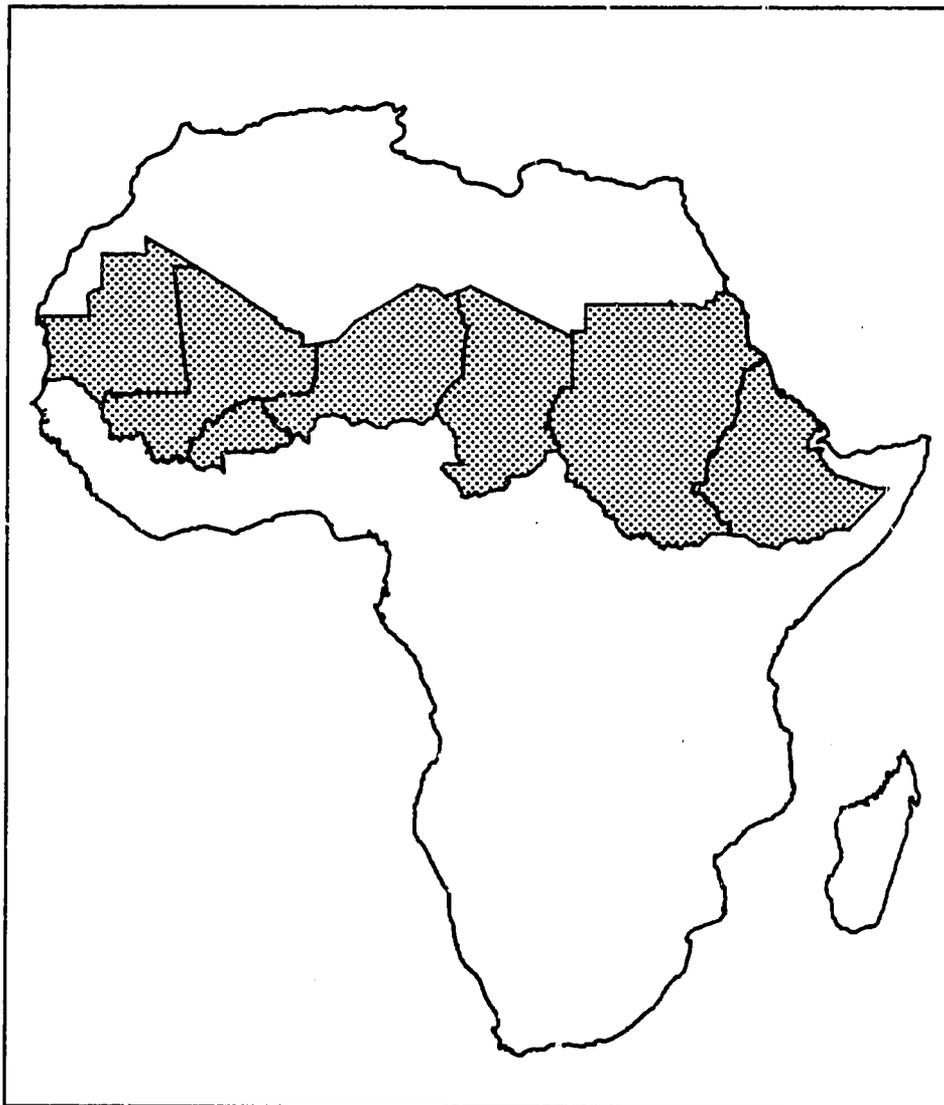


Vulnerability Assessment



Contains reports on:

Mauritania

Mali

Burkina

Niger

Chad

Sudan

Ethiopia

Vulnerability Assessment

June, 1990

Published for:

**Agency for International Development, Bureau for Africa
Office of Technical Resources**

Published by:

FEWS Project, Tulane/Pragma Group

1611 N. Kent St., Suite 201

Arlington, VA 22209

(703) 243-1070

FEWS Vulnerability Assessments

The Vulnerability Assessment, the third of three annual reports produced by the FEWS Project, monitors food security conditions in several African countries (see map on Front Cover). The other reports are a Pre-Harvest Assessment (October) and a Harvest Assessment (January). The harvest-oriented reports predominately monitor contemporary physical data (rainfall, satellite imagery, pests, etc.) that influence national production and *availability* of food. In a complementary fashion, the Vulnerability Assessment emphasizes socioeconomic conditions affecting the resources that socioeconomic groups utilize to insure *access* to food.

The 1990 Vulnerability report assesses the relative susceptibility of particular socioeconomic groups to food insecurity as the 1990/91 agricultural season commences. Recognizing the diversity among and within African countries, the assessment methodology draws on the field resources of USAID Missions and FEWS Field Representatives. The result is a decentralized, local analyst-dependent procedure for assessing the food security situation in a particular country. Although country specific, there are several guiding principles that reflect the FEWS interpretation of vulnerability to famine. These guidelines are experimental and will evolve over time as techniques are refined and circumstances warrant:

- FEWS views all people as vulnerable to famine, with people differing in their degree of vulnerability. Levels of vulnerability are distinguished by choice of productive endeavor and the adaptability of that choice to changing circumstances. For example, agriculturalists, agro-pastoralists and urban wage earners have different levels of vulnerability depending on prevailing conditions. The identification of relevant socioeconomic groups, distinguished by productive activity, is the first step in isolating levels of vulnerability within a society.
- Resource endowments by socioeconomic group, including sources of income and wealth, are used to characterize the flexibility of households to changing circumstances. For each socioeconomic group the analyst subjectively determines, in collaboration with other country resident experts, the impact of current and chronic conditions on a typical household's ability to adapt to substantial changes in these conditions.
- FEWS uses an ordinal scale to assess famine vulnerability levels. Ordinal scales rank relative levels without considering the absolute difference between levels. The four levels of vulnerability used by FEWS (see below) are determined by the need for a particular response by decision makers. This standard terminology facilitates communication, reduces ambiguity, and avoids misunderstandings.

FEWS Vulnerability Terminology and Synonyms

Vulnerability Level	Equivalent Adjectives	Action Required
Famine	N/A	Too late for preventive measures
Extreme	"At-Risk," Severe, High	Immediate preventive measures required
Moderate	Medium	Continued surveillance warranted
Slight	Low	Regular monitoring efforts sufficient

Vulnerability Assessments serve a dual role in identifying short and long-term threats to food security. They also provide background information on the location, behavior and socioeconomic status of vulnerable groups in FEWS-monitored countries to guide appropriate response mechanisms. Vulnerability Assessments indicate people and areas where either immediate stabilization, or more structural assistance, would be appropriate.

For more detail see: "Assessing Socioeconomic Vulnerability to Famine: Frameworks, Concepts and Applications", Thomas E. Downing, April 1990, and "Vulnerability and Food Security in the FEWS Project: Guidelines for Implementation", Charles A. May, April, 1990.

Table of Contents

EXECUTIVE SUMMARY OF REPORTS	1
Map 1: 1990 Vulnerable Populations	2
FEWS REGION: Physical, Social Factors Compound Vulnerability	4
Figure 1: Sub-Saharan Rainfall Index, 1941-89	5
MAURITANIA: At-Risk Populations in the Senegal River Valley	7
Map 2: Mauritania Reference Map	6
Map 3: Magnification of the Senegal River Valley Area	8
Map 4: Vulnerable Populations in Mauritania	9
MALI: Extremely Vulnerable Farmers in Sahelian Zone	13
Map 5: Mali Reference Map and Vulnerable Populations	12
Map 6: SAP and MATDB At-Risk Zones	14
Map 7: Magnification of the Eastern Sahelian Zone in Mali	15
Table 1: Livestock Numbers by Region in Mali	16
BURKINA: Northern Provinces Moderately Vulnerable	19
Map 8: Burkina Reference Map and Vulnerable Populations	18
Table 2: 1988-89 Cereal Balance for Burkina (mt)	20
Map 9: Gold Mining Areas in North Central and Sahel Provinces	21
NIGER: Extremely Vulnerable Groups Need Good Rains	23
Map 10: Niger Reference Map and Vulnerable Populations	22
Map 11: Areas of Chronic Food Insecurity in Niger	24
Map 12: Current Food Insecurity Signals in Niger	26
Table 3: Summary of Indicators for Vulnerable Arrondissements in Niger	28
Appendix A: USAID/FEWS Vulnerability Assessment Methodology for Niger	29
CHAD: At-Risk Populations Currently Receive Assistance	31
Map 13: Chad Reference Map and Vulnerable Populations	30
Map 14: Magnification of the Western and Central Sahelian Zones	32
Map 15: Placement of the Food Security Stock in Chad	33

SUDAN: Highly Vulnerable Farmers in Northwest	37
Map 16: Sudan Reference Map	36
Box 1: Geographic Divisions of Sudan	37
Map 17: Vulnerable Populations in Sudan	38
Table 4: Theoretical Cereal Balance for Northern Sudan ('000 metric tons) and Darfur (DR) Regions ('000 metric tons)	39
Map 18: Displaced and Refugee Populations in Sudan	40
Table 5: Historical Cereal Sufficiency for Kordofan (KR)	41
Table 6: Numbers of Refugees in Sudan by Region (1989)	42
Map 19: Magnification of the Western Provinces in Sudan	43
Appendix B: Vulnerable Groups in Sudan for 1990	45
ETHIOPIA: 2.5-3 Million At-Risk of Famine in Eritrea, Tigray	47
Map 20: Ethiopia Reference Map and Vulnerable Populations	46
Map 21: Magnification of Northern Ethiopia	50

Executive Summary of Reports

Social upheaval in the western and eastern portions of the FEWS-monitored Region has increased the overall level of vulnerability to famine. Forced relocations in the west (Mauritania) have placed 80,000 people at-risk in 1990. Civil war in the east has caused 2 to 3 million people (in each of Sudan and Ethiopia) to be at-risk. Poor environmental and agroclimatic conditions are primarily responsible for the extremely vulnerable groups in Mali (200,000), Niger (160,000) and Chad (19,000). In these three countries the extremely vulnerable are receiving assistance. The plight of the extremely vulnerable in Mali was worsened by response delays arising from government and donor disagreement over designations of levels and locations of vulnerability. Populations in Burkina are only moderately vulnerable as the 1990/91 agricultural season begins. A poor 1990/91 rain and agricultural season will increase vulnerability and the probability of famine in the FEWS-monitored Region.

MAURITANIA

Approximately 75,000 traditional farmers residing in the Senegal River Valley and 6,000 relocated shantytown dwellers outside Nouakchott (see Map 1) are extremely vulnerable in 1990. Riverine inhabitants are unable to plant because of border tensions and shantytown dwellers have been relocated to undeveloped areas as part of government policy.

MALI

Sahelian agriculturalists and former pastoralists (see Map 1) are extremely vulnerable as the 1990/91 agricultural season begins. Government and donor disagreement on numbers and locations of vulnerable groups has hindered relief efforts. The status of all vulnerable populations could deteriorate dramatically if 1990 rainfall fails or significant pest damage is incurred.

BURKINA

No extremely vulnerable, or "at-risk," groups were presently identified in Burkina. This situation may change in late 1990 if rainfall is less than average and cereal production is insufficient to meet needs.

NIGER

The degree of food insecurity of chronically vulnerable populations of western and eastern Niger will be heavily dependent upon rainfall received during the next few months. Food reserves are low. Another poor production year could result in severe food insecurity and migration as early as September 1990.

CHAD

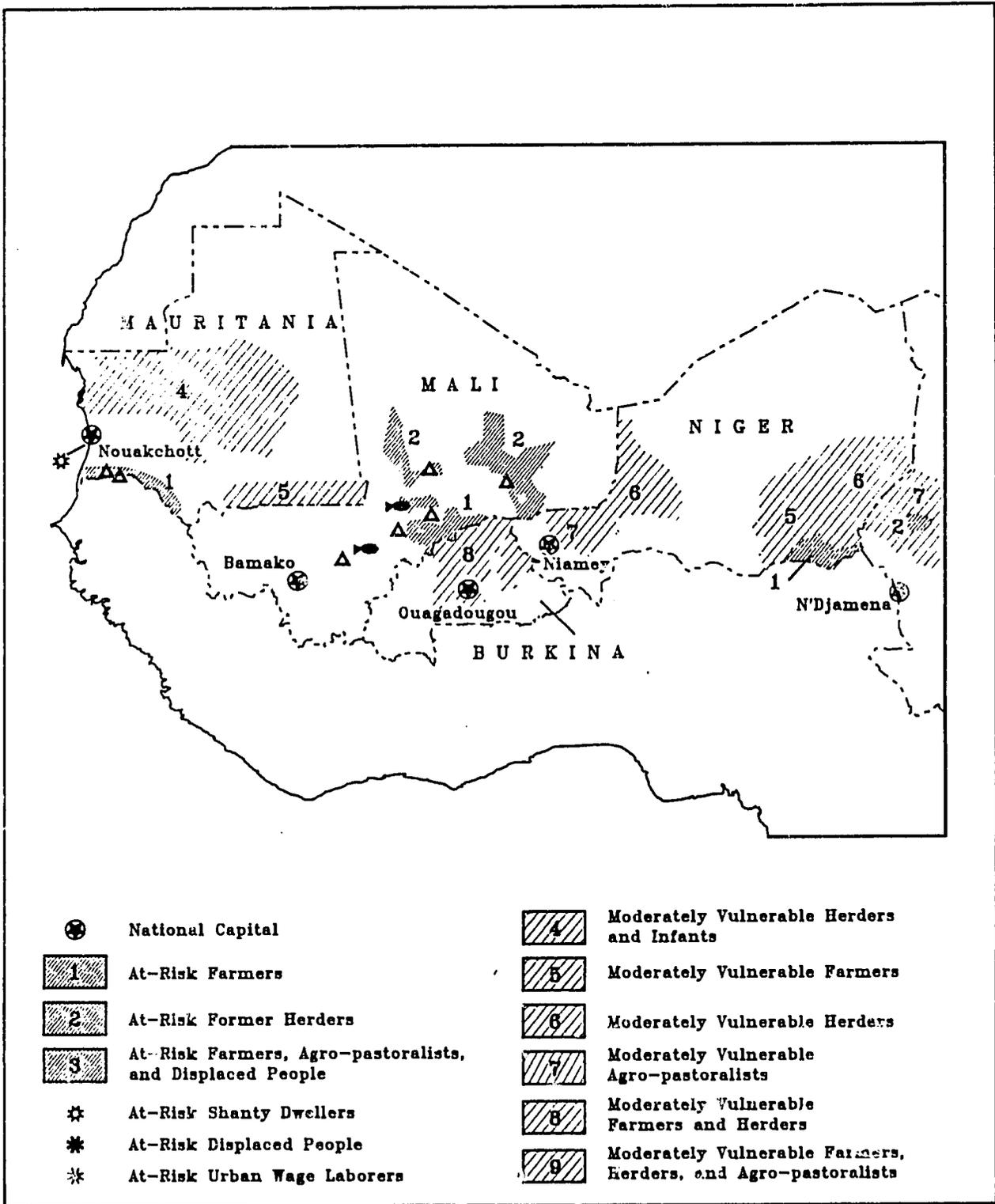
About 19,000 extremely vulnerable agriculturalists and former pastoralists (see map 1) are presently receiving assistance. A second, successive poor rainy season would result in reduced crop and pasture production with increased vulnerability of all vulnerable populations.

SUDAN

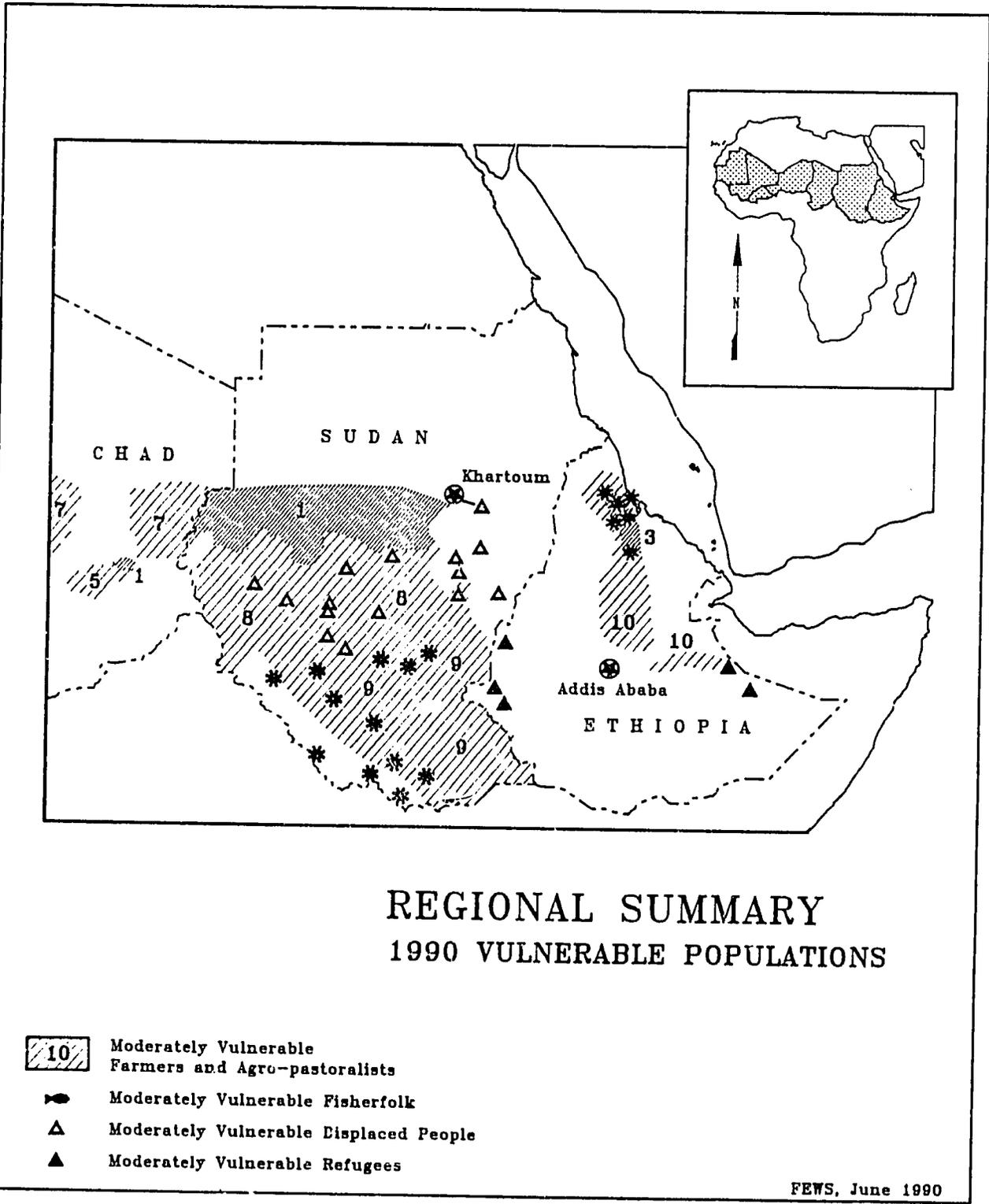
Traditional farmers in the provinces of Northern Darfur and Northern Kordofan are extremely vulnerable coming into 1990/91, owing to a poor harvest and a general lack of resources. Displaced persons in southern Sudan and the Transitional Zone are moderately vulnerable because relief supplies have been delayed. Minimal national level stocks will not suffice if the 1990/91 harvest is meager.

ETHIOPIA

From two and a half to three million midland and highland rural agriculturalists and agro-pastoralists, and urban poor and displaced people in government-controlled areas are "at risk" of famine in Eritrea and Northern Tigray. Civil conflict and warfare, particularly in northern Ethiopia, continues to heighten vulnerability and hinder relief efforts.



Map 1: 1990 Vulnerable Populations



FEWS REGION

Physical, Social Factors Compound Vulnerability

Summary

Regional issues that impact the level and extent of vulnerable populations are presented below:

- *Diminished public, private and market cereal stocks reduce the cereal safety net in case of poor 1990/91 harvests.*
- *An experimental method forecasts 1990 rainfall will approximate the levels of 1988 and 1989.*
- *Increased sahelian rainfall in 1988 and 1989 does not necessarily imply the Region has entered a "wetter" phase.*
- *Extremely vulnerable (i.e., at-risk) populations include approximately 80,000 people in Mauritania, 200,000 in Mali, 160,000 in Niger, 19,000 in Chad, and between two and three million people in both Sudan and Ethiopia.*

Diminished Cereal Stocks Increase Regional Vulnerability In 1990

National-level cereal production in 1989/90 was average for most FEWS-monitored countries. However, several specific areas within each country had poor harvests; southeastern Mauritania, the Senegal River valley, sahelian Mali, northern Burkina, northwest and southeast Niger, sahelian Chad, western Sudan and northern Ethiopia. Generally, these harvests did not immediately result in extreme hardship and food stress because carryover stocks from the good 1988 harvest were available. These on-farm, market, and public stocks, plus commercial and concessional imports, provided cereals for those areas with 1989/90 production deficits. The drawdown of these cereal stocks over the last nine months implies that a similar safety net will not be available if 1990/91 cereal production is below average.

USAID Mission and FEWS reporting throughout the Region have highlighted the possibility of extreme food stress as early as September or October 1990, in case of a poor rainy season. References to this possibility can be found in each of

the country reports included in this 1990 Vulnerability Assessment. Famine, as viewed by FEWS, is a process that results from a continual deterioration of the food security of a population, rather than an event brought on by a single factor. In 1990/91 the combined impact of reduced cereal stocks, widespread displacement of people due to civil strife, limited off-farm income possibilities, and the lingering effects of recent droughts could set the preconditions for extreme food stress. A catalytic event, such as a significant drought, could put the famine process into motion in several areas of the Region. Monitoring of the evolving 1990 agricultural season in the Region via FEWS 10-Day Bulletins begins June 22. FEWS recommends interested readers to use these bulletins to closely follow the progress of the 1990 rainy season.

Experimental Method Forecasts Rainfall Similar to Last Two Years

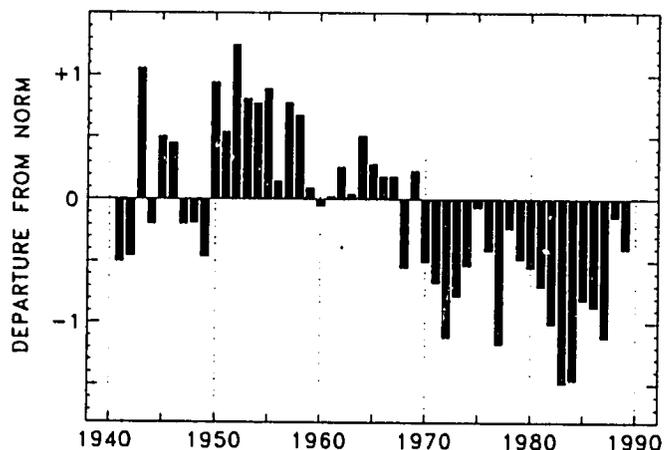
The critical importance of 1990/91 agricultural production to regional food security insures that governments and donors will carefully monitor the progress of the 1990 rainy season. Promising research on seasonal forecasts for the Sahel, carried out by the UK Meteorological Office (UKMO), offers advance insights into the upcoming rainy season. Their forecast methodology is based upon relationships between global-scale sea surface temperatures and seasonal rainfall in the Sahel (Senegal through Sudan). The experimental forecast for 1990 indicates a season wetter than those typically experienced in the 1970-87 period, especially west of the Greenwich meridian (zero degrees longitude).

This forecast is of "low confidence" because of uncertain atmospheric and sea surface temperature conditions, such as the presence of *El Nino* and anomalies in the North Atlantic. Forecast revisions will be reported in the FEWS 10-Day Bulletins. Seasonal forecasting shows great potential and FEWS is encouraging further refinements. Present seasonal forecasts that cover the entire Sahel are of limited use in assessing potential impacts on sub-regional agriculture. The UKMO, and other research organizations, are working to provide greater spatial and temporal detail. FEWS will continue to follow and report on the progress of seasonal forecasting for the Region.

Wetter Weather in the Sahel ?

Some media reports have proclaimed an end to the persistent regional drought of the last two decades and the beginning of a "wetter" phase in the Sahel. A subsequent "wet" 1990 is also forecast. The rainfall deviations from normal since 1941 are presented in Figure 1 for an area from Senegal through Niger. While 1988 and 1989 were "wetter" relative to the post-1968 period, Figure 1 shows that they were still below the long-term average (the zero line). Two consecutive "wetter" years are not sufficient indication that a deficit rainfall period has ended. Similar years in the 1970s (e.g., 1975 and 1976) did not herald a change to "wetter" conditions. FEWS does not consider the simple projection of 1988 and 1989 "wetter" years to determine a subsequent "wet" 1990 to be a reliable forecasting technique.

Figure 1: Sub-Saharan Rainfall Index, 1941-89

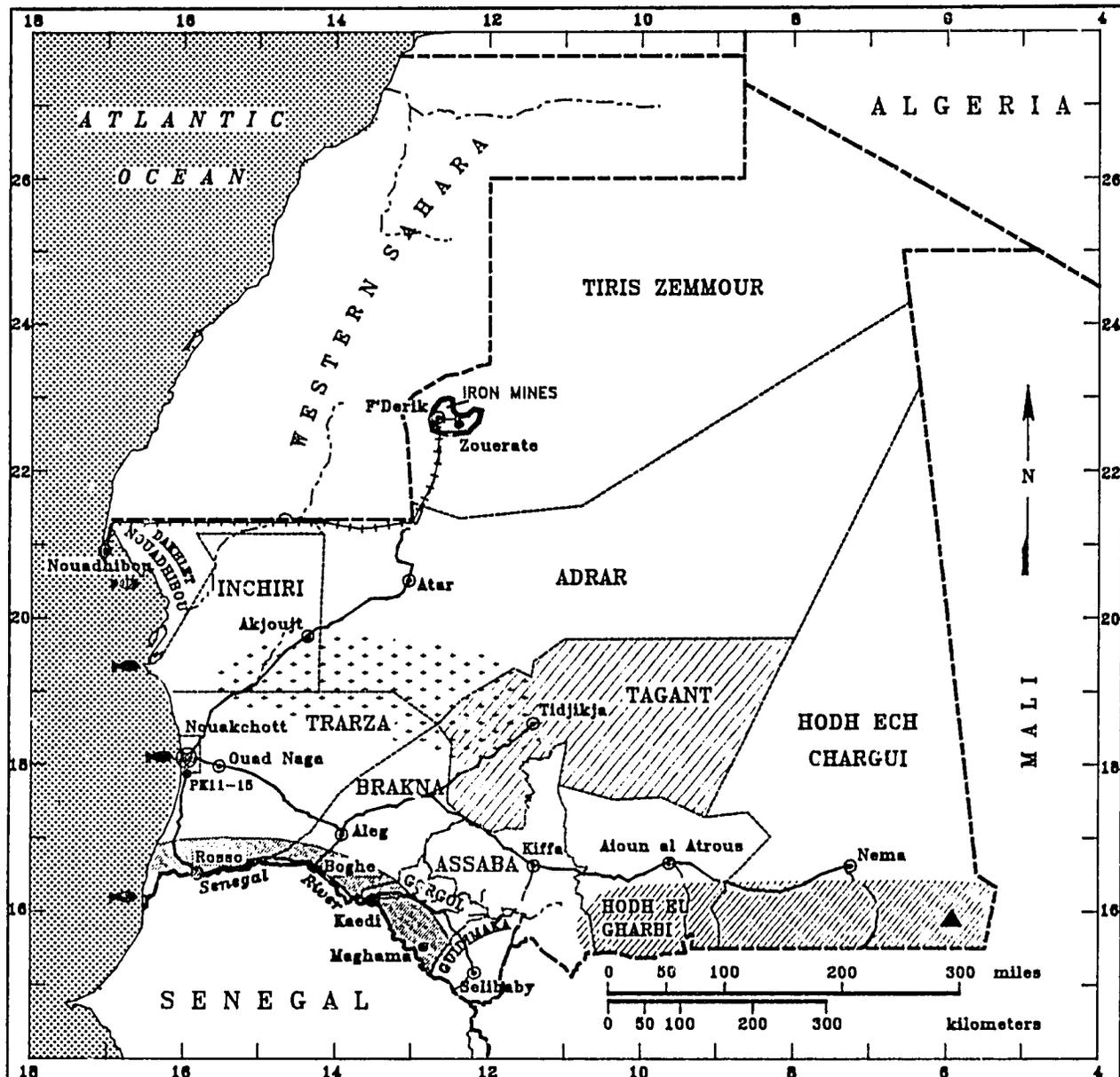


Source: Personal Communication from P. J. Lamb, Illinois Water Survey

Who is At-Risk of Famine?

There are approximately 5 to 6 million people who are extremely vulnerable (i.e., at-risk) to famine in the FEWS-monitored Region at mid-1990. Extremely vulnerable populations include about 80,000 people in Mauritania, 200,000 in Mali, 160,000 in Niger, 19,000 in Chad, and between two and three million people in both Sudan and Ethiopia. Their individual circumstances, both current and chronic, are described in the country reports that follow. Some regional patterns do emerge:

- The majority of people judged at-risk of famine (principally in Sudan and Ethiopia) are not currently receiving any substantial food assistance;
- The overwhelming number of people at-risk are found in two countries, Ethiopia and Sudan;
- Over half of the at-risk populations are extremely vulnerable due to the destructiveness of armed conflict and not simply the recent or cumulative impacts of drought;
- Over half of the at-risk populations are not, or only tenuously, under the control of the governments of the countries in which they reside;
- Agriculturalists and agropastoralists, rather than pastoralists, make up most of the at-risk groups;
- Most at-risk groups have experienced at least two other periods of similar levels of food insecurity in the last five years (especially following the 1984 and 1987 harvests).



MAURITANIA

REFERENCE MAP

- | | | |
|-----------------------------|----------------------|---|
| --- International Boundary | ⊗ National Capital | Riverine Farmers |
| ----- Wilaya Boundary | ⊙ Wilaya Capital | Possibly Intense Pest Damage Forecast for 1990/91 |
| - - - Intermittent Drainage | • Cities and Towns | High Infant Malnutrition |
| — Road | ⊕ Main Fishing Zones | Abnormal Pastoral Migration |
| - - - Track | ▲ Main Touareg Site | |
| ++++ Railroad | ⊕ Iron Mines | |

FEWS, June 1990

Map 2: Mauritania Reference Map

MAURITANIA

At-Risk Populations in the Senegal River Valley

USAID and Few/Mauritania Report Received in Washington May 15, 1990

Summary

Mauritania's most vulnerable groups in the upcoming year are the traditional farmers residing in the Senegal River Valley, repatriates from Senegal, shantytown dwellers recently moved farther away from Nouakchott, and children under five in the north-central wilayas (see Map 2). In-country and pledged food aid should be sufficient to cover immediate needs. The difficulty will be in convincing the Government of the Islamic Republic of Mauritania (GIRM) that all of the identified groups are truly "at-risk." Quantifying the extent of food stress and the vulnerable groups will be extremely difficult because the GIRM reports 1989/90 agricultural production to have surpassed that of the 1988/89 record year, which met approximately 40 percent of in-country needs. The Agricultural Statistics Bureau (ASB) estimates the final net cereal production figure at 141,621 metric tons (mt), about 7,000 mt greater than last year. USAID Mauritania's Office of Agricultural Resources (OAR/M) believes this grossly overstates the situation. In 1989/90, the entire Senegal River Valley appears to have had a mediocre harvest at best, and a catastrophic one at worst.

Methodology Application

The population of Mauritania is primarily composed of agriculturalists, pastoralists, and small businessmen. Political and social events have also created displaced and refugee populations. Other small, separate socio-economic groups include coastal fishermen and miners. It is within this categorization of Mauritanian socio-economic groups that the 1990 vulnerability assessment is undertaken.

The 1990 vulnerability assessment depends more upon qualitative data than in years past. The upheaval arising from the April 1989 political events between Senegal and Mauritania disrupted the existing data collection infrastructure. A significant portion of people in this assessment are considered "at-risk" because of these political and social constraints, rather than poor environmental conditions. Consequently, the assessment of vulnerability has not relied solely on secondary "hard" data sources, but on the "convergence of evidence" from formal and informal indicators.

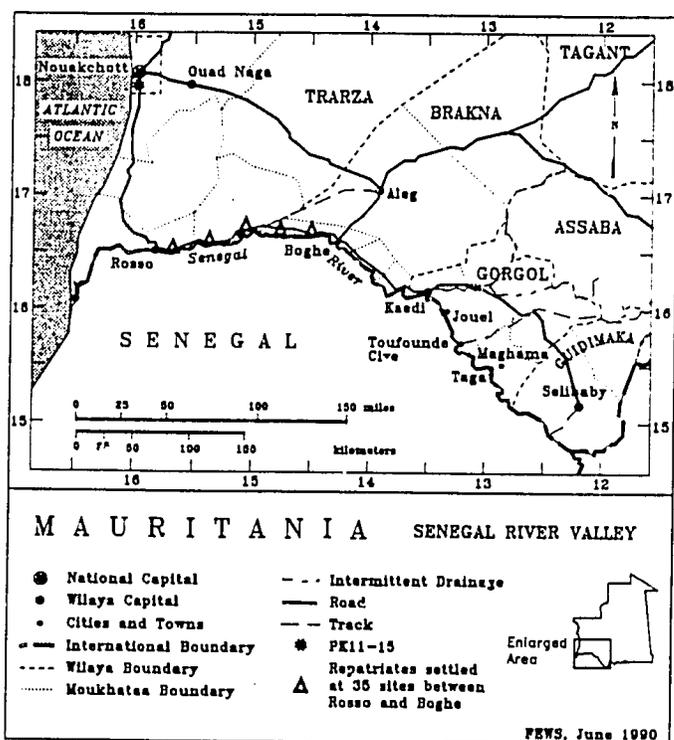
OAR/M does not believe that the available "hard" secondary data accurately reflect the current reality in Mauritania. For example, satellite derived vegetation data suggest that pasture is better than average (1982-1989), implying that herders may be less vulnerable than in an average season. However, many herders have migrated to Mali for security reasons (Mali reports approximately 5,000 refugees), or have lost much of their herds to raids and theft along the Senegal border. Similarly, the ASB has published encouragingly high domestic cereal production figures even though other field information and anecdotal reports suggest the contrary.

Analysis of Socioeconomic Groups & Subgroups

Agriculturalists in the Senegal River Valley

In April 1990, a joint field trip by FEWS (representing OAR/M) and the World Food Program (WFP) was undertaken to refute or verify the increasing informal reports of economic hardship among agriculturalists along the Mauritania-Senegal border. The trip covered the Senegal River Valley from Rosso to Maghama and continued southeast to Selibaby in Guidimaka Wilaya (formerly Region -- see Map 3). Thirty-five villages were visited along the river in three wilayas: Trarza, Brakna, and Gorgol. Farmers, repatriates, agricultural agents, nurses, and local officials were interviewed. OAR/M concluded that the inhabitants of many small villages within the Senegal River Valley are already experiencing significant food stress. Many others will begin to run short of food, or purchasing power, within the coming three to four months.

Only two of the villages visited between Rosso and Maghama harvested more than a four month's supply of traditional cereals this year. No individual harvested enough to make sales to the Food Security Commission (CSA). Some villages in Brakna Wilaya that remained intact after the April 1989 events were able to harvest rice in their irrigated perimeters, while others planted maize this year (due to late planting). However, reported yields were significantly reduced from last year (1988/89). The rainfed crop was mediocre due to the poor spacing of rainfall in the area and significant grasshopper infestations.



Map 3 : Magnification of the Senegal River Valley Area

The most disturbing conditions were found in Gorgol Wilaya. The majority of villages southeast of Kaedi (all the way to Maghama) experienced a very poor agricultural season. The harvest from rainfed crops was marginal in comparison to the previous five years and *walo* production (river recession) was nominal. Both yield and area under cultivation were reduced by fear and tension in the area. Late planting and the imposed military curfew left many farmers unable to keep birds from eating crops during restricted hours, contributing to lower yields. These curfew restrictions were enforced in varying degrees, depending on the *moukhatas* (formerly department). Approximately 80 percent of small irrigated perimeters were left unplanted because of stolen pumps, civil insecurity, lack of labor, and military restrictions. The exceptions to this scenario were the villages of Jouel and Toufounde Cive (see Map 3).

Ninety percent of surveyed villages had no remaining on-farm stocks from the 1988/89 harvest. Taga was the only village visited in Gorgol Wilaya that had on-farm reserves left from that year. All other villages were consuming cereal from this year's production. Most villages surveyed believed that the 1989/90 combined harvest (rainfed, irrigated and recession) would last no more than three months. Again, the exceptions were Jouel and Toufounde Cive in Kaedi Moukhatas. When asked to compare this year with the drought years of 1984 and 1985, many farmers replied that traditional production was as bad as in those drought years. Farmers commented that in some ways they are more insecure now because they did not harvest any irrigated rice. Nevertheless,

many farmers still have their animals and hence some limited economic security.

However, these traditional coping mechanisms, like selling livestock, may break down over the next few months, given the upheavals and constraints following the April 1989 events. For example, supplemental fishing and trading with villages across the river in Senegal are currently forbidden. Market exchanges are limited as travel and trade in many areas are under tight restrictions; most herders (sources of meat and dairy products) have moved their animals far north or east to avoid loss or danger while there are still tensions along the border. Many villagers no longer have the labor "pool" available to use in search of outside income. It is the opinion of OAR/M that, unless some type of food aid intervention is put in place, many people in the river valley will shortly suffer nutritional distress.

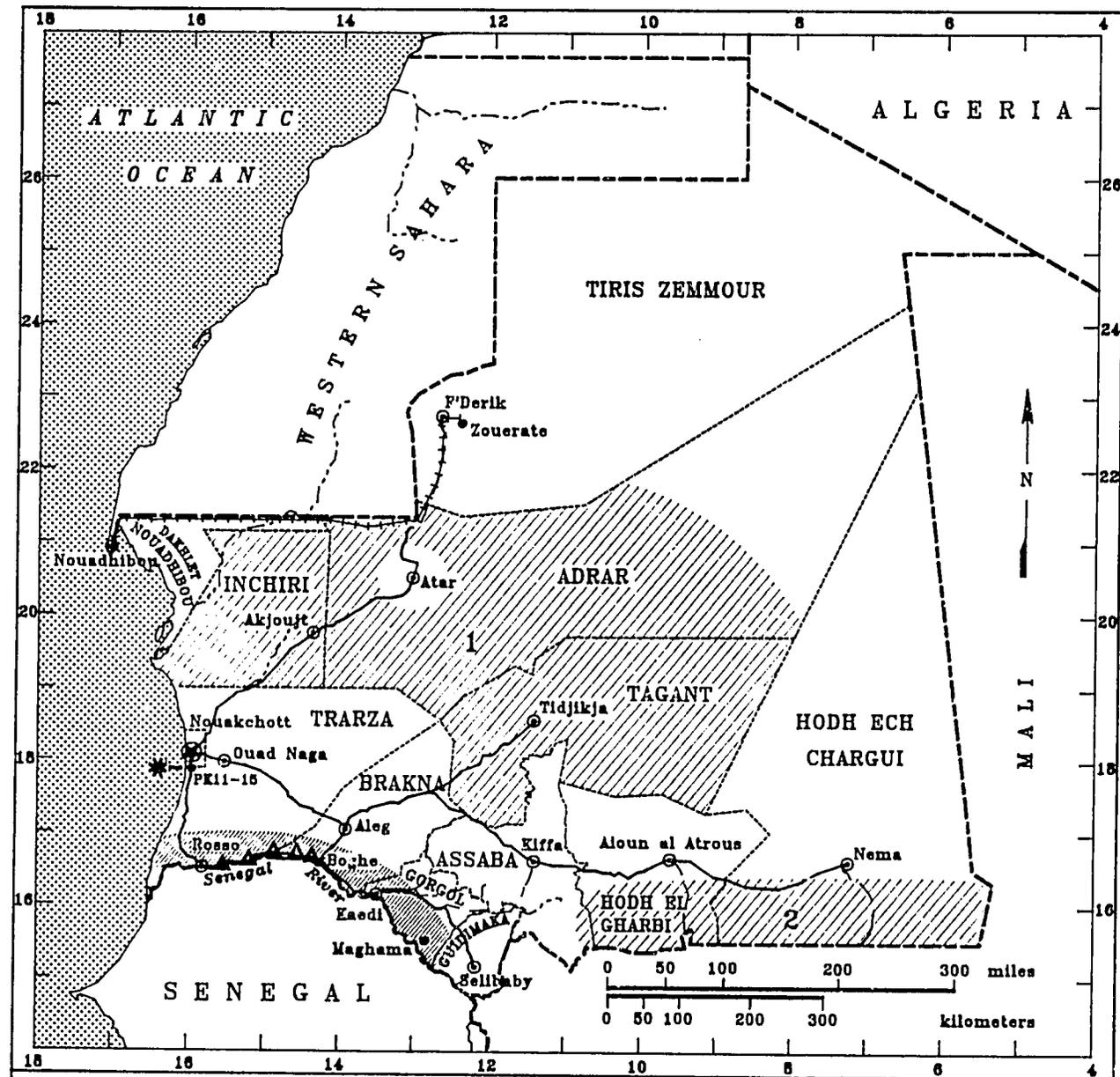
Agro-Pastoralists in the Hodhs

The two Hodh *wilayas*, Hodh el Gharbi and Hodh el Chargui, located in the far east of Mauritania (see Map 4), are considered moderately vulnerable. This assessment is due to a recent Malian grasshopper eggpod survey that revealed the potential for another serious grasshopper infestation with the upcoming rainy season. Continued monitoring is called for in this situation.

Satellite vegetation data suggest that pastures in these *wilayas* have been better than average during 1989/90. Rainfall data confirmed that the cereal production zone along the southern border with Mali had plenty of rain. However, widespread pest damage severely reduced the 1989/90 rainfed crop. Increasing cereal prices support reports that cereal production was not as abundant as the previous season. However, OAR/M does not consider the majority of the inhabitants of the Hodhs to be "at-risk" in 1990 because pastures were good, the harvest was not uniformly bad, and trade possibilities with Mali remain.

Displaced and Refugee Populations

Repatriated populations in small villages along the Senegal River east of Rosso are considered as a distinct, moderately vulnerable group (see Map 4). Most of these repatriates are in riverine villages from which other Mauritanians were expelled last April. The GIRM estimates 240,000 Mauritanian repatriates have returned from Senegal since April 1989, with most returning to their families. OAR/M believes the total number of repatriates is closer to 105,000. Those considered most vulnerable are being monitored by the United Nation's High Commission on Refugees (UNHCR). UNHCR monitors and distributes food aid to 25,000 of these people. These repatriates have been deemed moderately vulnerable. Their lack of economic and food security is unquestionable. However, since they are currently monitored by UNHCR and the Mauritanian Red



M A U R I T A N I A V U L N E R A B L E P O P U L A T I O N S

- ⊙ National Capital
- ⊙ Wilaya Capital
- Cities and Towns
- International Boundary
- Wilaya Boundary
- Road
- Track
- ++++ Railroad
- Intermittent Drainage
- At-Risk Riverine Farmers
- * At-Risk Shantytown Dwellers
- 1 Moderately Vulnerable Herders and Infants
- 2 Moderately Vulnerable Rainfed Farmers
- △ Moderately Vulnerable Repatriates

FEWS, June 1990

Map 4: Vulnerable Populations in Mauritania

Crescent and are receiving various forms of aid (materials and food), OAR/M does not consider this group currently "at-risk" of famine.

The majority of small villages along the river from Rosso to Boghe (in Trarza Wilaya) are occupied by repatriates. These people were placed in the homes and on the land of Mauritians who were expelled last year. Other repatriate sites are spaced throughout Brakna, Gorgol and Guidimaka *wilayas*. Most of the repatriate villages are dependant on food-aid distributions. In theory, each repatriate receives 400 grams of cereal, 40 grams of milk powder, and 20 grams of oil per day. However, except for repatriates in Maghama Moukhataa in Gorgol Wilaya, the repatriates in all other sites unanimously expressed anxiety over the irregularity and insufficiency of these distributions (it had been over two months since receiving food for some of them). Only a minority of the repatriate villages were able to harvest any cereal crops this year because of timing, lack of supplies, and insecurity. Many in Trarza Wilaya are currently using small irrigated perimeters to grow garden vegetables. Some farmers are selling their produce in nearby markets, but most admitted that they consumed what they were able to harvest.

Displaced Touareg Population in the Far Southeast

Touareg pastoralists immigrated from Mali into the southeastern part of Hodh el Chargui in early 1988 as a result of bad grazing conditions (see Map 2). Last year there were still approximately 1,500 remaining in the region. This group was considered vulnerable in the 1989 FEWS Vulnerability Assessment. It is believed that most of these people have moved back into Mali, given the prevailing uncertainties in Mauritania. Hence, this group is no longer listed as a vulnerable group distinct from the other populations residing in the two Hodh *wilayas*.

Shantytown Dwellers

The urban population of Mauritania has more than doubled since the drought years of the last two decades, due to rural migration, and continues to increase at an alarming rate. Consequently, the capital of Nouakchott has experienced the growth of shantytowns spreading in all directions from the city center. Nouakchott's estimated population of 387,853 includes over 200,000 residing in these shantytowns (1988 census figures). The majority of these people are impoverished and earn limited incomes through labor intensive, menial jobs in the informal sector.

Since January 1990, the GIRM has been moving a large portion of the population from two major Nouakchott shantytown areas (Sebkha and el Mina) to locations between the eleven and fifteen kilometer posts (PK) south of the city (PK11-15 -- see Map 4). These locations have very little reliable infrastructure such as water, transportation, schools, electricity and medical facilities. While exact numbers of the

relocated population are not yet available, FEWS estimates that about 20,000 people have been affected and that this number is increasing. The shantytown dwellers are chronically vulnerable. Relocated shantytown dwellers are presently considered extremely vulnerable, or "at-risk," due to the decrease in their economic resources brought about by relocation.

The GIRM requires that all relocated people buy plots of land in PK11-15 at an equivalent cost of 100 U.S. dollars or higher. The majority of shantytown dwellers cannot afford to pay the price of land, much less build on a plot. Others will buy as much land as they can afford, and still others, many who already have homes or land in town, will buy to rent or build on later. This is leading to an evolving "ghost town" where many barracks are visible, but very few people are seen.

Terre des Hommes (TDH), a small, international non-governmental organization, reports an increased incidence of infant and child malnutrition in PK11-15. TDH has set up several tents at the PK11 site and is targeting women and children under five for nutritional and medical attention. Free water is currently being supplied by the GIRM via roving cisterns until pipes can be installed. Nevertheless, two truck loads per day is insufficient for the number of people affected and additional water is being sold by the barrel. Insufficient water supply and lack of proper sanitation suggest an increased probability of disease. Ad hoc markets have appeared at the PK11 site and food prices are much higher than prevailing prices in central Nouakchott markets. Regular transport into the city for school, work, and trade is expensive and many people find it impossible to afford.

High Infant Malnutrition in the North-central Wilayas

Tagant Wilaya has been identified as moderately vulnerable because of high rates of infant malnutrition found in an August 1988 UNICEF nutrition survey (see Map 2). Global infant malnutrition was found to be 65 percent, using a cutoff of less than 90 percent weight for height. A full 17 percent of the children were found to be acutely malnourished (less than 80 percent of the standard weight for their height). The total rural population of Tagant Wilaya is approximately 66,000. Following the demographic breakdown of the population, there are approximately 8,000 children in the Tagant under five years old. Extrapolation of the survey results implies that approximately 5,200 children are malnourished. Following these findings, UNICEF has opened 17 recuperation centers.

Inchiri and Adrar *wilayas* are also considered moderately vulnerable, because of high rates of malnutrition found by the GIRM in late 1987. Estimates of infant malnutrition in these two *wilayas* are 49 percent and 53 percent, respectively (less than 80 percent weight for height). Current logistic and financial constraints have restricted UNICEF efforts to expand operations in these areas. UNICEF has informed the

CSA of the situation and requested setting up food stocks in these areas.

Continued high rates of malnutrition in these north-central *wilayas* suggests a chronic problem that has been evident since the beginning of the drought years. Apart from some oasis-based cereal production and date harvesting, most of the population relies on their animal products and on cereals brought in from the capital. Difficult and irregular transportation from smaller villages to towns makes food access-related stress a recurrent problem.

Pastoral Populations

There are reports of unusual pastoral migration as far north as Tagant, Inchiri and Adrar *wilayas*. Many pastoralists migrated to these *wilayas*, which are dependant on outside cereal supplies, because of the relatively good 1989 rainfall and the problems with animal raiding and pasture fires close to the Senegal border. These *wilayas* produce very little cereal of their own and are identified as moderately vulnerable because of the population influx and possible increased food stress. Although no formal surveys of these population movements are available, the national livestock service estimates approximately 2,000 additional pastoralists have migrated to the three north-central *wilayas*. Overgrazing and water stress may also become a problem as a result of these migrations. The livestock service has been alerted to this situation and FEWS suggests continued monitoring of possible food and water stress to identify problem areas before the situation deteriorates.

Iron Ore Miners

Iron ore production occurs in the northern portion of the country in the towns of F'Derik and Zouerate. Mining was Mauritania's primary export commodity until the early 1980s, when international prices for iron ore decreased. However, for the past four years, mining production has progressively increased with concurrent increases in employment and stable salaries. There are approximately 4,700 full-time employees, who are considered only slightly vulnerable.

Coastal fisherman

In 1983, industrial fishing replaced iron ore mining as the prime source of Mauritania's foreign exchange earnings and retains that importance despite recent statistics indicating a decline in the volume of catch (average recorded catch is 450-500,000 tons a year). Mauritanian participation in the national industrial fishing is small (about two thirds is Korean), but there are ongoing training programs for improving Mauritanian commercial fishing skills. The GIRM has emphasized coastal artisanal fishing in the last few years. This sector is significantly smaller than the commercial fishing sector and employs approximately 7,000 fishermen, with a yearly catch of 9-10,000 tons.

Artisanal fishing in Mauritania was traditionally undertaken by three main social groups: Imragan (a Maur group), Wolof (with Mauritanian citizenship) and Senegalese fishermen. The most productive group of these was the Senegalese, whose participation decreased by 60 percent after April 1989. Over the past year, the GIRM and other donors launched many training programs for repatriates. In addition, they have furnished boats and other needed materials, which have encouraged a resurgence of the coastal artisanal fishing sector. As a result, few severe repercussions from the changes are foreseen and coastal fishermen are only slightly vulnerable.

Conclusion

The Senegal River Valley is home for approximately 300,000 people. OAR/M estimates that about 75,000 (25%) of those people are extremely vulnerable to, or "at-risk" of, famine in 1990. The problem will be intensified if the GIRM continues to refuse to recognize the vulnerability of these people. GIRM insistence of stability and good harvests in the river valley remains the largest obstacle to effective intervention. Anecdotal reporting on changes in behavior and price data may be the most important indicators to follow for the continued monitoring of this population.

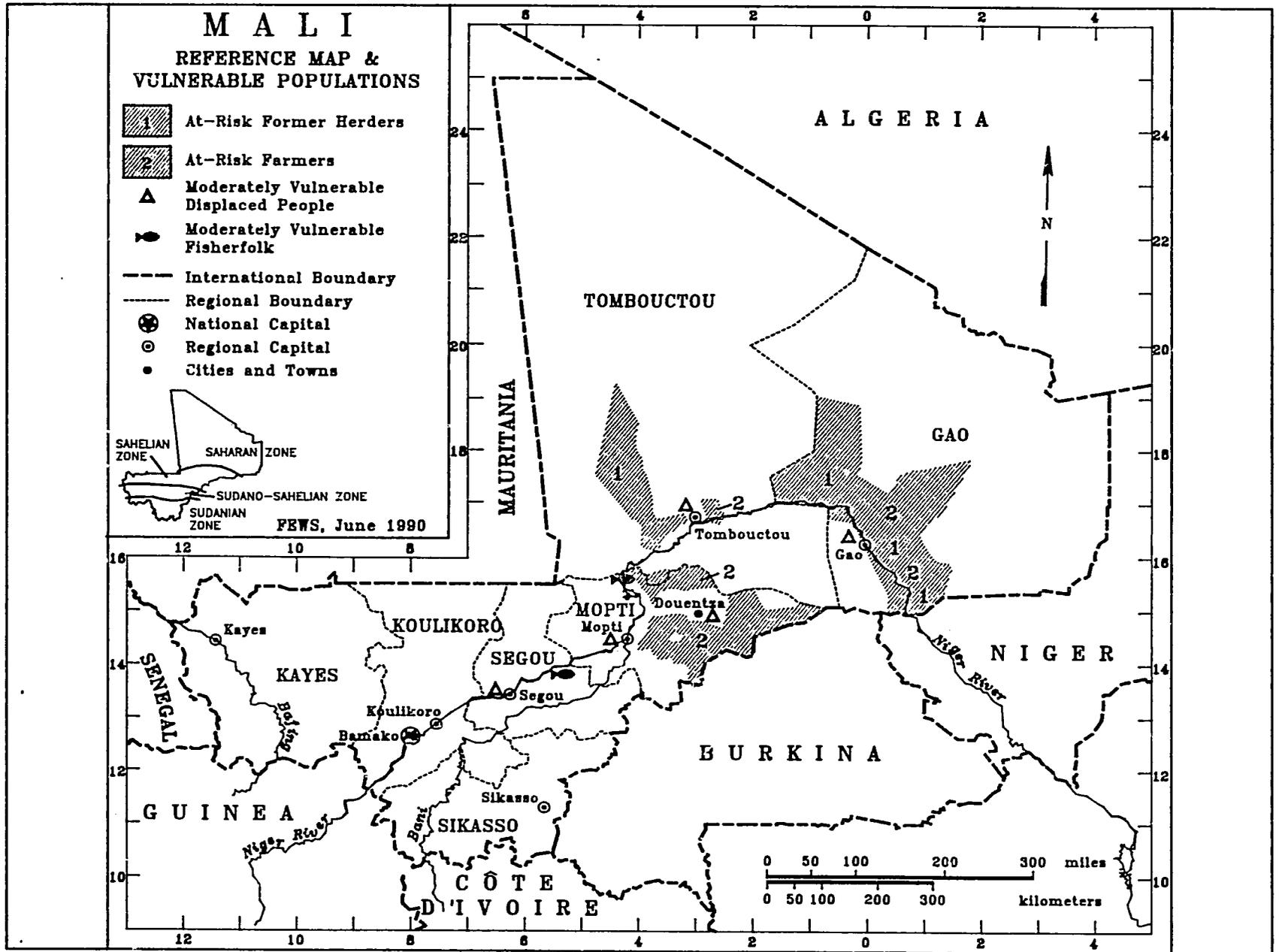
Approximately 5-6,000 Nouakchott shantytown inhabitants residing in PK11-15 are classified as extremely vulnerable or "at-risk" of famine in 1990. A total of 20-25,000 people are reported to have been relocated to PK11-15. This number is steadily increasing. Price and nutrition indicators will be the most useful information for continued follow-up in the shantytowns.

Repatriated populations, although still moderately vulnerable, must be continually monitored and receive food-aid because of their dependence on food aid distributions and material support. They continue to lack any economic or financial security.

Children under five living in the north-central *wilayas* of Mauritania are chronically vulnerable. Vulnerability as monitored by malnutrition levels was sufficiently high in Tagant Wilaya that immediate intervention was necessary and action taken by UNICEF. The other north-central *wilayas* should be surveyed by the Ministry of Health in case similar situations exist there.

All other moderately vulnerable groups identified in this report should be closely monitored by following the usual early warning indicators, including rainfall, normalized difference vegetation index (NDVI, see inside back cover), agricultural production, prices, and nutrition data.

Map 5: Mali Reference Map and Vulnerable Populations



MALI

Extremely Vulnerable Farmers in Sahelian Zone

USAID and FEWS/Mali Report Received in Washington May 21, 1990

Summary

Vulnerable socioeconomic groups in Mali for 1990/91 include extremely vulnerable agriculturalists in the Sahelian Zone, moderately vulnerable displaced populations and fishing communities, and slightly vulnerable pastoralists and agro-pastoralists (see Map 5). Free food distributions, intended to reduce the food insecurity of farmers in regions designated "at-risk" by the Système d'Alerte Précoce (SAP-Mali) in 1989, were not timely due to disagreements on numbers and locations. USAID field trips verified that people in "at-risk" arrondissements have depleted food stocks and are showing signs of food stress. Timely delivery of programmed free food to currently "at risk" populations will be a key determinant in their ability to cope in the months before the next harvest, and is an important variable in determining any change in their vulnerability.

Populations in the arrondissements of N'Gorkou, Sah, Korientze, and Ningari and in the cercles of Bandiagara, Douentza, and Koro (see Map 7) could face famine as early as October 1990 if the scheduled free food distributions are not begun in the Mopti Region and crops fail due to poor rainfall or pest infestations. Identified "at-risk" populations are doubly disadvantaged entering the 1990 agricultural season because their hunger reduces agricultural productivity and the threat of a repeat of last year's large grasshopper infestation could discourage out-migrants from returning home to cultivate in 1990. Reduced productivity, declining labor supply and decreased area under cultivation would lower production relative to last year and particularly affect those areas that experienced large grasshopper infestations in 1989.

Methodology Application

Household income for the majority of Mali's population derives from an agricultural sector dependent upon rainfall, which is highly variable in space and time. Following a twenty year trend of diminishing rainfall, the 1982-84 drought reduced household resources to a minimum and contributed to the degradation of the natural resource base used to cope

with drought (ex., livestock, gathered foods, etc.). The various socioeconomic groups have employed different strategies for coping with this situation. However, the effectiveness of these strategies depends upon many factors, including how often each strategy has been employed. "Coping" implies a temporary alternative allowing users to meet minimal needs until a crisis has passed. In northern Mali the continued trend of below average rainfall and what appears to be a new trend in increasing crop losses due to insects and plant diseases have resulted in a "perpetual crisis" that has reduced the effectiveness of coping strategies. Consequently, specific socioeconomic groups have become chronically vulnerable to famine and the gradual onslaught of famine has taken on an accelerated pace, leaving decision makers with less time to react to the crisis.

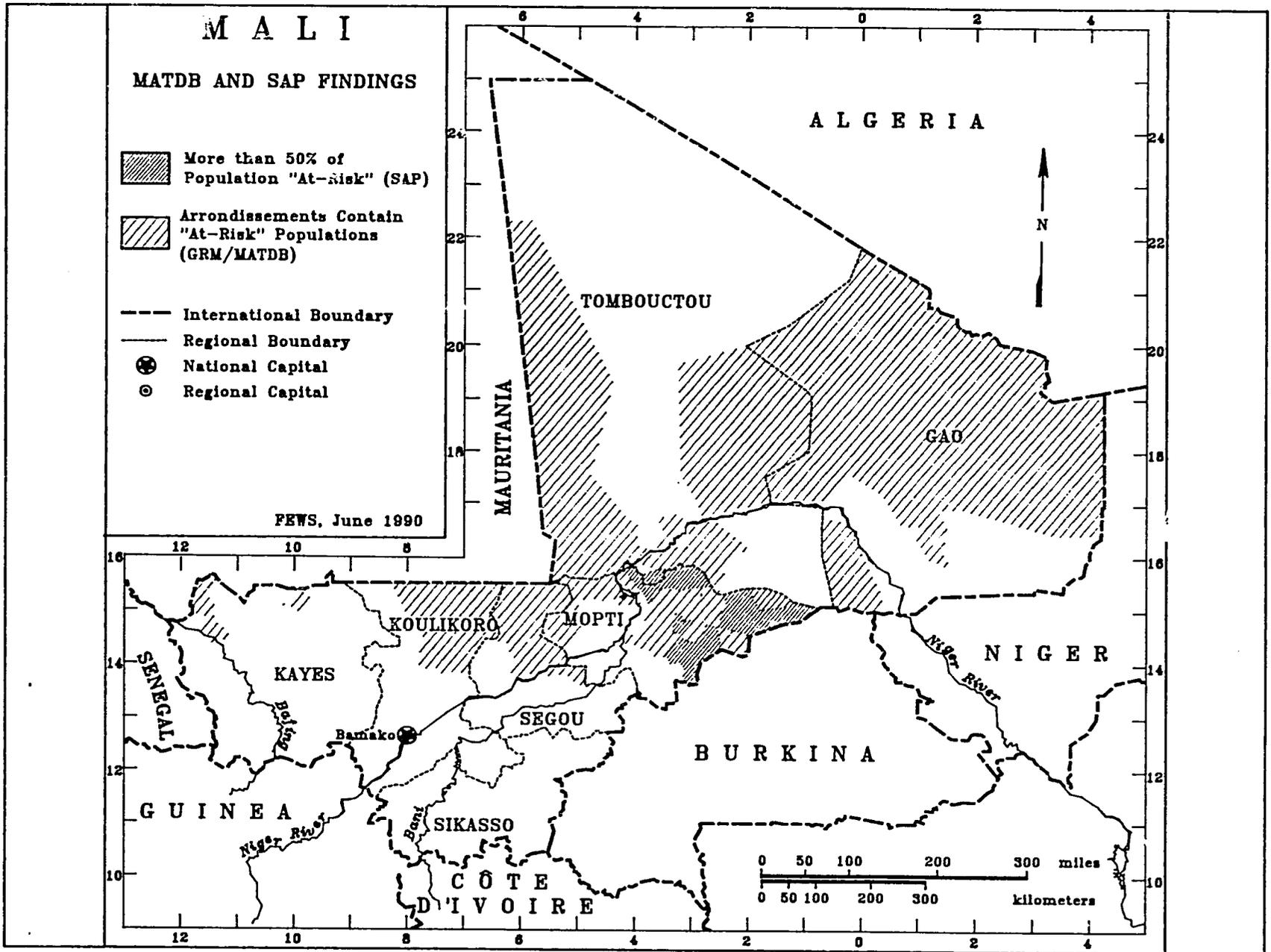
The 1990 vulnerability assessment utilizes information on the resources available to the identified socioeconomic groups to anticipate the vulnerability of these groups and judge their respective capacities to cope in 1990/91. Data on arrondissements monitored by SAP were provided courtesy of that project. Other data come from a variety of sources, including existing documents and data bases of the FEWS library. Appropriate household-level data on the different groups is incorporated when available. Nutritional data were unavailable for use in this assessment. This 1990 assessment should be seen as a preliminary examination of vulnerability to be built upon in subsequent years. Further in-depth examination is needed of the long-term consequences of "perpetual coping" with recurrent drought.

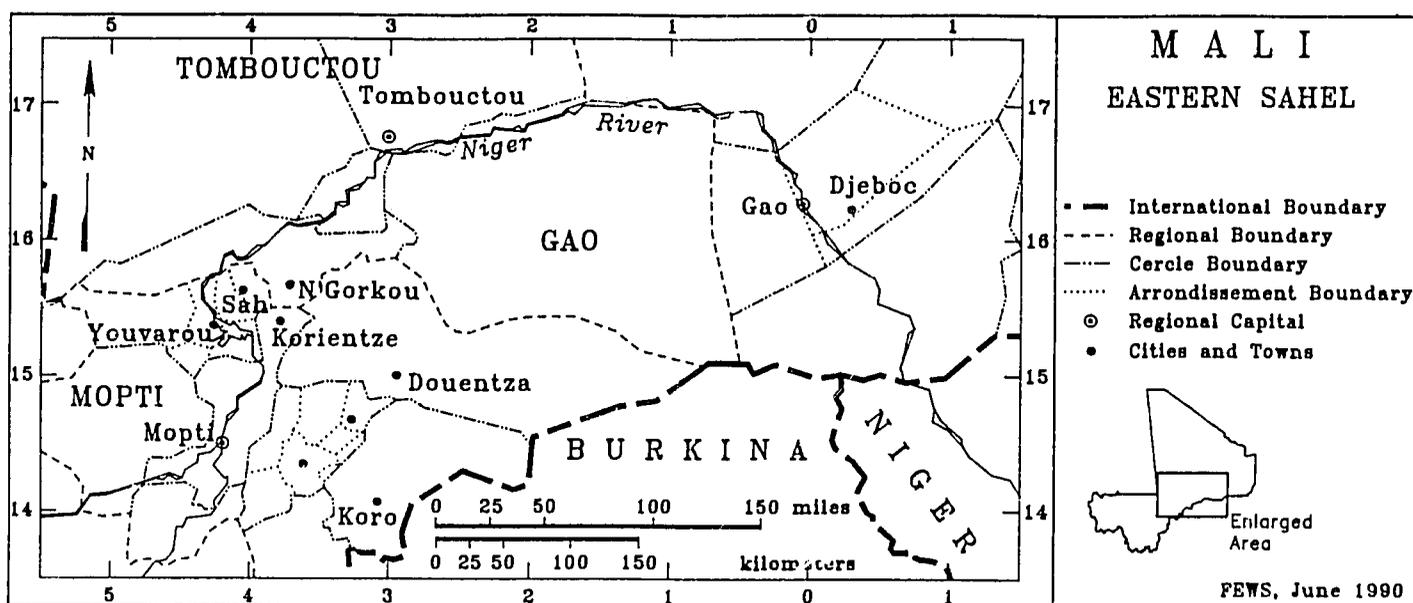
Analysis of Socioeconomic Groups & Subgroups

Agriculturalists in the Sahelian Regions

Agriculturalists in Mali's Sahelian Zone are the most vulnerable socioeconomic group as the 1990-91 agricultural season begins. Approximately 200,000 people in eleven arrondissements designated "at-risk" by the SAP in January 1990 have not received programmed assistance as of mid-1990 (see Map 6) and the start of the rainy season. USAID field missions to SAP-designated "at-risk" and certain arrondissements classified as "at-risk" by the Ministry of the Interior (MATDB) confirmed the extreme vulnerability of these

Map 6: SAP and MATDB At-Risk Zones





Map 7: Magnification of the Eastern Sahelian Zone in Mali

populations. In some cases, inhabitants reported selling clothes, agricultural equipment and draft animals to purchase grain on the market. Free food distributions to SAP "at-risk" arrondissements were agreed upon in March 1990 by the Programme de Restructuration du Marché Céréalière (PRMC - donor group). GRM insistence on additional donor financing of free grain distributions in 64 arrondissements delayed assistance to the SAP "at-risk" arrondissements. A recent compromise between the GRM and donors through the Comité d'Orientation et Coordination (COC) agreed to the wider distributions, but at a cost of reduced individual quantities.

SAP designated "at-risk" arrondissements will receive 2,473 metric tons (mt) of grain (half the SAP recommended quantities) and the Ministry of the Interior (MATDB) will allocate 1,000 mt each to Gao and Tombouctou Regions. Areas that have been designated "at-risk" by others, including Mopti Region arrondissements identified by USAID personnel, will receive 1,527 mt. The MATDB has not finalized specific distribution sites, although of 75 arrondissements it originally noted as "at-risk," 32 were in Gao and Tombouctou regions (See Map 6). Distribution quantities varied from 20 to 150 tons, with most arrondissements scheduled to receive under 60 tons. CARE has agreed to provide transportation from its truck fleet in Mopti Region. It is questionable whether the quantities received will allow farmers to cultivate to capacity. Individuals will receive 3.5 kilograms (kg) per person per month, half the SAP consumption recommendations of 7 kg per person per month (Mali minimum requirement is about 14 kg per person per month).

People in the arrondissements of N'Gorkou, Korientze and Youvarou and in the cercles of Bandiagara, Douentza, and Koro (see Map 7) are particularly vulnerable to a poor

1990 harvest. Traditional gathered foods are currently being harvested, including *Boscia senegalensis*, and the wild *fonio* harvest is expected from mid-August to mid-September depending on rainfall. Gathered foods and programmed assistance will improve present access to food, but increased competition for gathered foods in 1990 will limit the quantity available. Relief assistance in the next few months could be delayed because of the impending rainy season. Given the present precarious position, people in these areas may face famine at the 1990 harvest (October/November), if the harvest fails due to drought or pest infestations.

Former pastoralists in Gao and Tombouctou regions, now sedentarized agriculturalists, are chronically vulnerable given the fragility of the environment and their lack of agricultural expertise. These populations lack reserve resources to cope with a poor agricultural season and are considered highly vulnerable going into the 1990/91 season. Their 1990 food security situation would improve if the previously mentioned programmed assistance were to reach this target population in a timely manner.

Displaced Populations

Moderately vulnerable displaced populations exist around the towns of Gao, Tombouctou, Mopti, Douentza, and Ségou (see Map 5). Displaced populations that congregate around towns form peri-urban groups (*population flottante*). These groups are principally composed of former rural inhabitants who lost significant resources in previous droughts. The poor 1989/90 harvest in Mopti Region resulted in a large influx of migrant laborers into the town of Mopti. Suivi Alimentaire du Delta Seno (SADS) reports competition for jobs, in some localities, has reduced wages to half the 1988/89 levels. However, relatively low Mopti cereal prices since the harvest,

reflecting the satisfactory national harvest, have allowed continued access to food. A poor harvest in 1990/91 would drastically change this situation.

In general, displaced populations have neither land nor animals for their own production. They rely on labor and food markets to meet their income and consumption needs. Peri-urban displaced populations are chronically vulnerable because they lack the diversified income possibilities of other socioeconomic groups (ex., gathered foods for agriculturalists and pastoralists). Displaced people may become extremely vulnerable in a poor agricultural year. The peri-urban poor would then face decreased real wages from an increased supply of labor market entrants and increased prices for cereals from reduced agricultural production.

Fishing Communities

Fishing communities along the inland Delta are completing this year's season (end of migratory fishing is July-August) in a moderately vulnerable position. SADS reports that the fishing campaigns in the last three years have all been mediocre. The factors identified as being detrimental to the success of fishing as a livelihood in the Delta include: strong demographic pressures in the Delta, increased demand for fish within Mali outside the Delta, improved fishing technology increasing take-off rates, slow degradation of the aquatic environment from adverse climatic conditions, and breakdown of traditional management structures for protecting the fishing stocks of rivers and flood plains. The deteriorating environmental conditions affecting the supply of fish are persistent below-average river levels and rainfall. Flood levels of all Malian water courses in 1989/90 were their lowest since 1984 (one of the worst recorded years). The resultant increase in vulnerability of fishing groups in Mali was mitigated in 1989/90 by the increased price for fish, which compensated for higher grain prices and left the terms of trade relatively unchanged from the previous year.

Pastoralists and Agro-Pastoralists

In 1990 pastoralists and agro-pastoralists are the least vulnerable groups in Mali. Pasture conditions have generally improved throughout Mali since the 1984 drought and livestock owners have reconstituted herds (See Table 1). However, the redistribution of livestock ownership during and after the drought is unclear. People who retained or obtained breeding stock, or benefitted from herd reconstitution projects, have slowly rebuilt herds. Many herds simply changed hands during the drought and ownership of reconstituted herds could lie with a relatively small group of wealthy livestock owners (ex., urbanites sheltering wealth or investing). Many former pastoralists have become sedentarized agriculturalists or peri-urban dwellers, as discussed above, and no longer maintain herds.

Table 1: Livestock Numbers by Region in Mali

CATTLE			
Region	1983	1985	1987
Kayes	732,000	525,000	735,000
Koulikoro	724,000	628,000	705,000
Sikasso	1,053,000	1,101,000	1,228,000
Segou	720,000	555,000	554,000
Mopti	1,560,000	1,062,000	1,014,000
Tombouctou	558,000	295,000	244,000
Gao	314,000	148,000	79,000
Bamako	15,000	30,000	30,000
Total	5,676,000	4,344,000	4,589,000
SHEEP/GOATS			
Region	1983	1985	1987
Kayes	920,000	921,000	1,062,000
Koulikoro	1,173,000	1,440,000	1,796,000
Sikasso	614,000	-	581,000
Segou	1,391,000	1,308,000	1,154,000
Mopti	3,231,000	2,922,000	2,788,000
Tombouctou	1,491,000	1,045,000	1,231,000
Gao	2,379,000	1,720,000	1,857,000
Bamako	45,000	50,000	60,000
Total	11,244,000	12,553,000	10,529,000

Source: Direction Nationale de l'Elevage

Higher cereal prices (100 West African Francs (FCFA) per kg) around Gao and Tombouctou have resulted in a slight deterioration in the terms of trade for pastoralists and agro-pastoralists. In response, pastoralists have diversified their productive opportunities by cultivating *fonio* and sorghum. This adaptive production behavior was confirmed by a study near Gao in Djeboc Arrondissement (see Map 7) for the post-drought period of the mid-1980s. A good 1989 *fonio* harvest has allowed households to meet a portion of their cereal food needs from their own production. Pastoralists

and agro-pastoralists are still comparatively well situated, despite declining terms of trade, and considered only slightly vulnerable as they enter the 1990/91 agricultural season.

Conclusion

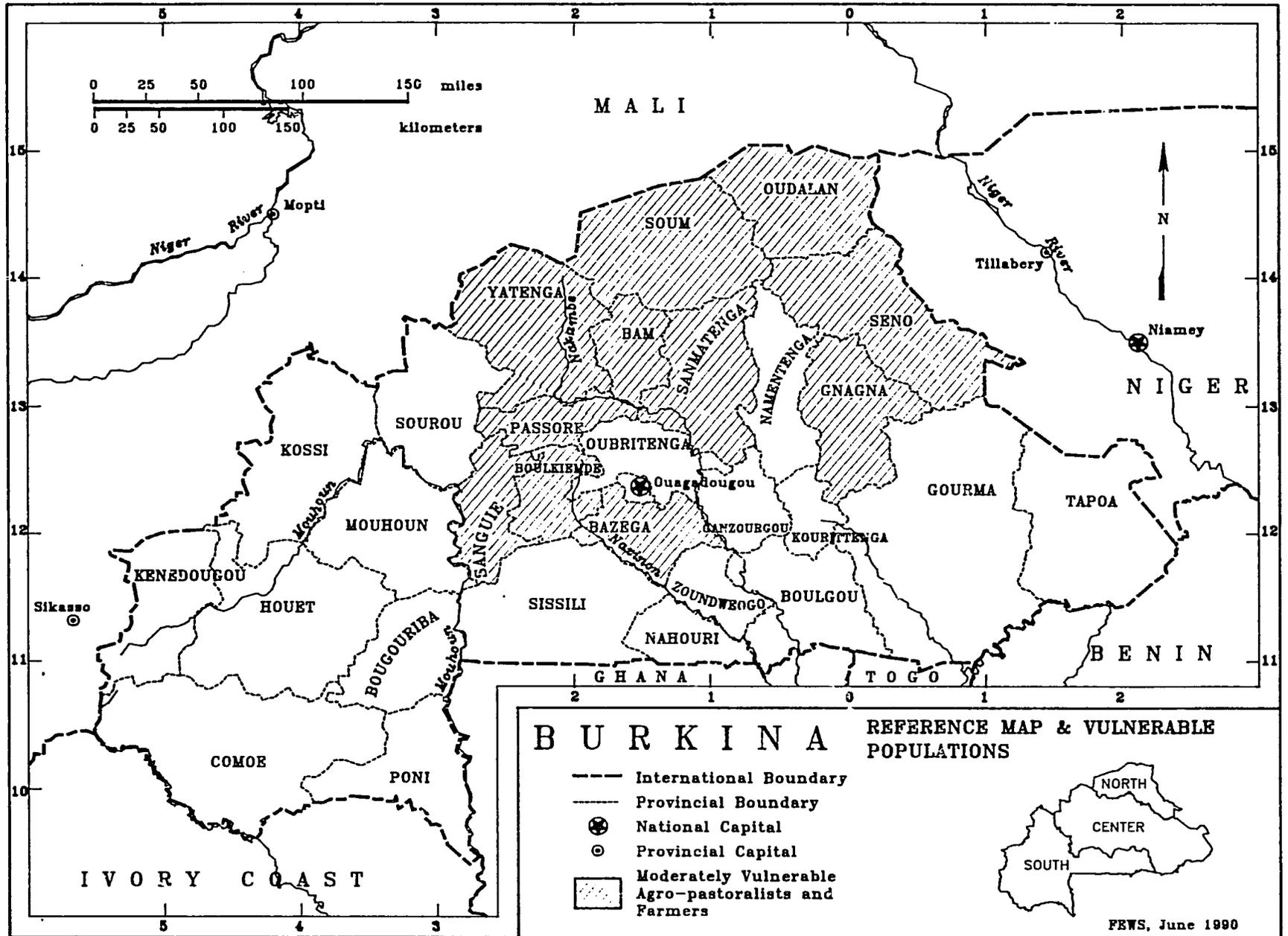
The locations of the most vulnerable socioeconomic groups in Mali, Sahelian agriculturalists and former pastoralists in Gao and Tombouctou regions, are depicted in Map 5. These populations are presently facing food access related stress. A key to alleviating their present status is insuring that programmed food aid reaches these target populations in the coming months.

The status of moderately vulnerable populations in Mopti Region may deteriorate quickly if drought-induced crop failure or renewed grasshopper infestations occur in 1990/91. Massive population movements from these areas at harvest would signal a decline in the food security situation, possibly

resulting in famine. Information on rainfall, vegetative growth via satellite imagery, grasshopper infestations and the effectiveness of control efforts, as well as population movements at harvest, will allow continuous monitoring of the progression of the crucial 1990/91 agricultural season.

Inefficiencies in the food distribution process and ineffective response mechanisms within Mali, including no agreed upon criteria for classifying populations "at-risk," lead to annual delays in getting assistance to needy people. Delayed food distributions in 1990 have exacerbated the current vulnerability of SAP designated "at-risk" arrondissements. Long delays in implementing assistance, resulting from nonexistent or ineffective response mechanisms, have negated the effectiveness of this early warning. This experience has highlighted the need to tie early warning to effective response mechanisms. Present donor community emphasis solely on early warning without concurrent monitoring of the response process may be a misallocation of resources. This problem warrants serious reflection.

Map 8: Burkina Reference Map and Vulnerable Populations



BURKINA

Northern Provinces Moderately Vulnerable

USAID and FEWS/Burkina Report Received in Washington May 16, 1990

Summary

The 1990 vulnerability assessment identifies women of childbearing age and infant children of smallholder agriculturalists and agro-pastoralists in eleven provinces of the central and northern regions of Burkina (see Map 8) relatively as being moderately vulnerable to famine in 1990. The estimated number of moderately vulnerable people is 1.18 million, approximately 37 percent of the total population in these eleven provinces.

Cereal production minus consumption needs (here called the cereal balance) was below average in eleven of thirty provinces in 1989. Reduced cereal production compelled households in the identified groups to purchase a large portion of their cereal needs, deplete household resources, and reduce cereal consumption. Some atypical migration has occurred and a small number of people in the Sahelian provinces have been designated "at-risk," prompting a modest food aid program by the Government of Burkina (GOB). The situation will become critical, particularly for women and children, if the cereal balances in these provinces are below average in 1990.

successive years, in areas where cereals are the major food consumed. If the cereal balance for the year is below the average annual balance, households must shift resources to purchase cereals and reduce expenditures on other important consumer goods (health, schooling, inputs, etc.). This strain on household resources is aggravated if cereal prices rise. A population's vulnerability to famine increases with major crop failures in successive years and high cereal prices that deplete household resources.

Possible 1990 areas of food access related stress were determined by calculating the 1985-89 cereal balance for each province, using cereal production data from the Ministry of Agriculture and Livestock (MAE). Provincial population figures were determined for June 1991 from exponential extrapolations of 1985 census figures. Provincial cereal balance results presented in Table 2 show ten provinces in the central and northern regions of Burkina where the cereal balance is less than the 1985-89 average. Although less deficit in 1989 than average, Oudalan Province in northern Burkina had very large deficits for the last five years brought on by repeated severe drought conditions; it also needs to be closely monitored in the coming season. These 11 provinces have large numbers of two of the most vulnerable socioeconomic groups in Burkina: women of child bearing age, from 15 and 49 years old, and children less than four years old in smallholder agriculturalist and agro-pastoralist households.

Methodology Application

The main determinant of food security issues in Burkina is annual production of the staple food, rainfed cereal. Cereal production in a given year is primarily determined by the rainfall pattern in the single, short growing season. Although cereal production methods are well adapted to the three agro-climatic zones of Burkina, rainfall is highly variable in both space and time, greatly influencing cereal yield and production. This variability creates cereal surplus and deficit areas. After harvest, cereals move between surplus and deficit areas via private commercial markets and the government cereals board (OFNACER).

The cereal balance relates net cereal production (85 percent of gross) to the consumption needs of the population (assumed to be 180 kilograms per person per year). Food access related stress is assumed to occur when a provincial cereal balance is below the 1985-1989 average for two or more

Analysis of Socioeconomic Groups & Subgroups

Smallholder Agriculturalists

Smallholder agriculturalists make up approximately 80 percent of the 2.5 million people living in the eight vulnerable provinces of central Burkina, and perhaps 15 percent of the 588,000 people living in the three northern provinces (Soum, Oudalan and Seno). Their annual incomes are generally below the country average of \$US 200 per capita. They inhabit the relatively densely populated Central Plateau of Burkina, where the variability of per hectare cereal yield is highest and soil fertility is declining due to shorter fallow periods. These subsistence farmers have limited household resources that include bicycles, radios, livestock, agricultural

Table 2: 1988-89 Cereal Balance for Burkina (mt)

Province	1988	1989	1985-89 Average
Sahel (Extremely Vulnerable)			
Oudalan	-8,058	-7,903	-10,845
Seno	3,858	-22,000	-12,090*
Soum	179	-20,007	-15,311*
Central Region (Extremely Vulnerable)			
Sanguie	13,017	867	2,146*
Sanmatenga	17,029	-17,091	-8,017*
Bam	1,825	-8,526	-5,935*
Bazega	-2,108	-32,014	-3,445*
Boulkiemde	10,131	-14,796	-8,005*
Yatenga	-12,226	-38,798	-36,724*
Passore	26,529	-9,073	2,859*
Gnagna	6,209	-1,847	9,145*
Central Region			
Ganzourgou	12,664	9,861	3,786
Kadiogo	-101,072	-88,566	-92,237
Kouritenga	-16,497	-10,239	-15,417
Tapoa	-1097	6,419	1,114
Sourou	5,922	1,259	-2,083
Namentenga	16,362	16,362	-7,062
Oubritenga	-4,290	-4,290	-2,605*
Gourma	22,191	23,848	12,225
Southern Region			
Bougouriba	1,790	3,637	8,268*
Boulgou	1,838	19,886	5,067
Houet	44,853	39,796	11,482
Kossi	43,480	50,763	28,355
Kenedougou	13,880	18,889	13,958
Comoe	20,381	13,611	17,165*
Nahouri	-6,049	-16,633	-7,052*
Mouhoun	16,232	21,628	12,298
Poni	-11,875	310	-3,985
Zoundweogo	-2,985	-9,145	-1,800*
Sissili	4,768	24,964	2,509
Total	116,882	-58,347	-102,238

* = 1989 is less than average

Source: Ministry of Agriculture, FEWS

implements, stored grain and remittances from family members working elsewhere (approximately 1.5 million Burkinabé work in Ivory Coast). The bulk of household income derives from sorghum and millet production, which in most years is enough to cover dietary needs. Cereal is sold on the market to obtain cash for medical care, weddings, funerals and consumer goods. Annual income for these smallholder agriculturalists is highly dependent on the quan-

tity and distribution of rainfall. Crop production, and hence income, is also vulnerable to attacks from grasshoppers and locusts.

Additional household income from remittances is largely dependent on the economic situation in neighboring Ivory Coast. In recent years, the Ivory Coast economy has deteriorated following decreased export earnings from their primary commodity exports. Current civil unrest in Ivory Coast has put additional pressure on the Burkinabé to leave. Quantifying returned Burkinabé is difficult, but, if a large scale return were to occur, the loss of remittance income and the influx of additional people would seriously increase stress on already limited household resources.

Smallholder agriculturalists in northern Burkina have access to artisanal gold mining sites (see Map 9). Artisanal sites employ about 75,000 people and annually produce 4.7 metric tons (mt) of gold. Daily estimated income per miner averages between 400 and 2,500 West African Francs (FCFA), enough to feed a family for a day or a week, respectively, at the current millet price of 85 FCFA per kilogram (kg).

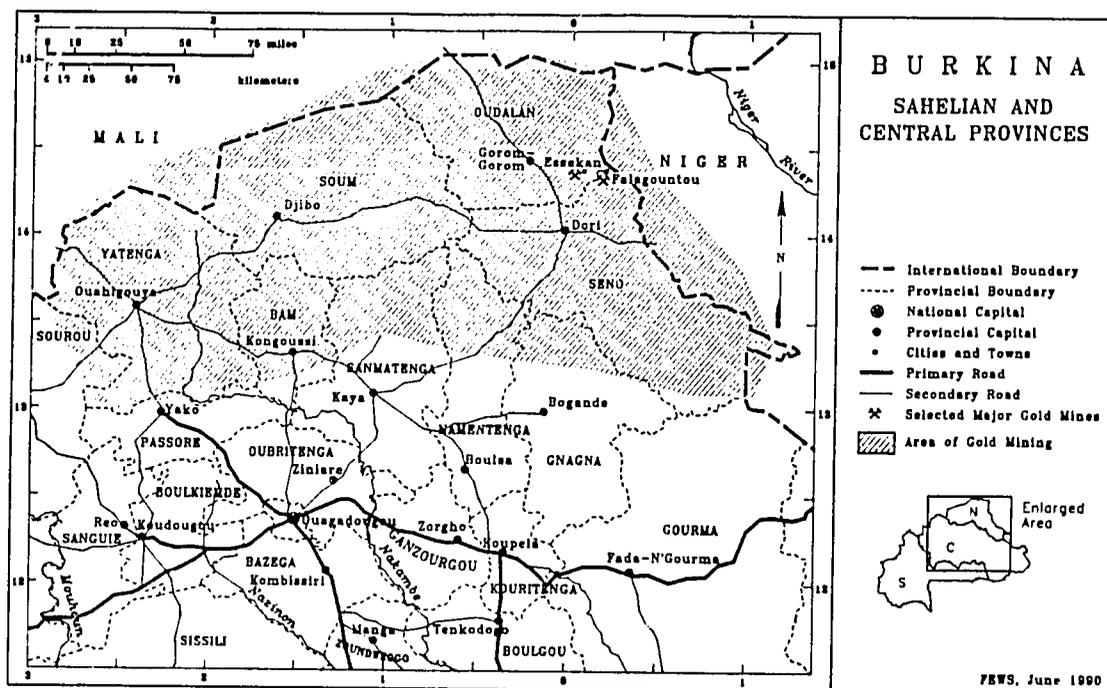
Agro-Pastoralists

Agro-pastoralists comprise approximately 80 percent of the population in the three northern provinces of Burkina and perhaps 10 percent of the eight vulnerable provinces of central Burkina. Agro-pastoralists grow cereals, but not as intensively as agriculturalists, due to the unfavorable climate for cereal production in northern Burkina. Agro-pastoralist household incomes mainly result from livestock production (cattle, sheep and goats). Agro-pastoralists also have access to remittances from family members working in neighboring countries and artisanal gold mines.

The wealth and income status of agro-pastoralist households is primarily influenced by the quantity and quality of pasture produced in the rainy season and the cattle markets of neighboring coastal states and urban Burkina. Livestock market outlets in neighboring states have declined in recent years. Decreasing incomes in Nigeria, due to lower oil prices, and competition from imported beef in Ivory Coast, have decreased marketing possibilities. Marketing in Ouagadougou is costly because of unofficial taxes levied in bringing livestock to market. It has become increasingly difficult for agro-pastoralists to recover from the devastating effects of the 1983-84 drought, especially in Oudalan Province.

Subgroups

Among agriculturalist and agro-pastoralist populations, women of child bearing age and infants are most vulnerable to the diseases related to reduced food consumption. Nutrition studies indicate that infant malnutrition rates of 10 to 30 percent are not uncommon even in "good" years. These high rates point to an extremely high chronic, or baseline, vul-



Map 9: Gold Mining Areas in North Central and Sahel Provinces

nerability which, in conjunction with cereal shortfalls, create household food poverty and individual food deprivation. Under these conditions, women and children are the first to suffer increased morbidity.

For the eleven provinces identified as moderately vulnerable, women between the ages of 15 and 49 years comprise approximately 23 percent of the total population. Children under the age of four years constitute about 18 percent of the same population. From provincial demographic data these figures result: in around 1.18 million moderately vulnerable people who require close monitoring in 1990.

Others

Other socioeconomic groups that are presently considered slightly vulnerable include urban wage earners, urban poor, craftsmen, largeholder agriculturalists, and merchants. Groups inhabiting southern Burkina are rarely subject to food stress because the area experiences well-distributed and plentiful rainfall. Although these people are also agriculturalists, farms in these areas are generally larger and more diversified than in other parts of Burkina due to cash crops such as cotton and maize. In the 1984 drought most southern provinces did not require food aid assistance. However, production shortages in the south can have a profound affect on cereal availability in the central and northern regions, because southern surpluses provide marketed cereal to the chronically cereal deficit areas in the rest of the country.

Conclusion

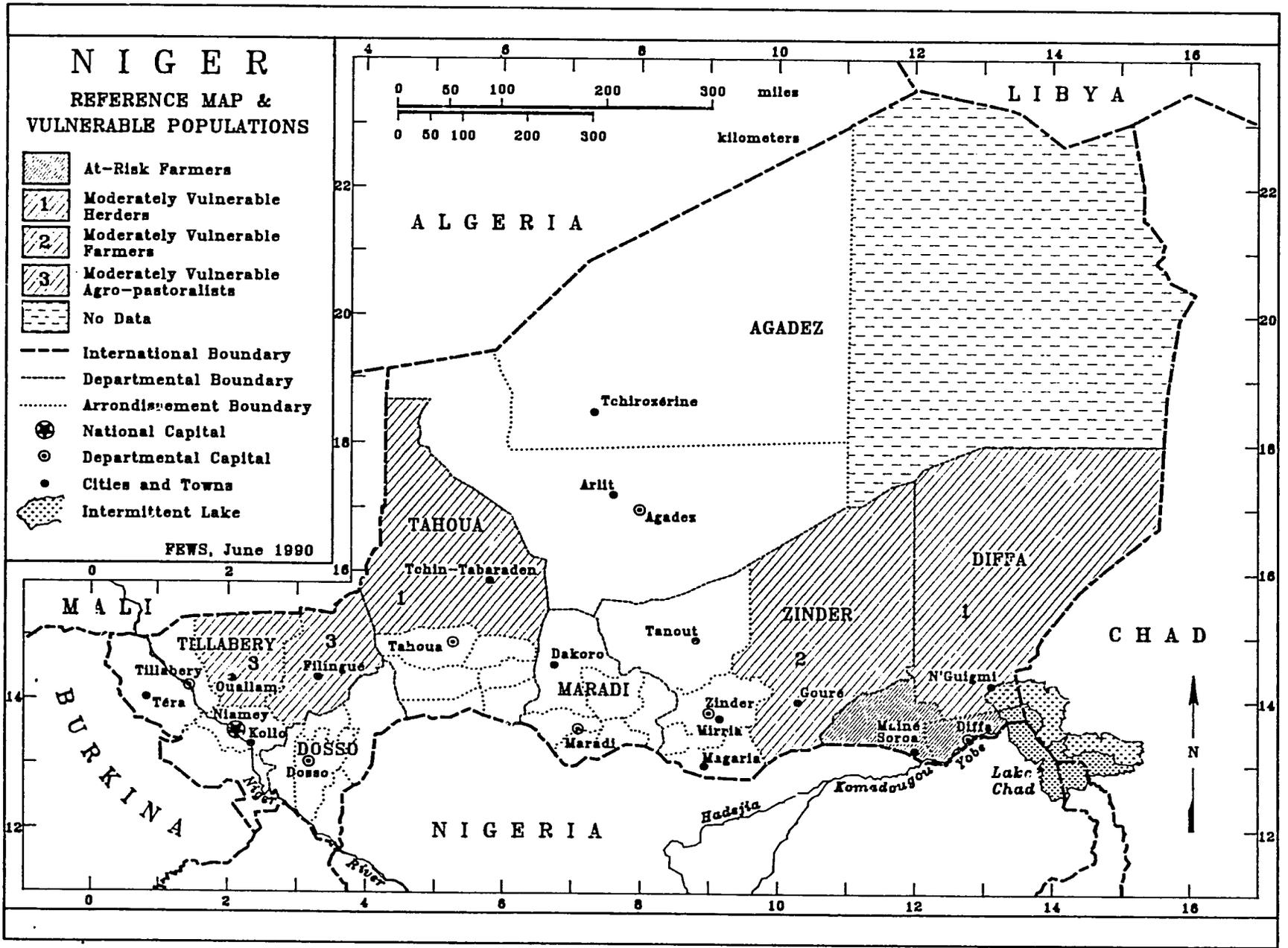
Women and infants, numbering approximately 949,000 and 229,000 in the eight Central Plateau and three Sahel

provinces, respectively, are moderately vulnerable to food access related stress in 1990. These women and children are members of resource poor families of smallholder agriculturalists and agro-pastoralists, not fully recovered from the drought of 1984. These groups are judged vulnerable from the below average provincial cereal balances in 1989 and subsequent depletion of household resources.

These groups and the areas in which they reside will be closely monitored in 1990 for information on the quality of the agricultural season and its impact on cereal and forage production. Indicators that will help assess the quality of the coming growing season include the distribution of rainfall, soil water balance models, crop reports and satellite imagery of vegetative growth. A large increase in the price of cereal, to 120 FCFA per kilogram for example, would reinforce information from these physical indicators if a poor agricultural season emerges. The ratio of female cattle to total cattle sold in northern markets would indicate how desperate cattle producers (mostly agro-pastoralists) are for cash. Without female animals these groups can not rebuild herds. This and other anecdotal information is being monitored by the Drought Commission of the GOB (CNLES).

If rainfall is poor in 1990, a large percentage of people in the moderately vulnerable provinces will become "at-risk," or extremely vulnerable, to food shortage, necessitating emergency assistance. Interventions of food aid or other assistance, such as seeds, may become necessary. Assistance that will be most appropriate in a long-term development context would target the identified most vulnerable groups of women and children. Possible programs would include vaccination campaigns and Maternal Child Health projects.

Map 10: Niger Reference Map and Vulnerable Populations



NIGER

Extremely Vulnerable Groups Need Good Rains

USAID and FEWS/Niger Report Received in Washington June 8, 1990

Summary

Food insecurity is near average for Niger as a whole, but regions near Lake Chad (Mainé-Soroa, Diffa, N'-Guigmi arrondissements), Zinder (Gouré arrondissement), Tchín-Tabaraden and north of Niamey (Filingué and Ouallam arrondissements) (see Map 10) are moderately to extremely vulnerable due to the lack of adequate food supplies. These areas would be adversely affected by poor rains in the coming growing season. Within these regions childbearing women and children under five years of age are considered the most vulnerable to food insecurity. If rainfall is not near or above average throughout Niger this growing season, then a general increase in vulnerability due to poor food production and depleted reserves is to be expected.

Country Background

Niger is a landlocked country with 75 percent of the land area desert and the remainder semi-arid with a single wet season. The main sources of food are dry land agriculture and livestock, with 24 percent of the country considered potentially useful for agriculture or livestock production.

Niger, a low income economy with a per capita income of 310 US dollars (World Bank, 1988), suffers from increasingly poor terms of external trade. An estimated 85 percent of the 7.8 million people are farmers, herders or agropastoralists who rely on their own family unit based production for the major part of their annual food needs. The remaining 15 percent are urban residents, who also rely on domestic production for a large part of their food needs. In many areas population density is placing heavy pressure on fragile ecosystems.

In Niger food production correlates more highly with rainfall than any other commonly monitored indicator. Based on rainfall, food production land use can be divided into four zones:

- A predominantly cereal production zone, where the probability of exceeding 350 millimeters (mm) of rain

is greater than 80 percent and rainfall is not a limiting factor except during severe drought;

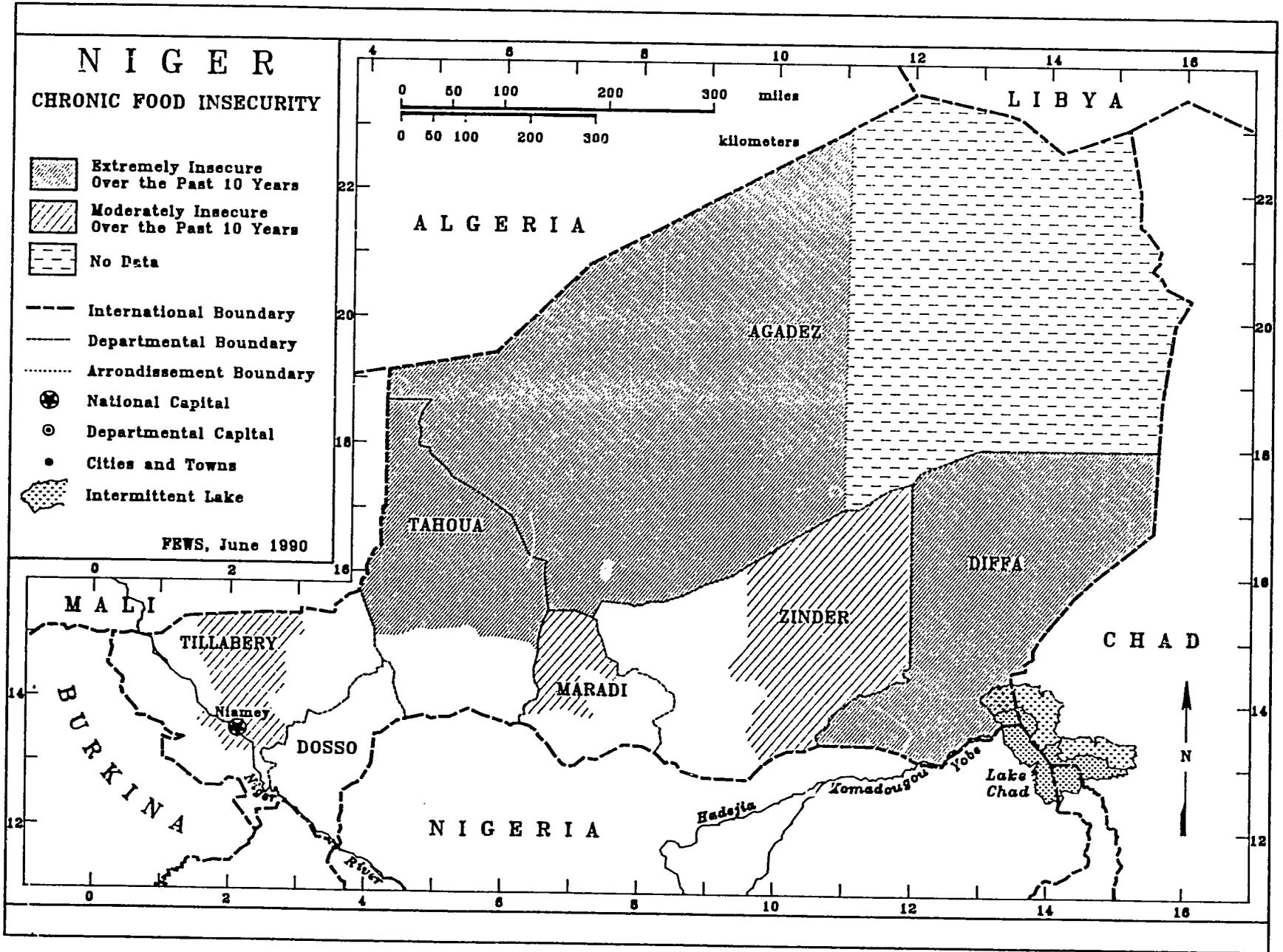
- An intermediate zone where rainfall variability is greater, the probability of receiving 350 mm of rain is less than 80 percent and farmers are more concerned with minimizing risk than maximizing production;
- A predominantly pastoral zone where rainfall is normally between 100 and 350 mm and soil, vegetation, and land forms allow livestock production based on transhumance; and,
- Special use areas, such as the Niger River Valley, Lake Chad Basin, rain fed depressions, seasonal and ancient water courses, scattered oases, and irrigated perimeters, such as gardens in the Air mountains and near urban centers (e.g., Arlit, Maradi, Niamey) which produce food, often of high economic value.

Ranging from localized seasonally-poor rainfall to several years of below average rainfall on a national scale, drought can cause serious problems for agricultural and livestock production. Reduced fallow periods, an increasing use of marginal lands and overgrazing all exacerbate the negative impact of poor or below average rainfall on food production.

Based on historical estimates of food production, population and consumption needs, Niger has been, on the average, food self-sufficient at the national level over the past three decades. Despite this average self-sufficiency, in any one year periods of insufficient rain have produced localized or nationwide crop failures and food supply deficits, inadequate pasture and decreased terms of trade for pastoralists, thereby increasing food insecurity (see Map 11).

The more frequent, localized, food insecurity problems due to climatic conditions are resolved through normal coping mechanisms. Serious regional or national problems are less frequent (one in five years), but result in government intervention in the form of food distributions (from national stocks or imports). Despite these interventions, the major part of the relief from large as well as small scale food shortages is provided by the victims themselves through migration, sales of assets and other coping methods.

Map 11: Areas of Chronic Food Insecurity in Niger



Methodology Application

The 1990 vulnerability assessment was developed from a process which focuses on the *arrondissement*, the third order administrative unit in Niger. Both quantitative and qualitative information was used: data from remotely sensed data bases, statistics and reports from the Government of Niger (GON), and reports and field observations developed by the U.S. Agency for International Development Mission in Niger (USAID/Niger). The data was segregated according to geographic definition (national level to site specific) and used to define potential vulnerability for increasingly smaller segments of Niger's population.

The data used in the assessment come from a wide variety of sources for which the levels of confidence differ considerably. As a result, the overall assessment procedure is based on a convergence of indicators for the definition of chronic and current vulnerability. The convergence approach permits the reconciliation of contradictory data (e.g., reported high per capita production and low stocks) through a *delphic* approach to the overall analysis of available data. In view of Niger's chronic slight to moderate vulnerability to food insecurity, the assessment focuses on areas which may be moderately to extremely vulnerable to food shortages. More information on the methodology used in this assessment is available in Appendix A.

Analysis of Socioeconomic Groups & Subgroups

There are three major socioeconomic groups in Niger (in descending order of vulnerability), agriculturalists, pastoralists, and urban dwellers. The 1990/91 Vulnerability Assessment focuses mostly upon agriculturalists as they make up 70 to 75 percent of Niger's population and have the highest level of current vulnerability.

Agriculturalists

Over 70 percent of Niger's population is engaged in subsistence agriculture along the Niger River and along the border with Nigeria. The typical agricultural production unit is a small family plot where rainfed crops are cultivated by traditional means.

The income components of the agricultural population consist of 1) cereals production, predominately millet and sorghum but including some rice, wheat and corn; 2) cash crops, especially *niébe* but including some peanuts, cotton, and sugarcane; 3) traditional gardening, especially onions, hot peppers, squash, and root crops; 4) dry season gardening of a wide variety of market vegetables; 5) animal husbandry, raising a limited number of cattle and small ruminants; 6) remittances from coastal countries where emigrants seek

employment; 7) cross-border relations which offer additional resources for the area 50 to 100 km north of the border with Nigeria. The determinants of income are largely rainfall for cereal and cash crop production, pest presence and water availability for gardening, and economic conditions in Nigeria and in the coastal countries for in-flowing cash.

Pastoralists

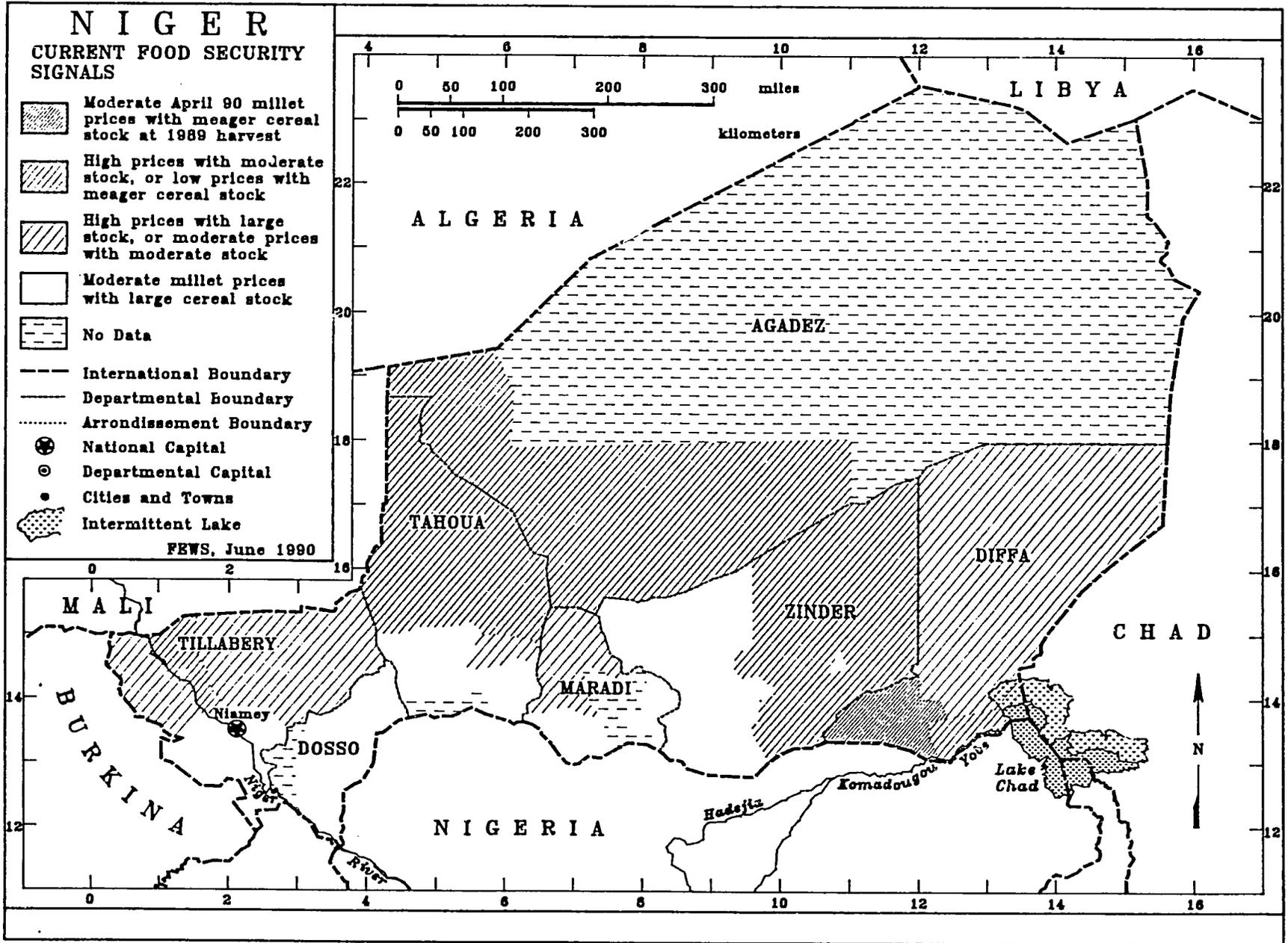
Approximately 25 percent of Niger's population lives in the pastoral zone which extends roughly across the middle of the country. Half of these people are nomadic herders, and half are sedentary cattle herders sometimes engaging in agriculture.

- **Nomadic Pastoralists.** Nomadic cattle-raising occurs in the middle pastoral zone and into the desert zone around oases and shallow basins. In June with the beginning of the rains, northern migration begins from the southern pasturelands; in October at the end of the rains, the pattern reverses with southern migration from the northern pasturelands. The almost exclusive income component is animals and their by-products, some artisanal activities, and gathering of wild foods such as dates, fruits, and wild grasses to supplement their livelihood. Income determinants are herd size and composition, herd health, pasture availability, with water being the limiting factor in Nigerien animal husbandry. Nomadic pastoralists can be subdivided into herd owners and herd tenders. Herd tenders are those who lost their herds in 1984/85 and are now laborers for large herd owners -- their compensation being some combination of money, milk, millet, or small ruminants.
- **Agropastoralists.** Half of Niger's pastoralists are cattle herders sometimes engaging in agriculture. They are located in the intermediate agricultural zone, the southern pastoral zone, and in the oases of Agadez Department. In addition to animals and by-products, their income is composed of some cereal production, fruit gathering, traditional gardening, dry-season irrigated gardening, remittances, and some artisanal activity. The determinants of their income are rainfall for agricultural production and livestock water needs, and economic conditions in the coastal countries for remittance flows.

Urban Groups

This Vulnerability Assessment does not focus on urban groups that make up 5 percent of the total population. Nevertheless, there are urban poor who have little access to food. Included in this latter group are ex-nomadic pastoralists who lost their herds in the 1984/85 crisis, and non-salaried workers who rely on income generated from small commerce, occasional wage labor, and remittances. Much of

Map 12: Current Food Insecurity Signals in Niger



the rest of the urban population is involved in artisanal activities, commerce, salaried jobs, or seasonal activities. All of the urban sub-groups, especially the urban poor, are susceptible to the negative impact of increasing prices on their access to food.

Summary of Vulnerable Arrondissements

The numbers following the arrondissement names are the overall vulnerability rating and the estimated total population of the arrondissement. Please see Appendix A for an explanation of the rating methodology and indicators used to establish relative levels of vulnerability.

- **Extremely Vulnerable:** Mainé-Soroa (2.0; 84,000) and Diffa (1.7; 82,000): Both arrondissements are extremely vulnerable to food insecurity due to chronic and short term (current) factors. Exhausted food stocks and limited purchasing power particularly affect the farming segment of the population, although many herders are affected by low animal prices.
- **Moderately Vulnerable:** N'Guigmi (1.54; 30,000) and Tchín-Tabaraden (1.38; 80,000): Although overall vulnerability is moderate, both arrondissements currently suffer from poor cereal stocks and to some degree from poor pasturage and low animal prices or demand. Gouré (1.23; 168,000): The farming populations of the east and north are more severely affected than in the south and west, where populations have better access to cross border trade and employment. Filingué (1.23; 306,000) and Ouallam (1.23; 201,000): Although initially rated as suffering from slight chronic and current vulnerability, reports of exhausted cereal stocks (despite good cereal production in 1988), poor gardening, decreased remittances and poorer seasonal employment opportunities indicate at least a moderate current level of food insecurity risk.
- **Slightly Vulnerable:** Dakoro (1.08; 276,000): Despite moderate to slight vulnerability ratings, agricultural indicators and field reports indicated there may be an increased risk of food insecurity in the north and center of the arrondissement. Tanout (.62; 201,000): While rated as having a slight to no significant vulnerability, the ratings are based on aberrant production data and contradicted by field reports. The arrondissement may have both a moderate chronic and current vulnerability to food insecurity. Tillabéri (1.15; 164,000) and Téra (.77; 313,000): Although receiving slight chronic and slight to moderate current vulnerability ratings, the arrondissements include areas of different food production and access. Areas along the Niger River benefit from rain fed and irrigated food and cash crop

production and wage labor. Populations further from the river benefit less from this food security network and may be at higher food insecurity risk than the overall rating indicates. Magaria (.69; 371,000): Although receiving a slight chronic vulnerability rating and rated as having no current vulnerability, reports from the GON indicate they consider this area to be at significant current vulnerability to food insecurity. Kollo (.62; 697,000 - including Niamey city) and Mirria (.46; 587,000 - including Zinder city): both areas have been rated as having only slight overall vulnerabilities to food insecurity but the presence of major urban areas (Niamey and Zinder) is not completely accounted for in the rating process. Both cities include populations highly vulnerable to food insecurity and are destinations of destitute rural populations during periodic food shortages. Arlit and Tchirozérine: although initially rated as being extremely vulnerable, their considerable economic resources, including mining and tourism, are not accurately accounted for in the rating system. The arrondissements are considered to be only slightly vulnerable to food insecurity.

Conclusion

Rainfall in 1990 will be the major determinant of the future vulnerability of populations in Niger. The impact of poor rainfall will be most severely felt in the arrondissements of Mainé-Soroa, Diffa, N'Guigmi, Tchín-Tabaraden, Gouré, Filingué and Ouallam.

Poor rainfall in these areas, resulting in a less than adequate harvest, would result in severe food insecurity and migration as early as September, 1990. In the other arrondissements noted above, the impact of poor rainfall and an inadequate harvest will become apparent no later than December, 1990, as migrations and use of different coping measures increase.

Overall, Niger does not appear to be entering the 1990 growing season significantly more vulnerable than on the average, although several regions are suffering from localized severe food insecurity (see Map 12). The use of normal coping mechanisms and well targeted food assistance should limit the severity of food insecurity in these areas.

Nonetheless, there may be little in the way of cereal or resource reserves remaining in Niger as the growing season begins. A generally poor rainy season throughout the country would result in a serious and general increase in the levels of vulnerability to food insecurity.

Table 3: Summary of Indicators for Vulnerable Arrondissements in Niger

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Department Arrondissement	Total Populn	NDVI/Pasture	89 Prod KG/CAP	88 Prod KG/CAP	80-89 Prod % Change	89 Prod vs Avg % Change	Current Stock	Mil Pre vs Avg % Change	Irrig Gardn	Cash Crops	Remittances	Cross Border	Chronic Rating	Current Rating	Overall Rating
DIFFA	195,182														
N'Guigmi	29,506	avg/poor	165	50	-43	49	low	9	poor	-	-	imp	3	1	1.54
Diffa		low/poor	26	233	-36	-79	none	0	fair	-	-	imp	3	2	1.77
Maine-Soroa		low/poor	26	166	-10	-64	none	53	poor	-	sig	imp	3	3	2.00
ZINDER	1,503,636														
Goure	168,363	avg/avg	88	205	-11	-38	none	0	poor	-	-	imp	2	2	1.23
Mirria	586,870	avg/NA	202	317	4	-6	low	5	fair	imp	-	imp	1	0	0.46
Magaria	371,419	low/NA	204	299	-14	-11	low	9	poor	imp	sig	imp	1	0	0.77
Tanout	200,794	avg/good	483	711	109	57	low	-1	none	-	-	-	1	0	0.62
MARADI	1,494,860														
Dakaro	276,097	avg/avg	163	335	31	-12	low	30	poor	-	-	imp	1	1	1.08
TAHOUA	1,376,996														
Tchintabaraden	79,655	high/good	42	150	15	-64	none	-3	fair	-	sig	-	3	2	1.38
TILLABERI	1,861,249														
Kollo	696,767	avg/NA	187	331	-3	-22	fair	-13	good	imp	sig	-	1	0	0.45
Tera	313,130	avg/avg	174	285	16	-9	low	40	poor	imp	sig	imp	1	1	0.85
Tillaberi	164,109	avg/avg	146	230	3	-20	low	33	good	imp	sig	-	1	2	0.92
Ouallam	201,050	avg/avg	130	207	-20	-16	none	-3	poor	-	sig	-	2	1	1.15
Filingue	305,563	avg/avg	127	247	-16	-35	none	-19	poor	-	sig	-	1	1	1.15

TABLE COLUMNS AND SOURCES:

- (1) Total population by department (GON) and by affected arrondissement (FEWS).
- (2) Evaluations of Normalized Differential Vegetation Index (NASA) and pasture production (GON). High, good or average = 0; low or fair = 1; poor = 2
- (3) Millet and sorghum net production in kilograms per capita (GON). > 190 = 0; 140-190 = 2; < 100 = 3
- (4) Millet and sorghum net production in kilograms per capita (GON). > 190 = 0; 140-190 = 2; < 100 = 3
- (5) Percent change in millet and sorghum production, 1980-89, based on GON data. Increase = 0; no change = 1; 15-25% decline = 2; > 25% decline = 3
- (6) Percent change in millet and sorghum production, 1989 vs 1980-89 average, based on GON data. < 5% change = 0; 5-25% decrease = 1; 25-50% = 2; > 50% decrease = 3.
- (7) Current cereal stocks based on USAID field trips. Fair = 1; low = 2; none = 3
- (8) Percent change in millet price, April 1990 vs 1985-89 April average. No change or lower = 3; 5-10% higher = 1; 10-20% higher = 2; > 20% higher = 3
- (9) Condition of off-season garden production, 1990, based on USAID field trips. Good = 0; fair = 1; poor = 2; none = 3
- (10) Cash crop importance as income component, based on USAID field trips. Important = 0; "-" or not a component = 1.
- (11) Remittance significance on cereals purchase, based on USAID field trips. Significance = 0; "-" or not a component = 1.
- (12) Proximity to Nigeria, Benin or Burkina for cross border trade & cereals access. Important = 0; "-" or not a factor = 1.
- (13) Chronic Food Insecurity: Initial assessment of structural food security based on production sufficiency and variability from 1980-89 (see Map 2). Rating derived from overlay of 3 levels of production variability on 3 levels of production sufficiency (see text for detailed scoring). Not vulnerable = 0; slightly vulnerable = 1; moderately vulnerable = 2; extremely vulnerable = 3.
- (14) Current Risk from Food Insecurity: Initial assessment of immediate risk from food insecurity based on stocks at 1989 harvest and millet prices for April 1990 (see Map 2). Rating derived from overlay of 3 levels of cereal prices of 3 levels of cereal stocks, (see text). Not vulnerable = 0; slightly vulnerable = 1; moderately vulnerable = 2; extremely vulnerable = 3.
- (15) Overall Vulnerability Rating: Final score derived from ordinal ranking of factors (1) to (14); sum of each factor divided by the number of factors.

Appendix A: USAID/FEWS Vulnerability Assessment Methodology for Niger

1. Regional Assessment

This focused on the identification of regions chronically vulnerable to food insecurity based on agroclimatic and socioeconomic trends over the past five to twenty years. Rainfall, cereals production, vegetation indices, cereal prices, and alternative income sources were used to assess baseline (chronic) vulnerability. Agricultural and pastoral areas were identified by mapping:

- Average 1968-87 annual rainfall and the probability of receiving adequate rainfall in any given year,
- Average vegetation index (NDVI - see inside back cover) values for 1982-89, and
- Variability and trend in 1980-89 millet and sorghum production.

The rainfall data was assembled from AGRHYMET and the National Meteorological Service. The NDVI data were assembled from the National Aeronautics and Space Administration (NASA) global area coverage (GAC) remotely sensed data set. Cereal production data were based on data bases and reports prepared by the GON's agricultural statistics division.

Per capita net millet and sorghum production was mapped based on the 1980-89 average. The population data used in the per capita calculation is a projection based on the 1988 national census and FEWS derived arrondissement level growth rates.

Cereal price zones were identified by mapping 1986-1989 average and peak millet prices, based on data from the GON national cereal market information system. Areas of marginal purchasing power were identified by information gathered on alternative income sources during USAID field trips.

2. Local Level Assessment

This level identifies areas forced to draw down on household resources to procure sufficient food for the 1989/90 consumption year. This process was based on four concerns:

- **Ability to produce food:** Identified by comparing 1989 per capita millet and sorghum production to the ten year average. The 1989/90 non-cereal production (cash crops and dry season gardening) was estimated from Ministry of Agriculture reports and USAID field trip reports. Pastoral conditions were identified by comparing 1989 NDVI values to the 1982-89 average and by comparing 1989 biomass production to 1989/90 livestock consumption needs. Biomass data was provided by the GON's Division of Livestock statistics.
- **Food reserves:** Identified by examining cereal surplus or deficit from both 1989 and 1988. For pastoralists, herd size, ownership and trading options for the past two years were evaluated.
- **Ability to purchase cereal:** Identified by comparing April 1990 millet prices to the 1986-89 April average and the 86-89 peak average. Animal prices (i.e., pastoral purchasing power) were identified based on USAID field reports. Remittance receipts and other alternative income sources (e.g., cash crops, off-season gardens, employment, and craft sales) were identified through USAID field trip observations.
- **Ability to find cereal:** Assessed based on market availability of cereals as reported during field trips, and proximity to Nigeria and Bénin. Food distributions in 1990 were also noted.

In addition, estimated population "at-risk" figures developed for earlier 1990 food security reports from the Mission were considered in the rating process. The earlier reports identifying "at-risk" populations used many of the same types of data and analysis as used in this assessment.

3. Vulnerability Rating

This is based on the regional and household issues defined above. Because of Niger's history of frequent food shortages and the general increase

in the marginalization of the means of food production, the country is considered as a whole slightly vulnerable to food insecurity in most years. This assessment focuses on the areas which could be rated as having a moderate to severe vulnerability: areas which require heightened monitoring and would require early interventions if local food security would be less than average following the 1990 harvest. It should be noted that the results of this assessment represent a relative, rather than absolute, evaluation of vulnerability: what may be evaluated as slightly vulnerable for Niger may be seen as extreme vulnerability in other countries.

The ordinal rating was based on assigning a numerical value to represent the degree to which a factor might contribute to vulnerability. The higher the value, the higher the expected contribution of the factor towards vulnerability. See Table 3 for presentation of ratings by arrondissement.

The results of the initial rating for chronic vulnerability were presented in a map which was composed from an overlay of three levels of production variability and three levels of production sufficiency. Arrondissements with millet and sorghum production greater than 190 kilograms (kg) per person and variability less than 50 percent were given a rating of 0.0; these areas are not considered vulnerable. Areas with a rating of 1.0 are considered slightly vulnerable (production greater than 190 kg per person and variability greater than 50 percent). A rating of 2.0 indicates moderate vulnerability (production between 140 and 190 kg per person and variability greater than 50 percent). A rating of 3.0 indicates extreme vulnerability (production less than 140 kg per person).

A second map presented the results of the initial rating for current vulnerability based on an overlay of three levels of cereal prices (for April 1990) and three levels of cereal stocks (available at the time of the 1989 harvest). Arrondissements with ten or more months of stocks and millet at less than 95 West African Francs (CFA) per kg were given a rating of 0.0 and not considered vulnerable. Similarly, areas with a rating of 1.0 are considered slightly vulnerable (at least ten months of stocks and millet at more than 95 CFA per kg; or between seven and ten months of stocks and millet at less than 95 CFA per kg). A rating of 2.0 indicates moderate vulnerability (seven to ten months of stocks and millet at over 95 CFA per kg; or less than seven months of stocks and millet at less than 80 CFA per kg). A rating of 3.0 indicates extreme vulnerability (less than seven months of stock and millet over 80 CFA per kg).

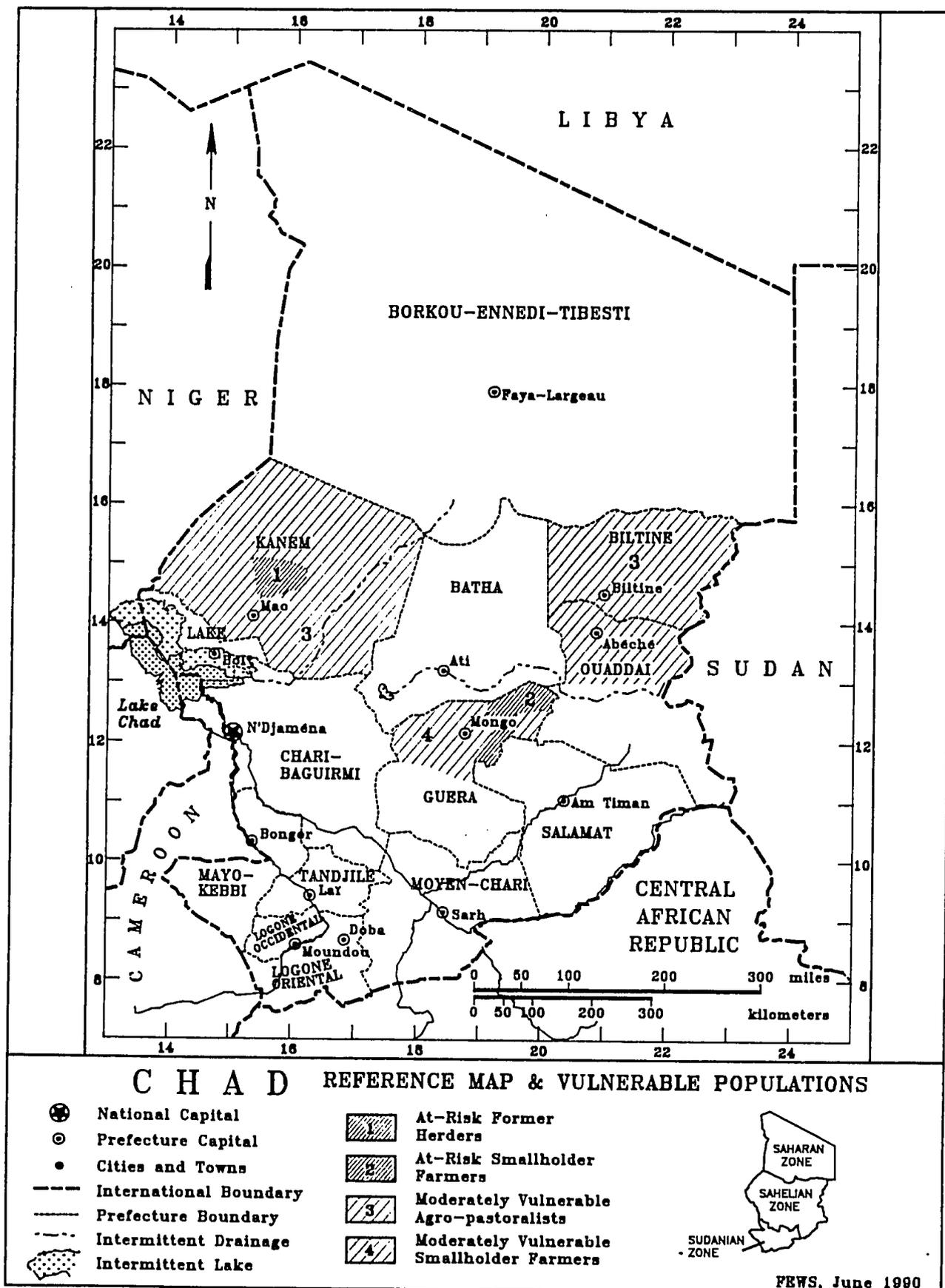
The arrondissements evaluated were those showing an initial chronic or current rating of at least 2.0; those given an earlier "at-risk" rating by USAID, or those containing significant urban populations. These arrondissements, the ordinal rating of these factors and how they were derived were assembled in a table.

An overall ranking of vulnerability was determined by summing the ratings of each factor (except arrondissement population) and dividing by the number of factors. The resulting index was divided into categories of slightly vulnerable (less than 1.10); Moderately vulnerable (1.10-1.61); And extremely vulnerable (over 1.61). Arrondissements thus classified are presented in a third map, entitled Pre-season Vulnerability to Famine.

A review of the initial rankings indicated that some of the scores for certain arrondissements did not accurately reflect the actual situation due to specific factors outside the rating system. For this reason, these arrondissements were included for the evaluation of socioeconomic groups below.

4. Socioeconomic Groups "At-risk"

This final assessment evaluates the degree of risk and possible impact of the factors contributing to the perceived vulnerability on specific socioeconomic groups within an arrondissement. This evaluation represents the most specific identification of persons "at-risk" from, and most vulnerable to, food insecurity. The location of these populations is summarized below. It is considered that within each extremely or moderately vulnerable arrondissement childbearing women and children under five years are at greatest risk. The estimates of actual numbers of persons at risk could not be developed from existing data for this report.



Map 13: Chad Reference Map and Vulnerable Populations.

CHAD

At-Risk Populations Currently Receive Assistance

USAID and FEWS/Chad Report Received in Washington May 23, 1990

Summary

As of mid-1990, the rural and urban populations of Chad generally have sufficient access to food, following a mediocre 1989/90 agricultural season. Localized cases of "at-risk" populations have been identified among former pastoralists in Canton Dogorda of Kanem Prefecture, and agriculturalists in cantons Moubi Hadaba and Moubi Goz of Guéra Prefecture (see Map 13). Agro-pastoralists inhabiting the area north of the thirteenth parallel, particularly in western (Kanem Prefecture) and eastern (Ouaddaï and Biltine prefectures) Chad, as well as smallholder agriculturalists in the north central region of Guéra Prefecture (see Map 13), remain moderately vulnerable to famine. These socioeconomic groups are moderately vulnerable from a combination of failed harvest, poor pasture and rising cereal prices, which have resulted in unseasonably early migrations and reliance on other traditional coping mechanisms.

A second, successive poor agricultural season in 1990/91 would result in increased economic dislocation and vulnerability to famine. Approximately 19,000 persons are currently extremely vulnerable and experiencing critical food supply problems that require outside assistance. An additional 339,000 persons are moderately vulnerable, requiring close surveillance.

The two agroclimatic zones further south (Sahelo-Sudanian and Sudanian) registered good to excellent harvests in 1989/90, in contrast to areas north of the thirteenth parallel. The population in these two zones are considered to be only slightly vulnerable to famine. However, smallholder agriculturalists in the south, who make up most of the population, lack the economic diversity that characterizes Sahelian lifestyles. They tend to retain fewer resources inter-annually and, hence, are more vulnerable to famine after only one poor harvest. A poor 1990/91 harvest would place this socioeconomic group in a position of moderate vulnerability.

Methodology Application

The 1990 vulnerability assessment flags areas and peoples of Chad that are moderately or extremely vulnerable to famine as the 1990/91 agricultural season begins. The assessment draws attention to specific groups within Chad who, A) are currently experiencing critical food acquisition problems, or B) have historically experienced food acquisition problems. This assessment also makes informed hypotheses that foreshadow potential trouble spots should the 1990/91 harvest be inadequate. The Food Security Operations Group (FSOG) of the Agency for International Development's Mission in Chad (USAID/N'Djaména) believes that an examination of past problem areas will provide an accurate vulnerability assessment for Chad.

An important caveat to this assessment is that population figures for Chad are approximate in the extreme. There has never been a census in Chad. Current population figures have, for the most part, been extrapolated from a 1964 survey which was limited to 649 villages and 16 urban centers in only eleven of Chad's fourteen prefectures. The 1964 survey was a rough approximation upon which all subsequent population estimates have been based. Since then, there have been massive outflows and inflows of people due to drought, war and changing economic conditions. When it became necessary to register voters during the recent electoral campaign (late 1989), major discrepancies were discovered between official population figures and those reflected by voter registration. Population values appearing in this assessment are derived from the 1964 census figures and should be viewed accordingly.

Analysis of Socioeconomic Groups

Former Pastoralists, Now Agriculturalists

Approximately 4,000 former pastoralists in Dogorda Canton of Kanem Prefecture (see Map 14) were deemed "at-risk" and in need of immediate food assistance following a thorough socioeconomic survey conducted in February 1990. These people turned to subsistence agriculture when their herds were lost during the 1984/85 drought. Their herds have

not been rebuilt. Inadequate 1989 rainfall totals (around 120 millimeters) precluded any harvest of rainfed crops. A regional survey of economic activities found that 70 percent of interviewed families gather and sell firewood to generate income for purchasing food. Only one in seven families (14 percent) reported gathering firewood as a normal activity; for the others, it is a sign of desperation. More than 45 percent of interviewed families indicated that at least one family member had migrated in search of work. The malnutrition rate among pre-school aged children was 15.6 percent (below 80 percent normal weight for height), a figure above the recommended intervention level (10 percent) of the Government of Chad (GOC) Ministry of Health. This figure is the highest recorded in Chad since standardized nutritional surveillance began in November 1986.

Smallholder Agriculturalists in Guéra Prefecture

Approximately 15,000 smallholder agriculturalists in Moubi Hadaba and Moubi Goz cantons of Guéra Prefecture (see Map 14) were identified as "at-risk" and in need of food aid assistance based upon a survey performed in November 1989. These people do not practice off-season agriculture or animal husbandry and are extremely dependent upon rainfed crop production. Families began to leave their villages as

early as September 1989, when it became clear the harvest would be inadequate. Malnutrition rates at the time of the survey were 10.7 percent (below 80 percent normal weight for height). A five-month ration of food aid was allocated to this region by the GOC/Donor Food Aid Action Committee (FAAC).

Smallholder agriculturalists in Mongo, Mangalmé and Bitkine sub-prefectures of Guéra Prefecture (see Map 14) have been historically less successful in coping with food shortages than populations elsewhere in the Sahelian Zone. Approximately 75,000 people in these three sub-prefectures are considered moderately vulnerable. As in the other regions, inadequate 1990 rainfall would significantly increase food-related stress in all the above areas.

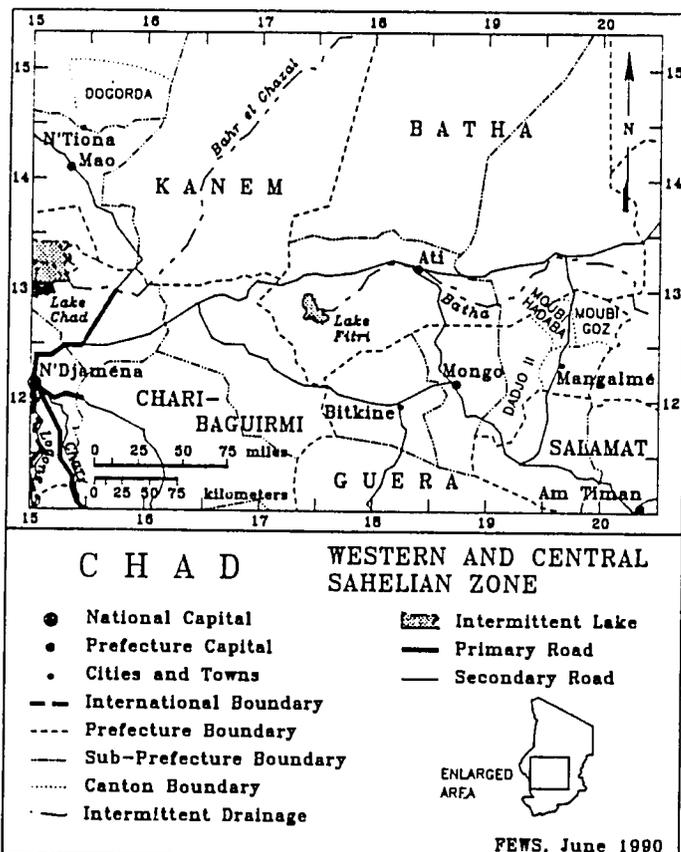
Agro-Pastoralists Above the Thirteenth Parallel

Agro-pastoralists in the prefectures of Kanem, Ouaddaï and Biltine (see Map 13) are considered to be moderately vulnerable in 1990/91. In contrast to the former pastoralists of Dogorda Canton mentioned above, agro-pastoralists in Kanem Prefecture have household resources, off-season agriculture, and traditional coping mechanisms with which to mitigate the poor 1989 harvest. If the 1990 rains fail, the resources required to sustain the population yet another year will be strained, with resultant increased vulnerability. Increased population displacement, decreased caloric intake, and increased malnutrition rates can be expected. The FSOG considers about 96,000 people in Kanem (particularly children under five years old and child-bearing women) to be moderately vulnerable.

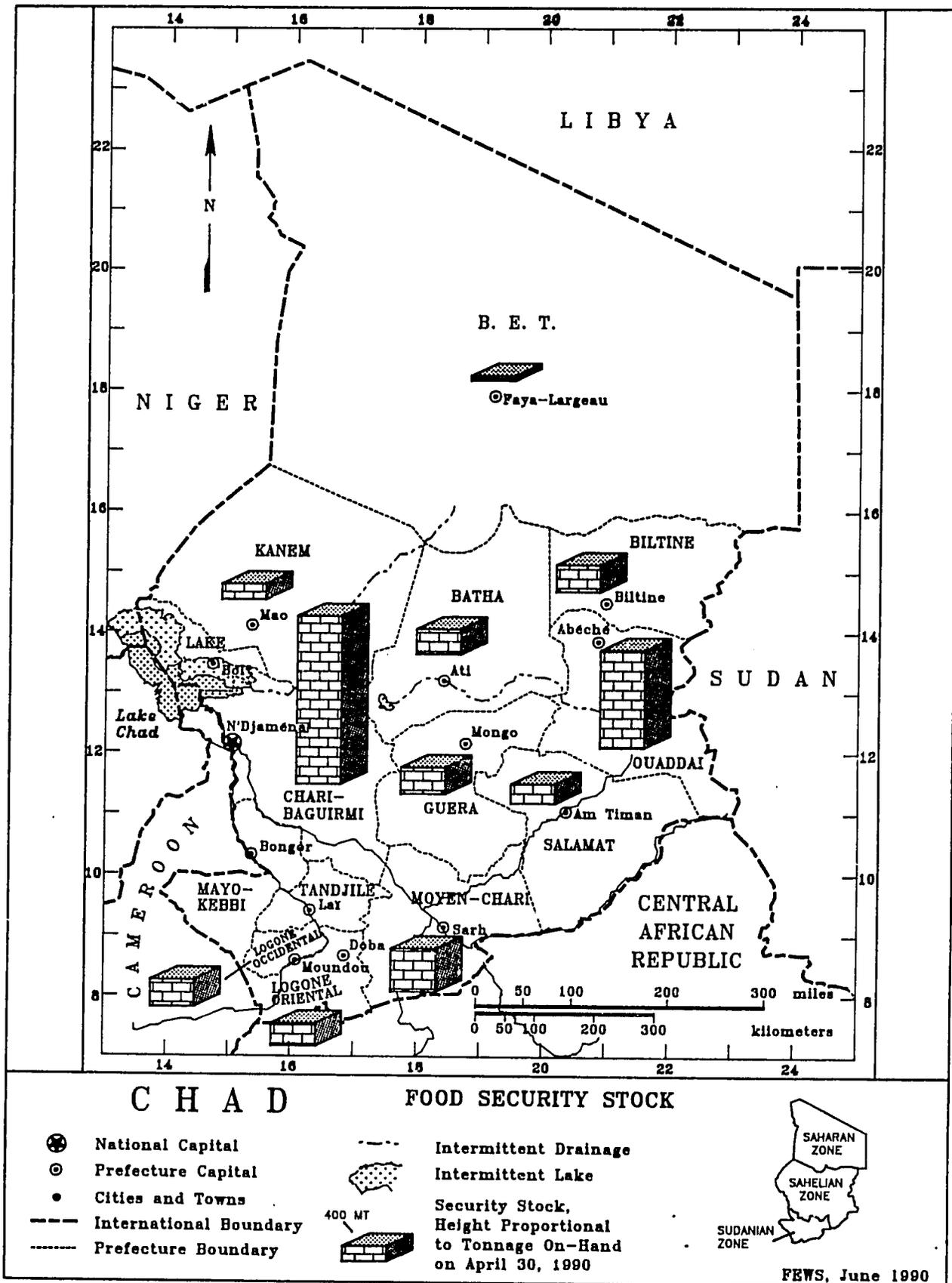
The populations in Ouaddaï Prefecture, particularly in areas north of the thirteenth parallel, and in Biltine Prefecture are in a similar situation to those in Kanem. An estimated 168,000 people are moderately vulnerable and will experience increased food-related stress if 1990 rainfall is inadequate. The general population in areas immediately bordering Sudan remain moderately vulnerable due to hostilities in the region and will be continually monitored.

Southern Agriculturalists and Agro-Pastoralists

Populations in the remaining rural areas are considered slightly vulnerable to famine. However, it is important to note that one poor agricultural season in the South (consisting of Mayo-Kébbi, Tandjilé, Logone Oriental, Logone Occidental and Moyen-Chari prefectures)(see Map 13) may be sufficient to place the population in an "at-risk" situation. People in these areas have less diversified economic activities and less of a "cushion" when the rains fail. Agriculturalists are heavily dependent upon the success of rainfed food crops (millet, sorghum and tubers) and cash crops (cotton, peanuts). Inadequate rainfall affects these crops and can place the population in a moderately-to-extremely vulnerable position. Preferences for consumption over savings in this



Map 14: Magnification of the Western & Central Sahelian Zones



Map 15: Placement of the Food Security Stock in Chad

region reduces the establishment of sufficient food reserves. Documented cases of famine have been worse in southern Chad than in the north. Organized surveillance of the South will be critical if either the cereals or cotton harvest are severely compromised during the 1990/91 agricultural season.

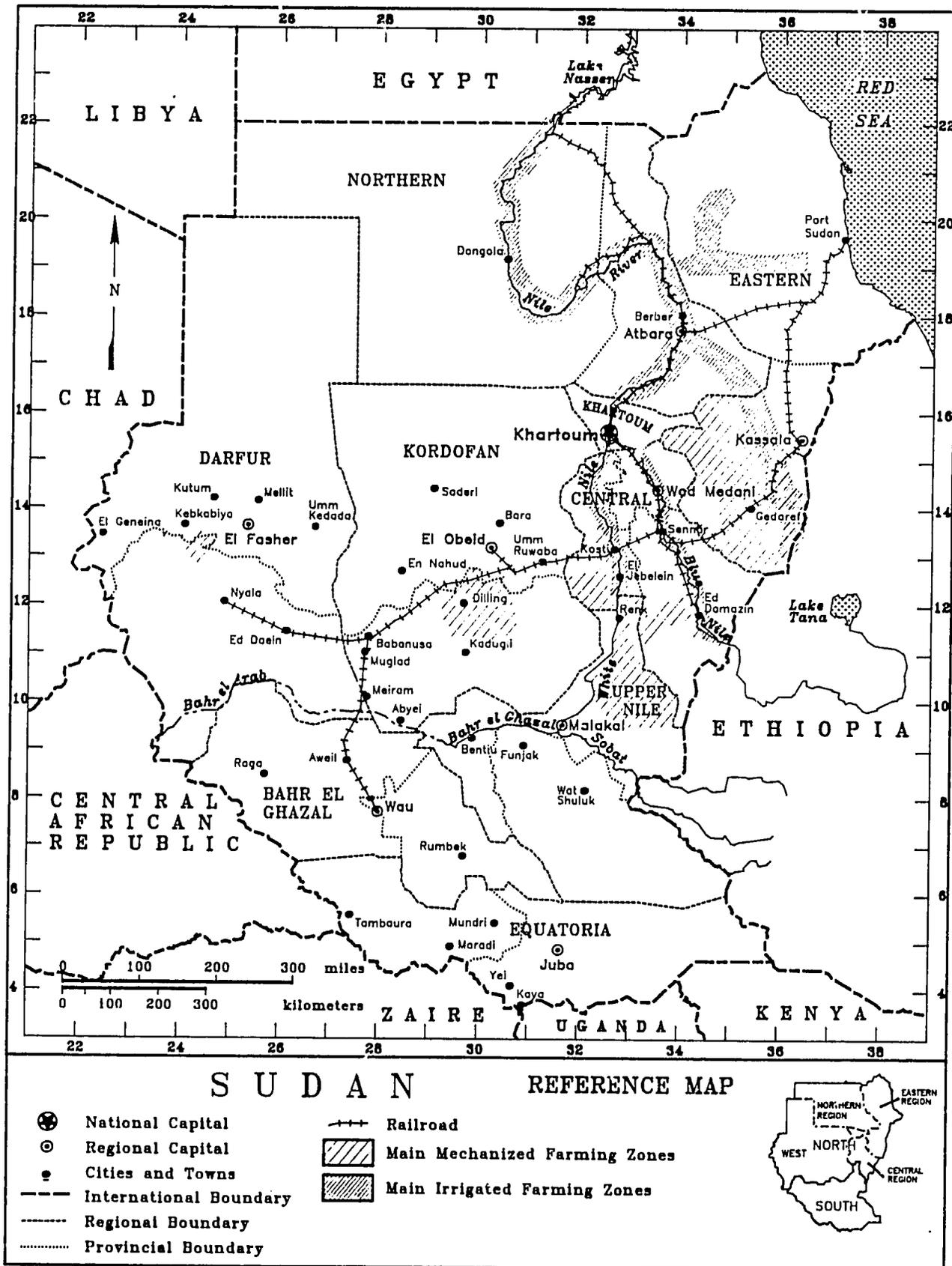
Conclusion

Only isolated cases of extreme vulnerability to famine currently exist in Chad. Approximately 19,000 persons, in two geographic zones within Kanem and Guéra prefectures, are currently "at-risk" and are receiving food assistance from the donor community. Generally insufficient rains north of the thirteenth parallel in 1989 have made the population in that zone moderately vulnerable to food-access related stress. Should the 1990 rains be inadequate, depleted reserves, poor pasture and fewer household resources will make coping with another poor harvest much more difficult. Below the thirteenth parallel, a certain portion of the Guéra population will similarly experience difficulty. Approximately 339,000 persons are deemed moderately vulnerable as the 1990/91 season unfolds.

Given the importance of the 1990/91 agricultural season in determining vulnerability, FEWS will monitor the entire country's rainfall (via point station data and METEOSAT imagery) and vegetative growth (by NDVI-see inside back cover). The European Community (EC) funded early warning project (Système d'Alerte Précoce - SAP) will continue to provide information to the FAAC to mobilize resources in the Sahelian Zone. The SAP stresses on-site field observations of several famine variables and indicators throughout the year in seven Sahelian prefectures (there are fourteen prefectures in Chad). Field visits to southern Chad to monitor moderately vulnerable populations, as mandated by the FAAC, will occur if these indicators point to an insufficient 1990/91 harvest.

An existing food security stock totaling 12,000 metric tons (mt) (see Map 15) will initially provide the necessary resources to respond, should emergency feeding be required immediately after the harvest. This initial response would be taken pending the mobilization and arrival of additional food aid from donor countries.

This page is intentionally left blank.



Map 16: Sudan Reference Map

SUDAN

Highly Vulnerable Farmers in Northwest

USAID and FEWS/Sudan Report Received in Washington May 23, 1990

Summary

Traditional farmers of western Sudan will be particularly vulnerable in 1990/91 because of low agricultural production in 1989/90. Continuing civil conflict during the past seven years has increased the number and vulnerability of displaced persons in southern Sudan. Displaced persons are moderately vulnerable because civil conflict has disrupted agricultural production and delayed food aid deliveries. At the national level, Sudan is currently vulnerable to food insecurity because public cereal stocks are severely depleted. Little is known about private stocks, making it difficult to judge their impact on Sudan's overall food supply. Minimal stocks are available to cover grain production shortfalls in 1990/91. All vulnerable groups are presented in Appendix B.

indication of magnitude. Cereal production in the North has been insufficient to meet consumption needs. Similar information for the South is unavailable. The figures in Table 4 do not account for lower grain consumption by pastoralists and urban dwellers, who generally supplement their diets with meat and dairy products.

Civil war has seriously reduced crop and animal production, displaced millions of people, and impeded relief efforts, causing hundreds of thousands of deaths. Coordinated international relief efforts since 1988 have been able to alleviate the threat of famine due to war. Relief efforts in Sudan are annual operations that are complicated by many aspects including war; poor transport infrastructure; chronic shortages of fuel, motor oil, and spare parts; and insufficient physical, financial, human and management resources.

Country Background

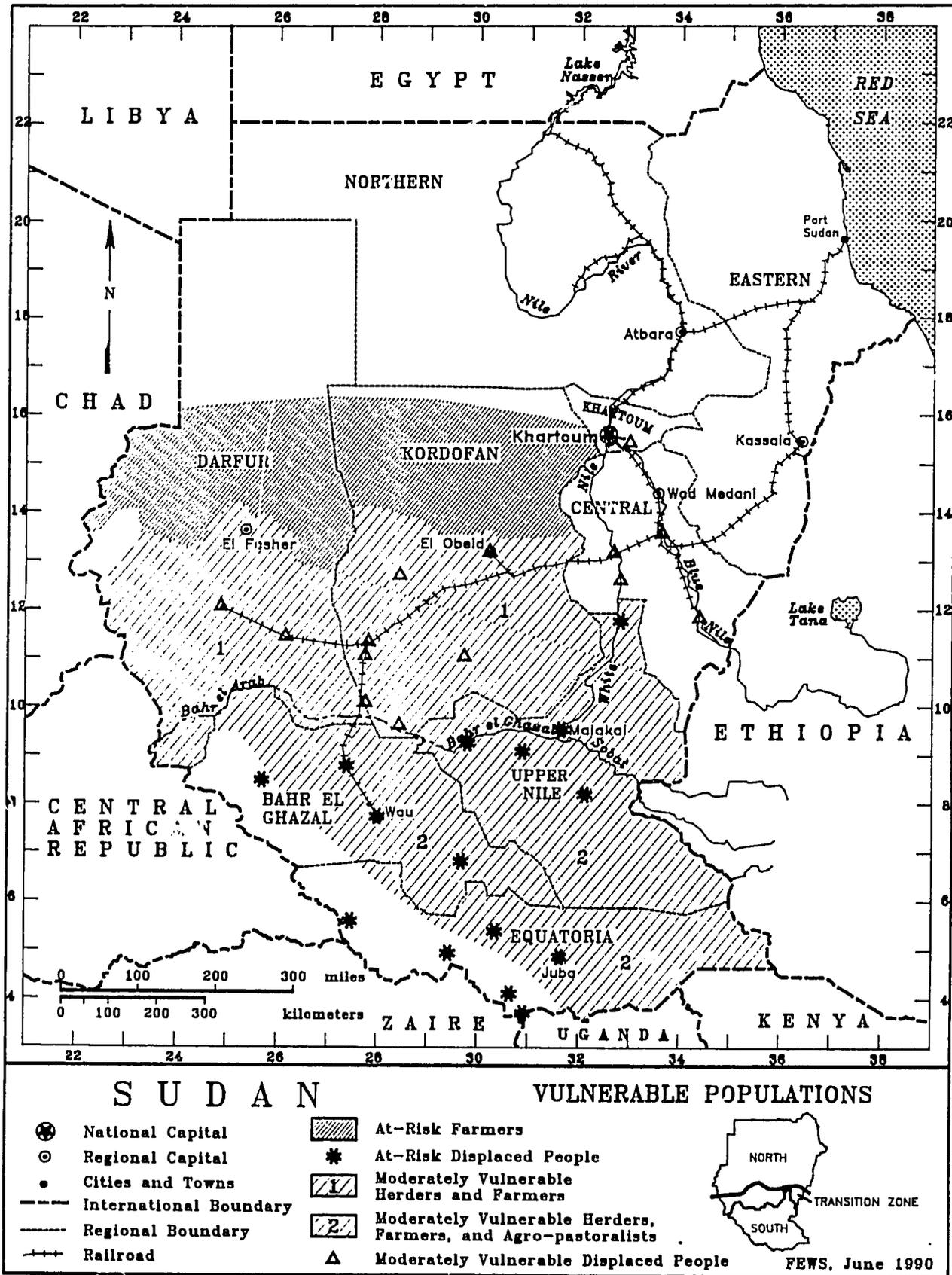
Sudan can be divided into two parts, a northern part significantly influenced by the burden of a seven year civil war, and a southern part virtually cut off from the North (see Box). Most of the fighting occurs in the South, where much of the land is held by the Sudanese Peoples Liberation Army (SPLA). Predominantly desert, northern Sudan is characterized by highly variable agricultural production. The mechanized and irrigated farms of the Central and Eastern regions of Sudan (see Map 16) generally produce a cereal surplus. Traditional smallholder agriculture predominates in western Sudan, but rarely meets consumption needs. Distribution of surplus cereals to deficit areas via commercial markets is not assured because of fragmented domestic markets, poor infrastructure, high transport costs and insufficient personal resources of traditional farming households. Market redistributions occur only when market forces allow for profits, or through deliberate relief.

Sudan depends on its own agricultural production. Food imports are limited to commercial and concessional wheat imports, primarily consumed in the cities, and relief. Sorghum, the predominant crop and preferred relief food, is often exported. Millet and maize are also grown, with the latter in the South. Table 4 presents a theoretical cereal balance for northern Sudan and should be used solely as an

Box 1: Geographic Divisions of Sudan

Sudan encompasses the largest area of any country on the African continent (around 2.5 million square kilometers). A variety of names for the geographic divisions of Sudan are used in this and other reports. An organizational guide to the common and administrative names used for the many regions and provinces of Sudan is presented below.

Common Divisions "Compass Point"	Administrative Region	Provinces	
North	Khartoum Northern	Khartoum	
		North Nile	
	East	Eastern	Red Sea Kassala
		Central	Blue Nile White Nile El Gezira
	West	Darfur	Northern Darfur Southern Darfur
Kordofan		Northern Kordofan Southern Kordofan	
South	Upper Nile	Upper Nile Jonglei	
	Bahr el Ghazal	Bahr el Ghazal El Buhayrat (Lakes)	
	Equatoria	Eastern Equatoria Western Equatoria	



Map 17: Vulnerable Populations in Sudan

Table 4: Theoretical Cereal Balance for Northern Sudan ('000 metric tons)

Year	Food*	Consumption**	Balance***
1979/80	2445	2831	-386
1980/81	2687	2920	-238
1981/82	3821	3011	+810
1982/83	2648	2988	-340
1983/84	2784	3068	-284
1984/85	1982	3151	-1169
1985/86	4784	3236	+1548
1986/87	3978	3323	+655
1987/88	2312	3413	-1101
1988/89	5697	3505	+2192
1989/90	2397	3599	-1202

Source: FEWS/Sudan

Notes:

- * Production plus imports, minus exports
- ** Consumption at 195 kg per person per year in the north, which includes seed, feed and loss. (123 kg per person per year is used in the south)
- *** Balance excludes carry-over stocks from surplus years

Methodology Application

Quantitative data in Sudan are insufficient and often unreliable. Reported figures are estimates and should be used as orders of magnitude. Current population figures for Sudan, based on the 1983 census, are unreliable because of uncertainties in rates of growth, mortality, and migration. Data on stocks, incomes, and remittances are practically non-existent. Mechanized and irrigated sector agricultural data are more reliable than the traditional sector, where figures often vary widely in different surveys of the same province. Agricultural production, health, and market data from southern Sudan are virtually unavailable. Numbers reported for displaced persons in the South, and elsewhere, are often in question.

The 1990 Sudan Vulnerability Assessment is supplemented with qualitative data from field reports and unofficial sources. A combination of quantitative and qualitative data were used in the assessment. Information sources include remotely sensed data, central and regional government offices, non-governmental organizations (NGOs), private and voluntary organizations (PVOs), interviews, and personal observation. The identified socioeconomic groups in Sudan were assessed for potential vulnerability from the impact of natural and political stress.

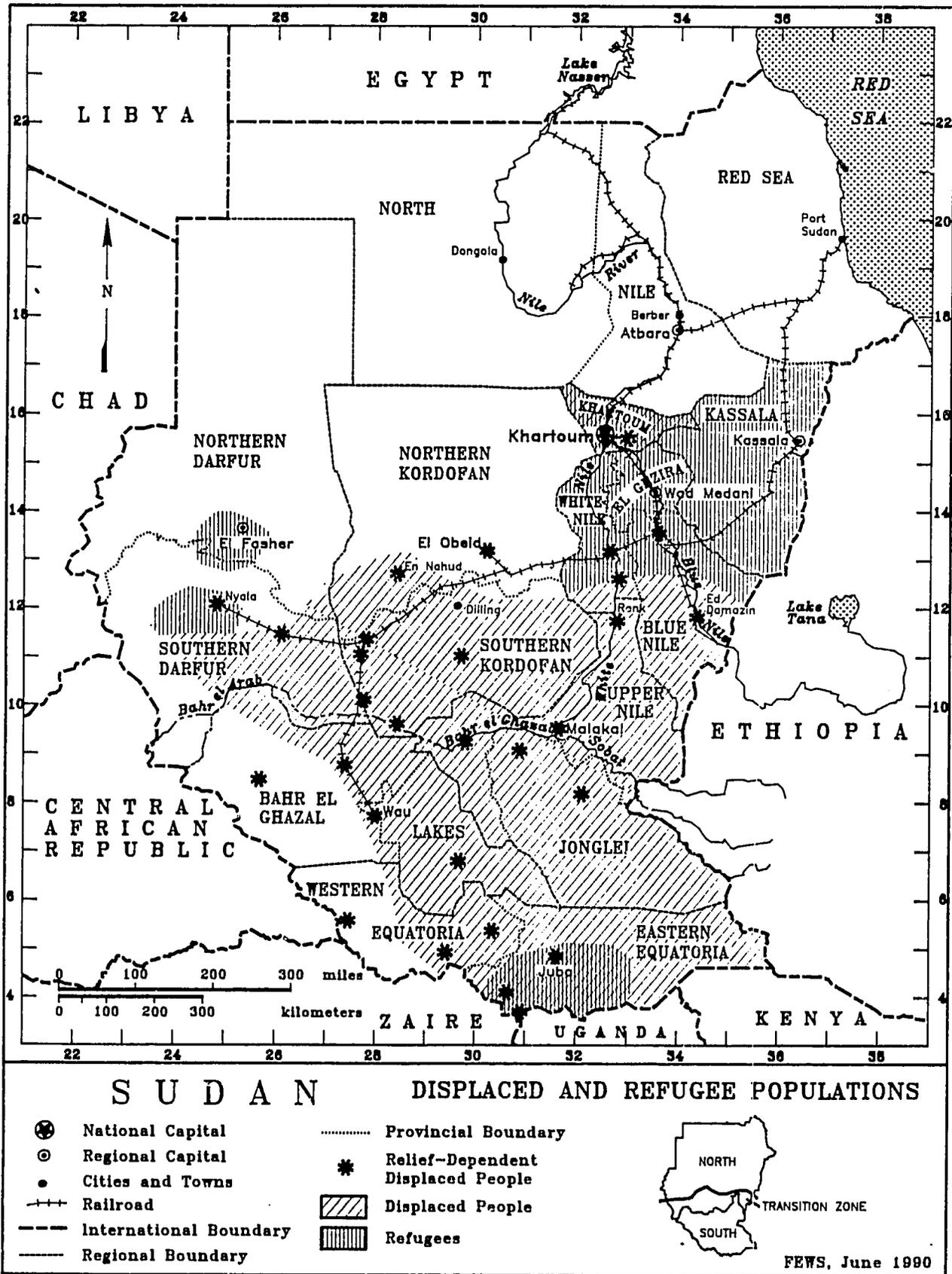
Analysis of Socioeconomic Groups & Subgroups

Farmers in the Traditional Rainfed Sector

Agricultural output and income of farmers that employ traditional agricultural technologies are highly dependent upon climatic conditions. These farmers are located in the West and in the Eastern and Central regions of Sudan (see Map 17). Households in western Sudan (composed of Darfur and Kordofan regions) historically face a cereal balance deficit (see Table 5), with the northern portions of these regions being most vulnerable (i.e., Northern Darfur and Northern Kordofan provinces). Western households achieve food security in relatively good production years by purchasing grain supplies from the mechanized sector with income from cash crops, livestock sales and wage labor. However, this chronic cereal balance deficit has become harder to overcome, especially in years when production is considerably lower than normal or successive bad years occur.

Northern Darfur Province experiences recurrent high malnutrition rates, and the bad 1987 harvest in Kordofan required targeted relief assistance to one million people. What has been an emergency operation in these northern areas is becoming structural support; requests for assistance are occurring almost annually due to the serious cereal deficits and environmental degradation. The declining resource base of the northern portions of the West has limited the capacity of the area to support agricultural activity. Northern Kordofan and Northern Darfur cereal yields have dropped dramatically in the past ten years. To maintain sufficient production the area planted has risen considerably. Increased deforestation has resulted in blowing sand that destroys crops, even when rain is sufficient. Trees are cut for fuel, charcoal and sales, with minimal efforts at replanting. Livestock resources in the area have not recovered from the massive herd losses during the 1984 drought. Impending famine in these areas is not caused by drought alone, but is a compound result of reduced rainfall, diminishing employment opportunities, decreased wages, increased food prices, and decreased grain flows to deficit areas, all factors which periodically reoccur here.

Traditional agriculturalists in the northern portions of western Sudan face 1990/91 in an extremely vulnerable position. Poor 1989/90 cereal and cash crop harvests have prevented accumulation of carry-over stocks, depleted other household assets, and triggered traditional coping mechanisms. Harvests in the 1990/91 season must be very good to insure recovery from 1989/90 and maintenance of household assets in 1990/91. The moderately vulnerable area councils of Northern Darfur Province are Kutum, Mellit, Um Keddada and Kebkabiya (see Map 19). In Northern Kordofan Province moderately vulnerable area councils include Bara, Soderi, and Um Ruwaba (see Map 19). Kebkabiya and



Map 18: Displaced and Refugee Populations in Sudan

Table 5: Historical Cereal Sufficiency for Kordofan (KR) and Darfur (DR) Regions ('000 metric tons)

Year	Production		Consumption		Deficit	
	KR	DR	KR	DR	KR	DR
1979/80	226	243	554	557	-328	-314
1980/81	361	362	569	573	-208	-211
1981/82	351	417	586	590	-235	-173
1982/83	222	362	603	607	-381	-245
1983/84	151	245	620	624	-469	-379
1984/85	86	144	527	530	-441	-386
1985/86	279	309	541	545	-262	-236
1986/87	197	194	557	560	-360	-366
1987/88	119	88	572	576	-453	-488
1988/89	351	319	588	592	-237	-273
1989/90	172	207	605	609	-433	-402

Source: Ministry of Agriculture, Department of Agricultural Economics, FEWS/Sudan

Kutum area councils in Northern Darfur will be extremely vulnerable in 1990/91 because recent insecurity, involving conflict between non-local tribal groups, has destroyed some grain reserves and disrupted preparations for the 1990/91 agricultural season.

The situation in the provinces of Southern Darfur and Southern Kordofan is better than in their northern counterparts, but rapid changes due to climatic and political factors are evident. Production of millet and sorghum has considerably decreased in Southern Darfur. In Southern Kordofan, yields of millet and sorghum have fallen sharply with a four-fold increase in area planted. The southern portions of Southern Kordofan and Southern Darfur have also become vulnerable to disruption of agriculture and commerce from the spreading civil war.

Increased reliance on migration by male household members to find labor opportunities at agricultural schemes is an increasingly common response to declining incomes from own-farm agricultural production, particularly in the northern areas of western Sudan. Although labor migration from Northern Darfur is inhibited by greater geographic isolation than Northern Kordofan, it is widely practiced and work can be found on large farms. This phenomenon has also resulted in a dramatic increase, since 1984, in the number of female-headed households in western Sudan. These households are especially vulnerable because they lack the on-farm labor and

migrant labor opportunities of households with adult men. In dry years they must often depend on loans, family gifts, and charity.

Average climatic conditions in eastern Sudan are better than in the West. Farmers in eastern Sudan normally grow enough to survive, even in dry years. They often supplement household incomes by working on nearby irrigated and mechanized farms. These farmers are considered to be only slightly vulnerable in 1990/91.

Farmers of southern Sudan are also affected by civil conflict that, compounded by climatic variability, results in a moderate level of vulnerability in 1990/91. As the location of fighting shifts, these farmers may become displaced with a resultant increase in their vulnerability.

Displaced Persons

The United Nations estimated 4.5 million displaced persons in Sudan in February 1990. The number of displaced persons has been increasing in recent years. Although primarily displaced by war, approximately 0.55 million are displaced as a result of agricultural failure, some since the drought of 1984. Vulnerability of displaced populations varies according to location. Identified locations include Khartoum, the Transitional Zone and the South. The Transitional Zone is located in the southern areas of Southern Darfur and Southern Kordofan, just north of the insecure conflict areas (see Map 18).

About 1.8 million displaced persons reside in the greater Khartoum area. A USAID study found 1.25 million (69 percent) are war displaced, unable to return or send money home. With continued conflict in the South, these numbers will increase. This peri-urban group is considered moderately vulnerable because people manage to secure minimum needs (studies have indicated low child malnutrition). New arrivals and certain individuals (i.e., women-headed households, infants and elderly) receive food assistance from NGOs through supplementary feeding programs.

The Government of Sudan (GOS) has plans to relocate displaced populations to settlements farther from Khartoum. If carried out, this plan will increase vulnerability because of inadequate infrastructure, including labor and product markets, at the new sites. The GOS is also returning displaced people to the South, with no reliable support or rehabilitation. Upon arrival at relocation sites promised land and inputs are not provided.

Approximately 350,000 displaced reside in camps in the Transitional Zone. These displaced are primarily agro-pastoralists from the South who have lost their animals and have no access to farm land. Current vulnerability of this group is moderate while NGO distributed relief continues (roughly 85 percent are totally dependant on NGO relief food). Reduc-

tions to half rations in these camps are frequent due to disrupted distribution channels and the periodic influx of newly displaced. Migrations to other camps has occurred when food distributions have stopped for months at a time. A program introducing sharecropping to camp residents has been introduced and if successful could decrease vulnerability.

An estimated 2.35 million displaced people are in the South. Some of these people congregate around GOS-held garrison towns, while others remain in rural areas. Most displaced in the South have lost their animals, have no access to agricultural land or farming inputs, and have no employment opportunities. Approximately 25 percent (about 0.6 million) are solely dependent upon relief and are considered extremely vulnerable, particularly mothers, infants and the elderly. Continued fighting, unsafe transport routes, communications problems, and continual delays in GOS and SPLA approval (especially of relief flights) have made relief delivery extremely difficult. In 1988, an estimated 250,000 people starved to death because of an upsurge in the number of displaced and relief delivery problems.

Vulnerability of displaced populations in the rural South depends on climate conditions. Generally favorable climatic conditions favor crop and pasture production in the South. Although good climatic conditions in 1989 were not exploited because of civil unrest, some farming areas are now considered safe. United States Government (USG)-funded, and NGO-implemented, distributions provided seeds and tools to 57,500 displaced families (about 345,000 individuals) in GOS-held towns. In SPLA-held areas the USG contributed U.S. \$2.1 million for similar activities. Favorable weather, reduced conflict, and increased inputs would mitigate vulnerability of the rural displaced in the South.

Refugees

The United Nations High Commission for Refugees (UNHCR) estimated a refugee population of 973,000 in December 1989. Refugees are mostly Ethiopians, with some Chadians, many of whom have been in Sudan since the 1984 drought. The drought-induced influx from Ethiopia in 1989 has not been large. Refugees are in settlements, camps, and urban areas in various regions of Sudan (see Table 6).

Refugees in settlements are only slightly vulnerable as they have some income from crop and animal production and agricultural and urban wage labor. Most long-time refugees in the East have received farm land in their planned settlements. New settlement arrivals face a similar situation, although available land is increasingly marginal and employment opportunities are decreasing. In some cases, NGOs provide supplementary food rations to female-headed households, pregnant and lactating women, children, and the elderly.

Table 6: Numbers of Refugees in Sudan by Region (1989)

REGION	TOTAL
Eastern	742,319
Central	50,071
Darfur	110,223
Equatoria	21,119
Khartoum	50,000
TOTAL 1989	973,732
TOTAL 1988	1,069,000
TOTAL 1987	847,000

Source: Commission on Refugees

Refugees in camps remain partially dependent on NGO provided food rations and are thus moderately vulnerable. A joint study (by the UNHCR, the GOS and the World Food Program) estimated 186,000, primarily camp, and some settlement, refugees will need food rations in 1991. Camp refugees have access to seasonal agricultural employment.

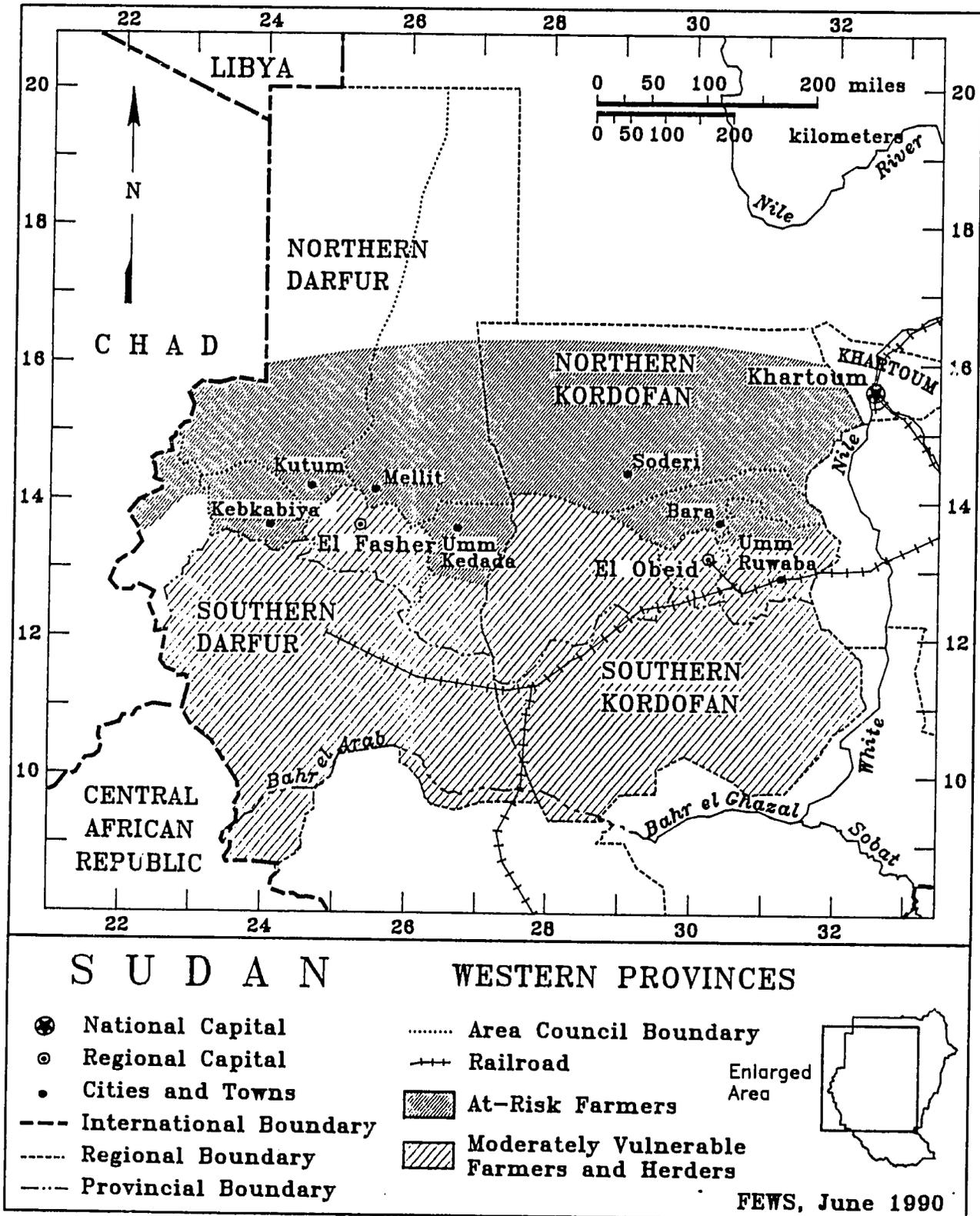
Urban refugees have generally found wage labor opportunities and their current vulnerability is low. NGOs provide rations to newcomers and vulnerable individuals, including mothers, infants and the elderly.

Farmers in the Mechanized Rainfed Sector

Farmers in the mechanized rainfed sector of Eastern and Central regions and small areas of western Sudan are slightly vulnerable. These farmers number only in the thousands and mainly reside in urban areas, while hired laborers work the farms. Farms are large (1,000 to 80,000 feddans - one feddan equals 0.42 hectares) and always produce a surplus. While highly variable climatic and economic conditions result in annual changes in area planted, yield and total production, there is always sufficient production to meet family consumption needs.

Farmers in the Irrigated Sector

Farmers in the irrigated sector of Eastern and Central regions number around 200,000 households and are slightly vulnerable. They grow sorghum for their own consumption and payment of laborers in addition to cotton and wheat. Yields are relatively stable, with adverse climatic conditions affecting wheat and cotton more than sorghum. These farmers maintain large livestock herds that diversify their income sources and further decrease vulnerability.



Map 19: Magnification of the Western Provinces in Sudan

Landless Laborers

The landless population in Sudan can be divided into permanently settled rural laborers and urban laborers. The majority of permanent farm laborers live near the mechanized and irrigated agricultural areas with normally good labor opportunities. This group is moderately vulnerable because they largely depend upon purchased food, although some are paid in food and others sharecrop.

Labor demand in the mechanized sector is sensitive to climate. Reduced rainfall results in less area under cultivation, reduced harvest, and a declining demand for labor. Reduced demand for labor and increased competition for jobs results in declining wages. Lower production causes grain prices to rise and reduces the purchasing power of wages, forcing laborers to buy less food at higher cost. However, there is little history of providing emergency food assistance to this group. They usually withstand a bad agricultural year through personal savings and family support networks.

Urban laborers are slightly vulnerable. Their wages do not depend on the outcome of the agricultural season. However, increased food prices from reduced harvests and inflation can greatly affect the purchasing power of their wage incomes.

Pastoralists

In this assessment, pastoralists and true nomads are considered together. Pastoral and nomadic groups are spread throughout Sudan, primarily in the semi-arid areas unsuitable for farming in the far north, and the northern parts of western and southern Sudan. Many are still recovering from severe herd losses suffered in 1984. In 1988, 400,000 nomads in Red Sea Province received food aid, but as their herds were reconstituted assistance has been discontinued.

Baseline and current vulnerability for pastoralists is moderate, although long-term environmental degradation and land competition with farmers have steadily increased. They are vulnerable to pasture failure (e.g., drought, deforestation, overgrazing, etc.) and water availability, but they have adapted to these recurrent conditions. Some studies suggest that the vulnerability for some nomadic groups has decreased with the increased marketing of their dairy products.

Agro-Pastoralists

Agro-pastoralists live throughout southern Sudan, especially in eastern Bahr el Ghazal Province (see Map 17). Agro-pastoralists use three food security strategies in a seasonal, semi-nomadic fashion. First and foremost, they are livestock herders with a diet dependent on milk. Second, they cultivate maize, sorghum and vegetables on local soils of limited potential, as they are better suited to pasture. Finally, they fish and collect wild foods, activities which have become more important in recent years. Food availability is lowest during planting (April-July) and before harvest (August).

Baseline and current vulnerability for agro-pastoralists is moderate. They remain vulnerable to climatic conditions which affect pasture, farm land and animal disease. Inoculation of one million cattle in a 1989 cattle vaccination program should reduce the incidence of disease. Conflict and raids have become a serious concern. The abduction and killing of menfolk in raids has left a high number of widows in some areas. Cattle are also lost in raids.

Conclusion

Traditional farmers in the provinces of Northern Darfur and Northern Kordofan are extremely vulnerable. Displaced persons in the South and the Transitional Zone, currently receiving assistance, are moderately vulnerable as the 1990/91 agricultural season commences. The vulnerability of western farmers is high because of persistently poor ecological and economic conditions and will increase greatly if the 1990/91 agricultural year is meager. These farmers, many of whom required relief in 1989/90, approach 1991 with depleted reserves and resources.

Displaced persons in the South and the Transitional Zone are moderately vulnerable because of continued conflict. They are often dependent on relief food, which is always difficult to deliver. Their status should remain stable in the coming year, assuming relief agencies continue to operate. Disruption of NGO activities in Sudan would increase the vulnerability of both the displaced and refugee groups.

Moderately vulnerable groups requiring continued monitoring include farmers in Southern Darfur and Southern Kordofan provinces, pastoralists, and farmers and agro-pastoralists in the South. Increased vulnerability for these groups results from poor agroclimatic conditions, decreased labor opportunities and wages, and increased grain prices.

Key indicators for monitoring these groups include climatic data such as rainfall and remote sensing of vegetation; agricultural data such as pest activity, cereal yields, cash crop production, and pasture conditions; economic data such as flows, prices, quality of livestock and cereals brought to market, and migrant labor wages and opportunities; and household data such as nutrition levels, labor migration, and use of alternate coping strategies.

National stocks and reserves are extremely low and offer minimal assistance in the event of decreased 1990/91 production. The surplus agricultural sector must also do well in 1990/91 to replenish diminished private and public stocks. Therefore, 1990/91 will be a critical year in which rains must come on time, be of at least average cumulative quantity, and evenly distributed. Failure of any of these conditions will likely cause serious food shortage problems in Sudan in 1990/91.

Appendix B: Vulnerable Groups in Sudan for 1990

Group	Subgroup	Subgroup Population	Location	Percentage Vulnerable	Base Vuln	Current Vuln	Current Relief
DISPLACED		1,800,000	Khartoum	75	Low	Low	No
			Khartoum	20	Moderate	Moderate	No
			Khartoum	5	High	High	Yes
	Trans. Zone	350,000	S. Darfur	90	High	High	Yes
			S. Darfur	10	Moderate	Moderate	No
			S. Kordofan	90	High	High	Yes
			S. Kordofan	10	Moderate	Moderate	No
	South	2,350,000	Equatoria	80	High	High	Yes
			Equatoria	20	Moderate	Moderate	No
			Bahr El Ghazal	75	High	High	Yes
Bar El Ghazal			25	Moderate	Moderate	No	
Upper Nile			65	High	High	Yes	
Upper Nile			35	Moderate	Moderate	No	
REFUGEES	Settled		Kassala Prov East	100	Low	Low	No
	Camps	110,000	Kassala Prov	100	Moderate	Moderate	Yes
			Darfur	100	Moderate	Moderate	Yes
Urban	50,000 21,000	Khartoum	100	Low	Low	No	
		Juba	100	Low	Low	No	
FARMERS	Trad.	1,267,000 1,633,700 1,244,500 969,600	North Darfur	100	Moderate	High	Yes
			South Darfur	100	Moderate	Moderate	
			North Kordofan	100	Moderate	High	Yes
			South Kordofan	100	Moderate	Moderate	
			Central/East	100	Moderate	Low	
	Mech.	Several '000 Families	Central	100	Very Low	Very Low	No
			East	100	Very Low	Very Low	No
			West	75	Low	Very Low	No
	Irrig.	200,000 Families	West	25	Low	Moderate	No
			Central	100	Very Low	Very Low	No
AGRO-PASTORALISTS		111,000 272,300 284,700 248,800	East	100	Very Low	Very Low	No
			South Darfur	100	Moderate	High	No
			North Kordofan	100	Moderate	Moderate	No
			South Kordofan	100	Moderate	High	No
			Red Sea	100	Moderate	Moderate	No
PASTORALISTS AND NOMADS		111,000 90,800 284,700 83,000 474,200	Central	100	Very Low	Very Low	No
			East	100	Very Low	Very Low	No
			South Darfur	100	Moderate	High	No
			North Kordofan	100	Moderate	Moderate	No
			South Kordofan	100	Moderate	High	No
LANDLESS	Settled		East	100	Low	Moderate	No
	Ag. Labor		Central	100	Low	Moderate	No
URBAN RESIDENTS	Poor			100	Moderate	Moderate	No
	Laborers			100	Low	Low	No
	Skilled			100	Very Low	Very Low	No
	South			60	Moderate	Moderate	No

Note: Population estimates are projections from the 1983 census using regional growth rates. Subgroup populations are obtained from estimates of the percent of provincial population within each group.

ETHIOPIA

2.5-3 Million At Risk of Famine in Eritrea, Tigray

Summary

Severe chronic and current food stress conditions have left from 2.5 to 3 million people immediately "at risk" of famine in the northern areas of Ethiopia, especially in Eritrea and northern Tigray (see Map 20). Mid-land and highland rural agriculturalists and agro-pastoralists are the most immediately threatened by a combination of chronic and current conditions. Urban poor and displaced families in government-controlled areas of Eritrea Region are also extremely vulnerable due to a different mix of chronic and current conditions. Somali and Sudanese refugees are currently only moderately vulnerable to famine, but are likely to remain chronically vulnerable for the foreseeable future. The relative vulnerability of Ethiopia is high compared to other FEWS-monitored countries. Minimal success in mitigating the causes of chronic and current vulnerability is expected until warfare and conflict become less of a determinant of food security in much of Ethiopia.

Country Background

Conditions in Ethiopia are among the most difficult in the world, as measured by quality of life and traditional development indicators. The third major international effort since 1985 to meet national food needs is presently underway, with a goal of supplying approximately 40,000 metric tons (mt) of emergency food assistance per month throughout the remainder of the calendar year (or 240-250,000 mt). This effort is greatly impeded by an upsurge in fighting in northern Ethiopia. War has afflicted much of northern Ethiopia for over 25 years. Eritreans fighting for secession, Tigrayans fighting for the overthrow of the current government and other smaller groups of varying objectives are currently locked in a major struggle with the Government of Ethiopia (GOE).

Methodology Application

A variety of physical and socioeconomic monitoring and background data were consulted in preparing this vul-

nerability assessment. These data were obtained in the U.S., Ethiopia and elsewhere. Particularly relevant information was provided by personnel of the Agency for International Development (USAID) Representation in Addis Ababa, the University of Leeds (United Kingdom) Eritrea Food and Agriculture Assessment Study, various World Food Program (WFP) and United Nations Emergency Preparedness and Planning Group (UN-EPPG) reports and monitoring, GOE Relief and Rehabilitation Commission (RRC) reports, Eritrean and Tigrayan organizations, and remotely-sensed satellite data.

Interpretation of the available information identified particular socioeconomic groups within the population that are more threatened by food stress and possible famine than others. Analysis of available data and qualitative perceptions has been cautious due to limited temporal and spatial information. Baseline data on food production, traditional coping strategies, access to food, and other resources is rarely available below the regional level. This is particularly true of the areas and populations judged "at risk" of famine in this report. Furthermore, the volatile nature of current events may quickly render inaccurate much of the information in this report.

Analysis of Socioeconomic Groups & Subgroups

Agriculturalists and Agro-Pastoralists in the North

Approximately 2 to 2.5 million mid- and highland agriculturalists and agro-pastoralists of Eritrea and northern Tigray regions are judged to be "at risk" of famine. They are largely found in an arc 50 to 100 kilometers (km) wide that runs from the town of Keren south-eastward through Asmara, down through Adi Kwala and Adigrat, and finally southward to Mekele (see Map 21). People in these areas generally occupy farming and grazing land above 1,500 meters in altitude and are located quite close to the main roads passing through these points. The principal crops grown include sorghum, barley, maize, millet, teff and pulses, with oxen used to till the soil. Many farmers and most agro-pastoralists keep a variety of animals for consumption and sale.

The "at-risk" status of these farmers and agro-pastoralists is a result of combined chronic and current conditions.

Chronic conditions that negatively affect the food security of these populations include:

- *Continuing destructive warfare* (over 25 years) that recently spread beyond Eritrea and Tigray,
- *Several major droughts*, consequent crop losses and famine over the last twenty years, and
- *Inappropriate agricultural policies and practices* that have magnified the impact of warfare and drought and hastened the depletion and erosion of farming soils.

Recent conditions and events that have contributed to the current "at-risk" status of these populations include:

- *Poor main season harvest of 1989* -- on-farm agricultural production in rural Eritrea meets less than five month's food needs in a "normal" war year with "normal" rainfall. This probably holds for eastern Tigray as well. Production in "bad" years (ex. 1987) provides less than two months supply. The harvest in 1989, particularly in the arc described above, was as bad, or slightly worse, than in 1987.
- *Frequent poor to mediocre main season harvests in these areas* (ex. 1984, 1986, 1987, and 1989) -- Successive poor harvests drain household resources that are normally used to meet production shortfalls. Frequent poor harvests have left little opportunity to save or replenish assets.
- *Loss of off-farm agricultural wage labor opportunities* -- Poor farmers and agro-pastoralists seek off-farm agricultural wage labor to increase incomes and supplement on-farm food production shortfalls by purchasing grain. Increased fighting in northern Ethiopia and poor crop prospects have greatly reduced demand for agricultural wage labor, precisely when it is most needed as an income supplement by poor households. Increases in grain prices, due to supply shortages and marketing difficulties, have compounded the reduced purchasing power of households in these areas.
- *High livestock mortality during the 1983-85 drought* -- Farmers and agro-pastoralists held roughly half the number of animals in 1987 that they possessed prior to the 1983-84 drought. A 1988 University of Leeds study found that rich farmers had an average of 1.9 oxen, middle-income farmers 1.2, and poor farmers, comprising over 60 percent of the rural population, 0.3 oxen per household (some under-reporting was suspected). High livestock mortality and subsequent reduced herd size have had a dual negative impact on food security. These populations depend upon animal sales to supplement their income when grain production shortfalls occur. Fewer animals means fewer assets to liquidate

in poor grain production years. Preparing land for cultivation in the mid- and highlands requires two oxen. Most rural households will therefore have to rent one or more animals at higher rates (typically one-third of the harvest) and plow only after the animals' owners have prepared their own fields.

- *Intensified fighting since 1988* and especially since the fall of the port of Massawa (February 1990) -- GOE-controlled areas, since February 1990, contain the most affected mid and high altitude populations and have had little or no access to food aid from either the GOE or the rebels. Disruptions in food production, marketing and delivery of relief are greatly intensified by the continuing conflict.

Farmers and agro-pastoralists in parts of Eritrea and Tigray outside the arc defined above are not as seriously vulnerable. Low altitude farmers grow less of the drought-susceptible barley, maize, and teff and more of the hardier sorghum and millet. Satellite, rain station, and anecdotal reports indicate that the rains and harvests of 1987 and 1989 were not as poor at lower altitudes and in other parts of Eritrea and Tigray. Western Tigray produced a marketable grain surplus in 1989. In the last several years, fighting has been less intense outside of the areas between Keren and Mekele. Food aid deliveries outside the arc by the Eritrean Relief Association (ERA) and the Relief Society of Tigray (REST) have been substantial since the beginning of 1990, and apparently successful in meeting food needs in most areas. In particular, REST relief operations, and those it has allowed to pass along the "Southern Line" relief corridor (see Map 21) from Asseb through Dese, have apparently forestalled movements of people in search of food in the area north of Mekele, which had a devastated 1989 harvest.

Urban Poor in Government-Held Areas of Eritrea

The urban poor of GOE-held towns in Eritrea Region are considered extremely vulnerable to famine until their access to emergency food aid can be improved beyond present supplies. Minimal regular resupply of food to GOE areas occurred until an airlift to Asmara began in May 1990. Approximately 9,000 mt of food stocks were held by relief agencies in Asmara at the end of May 1990. Food prices are reported to be "very high." A field officer of the UN-EPPG visiting the GOE-held towns of Asmara, Keren and Adi Kwala reported "No signs of wide-spread malnutrition were seen, but there was clearly hardship both in rural areas and amongst urban poor of Asmara." Hardship will eventually turn to malnutrition and is probably already affecting the most vulnerable subsets of the urban population -- infants, women of childbearing age, and the elderly.

Approximately 500,000 residents, displaced, and military dependents in Asmara, and perhaps another 100,000 in Keren and other towns, still reside in GOE-controlled areas. The

majority of urban residents rely on wage labor and salaries for their incomes. Continuing warfare has constrained local economies for some time and recent rebel advances around GOE-held towns have reduced the frequency of payment of public and private sector wages and salaries. The urban poor generally have less access than their rural counterparts to crops and animals as a coping strategy against hunger. Their access to family resources outside of government-held areas is greatly restricted and, since February, emergency and regular food aid has almost stopped.

Displaced Populations

Warfare and drought have caused considerable displacement of populations within Ethiopia, especially in Eritrea, resulting in an extremely vulnerable population. Encircling warfare has made it extremely difficult to meet the needs of the displaced in GOE-held areas. The existing humanitarian infrastructure may not be able to assure the sustenance of the displaced in these areas. Firm estimates of the number and location of displaced populations in Eritrea and elsewhere are difficult to obtain. Most displaced have left their home areas to lodge with other family members or neighbors. Approximately 107,000 displaced people reside in a facility outside Asmara.

Periodic reports from a variety of sources note displaced people in Gonder, Tigray, Wello, and elsewhere, although little quantitative information on numbers, locations and needs is available. Over 200,000 Tigrayans were believed to have moved into south-eastern Eritrea in 1989 to insure access to previous food distribution sites, but their present circumstances are hard to determine. Frequent mention is made of the relative success of the Tigrayan Peoples Liberation Front (TPLF) in avoiding massive numbers of displaced in early 1990 by providing sufficient emergency food distributions close to home villages.

Most displaced families rarely move from homes and lands until the situation is quite desperate and they carry few assets when they do move. Female-headed households are particularly vulnerable as there is only one income earner, women may have limited workplace skills, and they are frequently occupied with the care of infants and children. Assistance required to deal with the chronic vulnerability of displaced populations include water, food, shelter, security, and health and medical services.

Somali and Sudanese Refugees

Somali and Sudanese refugees are moderately vulnerable and require particular monitoring, but no immediate material assistance beyond that already planned or provided, except as a result of disruptions of camp conditions by local conflict. Although there remain a number of logistic, security, health, management, and political issues regarding refugee care in Ethiopia, conditions are generally good at the moment. In

April 1990, there were approximately 360,000 Somali refugees in six camps in Harerghe Region and 350,000 Sudanese refugees in three camps in Western Ethiopia (see Map 20). Both groups of refugees are fleeing conflict in their home areas, and most have been in Ethiopia less than three years. Food, water, logistics, health and other services are currently provided by the United Nations High Commission for Refugees (UNHCR), WFP, international donors, and a variety of local and international private voluntary and non-governmental organizations. As in the case of the displaced populations described above, these refugees are now chronically vulnerable and will require substantial assistance for the foreseeable future.

Agriculturalists and Agro-Pastoralists in the Center and East

Agriculturalists and agro-pastoralists in southern Tigray, Wello, northeastern Shewa, mid- and highland Harerghe, eastern Gonder, and northwestern Bale regions (see Map 20) are more moderately vulnerable than in Eritrea and Tigray. Although frequently subject to severe food shortages, most of these areas received good rains in 1988 that produced excellent harvests. Rains during the 1989 main season were average to good, and harvests were average to better-than-average. Although warfare has definitely affected almost all of Gonder and Wello and parts of Shewa, the level of destruction and disruption, with local exceptions, appears less than in Eritrea and Tigray.

Recent events have helped to moderate the vulnerability in these areas. The "Southern Line" relief operation has delivered emergency food in increasing quantities (13,000 mt as of May 19) along the main road from Dese, Wello Region, to Adigrat in Tigray Region (see Map 21). The secondary *belg* (spring) agricultural season appears to have been successful and will provide substantial amounts of food (in the range of 400,000 mt) to northeastern Shewa, Wello, Bale, and surrounding areas. In some areas of Wello and Shewa, the *belg* harvest will supply as much as 50 percent of annual food production.

The chronic problems in these areas are similar to those in Eritrea and northeastern Tigray. They include greatly variable rainfall, frequent droughts and consequent food shortages, general poverty, relatively fragile and eroding soils, inappropriate government policies, and lack of infrastructure. The social and economic disruptions due to conflict also play a major role in predisposing these groups to periodic food stress.

Pastoralists

Pastoralists throughout Ethiopia are only slightly vulnerable in 1990/91. The poor quantity and timing of rainfall in 1987 and 1989, though devastating for crops, was adequate for pasture production. Grazing areas are available and,

Conclusion

From 2.5 to 3 million people are currently extremely vulnerable to, or "at-risk" of, famine in northern Ethiopia. A common feature of the conditions of most of these populations is the persistent and spreading warfare in the country and in neighboring countries. Elements which chronically predispose these same groups to hunger and potential famine are also quite important in their present conditions. Resolving only the recent causes of their risk does not, in many cases, appreciably change the level of their overall vulnerability.

Important indicators to follow for monitoring agriculturalists, agro-pastoralists, the urban poor, and displaced populations will be prices and quantities of cereals. Cereal price monitoring is important because most people obtain a large percentage of their food needs from the market. Animal prices are important because livestock sales are a major source of income for many groups. When sales prices for animals decline, purchasing power falls. Off-farm agricultural wage rates, where work is available, will also be a key indicator of income levels and possibilities.

Quantities of emergency food deliveries to critical urban, rural, refugee, and displaced facilities will also be a key determinant. Many groups have received more than one-third of their food supply from emergency assistance even in recent "good" agricultural production years. The progress of the 1990/91 agricultural season in Eritrea and northern Tigray will be monitored via rainfall and remote sensing data for Eritrea and northern Tigray. The relative quantity of agricultural output for the 1990/91 season may be apparent from rainfall data as early as mid-July. In areas such as Harerghe, Wello, and eastern Gonder, this same data from a later period in the year will be an important indicator of the likelihood and possible degree of food stress for late 1990.

Conflict and warfare have an unpredictable, but frequently disastrous, impact on vulnerability levels of all groups. Unfortunately, the restricted access to information that accompanies civil conflict inhibits the tracking of food security for affected populations. Areas of conflict will have to be closely monitored.

Key Terms

At Risk - FEWS Reports employ the term "at risk" to describe populations either currently, or in the near future, expected to have insufficient food, or resources to acquire food, to avert a nutritional crisis (i.e., progressive deterioration in health or nutritional condition below the status quo). "At risk" populations require specific intervention to avoid a life-threatening situation.

Food needs estimates are sometimes included in FEWS reports. However, no direct relation exists between the numbers of persons deemed "at risk" and the quantity of food assistance needed. Famines are the culmination of a slow-onsetting process, which can be extremely complex. The food needs of specific "at risk" populations depends upon the point in this process when the problem is identified and the extent of its cumulative impact on the individuals concerned. The amount of food assistance required, from either internal or external sources, depends upon many considerations. Food need estimates periodically presented in FEWS reports *should not* be interpreted as food aid needs (e.g., as under PL-480 or other specific donor programs).

ITCZ - The Intertropical Convergence Zone (ITCZ) is equivalent to a meteorological equator; a region of general upward air motion and relatively low surface pressure bounded to the north and south by the northeast and southeast Trade Winds, respectively. The upward motion in the ITCZ forms the rising branch of the meridional Hadley Circulation. The ITCZ moves north and south following the apparent movement of the sun. It is at its most northerly position in the summer months. The position of the ITCZ normally defines the northern limits of possible precipitation in the Sahel; rainfall generally occurs 100 to 300 kilometers south of the ITCZ.

NDVI - Normalized Difference Vegetation Index (NDVI) images are created at the laboratory of the National Aeronautic and Space Administration (NASA) Global Inventory Modeling and Monitoring System (GIMMS). The images are derived from Global Area Coverage (GAC) imagery (of approximately 7 kilometers resolution) received from the Advanced Very High Resolution Radiometer (AVHRR) sensors on board the National Oceanic and Atmospheric Administration (NOAA) Polar Orbiting series of satellites. The polar orbiter satellites remotely sense the entire Earth and its atmosphere once each day and once each night, collecting data in 5 spectral bands. Bands 1 and 2 sense reflected red and infra-red wavelengths respectively, and the remaining 3 bands sense emitted radiation in 3 different spectral bands. The NDVI images are created by calculating

$$(\text{infrared} - \text{red}) / (\text{infrared} + \text{red})$$

for each pixel from the daytime satellite passes. Since chlorophyll reflects more in the infrared band than in the red band, higher NDVI values indicate the presence of more chlorophyll and, by inference, more live vegetation. A composite of daily NDVI images is created for each 10-day period, using the highest NDVI value for each pixel during that period. This technique minimizes the effects of clouds and other forms of atmospheric interference that tend to reduce NDVI values. NDVI is often referred to as a measure of "greenness" or "vegetative vigor." The NDVI images are used to monitor the response of vegetation to weather conditions.