use system. Commercialization of economy. Cattle trade expanded. Caravan trade declined.
LABOR SUPPLY	Cheap labor for coastal plantations, and infrastructure building. Troops for war.	Forced labor. Labor migration. Migration to avoid coerced labor.
ADMINISTRATION	Ensure control. Collection of taxes. Provision of labor and troops. Education, etc.	Traditional social hierarchy disrupted. French hierarchy superimposed. Restriction on-trade.

Source: Campbell, 1977

policy in terms of pacification, cost-minimization, export production, supply of cheap labor, and administrative control (See Table 2). The effect of these changes was profound, heavily impacted the resource base of both agricultural and pastoral livelihoods (Figure 6) and changed traditional ways of coping with drought.

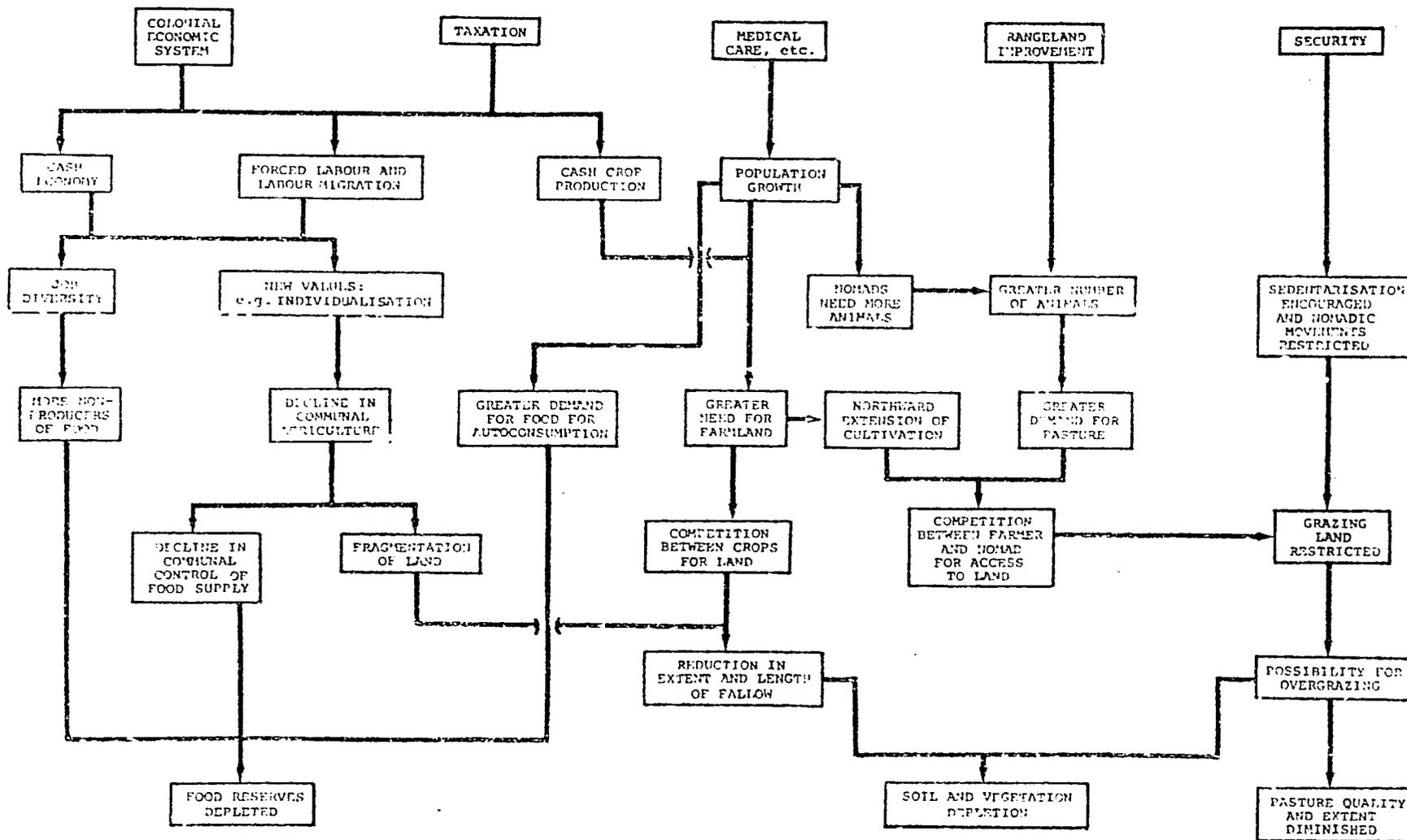
For nomadic pastoralists the changes were exceptional, reversing their general dominance. Campbell (1977) has sketched these impacts on the Tuareg of Niger who resisted the French until the failure of their revolt in 1916 (Figure 7). With their political power destroyed, their supplementary caravan trade declined along with their role in the salt trade. Frontier controls limited their movements while their decline in power and more favorable climatic regime permitted the northward expansion of agriculture and Fulani herding into their grazing lands. Ironically, at the same time the "benefits" of colonial technology (veterinary services and well drilling) may have led to increased herd size. Independence from France had little effect on the Tuareg decline, the new national elites having emerged primarily from the agricultural peoples in all countries except Mauritania.

The effects on agricultural peoples were different, in the case of the Hausa for example allowing their spread outward from their defensive villages. But the integration into the wider colonial world impacted traditional adaptive mechanisms. Campbell summarizes these impacts on Table 3.

The foregoing analysis emphasizes the destruction of traditional coping mechanisms and the simultaneous enlargement

Figure 6

THE IMPACT OF SOCIO-ECONOMIC CHANGE ON AGRICULTURAL AND NOMADIC RESOURCES

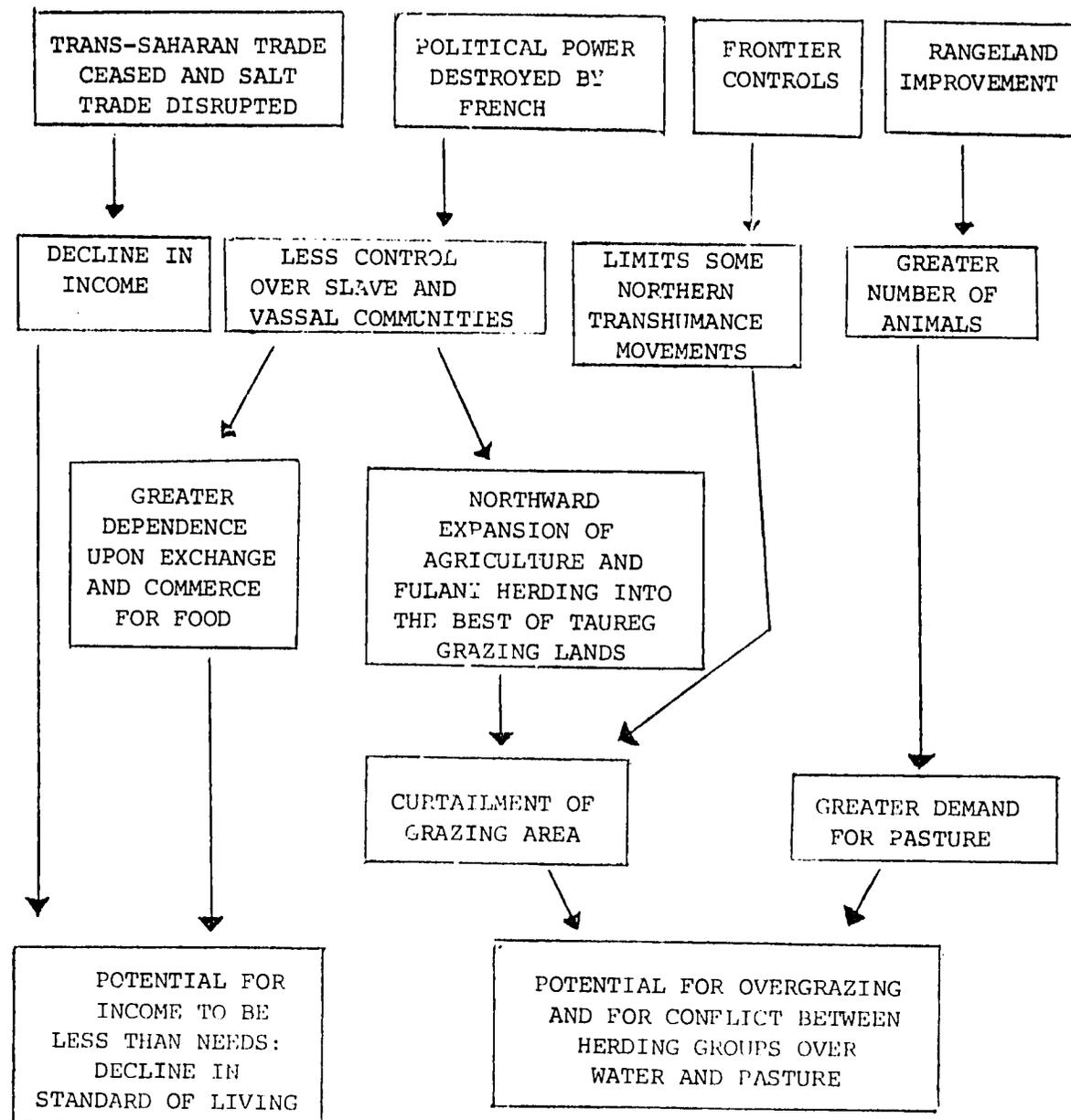


Source: Campbell, 1977

Figure 7

IMPACT OF SOCIAL AND ECONOMIC CHANGE UPON

SELECTED ASPECTS OF TUAREG SOCIETY



Source: Campbell, 1977

TABLE 3

THE IMPACT OF SOCIAL AND ECONOMIC CHANGE IN SOME HAUSA STRATEGIES FOR DEALING WITH DROUGHT

ADAPTIVE MECHANISM	EFFECT	ORIGIN OF CHANGE	IMPACT
Village Ties	Inter-village support: spotty rainfall distribution increases chance of one village in group having a harvest.	Colonial administration. Values associated with modernization.	Less mutual help; greater dependence on modern sector for aid or for food on market.
Family Ties	<u>Mai gida</u> controls food distribution, land use, labor allocation, etc.: ensured controlled supply and storage of food.	New values and opportunity for economic gain in modern sector lead to greater individualization.	Extended family as basic production unit and source of support declined.
Grain Storage	Important as source of food in dry season and in times of drought.	Decline in communal organization & control of <u>mai gida</u> . Expansion of urban food market.	Less food stored: potential of famine due to crop failure greater.
Extensive mixed cropping	Mixed cropping reduces chance of total harvest failure, protects soil, reduces risk of crop disease, maximizes use of soil nutrients.	Monocropping, e.g. groundnuts. Extensive cropping declined as plots fragmented & farmed more extensively.	Reduction in food output.
Regular fallowing	Allows regeneration of soil fertility.	Fragmentation, land scarcity, greater demand for food & cash crops.	Reduction in soil fertility & in crop output.
High birth rate	Insurance against high mortality rate & losses due to disease or famine. Ensures adequate labor supply.	Medical care...decline in infant mortality: faster population growth	Greater demand for food and land.

Source: Campbell, 1977.

of populations of people and cattle. But the changes also enlarge possibilities for coping with drought. Caldwell (1975) notes the persistence of traditional mechanisms, but cites additionally the growth of infrastructure and of national and international assistance. Imperato (1976) cites the successful campaigns against childhood disease that so often accompany famine. That profound change occurred in the Sahel between the two droughts is hardly disputed, but how was the balance of benefit and harm struck?

II. COMPARATIVE DROUGHT IMPACTS

Drought, particularly agricultural drought, is the most poorly-assessed hazard of the leading geophysical hazards. Unlike earthquake, floods, and tropical cyclones, its onset is often slow and cumulative, extending over years rather than moments or days. Major droughts are extensive. They cover large, poorly-defined areas within which are found spatial and temporal anomalies--well-watered areas, normal rainfall seasons. Deaths from drought do not appear in registers of causes of death, crop and animal losses may be concealed by other economic and technological trends, and losses in the non-commercial economic sectors are usually estimated on the basis of assumptions about the "normal" livelihood system.

For any given meteorological pattern, the impacts vary by the nature of the society and livelihood system. Comparing, for example, Australia and Tanzania, whose populations in 1969-1970 were almost equal, one finds average annual deaths attributable to drought numbered in the hundreds in Tanzania while they were virtually eliminated in Australia. Monetary equivalents of the damage and costs of adjustment to drought are twice higher in Australia than in Tanzania in absolute terms. But in relative terms, in the proportion of Gross National Product lost to drought or employed in limiting its potential effects, Tanzanians employ an equivalent of almost

2% of their GNP in comparison to 10% equivalent employed in Australia (Burton, Kates and White, 1978).

In theory, hazard assessment has advanced to the degree that we can at least list the salient terms in an impact account for drought in the Sahel. These include the health and well-being of the populace, economic losses of crops and animals, costs of emergency adjustments, relief and migration, social adjustments and disruption, structural changes in economy or society and sustained ecosystem disruption or change. Data limitations restrict comparisons to only some of these impacts: crop and animal losses, malnutrition, mortality, and socio-economic and political changes.

Data Sources

Even in societies where statistical reporting has evolved into a fine art, the costs and losses of great disasters are never known and are at best approximated. In the Sahel, with only the most rudimentary and limited coverage by statistical indicators, assessing the impacts of drought is a task of inference from scattered surveys and biased reports, of judgment by experienced observers, and of qualification in the face of substantial ignorance. Particularly, for the period 1910-14, we are limited to oral history and the reports of colonial administrators, foreign residents and travellers.

There are three major sources for the early analysis. For northern Nigeria, Michael Watts (1978) prepared a report based on his extensive archival research and fieldwork in northern

Kaduna State. For the former French colonies, Haleh Pourafzal searched the various reports of the Governor-General of French West Africa and the specific reports for Mauritania, Niger, Upper Senegal-Niger and Senegal for the years 1910-15, and in the Yatenga region of Upper Volta, J.Y. Marchal (1974) has carefully reconstructed from the colonial records of the Cercle de Ouahigouya a 66 year chronicle of agricultural harvests, shortages and related impacts.

For both droughts, we have examined the major bibliographic sources (Barres, 1974; Joyce and Beudot, 1976-; Sahel Documentation Center, 1977-; Department of Demography, Australia National University, 1973-74; Oxby, 1975; Roch et al., 1975) for cross-references to the drought periods and have reviewed the papers of the London (Dalby and Harrison Church, 1973; Dalby, Harrison Church, and Bezzaz, 1977), Nouakchatt Colloque...(1976), and Niamey (UNESCO, 1975) symposia and the collected case studies of pastoralist drought response of Gallais (1977). Finally, Pourafzal examined estimates of crop and animal losses at the headquarters of the Permanent Interstate Committee for Drought Control in the Sahel (CILSS).

A few unpublished papers referred to in sources or suggested by reviewers have proven difficult to obtain. And there seems to be ever-continuing work on documenting the drought and its aftermath. Nonetheless, while there may be some untapped lode of useful data, we do not anticipate a substantially different picture of drought emerging. The reports for 1910-15 are particularly thin, but it is no accident that we know so little for this period of history. Watts has described the problem of interpreting the colonial record in his report:

Most of the data presented in this report were derived either from archival sources in London, Oxford, Kaduna and Ibadan, from informants in northern Kaduna State, from various literary or anecdotal sources and, finally, printed matter pertaining to the early colonial period. The limitation of relying heavily on colonial sources is self-evident but it is the best source of empirical data which we have. The 1913-14 famine occurred just one decade after the conquest of the north and the administrative and organizational response reflected a large measure of inefficiency, local level chaos and sheer ineptitude. What data are available then tends to be limited in its spatial referents, often lacking in specific numerical detail and are ideologically colored. Take for instance the following statement by a colonial resident on the famine in Kano during 1908:

Yes, the mortality was considerable but I hope not so great as the natives allege--we had no remedy at the time and therefore as little was said about it as possible.

Thus, in spite of the colonial experience in 19th century India and the evolution of a famine code, the situation in northern Nigeria reflected a certain naivete and lack of concern. Unquestionably by 1913, the fiscal constraints under which the colonial administration operated effectively prevented either widespread famine relief or indeed an accurate reporting-monitoring system. In short, the information pertaining to the human suffering and social dislocation of 1914 is unreliable, spatially inconsistent and almost wholly non-quantitative.

Watts' comments are underscored by the scarcity of drought assessment evidence in Fourafzal's abstracts of the French Colonial Reports. The overwhelming impression given by these is the limited reporting by the colonial administration of an event that seared the memories of the Fulani, Hausa and Tuareg peoples (Laya, 1975). Thus in the final analysis they tell us more about the colonial authors of these reports and the system they represented than about the human impact of the great drought of 1910-15.

With these limitations in mind, comparative estimates of crop and animal losses are presented first, and then the impacts of such losses on human nutrition, illness and mortality, and finally

some aggregate effects on economy and society.

Crop and Animal Losses

With the exception of Senegal and Nigeria the Sahelian countries are among the poorest in the world and their statistical reporting services for crop production are limited to certain export crops, particularly peanuts and cotton. Similarly, the actual size and composition of the national herds is not really known.

In the most recent drought, there was some urgency in developing estimates of crop losses, for these were used to estimate anticipated shortfalls of the staple grains, millet and sorghum, that required replacement by the international relief effort. With such an end in mind, there is surely some tendency to inflate the size of losses. Indeed, except for the cases where nations seek to cover up harvest failure and famine, disaster losses from all causes tend to be initially inflated, often by a factor of two (Burton, Kates and White, 1978). Nonetheless, an examination of the types of estimates made (see Table 4), suggests that overall losses of one-third to one-half of food crops and herds in the worst years of the drought are reasonable and conservative estimates.

Latitudinally, these differed considerably. Gallais (1977) summarizing the observation of eleven case studies of pastoralists concludes that north of the 250 mm rainfall isohyet cattle losses exceeded 80%, and between 250 and 500 mm 30-60%, except in certain isolated, well-watered areas where only 10-20% mortalities were experienced.

TABLE 4
ESTIMATED SINGLE YEAR CROP AND CATTLE LOSSES 1968-74

	% Crop Losses ¹ (worst years: 1968-74/1967-68)			% Cattle Losses E.D.F. ³	
	Millet/ Sorghum	Cotton ²	Peanuts	1973/1972	Other ⁴
Mauritania	.77	-	-	45	25,30,42 (60-80)
Niger	42	86	76	36	33,45,50 (60-65)
Nigeria (North)		not available			
Gambia	42	(+2)	19	34	16,32,40,50
Sierra Leone	38	36	15	34	34,40
Senegal	51	(+20)	43	25	10,15,20
Upper Volta	11	25	14	15	2, (7-8) 13,30

¹Data taken from Berg, 1975

²(1968-69 Base Year)

³European Development Fund Study cited in Berg, 1975.

⁴Various Sources

These estimates are not easily compared with the following reports from 1910-15:

Mauritania 1913	"production of millet mediocre"
Senegal 1912-13	"grains are beginning to become scarce in certain <u>cercles</u> "
	"bovine epidemic disease, mortality from 33-42%"
Niger 1913	"millet production insufficient for subsistence needs" "certain valleys...had millet production of 2/3 to 3/4 of the average--some areas had only 1/2 of the average and others had none at all" "The semester has been particularly unfavorable for sheep and cattle. The exceptional drought of 1913 has led to an important exodus to more favorable regions. A great number of cattle have died"

"animal mortality: cattle 1/3, sheep and goats 1/2 and camels, negligible.

Nigeria 1914

"the Wodaabe pastoralist Fulani of Western Bornu Province were estimated at 10,000 with 88,000 cattle in 1913 and 5,500 with 26,000 cattle in 1914"

But neither do they suggest a very different picture of crop and animal losses in 1910-15 compared to 1968-74. The comments appear interchangeable with similar reports during the recent drought. Thus it is assumed that similar crop and animal losses occurred in response to comparable moisture deficiencies and turn to the human impacts of the drought, to consider what happened in each of the periods when Sahelian-Sudanic inhabitants faced losses on the order of a third to a half of their food supply.

Malnutrition

The diminution of the food supply in the form of grains and milk products immediately impacts the health and well-being of the population, particularly the very young and very old. Thus, the efforts that were made to document the impact of food shortage on human nutrition focussed primarily on children. Beginning in 1973 and continuing through 1975, a variety of surveys were undertaken to document the degree of undernutrition. By and large these are not comparable, either because the surveys were not randomized (e.g. surveys in refugee camps) or different indicators were used (e.g. clinical observation, and various ratios of age, height, weight, arm and head circumference). All the surveys lack pre-drought control data, and only a few scattered baseline surveys exist for the Sahelian-Sudanic region (Garcia and Escudero, in draft).

Data employing a common indicator, not dependent on know-

ledge of age, have been combined in Table 5 and is based upon the claimed constancy across cultures and continents in the weight-height relationship originally documented in Boston. Using 80% of the normal weight-height ratio as the arbitrary designation below which occurs what is variously called "acute" or "moderate" undernutrition, data were collected by The Center for Disease Control (See Figure 8) and two other groups in five countries. In the standard reference population about 3% (Kloth, 1974) would be expected to be below 80%. Reviewing the available sparse data, Garcia and Escudero conclude that in the Sahelian-Sudanic region some 5-10% of children under six are below the standard in the best of years, evidence of the chronic malnutrition to which children are exposed. Such malnutrition even varies seasonally as shown in the 1975 pre-planting and post-harvest surveys in Mauritania, Mali and Upper Volta.

Overall, the CDC surveys of 1973, 1974 and 1975, the work of Seamon et al. (1973), and deGoyet (1976) suggests that the already high rates of acute malnutrition among young children (5-10%) doubled during the worst years of the drought and in the severely-affected areas. No similar data were available for the earlier period. Malnutrition, especially among children, does not appear in the colonial reports except in passing anecdotal references.

Mortality

The death toll from the famine and the migrations that accompanied the Sahelian drought will never be known. The

Table 5

ACUTE MALNUTRITION SURVEYS: SAHELIAN-SUDANIC REGION
 PERCENTAGE CHILDREN¹ 80% NORMAL WEIGHT/HEIGHT

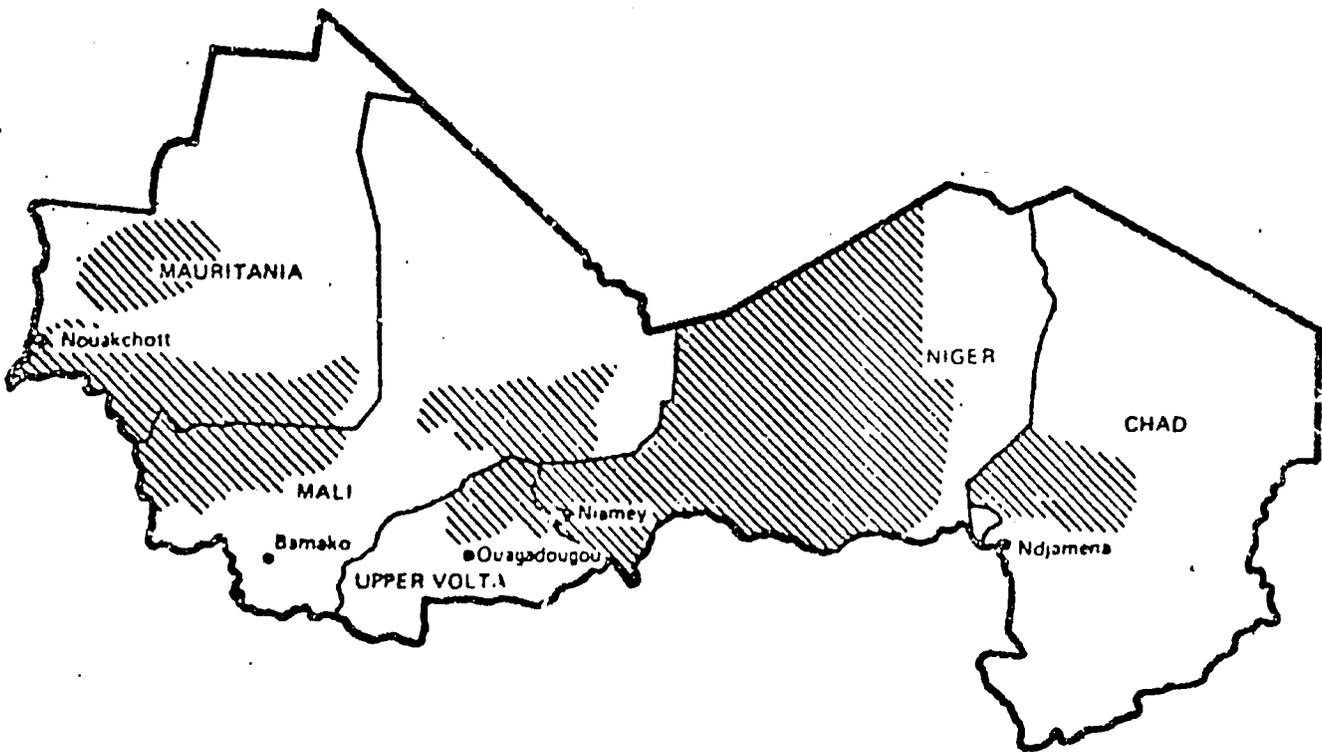
Country and Investigator	Survey Year, No. Surveyed, % Malnourished							
	1973		1974		1975		1975	
	(N)	(%)	Pre-Planting (N)	(%)	Post-Harvest (N)	(%)	Pre-Planting (N)	(%)
<u>Mauritania</u>	(R.R.) ²		875	9.9	815	4.5	875	7.7
<u>Niger</u>								
C.D.C.			774	11.4				
(Nomads)	230	11.7						
(Villagers)	208	3.8						
de Goyet & de Goyet			881	10.3				
(Nomads)			1362	6.5				
(Villagers)								
<u>Mali</u>								
C.D.C.	(R.R.)		625	10.7	796	4.4	825	6.2
de Goyet & de Goyet			843	8.3				
(Nomads from Mali)								
<u>Chad</u>								
C.D.C.			779	22.5				
<u>Upper Volta</u>								
C.D.C.	996	9.8	875	9.1	898	7.0	916	9.2
Seamon <u>et al.</u>								
(Nomads)	132	49.0						
(Villagers)	43	38.0						

¹Center for Disease Control children surveyed c. 6 mos.-6 years, de Goyet and de Goyet unspecified ages, Seamon et al. ages 0.9 years.

²(R.R.) reports requested

Sources: Center for Disease Control, 1973, 1975; Kloth 1974; Seamon et al. 1973; de Goyet and de Goyet 1976.

Figure 8
SAMPLE AREAS FOR THE 1974 AND 1975 CDC NUTRITION SURVEYS
IN THE SAHEL



commonest estimate of the death toll from the recent drought, 100,000 persons, is cited in various ways, depending on the analyst's commitment to one of the competing views. Thus, the figure might be cited in a relatively neutral fashion or as an upper or lower limit. Examples of variable interpretations of the significance of the same estimate include the following:

The Center for Disease Control of the U.S. Public Health Service estimated on the basis of reported death rates that some 100,000 people died from famine in Mauritania, Mali, Niger and Upper Volta in 1973 (Imperato, 1976).

. . . at an absolute, and most improbably upper limit, a hundred thousand people who would not otherwise have died succumbed to the effects of the famine (Ware, 1975).

For the Sahel countries, the U.S. Public Health Service experts calculated at least 100,000 deaths from the drought during 1973 alone, most of the dead being children . . . (Garcia and Escudero, in draft).

There are no precise figures for the number of dead, but it is sometimes estimated to have been between 100,000 and 250,000 out of the total nomad population in the affected countries of two and a half million (Swift, 1977).

In actuality, this oft-repeated estimate is almost always used out of context. When it appeared in a CDC report, it was limited to the nomadic population and to the year 1973. It consists of an upper level bound of the highest death rate found among surveyed nomad clusters in Niger which was then extrapolated to the entire nomadic population. Or conversely, as Caldwell (1975) points out, it is equivalent to a 0.1% rise in the death rate over the entire population for four years.

Some local reports are available. In the course of their

nutrition surveys, the Center for Disease Control collected population and reported death data using the periods between the seasonal rains as a reporting period. They then calculated the crude death rates given in Table 6 which range from a low of 31 to a high of 49 per thousand. Two village-level reports are also available. Caldwell (1975) cites a death rate of 57 per thousand for Yatenga in northern Upper Volta in 1972-73 probably supplied by Lallemand. And the best set of data available anywhere in the region is for the Hausa village of Tudu (a pseudonym) in southern Niger where Faulkingham (1977) has collected data since 1969. His series for food production, births, deaths and seasonal migration are shown in Table 7.

Because these data are the only longitudinal data available (to our knowledge), they have figured importantly in the thinking of those skeptical of high Sahelian-Sudanic drought death rates (Caldwell, 1975) even though, as Faulkingham himself notes, it is simply one village and in some ways an atypical village. Nonetheless the data illustrate how conclusions based only on the drought years themselves, might need to be revised.

"The demographic situation as researched at the end of 1973 showed no deleterious impact of the drought on the population. The population was very young (mean age: 15 years) and growing at about 4% per year. Death rates through 1973 were high by world standards (mean: 17.93/1,000) but actually declined slightly from 1969 to 1973. The crude birth rate was very high (mean: 52.04/1,000) and unaffected by the shortfall in food production. In sum, at the end of 1973, the population was young and growing rapidly, in spite of the drought.

However, the record for 1974 and the first six months of 1975 reflects the death of scores of children,

TABLE 6
MORTALITY ESTIMATES IN CENTER FOR DISEASE
CONTROL SURVEYS

<u>Country</u>	<u>Sample Population</u>	<u>Year</u>	<u>Crude Death Rate Estimate/1,000</u>
Chad	3,982	1973-74	49
	(n.a.)	1974-75	37
Niger	3,694	1973-74	49
Upper Volta	3,786	1973-74	30
	3,743	1974-75	32
	4,162	1974-75	31

Source: Kloth, 1974; CDC, 1973; CDC, 1975.

TABLE 7
A VILLAGE IN NIGER: VITAL STATISTICS 1969-75

<u>Year</u>	<u>Food Production in Days¹</u>	<u>Births/1000</u>	<u>Deaths/1000</u>	<u>Seasonal Migration % Males 15-41</u>
1969	250	61.3	21.4	37.3
1970	122	47.6	17.2	40.8
1971	121	48.4	19.5	46.7
1972	77	46.0	16.4	62.2
1973	7	56.9	15.4	75.0
1974	232	31.9	43.3	
1974-75		34.2	40.6	62.5

¹Number of days sufficient to feed village population at an assumed caloric need of 2222 k cal.

Source: Faulkingham 1977

particularly those born during the drought years, as many succumbed to an epidemic of spinal meningitis between October 1974 and March 1975. The worst year was 1974, when 68% of all deaths were of children between the ages of 0 and 4 years; fully 25% of all the children of the 1-4 years group died during this period." (Faulkingham, 1977).

Reviewing the scattered evidence, we conclude that death rates increased significantly but not enormously (25-200%) over the relatively high pre-drought death rates of 25-40 per thousand in selected years. The aggregate effect of such increases is to make the widely quoted figure of 100,000 deaths probably conservative. Premature deaths, particularly of young children, extended over a population at risk of 10-15 million for several years including years after the drought was over could easily number two or more times the widely cited estimate of upwards of 250,000.

The difficulties in estimating mortality and morbidity are grossly magnified in attempting to make comparison with 1910-15. Only a handful of references appear in the colonial reports surveyed:

Niger, 1914: various estimates of mortality include:
 "1/4 of population", "20,000 people";
 "Approximately 80,000"

Segou, Mali, 1914: "Infant mortality very high" no reports of famine deaths, only plague.

And from other sources:

Mali: "It is estimated that 10% of the population died" a number that is surely an underestimate (C.I.S., 1974, p. 252).

Mali, 1914: The torrential and unusual rains which have fallen on the region from the 5th to the 25th have strongly increased the deathrate during the month of August in Sangha and Bandiagara.

In the first center the number of deaths has increased to the enormous number of 686, that is an average of 23.3 per day, and in the second (center) to 298, i.e. 9.6 per day.
(August 1914)

Of all the races in the cercle, the one that was hardest hit was the Kado race (Dogan) of which on the average half has been destroyed or has emigrated. Unfortunately, the deaths occurred mostly among children in the age group 8-14 years of age--this forebodes a slower recuperation of the population.

(October 1914)

The result gives a loss of more than one third below the number of the population in 1913.
(November 1914)

(quoted by Gallais (1965) from the administrative reports of Sangha)

Niger, 1914: The 1914 famine (called Kakalaba by the Nigerian Hausa) was among the most murderous and is engraved in the collective memory down to this day. (Seemingly more so than in the 1973 famine in the same region).
(Bonte, in draft).

Nigeria, 1913-14: Hastings, in a flight of fancy, suggested that in Kano province alone the death toll was on the order of 50,000. Polly Hill states that "many thousands of people died in Kano...and at least 4,000 in northern Katsina." For the rest we have to be content with the vague colonial references to "very high death rates in Daura and Zongo", "considerable mortality in Kozaure" and a "rather heavy figure for Gunel".
(Watts, 1978).

These data, or more appropriately, observations, are in Watts' words "unreliable, spatially inconsistent and almost wholly non-quantitative". Yet where they are quantitative they cite figures considerably higher than similar figures for 1968-74 (for comparable areas).

Detailed support for estimates of about 10% fatalities come from the reports of the Ouahigouya colonial administrator

(provided by Marchal, 1974), who consistently revised upwards his fatality estimates.

August, 1914 ...one tenth of the population have fallen victims of the famine (approximate estimate), 31,500 persons of a population of 315,000 inhabitants.

November, 1914 I have travelled through 23 villages during this tour and I have had them give me the number of taxable persons who have died during the famine. Last year these villages had a population of 13,495 taxable inhabitants. 3,354 persons have died during the famine....

Annual report, 1914 The number of 40,000 dead in the Cercle during this period of distress can now be considered true.

September, 1915: The census has been continued; Southeast... The results are absolutely deplorable. There is a 44% decrease of numbers from 1910. This stems from three causes: from the fact that all the dead taxpayers from the famine have not yet been registered in November 1914; from refugees; and from too large an estimate of these villages by my predecessors.

Annual report, 1915 Following a very poor rainy season in 1913, the October-November 1913 harvest was very small and brought on an intense famine in August and September 1914. This famine killed thousands of people: around 57,626 by my calculation, of whom 44,225 were taxable.

Baier's (1980) historical studies of Central Niger provides further evidence of high mortality.

... A severe drought in the 1913 growing season, which had been preceded by bad years of lesser magnitude, resulted in food deficits across the entire Sudano-Sahelian zone. Judging from the level of Lake Chad and from reports of minor, localized droughts beginning in the 1880's the climate had been worsening for two or three decades before 1913. With grain reserves already low and livestock weakened, the damage caused by a rainfall deficit was greatly magnified; and of course the fact that the drought affected the entire Western and Central Sudan made matters worse. In Damagaran food shortages became serious in March or April of 1914, just six months after

the poor harvest. With the arrival of the growing season many people were too weak to work, and death from starvation became commonplace. People died along the roads as they attempted to flee south, and the living did not have enough strength to bury the dead. Parents who despaired of surviving left their children in the market-place in the hope that benefactors would take them in and feed them. Informants say that as many as two hundred children at a time were seen in the zongo market....

A mass exodus of people trying to save themselves took place, with emigrants leaving for the south, where rainfall was always greater and the effects of drought less severe. One estimate of the death toll among those who stayed behind was 80,000; three years later many of those who had fled had not yet returned, and it is safe to conclude that many of these died along the roads.

The indicated differential mortality is especially great if one considers the population changes that occurred over 60 years and the much smaller population being discussed in 1910-15. In 1910, French colonial administrators recorded a population of about 7.5 million in an area that contained perhaps three times that number in 1968.

Socio-economic Impacts

The chain of drought-related impacts, the losses in crops and animals, the hunger, sickness and death that ensues, the major human movements that are generated, filter upwards and outwards into the realms of government and economy, nation and region. The more distant these impacts from the primary ones of reduced crops and pasture, the more difficult the chain of causality. As we have shown, even the level of drought-related

malnutrition is difficult to document in the absence of knowing the chronic-levels of undernutrition endemic to the region. Much more difficult is disentangling the effects of drought and inflation (Berg, 1975) or the relationships between droughts and the coups d'etat in Niger and Upper Volta in 1974 (Ormieres, 1975).

A common finding of disaster research (Haas, Kates and Bowden, 1977) is that disaster accelerates on-going social and economic trends. Thus rural inequality (Watts, 1980), participation in seasonal migration (Faulkingham, 1977), trends towards urbanization (Campbell, 1976), and increased international connectivity and dependence (Bonte, in draft) have probably all increased as a result of the recent drought. Similar effects followed the drought of 1913 accelerating the development of a labor market, a long-distance cattle market and encouraging the mass migration to the coast:

- Senegal 1913: Many young people have left; some to look for jobs on Theis-Kayes road, others to take cattle for sale. But they all have one thing in mind: to earn some extra revenue to send to their families and pay their taxes.
- Mali 1913: A great number of young people have left the region to go cultivate ground nuts in Gambia and in Senegal. Some have gone with the decision not to return.
- Upper Volta 1914: One third (105,000) has left the Cercle temporarily for the South but most of them will return for the harvest. However some families have definitely settled permanently in the Cercles in the South. (Marchal, 1974)

Similarly the long-distance cattle trade was encouraged:

- Mali, Upper Volta, Increase in the livestock which has been and still is passing to Coomossie (quoted from Colonial Report, Grove, 1973).
- Ghana, 1913:

Mali, Upper
Volta, Ghana,
1914:

Even more cattle were passing south...herds frequently 300 in number and owned by one man came from the fertile grasslands of the Niger Valley from around Segou, Mopti, and Sahara...to be sold for gold in Kumasi. This trade is new to the Northern Territories (Ghana) and is of great importance. (Quoted from Colonial Report, Grove, 1973). it would seem that the long-distance trade in cattle, which is now an outstanding feature of the region's economy was greatly stimulated by the drought (Grove, 1973).

Nigeria, 1913-
14:

Merchants in Katsina area have told me of their fathers establishing themselves in business at that time (1913-14) when hides and skins could be bought cheaply in the villages and traded to Kano (Grove, 1973).

These larger movements and migrations inevitably strained relationships. The conflict engendered by Tuareg movements perhaps precipitated the last major rising of the Tuareg in 1916 (Grove, 1973). The migration of Malians into Upper Volta was probably a major factor in the December, 1974 border incidents between the two countries (Berg, 1975). Political trade was accelerated as well. The drought (1913-14) is cited by Baier (1980) as a major factor in the weakening of Tuareg-power and their desert-based economy, a process intensified by French failure to provide relief and at the same time to continue to collect taxes and commandeer camels. Complicity in tax collection served to discredit the local leadership who functioned as chefs de canton and the famine hastened the decline of the thriving indigenous merchant class.

For Baier (1980) these political impacts may have been unintentional. In discussing the decision to maintain tax levies, he notes:

Never having seen the destructive potential of a major Sahelian drought, they probably had very little appreciation of the ultimate effects of their decision.

Less charitable is the description of the sociopolitical effects of the recent drought on nomadic life. Marnham (1979) has brought together for the Minority Rights Group journalistic reports and anecdotes of governmental insensitivity and outright hostility to the nomadic peoples during the drought and in the development planning following it. The competing views of underdevelopment and modernization never seem stronger nor more conflicting than when it comes to assess the meaning of drought-induced acceleration of shifts in movement, migration and political fortune.

III. COPING WITH DROUGHT

Drought persists over a six year period, a third or more of a vast region's food supply is lost; malnutrition doubles and death rates rise. Yet, as Caldwell (1975) observes: "the real lesson was not how easily man succumbed to the drought but how tenacious he was in managing his survival." Such tenaciousness is a function of both the everyday and the exceptional, the resilience of the differing livelihood systems and the extraordinary means employed in coping once a major drought ensues.

Resilience in Traditional Livelihood Systems

All five of the major livelihood systems contain numerous social and ecological adjustments designed to reduce or mitigate the effects of drought. Campbell (1977) has described these in some detail for three of the groups he studied in the Department of Maradi in Niger: the Hausa dry farmers, the Bororo Fulani cattle specialists and the Tuareg camel specialists. Each traditionally employed a series of selected strategies as shown in Tables 8, 9, and 10.

The principal drought resistant strategies for the Hausa were: (1) grain storage; facilitated by (2) land management and controlled use of labor and food supplies by the extended family; and (3) potential migration to and/or help from associated

TABLE 8

SELECTED HAUSA STRATEGIES FOR DEALING WITH DROUGHT

TYPE

Location and Land Use	<p><u>Valley settlement.</u> Access to groundwater better. Land more fertile. Less risk of failure of crop due to insufficient rain.</p> <p><u>Land use, locale based.</u> Maximize use of available soil and water resources.</p>
Agro-pastoral practices	<p><u>Mixed cropping.</u> Provides range of crops. Reduces risk of total failure. Maintains soil fertility, inhibits crop disease.</p> <p><u>Fallow.</u> Restores soil fertility; bush fallow keeps out weeds.</p>
Social relations	<p><u>Extended family.</u> Controls labor and land and ensures production. Controls food consumption and saves surplus for use in potential drought.</p> <p><u>Village Ties.</u> Inter-village aid. Migration from one to another possible in time of food shortage.</p> <p><u>Religion.</u> Codified land-use and grain storage.</p> <p><u>Ties with Fulani.</u> Manure for fields. Diversity to diet.</p> <p><u>Ties with Tuareg.</u> Get salt and animal products.</p>

Source: Based on Campbell, 1977.

TABLE 9

SELECTED FULANI STRATEGIES FOR DEALING WITH DROUGHT

TYPE

Location and
land use

Seasonal moves. To make best use of available pasture.

Locale Use. Maximizes available resources.

Frequent rotation. Minimizes overgrazing and spread of disease.

Agro-pastoral
practices

Maximize herd numbers. Animals are source of savings; larger the herd the greater the probability of sufficient number surviving a drought and permitting the rebuilding of the herd.

Diversity. Sale of small animals for social purposes and to raise cash. Reduces impact of disease. Allows use of different grazing resources.

Social
relations

Nuclear family. Enhances mobility.

Extended family. Provides sharing of information and sharing of animals to help rebuilding of herds after losses due to disease or drought.

Ties with Hausa. Exchange of meat and animal products for grain. Dry season pastures on farmlands.

Source: Based on Campbell, 1977.

TABLE 10

SELECTED TUAREG STRATEGIES FOR DEALING WITH DROUGHT

TYPE

Location and land use	<u>Mobility.</u> Extensive ranging, minimized overgrazing and maximized use of available pasture.
Agro-pastoral practices	<u>Trans-Sahelian regional salt trade.</u> Provided alternative source of income and security. Savings used for food purchase in times of need. <u>Animal husbandry.</u> Herds kept as source of food and for exchange. Large number provided for greater chance of sufficient surviving effects of disease or drought to enable restocking; variety of animals gives flexibility in terms of use of grazing resource and in exchange. <u>Gathering of food.</u> Complete system of gathering of wild plants and hunting of animals in times of food shortage.
Social relations	<u>Hierarchical Social Order.</u> Ensured survival of nobles viz: nobles provided for: military control of grazing lands; protection of herds and vassal communities; and organized raiding parties which helped reconstitute herds after drought or disease. Vassal agricultural groups: produced grain for nomadic journeys and supported nobles in time of extended food shortage. Slaves: sedentary groups supplied food and nomadic groups managed herds for nobles.

Source: Based on Campbell, 1977.

villages in time of extreme need. Those strategies were maintained through complex social relations and selected land management and were continuous, integral features of the Hausa socio-economic system.

For the Fulani, mobility substitutes for valley settlement sites and herd management for land use management. The Tuareg substituted highly structured and hierarchical relationships for the reciprocity of the Fulani and Hausa and engaged in the salt and caravan trade to diversify their income sources. All of the livelihood systems maintained a repertoire of alternative food sources and craft activities.

As described earlier (pp.21-27), the Twentieth Century, during both the colonial and independence periods, saw a marked decline in the efficacy of many of these traditional strategies. In the face of the two to threefold increase in numbers, the extension of the cash economy, and the destruction of nomadic (particularly Tuareg) power, shared use of the land and reciprocity declined, the acquisition of savings in the form of cash rather than grain increased, and labor migration in order to conserve food and acquire cash became common. But the traditional ways persisted as well, and the response to a major drought once it ensued included similar elements both in 1910-15 and 1968-74. However, the emphases on particular responses shifted dramatically.

Thus, in the face of drought, all the Sahelian-Sudanic peoples resorted to some combination of three major actions: they suffered, they sought alternative food supplies in their

locale, or they moved to where they hoped to find food or opportunities to earn money to acquire food. The suffering (or the bearing of losses as described in the hazard literature) has been comparatively assessed in the previous section on drought impacts. In this section we examine the employment of a series of mechanisms to increase food supplies.

Stored Grain

If a single building type can symbolize a culture, the granary surely rivals the mosque in much of the Sahel among the agricultural and agro-pastoral peoples. Storing commonly up to a two year supply, the granaries of the Sahelian-Sudanic region were the first recourse during the crop shortfalls of 1968. Yet in a large, although unknown number, of Sahelian-Sudanic agricultural villages, the ability to feed itself even in good years had been lost for some time (Watts, 1978; Faulkingham, 1977). In others the various demands for cash convert an actual biological surplus into a shortage as debt-ridden farmers sell crops at harvest only to purchase them back at exorbitant prices during the rains (Watts, 1978).

Wild Foods

As Caldwell (1975) has described:

All local surveys agreed on the central importance of organized fasting and of eating the natural flora. A (Niger) household census, in January 1974, found that half the households had fasted for at least four of the preceding ten days and that a quarter had cooked and eaten tree leaves at least once a day (Faulkingham and Thorbahn, 1975). At the same time in Yatenga, Upper Volta, another study showed that the heads of households were rationing food and that everyone was

being sent each day into the bush to gather wild plants and edible leaves, which although sparse in the dry season and particularly in the drought, completely replaced grain for some families (Lallemand, 1975)... In the villages of Kano State, northern Nigeria, farm and wild trees and other native plants were being used on a large scale, especially in soups, being, in some areas, the main source of food for people and a valuable supplement for cattle (Mortimore, 1973). The populace was in fact increasing its use of types of food identified and used as staples for tens of thousands of years before the institution of grain culture perhaps two millenia ago and always used to a more limited extent since during famines and even during the hungry period occurring at the end of the dry season and in the early rains. An examination of the value of the wild foods being eaten in Upper Volta at the height of the drought showed their calorific and protein value to be as high as that of the cultivated crops (Seaman et al, 1973).

References to wild food collection is found as well in the colonial archives, where in Niger in 1914 it was noted that... "grains and fruits of various shrubby species are particularly searched for and appreciated by a population that millet scarcity has reduced in many areas to a state close to famine." The use of wild foods in both droughts was not without its problems. Reference to intestinal disorders brought on by their use was common.

Purchased Food

Even in the most severe of droughts food is usually available for purchase. The drought may be locally ineffective, pockets of good harvests being interspersed with failure. Merchants and moneylenders who capitalize on seasonal hunger may have large stocks. Imports may find their way into an area or relief supplies may be sold (to recoup transportation costs as in Niger) or be diverted illegally to local markets.

In any event, there is some food and prices rise. Watts (1978) has been able to reconstruct comparative price movements for sorghum in Kano in 1912-15 compared to millet prices in Katsina in 1972-74. These are shown in Figure 9. Prices rose thirty-fold in the earlier drought compared to a fourfold increase in the more recent drought.

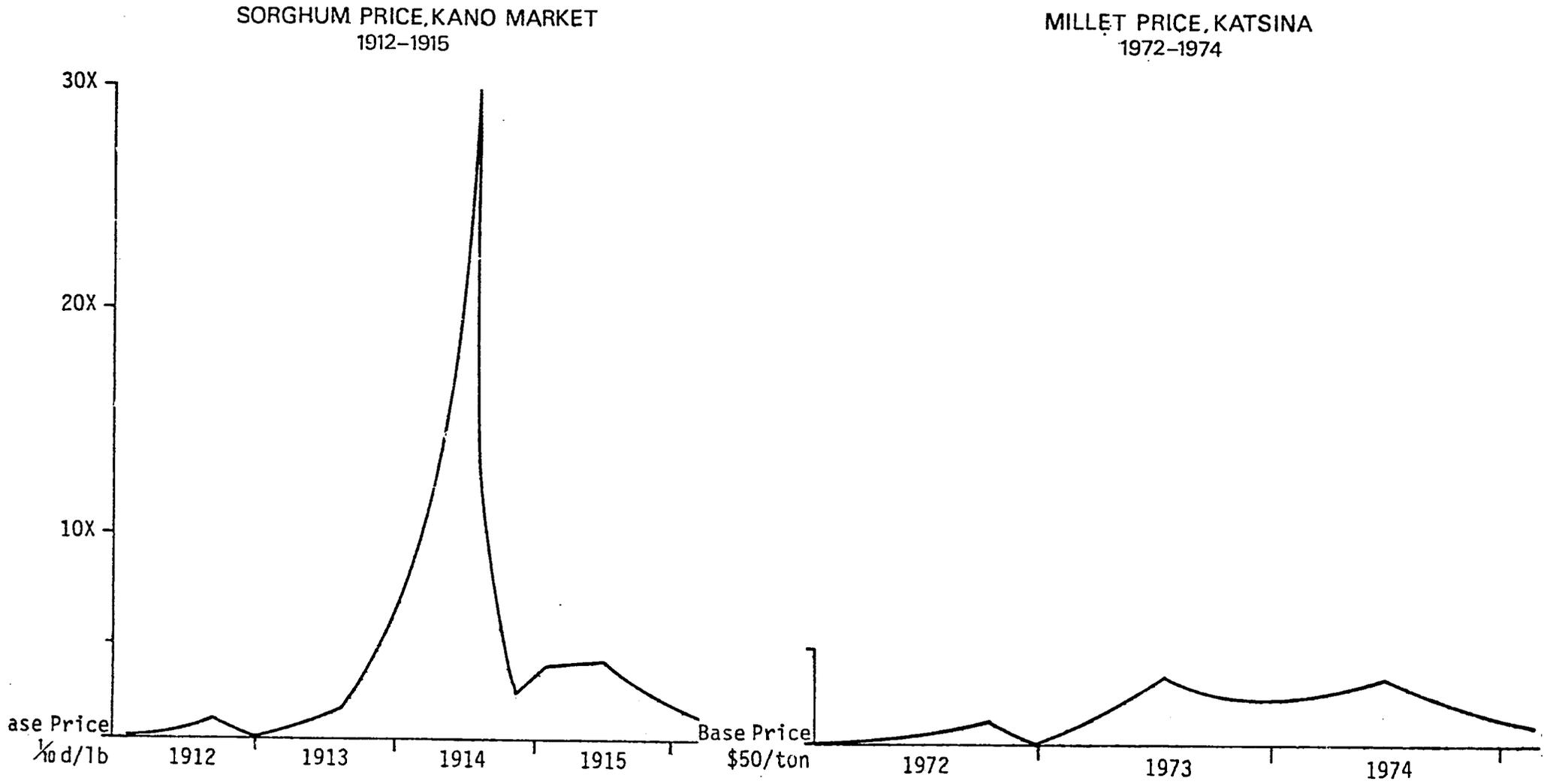
Lallemand (1975) reports similar price increases in the Mossi village of Yatenga, a measure (c. 17 kg) of millet increasing threefold from the normal hungry season price of 350 CFA to 1,000 CFA in June of 1973.

How were these purchases made? Essentially there were three sources of funds: (1) savings, accumulated as cash, animals, household possessions or jewelry; (2) sales of labor, crafts, or commercial crops raised on moisture-favored land; and (3) gifts or loans. The terms of trade in these exchanges of savings, income, or loans for grain were unfavorable in the extreme and the net effect was a massive pauperization of the already poorest quarter of agricultural livelihoods and perhaps a half to two-thirds of pastoral peoples.

Watts (1978) describes this sequence in two villages in Northern Nigeria:

In both Sabo and Rijiyar-Tsamiya the graduated sequence of responses to, in the first instance, drought and subsequently actual food shortage, conformed to a similar pattern. Generally, the initial reactions were shallow and were gradually over-ridden by deeper and in some ways less reversible responses. The onset of drought tended to be met with a battery of agronomic mechanisms such as changed planting schedules, cropping patterns and cultigen varieties and in some instances simple moisture preservation techniques. However, the mediocre harvest in 1972 meant that many granaries were bare by the dry season. In most cases, households attempted to cope locally, principally by selling their

Figure 9
INCREASES IN GRAIN PRICES: 1912-1915 and 1972-1974



labor power and livestock, pursuing various crafts and the extensive use of substitute foods. It was the failure of the rains in 1973, nevertheless, that heralded real disaster. By this time the poorer households had sold most livestock during the previous year (and in any case, with a flooded market, the prices which livestock could demand were 30-50% below the norm), the labor market for local employment was grossly over-supplied, wages fell, and even for those able to find employment the cereal inflation meant a radical transformation in the terms of trade against them.

During the 1972-74 period in Rijiyar-Tsamiya, 2/3 of the cattle, 3/5 of the sheep, 2/3 of the goats, and 1/2 of the donkey population changed hands. As a broad pattern, 80% of households sold labor, 60% sold livestock and fodder, and 35% sold manure or firewood. The development of chronic hunger, however, necessitated more drastic strategies. Principally this meant a resort to loans in cash or grain from village traders, the pledging or outright sale of farms, or, ultimately, outmigration. In Sabo village, just over 30% resorted to the former while for Rijiyar-Tsamiya the corresponding figure was 26%. Land transfers are notoriously difficult to trace, but it appears that 8% of total community holdings were sold to the wealthy village elite of Rijiyar and 17% pledged; figures for Sabo are 4% and 10% respectively. In both cases, outmigration was not a major option. No families from Sabo migrated (in fact, several youths from Niger actually migrated to the village), although twenty or so males left to take up menial laboring tasks in a local administrative center. It is clear that the different economic strata within the two villages responded in rather different ways. While the poor resorted to the sale of livestock, pledged farms, incurred debts, borrowed grain at usurious rates of interest and attempted to sell their labor, the rich counterparts bought livestock at deflated prices, purchased the scarcest resource of all, namely land, on their own terms, in some cases sold grain in a seller's market, and, as irony would have it, supported horses and donkeys as others waited for the slothful efforts of the State relief organizations.

Similar responses are reported by Campbell (1976), Faulkingham (1977), Lallemand (1975), Mortimore (1973), with only the details of greater or lesser reliance on animal sales, crafts, or migrant labor differing. Laya has documented in an interview with a Wodaabe Fulani the complex of nomadic responses, drawing upon multiple sources of assistance and ending finally in the relief camp at Lazaret, Niamey.

Q: Why did you leave the Abala region?

A: Because of the poverty.

Q: How many of your own head of cattle perished?

A: A hundred and forty.

Q: Where? Under what circumstances?

A: They died in the vicinity of water points; some of them died in the vicinity of a borehole at Doumana in the Abala region.

In fact, they began dying during the dry season by groups of 3 to 4. Then came the time when on leaving a camping ground we had to leave behind 10 or 20 head of cattle which could not stand up; those which we forced to stand staggered and then stopped. So we only took away those which could walk and these too were exhausted a little further on. There are the circumstances under which they died one by one.

Q: Was there no grass?

A: Not at that time.

Q: What were the cattle feeding on?

A: On branches of trees known as jiigaaje; we cut these branches until there were no cattle left; it was only after this that it began raining.

Q: How many cattle do you have left?

A: Ten: heifers and young calves.

Q: Who is now tending the calves?

A: A younger brother in the Menaka region; we have the same father.

Q: What in your opinion destroyed a large proportion of the cattle last year?

A: The lack of fodder, for it did not rain. It is true that we lost a large number of cattle but this year's catastrophe has been the greatest of our lives.

Q: Have you known any period when as many cattle were lost as this year?

A: I have never witnessed such distress since my birth. I suffered so much that I wondered what would become of me. I remembered that I had 50,000 francs and this enabled me to feed my family until the rain came. Then, I found myself in a difficult situation: I left for Abala where I was not given anything, even if supplies were sent there. From Abala, I came to Filinque where I found people could buy sacks of millet. I spent the rainy season there until the millet was ripe... The President asked us to return to Abala where he told us we could be provided with food: we

went back to Abala and we were given some provisions which were highly appreciated. But when the provisions stopped we had no money; nevertheless, we stayed in the hope of getting food. When we were on the point of death we returned by truck to Filingue where nothing was distributed to us. My brother and I went to our relatives living in Niamey: they gave us two sacks of millet and truck fare to Filingue...

Q: Who gave you the two sacks?

A: Our mother's elder sister... She gave us some money also... We distributed the contents of the two bags and then we came back to Niamey hungry; our aunt took us to those responsible for the distribution of foods and they gave us a sack of sorghum... Then we were settled here. Among the ten cows I left at home, there are five animals on loan. The others which are all three years old are my personal property. How can I sell them in order to support my family? During the dry season, while I was taking cattle to the market, they died of exhaustion on the way. I lost ten of them under such conditions. These are the reasons why I am now in Niamey.

Relief

Between 1972 and 1974, 600,000 tons of grain were shipped to the Sahelian region from the U.S., about half of the world-wide total (US/AID, 1976) of relief supplies. In addition, Nigeria distributed some 145,000 tons of grain in its northern areas (Watts, 1978). These amounts, if they consisted of palatable grain and were distributed where and when needed, would have been almost sufficient to make up the drought-induced shortfall in production. Unfortunately the palatability of the grain, much of it sorghum, was less-than-desired by the populace (Lallemand, 1976), the relief came late (Sheets and Morris, 1974; for a reply see U.S./AID, 1974), it was distributed with great difficulty (US/AID, 1974) and with considerable inequity (Sheets and Morris, 1974).

It is now possible from several sources other than Sheets and Morris' anecdotes to piece together the degree of penetration of relief supplies into the livelihood systems of the Sahelian-Sudanic region. For example, in the course of the Center for Disease Control village surveys (about 35 villages in each county) a fairly high percentage of villages reported receiving some supplies in 1973 and 1974, although supplies may have been small and for most limited to one or at best two deliveries.

TABLE 11
PERCENTAGE OF SURVEYED VILLAGES REPORTING RECEIVING SUPPLIES
DURING THE YEAR

	<u>1973-74</u>	<u>1974-75</u>
Mauritania	89	91
Mali	"most"	79
Niger	80	no survey
Chad	0	87
Upper Volta	50	100

Source: CDC (1975)

Lallemand (1975) describes the arrival in Yatenga of sorghum in 1973 which led to a reduction in the inflated millet price. Faulkingham (1977) assesses the impact of the donated grain as follows:

The impact of this cropping shortfall was blunted substantially by the availability of grain supplies donated to Niger by other nations. In nearby Madaoua any citizen could purchase a 50 KG sack of American-donated sorghum for 900 CFA francs (about U.S. \$4.50) yet such a sum was

beyond the means of most of Tudu residents for most of the time. Merchants in Madaoua bought the donated grain in bulk at the official price and then sold it in 2.2 kg amounts to the local peasantry at 120% above cost price. In the wake of the coup d'etat of April 1974, the price of donated grains fell by nearly 50% and thereafter food was much more available; further, on three occasions, cadres of Niger's army distributed free grain to the needy in Tudu, between May and October, 1974. Clearly if it were not for the availability of those donated grains, the drought in Tudu would have produced starvation or out-migration or both.

While the self-help efforts of the Nigerian government were well-reported in the international community, Watts reports serious problems with the actual distributions. By any standards the distribution of 145,000 tons of grain was substantial, nevertheless in the villages he surveyed, the total grain relief during 1974 lasted barely one week.

For most of the nomadic peoples, relief supplies were consumed at food distribution centers usually located near major cities or administrative centers. For example, in the Department of Agadez in Niger, 70% of the population of 100,000 gathered at food distribution centers (Campbell, 1976).

Campbell has analyzed Sawadogo's (1974) data for the refugees at the Food Distribution Center in the Department of Maradi and found about a third each were dry farmers, agro-pastoralists and specialized pastoralists (22% cattle; 7% camel). All had come from within 200 km. of the camp.

Relief also came in the form of gifts from neighbors, families and clansmen. These traditional sources were institutionalized in many cultures, the Hausa for example having elaborate communal redistributive mechanisms (Watts, 1978).

But except for fortunate families with kin in the South or in salaried positions, such redistribution diminished as the drought deepened. To survive, people utilized the entire range of relief sources: purchased food, distributed food, family assistance, gifts, and migration to food camp relief centers as reported in the interview reproduced in the previous section.

If some relief in 1968-74 was too little or too late, then it was surely so in 1912-13.

Nigeria 1913:	Food relief was as one colonial officer put it in a marvellous piece of British understatement "tardy", the imported rice (450 tons) actually arrived in Kano in September and October of 1914. (Watts, 1978)
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And one of the very few documented references to relief in

French West Africa:

Senegal 1913:	District officers in the Senegal River regions were allowed to take a credit of 300,000 francs from "reserve funds" to buy 700 tons of rice.
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In general, there was no significant relief provided by the Colonial administrator, but levies on the society in the form of taxes and animals continued unabated (Marchal, 1974; Baier, 1980).

IV. CONCLUSIONS

Recapitulating briefly we have made the following points:

- The droughts of 1910-15 and 1968-74 were probably of comparable magnitude and spatial extent as meteorological events, although the hardest hit areas differed somewhat in each of the droughts.
- At least five distinctive rural livelihood systems are found in the Sahel-Sudan region, each with potentially different vulnerabilities.
- Significant social change took place between 1910-15 and 1968-74. This resulted in increased numbers of people and animals, reduced reliance on local resources and greater integration into a partly monetized and commercial world.
- There is little basis for inferring different impacts on crops or animals in the respective droughts on the basis of the limited reports available except for differences in the drought patterns.
- The evidence, while sparse for 1910-15, suggests heightened human mortality for that period compared to 1968-74 even though deaths in 1972-73 were probably underestimated.
- The larger aggregate socio-political and socio-economic impacts are not really comparable although acceleration of on-going trends seem characteristic of both periods.

The Case for Lessened Vulnerability

Thus the case for lessened vulnerability rests on lower mortality and morbidity in the face of a similar meteorological drought, and similar crop and animal losses. Watts' (1978) report for our project, which carefully integrates what is known about the Sudan zone of Northern Nigeria, summarizes well the evidence in a regional context:

From a purely meteorological perspective, the droughts of 1913 and 1973 show considerable empirical and structural affinities; the annual totals, the preceding period of dry years, the temporal pattern in the onset, distribution and termination of the rains and the spatial extent of the drought itself are remarkably similar. Furthermore the broad outline of the genesis of famine itself shows that 1913 and 1973 have much in common. Severe hunger began to appear in the early part of the year (December 1913 and 1973), grain became increasingly scarce, prices soared, refugees from the north and the desert edge poured into northern Nigeria and households began to dispose of their assets (particularly livestock) to cover grain purchases.

These superficial parallels should not serve, however, to cloud other more important structural differences. Firstly, there are some simple but important structural differences in magnitudes; in 1913 human mortality was enormous but in 1973 minimal; price inflation of grains occurred in both famines but were, proportionally, much greater in 1913. From 1912 to August 1914 the increase in millet was in the order of 30 times whereas in 1973 the average was a two or threefold increase. Livestock mortality was probably considerably greater in the 1970's simply because the sheer numbers of cattle involved had grown enormously since 1913 (the eradication of disease, the well drilling policy etc.) and because population growth had necessitated a corresponding reduction in land available for grazing. And finally the patterns and perhaps the extent of migration was very different; clearly in 1913 dislocation of families and entire villages occurred over immense areas, large numbers of refugees fled the desert edge into the savannas and in some cases the geographic displacement involved large distances. In 1973, migration, though crucial, was less widespread, tended to be temporary and short distance to adjacent urban areas where the possibility of casual labour in the tertiary economy existed, and international movement was to a

degree limited by the more stringent control of human movement over international boundaries.

More significantly, however, informants who had experienced both famines invariably stressed that the crucial distinction between 1913 and 1973 was food availability-- and by extension the mechanics of its genesis. In Katsina and Daura elders emphasized that in 1913, for quite extended periods, grain was simply not available in the marketplace irrespective of whether purchasing power was available. In 1973 conversely, only in a few isolated areas did grain disappear entirely; grain was available, said most informants, but purchasing power congruent with prevailing prices was not.

The Case for Increased Vulnerability

It is clear from our review, that to some degree the cases for greater or lesser vulnerability rests with different livelihood systems. The evidence for lessened vulnerability focusses overall on the Sahelian-Sudanic people. The evidence for increased vulnerability in an absolute sense focusses on the pastoral and particularly the nomadic peoples of the Sahel and the sub-desert. It appears to be the consensus of most observers, supported by the evidence from the nutrition surveys and the refugee camps census, that proportionately nomads suffered the greatest burden in the recent drought.

This cannot be compared to the earlier drought because of the sparse 1910-15 references to nomads by colonial administrators who were often hostile and whose power had not yet been extended over the nomadic peoples. But the meteorological data, and to a degree the absence of earlier reports, do suggest that the nomadic peoples suffered greater stress in 1968-74.

What is less clear is the basis for this greater suffering. The degree to which the sub-desert and northern Sahel were more

seriously affected meteorologically in 1968-74 and the degree to which the balance of political and social power had worsened for the nomadic peoples is unclear. For while the overall population probably increased by a factor of three between 1910 and 1968, the relative proportions of nomadic peoples in these two populations may have been cut in half through the differential growth rates of nomadic and sedentary populations and the processes underway of semi-sedentarization, particularly among the Fulani peoples. Similarly, the balance of political power and access to resources shifted in a striking way through the defeat by the French of nomadic military power and the entrenchment in the current leadership of most countries of leaders from the agricultural regions.

Practically this resulted in the spread of sedentary farmers out of clustered and defensible villages of vassal enclaves into a dispersed settlement pattern. Assisted by the favorable rainfall regime of the 1950's and early 1960's, settlement moved north into lands formerly grazed by pastoralists, while access to shared lands along the rivers or the use of post-harvest stubble became more restricted with competition from the more rapidly growing sedentary populations and the herds of agro-pastoralists. And finally, needed grain supplies for pastoral nomads (and sedentary peoples) became more restricted as human labor and land were devoted to cotton and peanut production which increased in area to occupy almost a fourth of the available land. Thus there was almost surely a worsening of the livelihood systems of 2 to 2-1/2 million

nomads and an increase in their vulnerability to drought (Bernus, 1975; Swift, 1977).

A different argument, although related to the first, is an argument for a "relative" increase in vulnerability. It begins with a description of the growing failure of subsistence systems to provide the livelihood of those dependent upon it, and the gradual monetization of all exchanges. Raynaut (1977) cites, for example, the development of trade in food crops, and sale of land, agricultural wage earning and even the sale of prepared food. Depending on the author, Sahelian peoples are relatively worse off because of one or more of the following:

- They no longer have control over their own resources.
- Increasing reliance on the market mechanism means that their drought reserves in terms of money or livestock are "devalorized" when they must purchase high cost grain or dispose of cattle by sale at low prices in time of drought.
- There is a continuing process, accelerated by drought, in which people are pauperized, lose their land or herds, and are forced to become wage earners or destitutes.
- Most males must leave their household for migrant earnings at least part of the year and their lands and families (despite small remittances) suffer.
- Differences in class or livelihood system (pastoralist vs. agriculturalist) emerge that destroy the unity and self-esteem of the society.
- All of the above takes place without any real increase

in benefits from the monetized society because of the burden of external domination.

These and similar arguments (they are sometimes made as assertions without evidence) are difficult to place within the analytic framework of the competing views. The authors seem to imply a worsening but may not specifically state whether people were better or worse off. At the same time, none of these scholars actually assert that the people of the Sahel were better off when in an earlier era more died from drought or that it was better to have an integrated society even if it was the integration of a master-slave or lord-vassal relationship. Because they are clearly thoughtful social critics, one must infer that it is the relative worsening, the gap between what is and what might be, that causes their concern. For they envision a society that could provide greater social and subsistence security, in contrast to one that at best is dependent upon the slim reed of international aid received at great cost to the social fabric.

Weighing the Evidence

All the evidence is still not available. We continue to discover studies we were not aware of or search for original, fugitive papers to examine the basis for some particular assertion. Nonetheless, on balance, for the majority of the Sahelian peoples, particularly the 13-15 million whose equivalent numbers did not exist in 1910, a comparable recurring great drought saw a lessening in the grim toll of human

mortality and morbidity. This is less clear for the 2-1/2 million nomadic peoples whose political, social and subsistence position worsened in the 60 year interim, and whose suffering probably was reflective of that worsening.

But there should really be naught for our comfort in this relative improvement. For even with lessening, the toll of mortality was large and the morbidity great, stunting and wasting the youth of the region, and impoverishing the poorest of the poor.

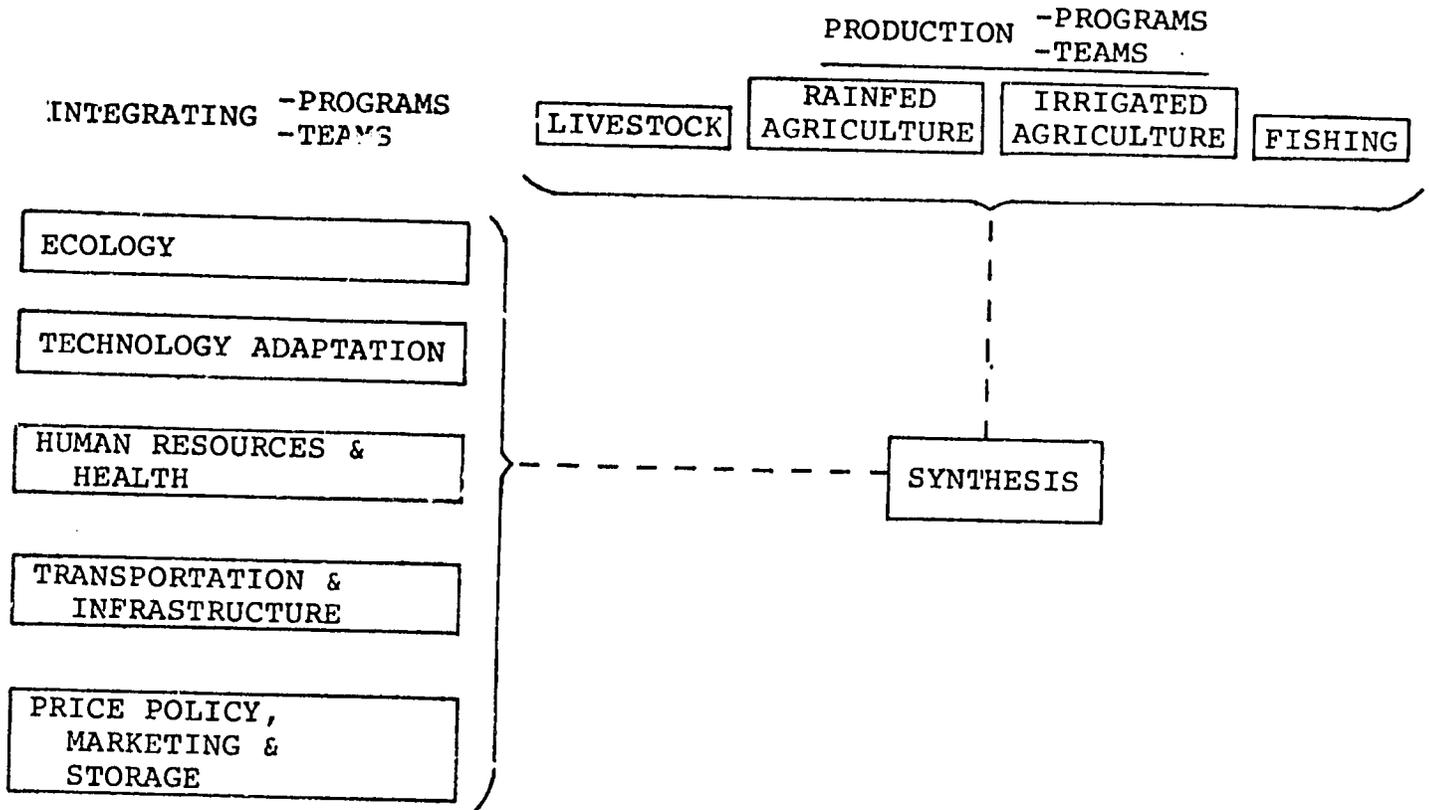
Implications for Current Development Policy

One aftermath of the drought has been the transformation of the Permanent Interstate Committee for Drought Control in the Sahel (CILSS) into a regional coordinating institution for the long-term development of eight Sahelian countries (Chad, Cape Verde Islands, Gambia, Mali, Mauritania, Niger, Senegal and Upper Volta). Together with a consortium of western donor countries (now numbering 12), CILSS participates in the Club des Amis du Sahel. This forum of donors and Sahelian nations has undertaken to plan the comprehensive development of the Sahel (Sahel Development Program) and provide sustained support over a 20-year period. Central to the Sahel Development Program is the goal of normal year food self-sufficiency for the region and a reversal of the precipitate decline in the ability of the region to feed itself in the face of recurrent dry years much less serious than those of 1910-15 or 1968-74.

A somewhat novel structure has been adopted in organizing the development program (See Figure 10). Major new efforts are

Figure 10

SAHEL DEVELOPMENT PROGRAM ORGANIZATION



Four production teams are charged with developing the sectors basic to food self-sufficiency and five horizontal teams are responsible for addressing the key structural, human, and technological considerations. The tenth, a synthesis group, is responsible for maintaining substantive integration among the other teams and team schedules. The latter group also has the authority to make basic program decisions on behalf of the Club.

Source: U.S.A.I.D., 1976

in various stages of planning, debate and design. These seek to increase the production and distribution of food grains, to extend the irrigated agriculture sector particularly in the Senegal and Niger River basins, to rationalize livestock production and marketing and integrate it with agriculture, and to maintain and increase fishing yields. Supporting these food-related efforts, are projects in ecology and land use conservation, human resource development, technology adaptation, and pricing, marketing and storage policy.

A great deal of debate and uncertainty centers around this still evolving program both as to the aims and the methods of this ambitious development program. (See for example Franke and Chasin, 1980). Questions range from a basic challenge to the program as a repetition and expansion of those relationships that increase the vulnerability of Sahelian peoples, to questions of strategy (pastoral stratification, investment in large-scale infrastructure, transportation and water development), and of implementation (absorption capacity, grass roots participation). In justification or critique of one or another program, the drought experience is frequently cited. Thus irrigated agriculture is encouraged in the name of drought-proofing crops or road building in the cause of rapid transport of emergency relief supplies.

In general, it is misleading to invoke the drought as justification for development efforts as the problems towards which these efforts should be addressed are not unique to drought periods in these poorest countries. Faulkingham (1977) documents a declining ability to feed itself in Tudu, irrespective

of the drought. The Center for Disease Control finds persistent high child malnutrition in Upper Volta, the least drought affected of the Sahelian states. Bernus (1975) Swift (1977) describe the increased vulnerability of nomadic peoples as a long-term development. Thus to justify aid to the Sahel on the basis of extraordinary drought can only lead to misunderstanding the endemic nature of the problems of the various livelihood systems in the face of a growing population and an extended dependence.

Nonetheless, to the extent that a legitimate goal of the CILSS/Club program is to reduce the toll of human misery when drought recurs, then some implications follow from this review:

1. Food self-sufficiency are attractive catch-words with varying meanings. In terms of reducing the toll of drought, development activities that increase self-sufficiency at the family-household and village level are clearly the most significant. It is the family granery, and the herd that can be evacuated safely, that is the first-line of drought protection for Sahelian peoples. This principle may run counter to some proposed development schemes that see self-sufficiency in national or even regional terms based on irrigated rice and wheat and stratified livestock production. Other proposals envision a more specialized dryland production system with a fairer marketing and distribution system.

Faced with choices (and there are many) the closer the resources, the grains and the herds are to the family-household, the more hopeful and reliable is the famine-reduction

activity. This principle will surely hold for the 20 years envisioned in CILSS/Club planning. To make choices on the basis of this principle often involves foregoing some economy of scale, greater increase of production, or promising production "package". So these are not easy decisions. But judging by the past as well as the current process of development planning and implementation, a development effort that depends on (or even attempts to develop) the equitable distribution of food resources to the poorest quarter of the society, will imperil this group when drought recurs unless they control the food themselves.

2. The weakest part of the livelihood analysis in this study deals with the riverine-based peoples dependent on recessional flood cultivation, riverine and lacustrian populations directly dependent on stream flow and lake levels, and the agro-pastoralists dependent on wet-land grazing resources. The estimate of 10% of the rural sector employed in this study may be an overestimate but they surely number in the millions. (For one of the few current detailed studies of riverine-based peoples, see Bradley, Raynaut and Torrealba, 1977). The dearth of material during the drought dealing with these groups is matched by the apparent insensitivity of current discussions of irrigated development. It is quite possible that major river basin development will actually imperil the life and livelihood of hundreds of thousands of Sahelian peoples by drastically reducing the recessional flood cultivation, seasonal grazing areas and basic fish stocks as well as increase their drought vulnerability without any direct benefits.

3. The impact of the drought experience on road con-

struction and transport is uncertain. On the one hand rapid distribution of late-arriving food supplies was hampered by road conditions, but on the other hand massive and successful movements of people took place and are taking place in the Sahelian-Sudanic region within the rudimentary road transport system. Serious drought is always multi-year, thus a responsive system of local storage, livestock evacuation routes and rapid international aid (utilizing the long dry season for transport) could provide the required emergency assistance even with current levels of road infrastructure. Improved transport is necessary for many development purposes and should be justified in the context of these needs and not on the basis of the rare need to transport emergency supplies.

When Drought Recurs

Three times (1910-15, 1941-48, 1968-74) in this century major droughts occurred over all or most of the Sahelian-Sudanic region and thus it should not be surprising when drought recurs again, perhaps before the end of the century. Would a retrospective comparison at that future time find significant reduction in the toll of death and poverty?

Recall first the major judgments of this comparative study of the two major droughts of 1910-15 and 1968-74: similar droughts, similar crop and animal losses, unquantified impacts for 1910-15 and underestimated death toll for 1968-74, but proportionately smaller impacts in 1968-74 given the 2-3 fold increase in population, and change in the most heavily impacted

livelihood system from dry-land farmers to pastoralists. On balance, there is no evidence for increased vulnerability except for nomadic peoples. There is some evidence for reduced vulnerability for agriculturalists. And there is overall concern for the stresses in Sahelian-Sudanic livelihood systems glaringly exposed in the aftermath of the drought but endemic to everyday life: loss of control of resources, growing dependence for food supplies, serious ecological pressures, localized competition for land-resources, and monetary demands outpacing income opportunities.

These are likely to continue. A simulation of the agricultural carrying capacity of the Sahel-Sudan region (Matlock and Cockrum, 1974) based on a considerably improved and ecologically sound agriculture found the region capable of supporting 33 million people. However, in that model of improved agriculture, improvement comes with the catastrophic loss of the jobs of 60% of the work force! And while sustenance increased considerably, it would nonetheless be shortly overtaken by population increases projected to be 42 million (Caldwell, 1975) by the end of the century. A methodologically different simulation of a pastoral area found a similar result. Even with high investment and a reasonable local adaption of recommended policies, a continuous annual outmigration of about 1.5% of the herdsmen would be required (Picardi, 1974).

It is not at all clear that the development activities being planned and implemented in the CILSS/Club program will seriously decrease the drought vulnerability of pastoralists

and poor farmers. Some projects being discussed will surely increase their vulnerability (e.g. river basin development without provision for maintaining current recessional flood agriculture). Even with the most sensitive of programs and with productivity increases equitably distributed, these may not be able to compensate for short-run population pressures. Thus, are the people of the Sahel-Sudan region condemned to a repetition of 1968-74, two, twelve or twenty years hence?

Perhaps surprisingly, the answer is not necessarily dismal. Drought will surely recur again, but there is nothing necessary about its human impacts. There is enough experience from many parts of the world (Burton, Kates and White, 1978; Kates, 1980) to argue that loss-of-life from natural hazard can be diminished even in the absence of needed development or social reconstruction, although the task is made much harder in societies indifferent to marginal groups. Clearly this is an argument, not a demonstration. But to assert that reduction in the toll of drought is dependent only on fundamental social change may be to condemn many of the 700,000,000 inhabitants of the world's dry lands to repeated cycles of death and pauperization. It is necessary to work for amelioration, while mindful of the limits of such efforts in the face of economic and social injustice or in the absence of meaningful development. It is still possible to support and reinforce the drought strategy elements of Sahelian-Sudanic livelihood systems in such a way as to reinforce rather than undermine their ability to cope with drought. This combined with a regional

mutual aid system and a responsive global assistance program could at least halve the death toll of 1968-74 even in the face of significant population increases. At the very least, a greater measure of disaster security could become the first universally attainable basic need.

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APPENDIX I

COMMENTARY

With few exceptions, the bonds of scholarship are close ones, the shared interests of scholars and scientists encourages great generosity in their giving of critical assistance and review. Even more so is this the case, when scholars share a common concern for the people and lands of the Sahelian-Sudanic region.

Twenty scholars in Africa, Europe and North America were sent draft copies of this paper and ten replied with corrections; commentary, and new sources and references. The new references have been pursued and the substantiative points included in the text. However, the most interesting comments have been of a different sort--points of nuance, emphasis, and disagreement. These I have excerpted and attach in this Appendix. Their emphases and points of view require no comment, they are the honest differences of interpretation and experience that all scholars respect.

I. Climate, Society and Livelihood.

On the Sahelian-Sudanic environment:

I wish Bob would do more with the notion of the kind of environment found in the Sahel, and its resiliency to seeming insult. The term "fragile Sahel ecosystem" appears in at least 95 percent of development documents dealing with the area, yet as I read (and listen to Bob Kates and others) I get the sense that it is not all that fragile after all. To instruct planners on this point would be immensely valuable.

- M. Horowitz

On the effects of colonial technology:

The author repeats the oft-stated assertion that the colonial technology--veterinary medicine and new watering points--led to an increased Sahelian herd. This is a reasonable assumption (one I made myself in a 1976 paper), but there is in fact very little evidence for it. As Stephen Baier points out, the first reliable broad animal census was undertaken along with the rinderpest vaccination campaign of the mid-1960's, and the drought followed just a few years thereafter. Thus, we don't know how large the herd was nor what the contribution of colonial technology was to its size. There are data from the Sudan (R.T. Wilson, "Temporal changes in livestock numbers and patterns of transhumance in Southern Darfur, Sudan," J. of Developing Areas 11:493-508, 1977) supportive of this assertion, and one might interpolate to the Sahel, but it would be wise to be more tentative about any substantial and rapid herd growth during the colonial period.

- M. Horowitz

II Comparative Drought Impacts.

On the reversibility of impacts:

I believe your analysis would benefit from some attempt to classify impacts into "temporary" and "permanent," or--the classification I used in my paper on economic impact--reversible and non-reversible. It seems to me important to stress that many of the impacts of drought are in fact transient; on the economic side this is true of all the conventional foci of attention: agricultural output, livestock losses, budget and balance of payments effects, etc. To look at the classification this way also is useful in suggesting questions for analysis. For example, simply asking whether livestock losses or tree destruction are "irreversible" raises interesting analytic and empirical issues.

- E. Berg

On comparing the drought periods:

I wonder how realistic it is to compare 1973 with 1913, as though 1913 fell into that period before modern economic and political development had weakened the ability of Sahelian populations to resist drought. In most of the Sahel, 1913 was in the immediate aftermath of the colonial conquest, and was a period of major dislocation of food production; it was, for example, the start of the period of forced labour. So 1913 may itself have been a period of heightened vulnerability by comparison to before 1900. I realize that 1913 is the only major drought for which there is some modern

evidence available., but it might be worth pointing out the special characteristics of 1913.

- J. Swift

On comparing pastoralists and agriculturalists.

Kates notes "that proportionately nomads suffered the greatest burden in the recent drought"; yet "nomads"-- pastoral specialists-- are not a homogeneous grouping. Hervouet (in Gallais, ed., 1977) demonstrates how Mauritanian Fulbe emerged from the drought with fewer losses than Maure herders.

- M. Horowitz

III. Coping with Drought.

On the description of coping mechanisms:

It would help if the paper laid out in rather more detail just what are the coping mechanisms (and what others have termed "adaptive strategies") associated with the various livelihood systems identified. These five types of systems outlined are very broadly drawn, and the reader less familiar with the region might miss the important variations among the types. For example, two systems of "primarily diversified pastoralism" are mentioned, "one emphasizing cattle and one including camels." Yet ovine and caprine pastoralism is also important, and a shift into a larger proportion of small ruminants is one recurrently reported coping mechanism. Sheep and goats have shorter gestation periods than cattle and camels, and goats twin frequently and are able to browse a very broad range of plants. I won't belabour this point since there is a large literature on it. A number of the constituent studies in Gallais (1977) are germane to the subject topic, and reveal an enormous complexity of responses within what superficially appears to be an ecological type. The complexity is somewhat obscured in the draft paper.

- M. Horowitz

On the role of foreign aid:

You correctly note that aid is one of the aspects of modernization which may have reduced vulnerability, and clearly much of the strength of the 'less-vulnerable' position rests on the fact that aid did indeed prevent massive deaths during the drought. I do not believe that any of the proponents of the 'more-vulnerable' thesis would deny

this, however I think that more analysis of the effectiveness of the aid process is required before the 'less vulnerable' thesis can be accepted.

The drought began in 1968, the major relief effort did not begin until late 1973. Why did the delay occur and what influenced the change in 1973? Does linkage with the world economic system automatically lead to assistance during time of disaster? Is aid conditional upon the existence of a political context which favors aid? A Ph.D. Dissertation by J.W. Morentz (1976) discusses a number of these issues, particularly the problems of communicating the magnitude of the drought problem prior to 1973. He concludes that despite the fact that many aid agencies, including AID and Friends Relief Services, knew about the drought and its impact they chose not to publicize it and only a series of articles in Le Monde and the New York Times in late 1972 and in particular in summer of 1973 forced governments and aid agencies to take action.

This suggests that the principal linkages between the Sahel nations and the rest of the world did not provide security in the face of the drought, modernization did not necessarily involve less vulnerability. Only when the western aid agencies became politically vulnerable due to this inaction did they initiate the massive, and relatively successful, relief effort.

The effectiveness of modernization and its attendant world linkages in replacing indigenous coping mechanisms is also thrown into question by statements by the U.S. government tying aid directly to support of U.S. policy by recipient nations. The New York Times of January 9th, 1976 carried a front-page article concerning Kissinger's threat to cut aid, including humanitarian relief, to countries which did not support the U.S.

I think therefore that while acknowledging that foreign assistance did contribute to reducing mortality we also have to ask how close the Sahelian nations came to not receiving aid, a situation which might have justified Thomas Johnson's fears that "Six Million Africans may die by October" - New York Times, June 24, 1973, page 1. Had aid not been provided then the "more-vulnerable" position would have been clearly correct; aid was provided and the greater-lesser vulnerability debate continues.

- D. Campbell

On food self-sufficiency:

What you mention about the availability of food but a lack of means to purchase it I think is one of the most crucial elements. There is hardly anything being done to create or increase employment in and out of the urban areas, so this situation is not likely to be different when the next drought hits. The family as the first line of defence is also a very crucial element which I do not think we can really over-emphasize especially when it comes to what to

do about the situation, bringing the individual families into decision making in the development context.

-L. Mhlanga

On livestock evacuation:

I doubt that the safe evacuation of household herds is a sensible drought plan on more than a very small scale. Southern pastures are likely to be in as bad a state and the long treks cause high animal mortality. I believe that drought-proofing the Sahelian pastoral economy must plan: (a) to facilitate destocking via sales and slaughter, at acceptable prices to pastoralists in relation to the price of food grains; (b) to facilitate restocking after the drought. There is lots of successful experience of (b) after 1973, especially through modern varieties of traditional animal loans. But (a) remains a major problem to implement. It is an important issue for future policy research.

- J. Swift

On river basin development:

River basin development in Mali seems to be having the following effects on the three livelihood systems you cite: Flood retreat farmers get land in the new controlled irrigation schemes so are probably better off; pastoralists lose flood retreat pastures, and this is liable to put out of commission a much larger Sahelian grazing area, which is only viable if the river basin dry season pastures are available; as yet I know of no evidence of declining fish stocks resulting from river basin management in the Sahel. A major problem is the apparent inability of Government to coordinate or set criteria for competing claims by different Government departments for potentially high quality river basin land.

- J. Swift

IV. Conclusions

On drought-induced mortality:

First, your conclusions on drought-induced mortality seem to me rather strong. Given the conceptual difficulties and the sparsity of observations, I have inclined toward agnosticism, along the line of Caldwell's position. The data you present don't change my mind on this.

- E. Berg

On differential income impacts:

You reach a very strong conclusion on the income distribution effects of the drought. This is in fact the most far-reaching of your conclusions. You say there was "a massive pauperization of the already poorest quarter of agricultural livelihoods and perhaps a half to two-thirds of pastoral peoples." Now was this a temporary or permanent "pauperization"? The Watts description, which you cite at length, is unclear on this point. If land were sold, or crippling debts incurred, the consequences are conceivably dramatic, in the long-term sense. But is this true? And how common was it? What does "pledging" mean in the villages cited by Watts. Moreover, Watts' discussion of livestock matters is ambiguous on a key point. He says large numbers of animals "changed hands". But what did buyers do with these animals? Presumably the constraint--at least in many instances--was physical: lack of pasture or water, and weakness of animals. This means animals had to be sold. The implicit notion, that some herders (relatively rich ones) accumulated animals, seems doubtful.

The central point is that this income distribution effect might well be highly important especially so since it may not be readily reversible. Given its importance, is it desirable to rely so strongly on Watts' account? And can one generalize his results, even if accurate for Niger, to the region as a whole?

- E. Berg

On 1910-1915 and 1968-1974 comparisons:

. . . the differences you perceive in the importance of the impact of the two droughts--that of the first part of the century and the more recent one--are not due only to fifty years of socio-economic development in those societies. It is true that the consequences of 50 years of colonization are important, especially the spectacular growth in population and livestock because of improved health and veterinary services. That explains the high mortality of the animals in 1970 compared with 1914. Nevertheless, some of the differences between the two droughts are due also to the views of observers at those different periods of time. In 1914, the colonial administration had only just begun, population and animal census were far from being accurate and tended to concentrate on those groups which were most easily identifiable, that is, villages, and sedentary farmers. Thus, attention was focused mostly on the latter in 1910-1915 and the documents of that period (reports and regional supervisors) lead to the belief that the sedentary farmers in the South of the Sahelian-Sudanic zone were the most affected by drought.

Conversely, in 1973, the focus was mainly on the "Sahel," which was taken to be a mostly nomadic region; where the incidence of animal death was catastrophic, (due to the over-use of grazing lands because of the increase in cattle in the

previous 50 years.) This does not mean that the "Sudanese" sedentary farmers did not suffer from the drought. I can tell you that in the Yatenga (Upper Volta), where population density reaches 75 persons per square kilometer, the population did not harvest much grain between 1969 and 1972; people migrated to the southern region and to the Ivory Coast and the survival of the population was possible only because of the supplies furnished by international aid.

The arguments above lead me to modify somewhat your conclusion that the 1910-15 drought affected mostly the sedentary agricultural peoples in the Sudan while the 1968-1974 drought was harder for the nomadic Sahelians to bear.

As you have suggested, different strategies, differing life styles, must be taken into account; just as the effects of the development choices imposed by colonial administrations must also be taken into account when comparing the two droughts.

- J.Y. Marchal
(translated from French)

My major problem pertains to the conclusion so let me begin there. Basically, I have enormous qualms about the section entitled "The Case for Lessened Vulnerability" and particularly that I am cited as apparently being in support of that argument. Let me reiterate most strongly that I have just completed a 600 page dissertation in which I try to document precisely the fact that in parts of northern Nigeria there has been a trend toward increased economic vulnerability among peasant householders as they have been progressively subsumed into a capitalist world system and as the precapitalist formations have been gradually dissolved I believe that in Hausaland at least there is a case (in contrast to what you say on page 75) to be made for increased vulnerability among peasant producers. Most of my dissertation attempts to show how the basic risk averse "moral economy" of the nineteenth century state formation which guaranteed a measure of subsistence security was eroded, initially under the aegis of the colonial state. I specifically trace the changing agronomic patterns, the disintegration of redistributive networks, of patronage, of local grains trade, of state granaries etc., etc. (in other words the breaking of the cycle of peasant reproduction) since 1900 in northern Nigeria. In other words my ideological position is in keeping with "The Case for Increased Vulnerability." . . . Now, what in fact do I say in the passage which you quote on pp. 64-65? Firstly, let me reiterate that I am talking about northern Nigeria only and I firmly believe that this has little relevance for the vast majority of the Sahel. This is an area of highly complex, pre-colonial state structures, of very high population densities in some areas since the 18th century, of land scarcity in the close settled zones, of highly influential merchant capital prior to 1900 and so on. So I strongly suspect that the Nigerian data should be taken on

their own terms; I would be loathe to generalize to other parts of Hausaland. Nonetheless what I say on pp. 64-65 is that the regional economy seemed to be highly disrupted in 1913-14 in the sense that human movement and displacement was considerable (probably more so in that sense than in 1972). Moreover human mortality seemed to be high though what percentage of those actually came from outside Nigeria (and I suspect this was quite high) is impossible to estimate. However, I clearly was not arguing that peasant farmers were less secure (or less vulnerable) as a whole in 1913. In some important sociological and political aspects they were very secure (though here I would emphasize that the colonial impact especially through cash cropping was considerable precisely in those areas which were apparently badly hit in 1914, i.e. Kano emirate). I have attempted to show the reduction in flexibility and choice, the increase in rural inequality and differentiation, and the penetration of commodity production in rural Hausaland since 1900. I was trying to emphasize that in 1913 a major constraint lay in the forces of production especially technology (transport); a great strength lay in social relations of production. These strengths and weaknesses were gradually inverted (hence my emphasis on the availability of grain). As you recall, my paper on seasonality emphasized the enormous vulnerability of the poor peasantry in relation to village level political economy (especially debt, the grains trade, taxation and marriage costs) and the fact that drought and periods of food shortage were catalysts for increasing rural inequities (a point which does not emerge in your paper and which I empirically document for 1973-74 in northern Kaduna State). In short, I really object to being cited as an antagonist to the increased vulnerability argument when all of my work supports it and hopefully takes the discourse somewhat further.

- M. Watts

[In making the comparison] you talk about "relative" versus "absolute" increase in vulnerability. It would be fair to argue, as you seem to be doing, although not very explicitly, that the absolute standard (i.e. how many people died) is not unknowable but also not very relevant. Standards of what is acceptable and unacceptable change: given the huge changes in the world economy and potential and in the total wealth of the countries concerned between the two droughts, the crucial fact is that 500,000 or more people may have died of starvation and starvation-related incidents in 1973, not that this was more or less than in 1913. If you add to this the fact that 1913 was, as pointed out above, in the period of disruption after the colonial conquest, while 1973 came after more than 10 years of efforts at rapid post-independence economic development in a much richer world, then the question is not: "in which year did more die?", but "what are the reasons such a catastrophe could still happen in 1973?". . . . This is not, of course,

to deny the utility of your careful collection and weighing of the evidence; but if the question is put in this way, it leads one to look for a rather different type of answer.

- J. Swift

On agriculturalist-pastoralist comparisons:

Whether the drought indeed affected the agricultural zone more in 1912-1913 and the pastoral zone more in 1972-73 is a question. The southern zones were probably better known and were the object of more numerous reports in 1912-1913, while information was more available in 1972-1973, even from the most distant zones and there were particularly tragic pictures of dead herds as a consequence of the drought. I would therefore tend to be less optimistic than you in the conclusion; the competition for the exploitation of land, both agricultural and pastoral, is likely to become exacerbated in the years to come. The intensification of production (through irrigation and dykes) leaves the exploiters even more susceptible to hazards because of their specialization, without reducing the overexploitation of the traditionally productive zones.

- E. Bernus

(translated from French)

I am afraid that I can't add very much in the way of detailed comments because in the area that I know well, at least, the historical evidence supports your main conclusions. The French archives and oral data as well from central Niger support your general conclusion that the 1910-15 drought affected sedentary agriculturalists most severely whereas the later disaster fell most heavily on pastoralists. The reason that pastoralists are in trouble is, as you say, the result of a series of historical changes: restrictions on desert-savanna transhumance, the loss of land use rights at the southern end of the old transhumance cycles, and so on.

- S. Baier

. . . where you state that disaster accentuated ongoing social and economic trends. Perhaps it does so more for pastoralism than for agriculture as far as increasing inequality of factor ownership or control is concerned. The case of sale or pledging of land you quote from Northern Nigeria is unusual for Sahelian agricultural areas because of the generally light settlement pattern elsewhere than in Northern Nigeria.

Further I can think of some probable reasons for the greater suffering of pastoralists than agricultural peoples in 1973 relative to 1913: (i) Pastoralists depend for grain on farmers' physical grain surplus. Between 1913 and 1973 there was probably a reduction in total grain production per farm because increasing cash crop cultivation competed for land and farmer's time. The physical grain surplus (represented

by the quantities stored in graneries and the amount marketed fell. Farmers continued to cultivate enough grain to cover their own household needs, but their main cash earning became cotton or groundnuts rather than the sale of surplus grains. As a consequence, (a) the quantity of grain available for exchange fell, as a result of which pastoralists' grain supplies became more insecure than those of the farmers, who were still growing their own; (b) pastoralists increasingly depended on the market rather than on traditional exchange with the farmers in order to get their food grains. It is reasonable (although undocumented) to assume that the terms of trade between animals and grain fluctuate more on the market than in traditional exchange located within a complex web of social relations. As a result of this, pastoralists would have been worse hit in 1973. (ii) I would estimate, again without quantitative evidence, that in time of drought pastoralists depend much more on hunting than do farmers and that in pre-colonial, even 1913, economy, drought caused a rapid conversion of the pastoral economy into a partial hunting economy (in addition to gathering which both pastoralists and farmers do of course). The massive destruction of game animals between 1913 and 1973, first by the French and subsequently by almost anybody with a gun in the independent Sahelian countries, means that hunting is no longer a viable fallback activity. (iii) An important question, which ought perhaps to have been given greater prominence in your review, is how pastoralists and farmers recover from disaster. Farmers have no problem if they can save or acquire small quantities of seed. Six months after the rains return they have a crop. Pastoralists have to reconstitute their herd capital, which is a considerable task, especially since animals always cost much more after a drought because of scarcity. How Sahelian pastoralists did reconstitute their herds in 1913 compared to 1973 would be an interesting study in itself. The Kel Adrar Twareg in 1913 intensified caravan trading across the Sahara, making two or three trips in one season instead of the normal one. This option was not open in 1973 because of frontiers, customs, etc. On the other hand, in 1973 there was a much greater possibility of migrant labour to North Africa, which is what many North Malian Twareg did. (In both years lots of Malian Twareg went to Northern Nigeria). It is not clear to what extent wages from this labour migration are being used to reconstitute herds among Malian Twareg, but I have a feeling that they are being more spent on consumption items (e.g. radios) and that there is an increasing acceptance of labour migration for several months each year as a way of life; i.e. it may be becoming an economic activity in its own right rather than a means to reentry into the pastoral economy.

- J. Swift