SUDAN

Record Harvest in the North,
Famine Continues in the South

FAMINE EARLY WARNING SYSTEM

Produced by the Office of Technical Resources - Africa Bureau - USAID
FAMINE EARLY WARNING SYSTEM

The Famine Early Warning System (FEWS) is an Agency-wide effort coordinated by the Africa Bureau of the U.S. Agency for International Development (USAID). Its mission is to assemble, analyze and report on the complex conditions which may lead to famine in any one of the following drought-prone countries in Africa:

-Burkina
- Chad
- Ethiopia
- Mali

- Mauritania
- Niger
- Sudan

FEWS reflects the Africa Bureau's commitment to providing reliable and timely information to decision-makers within the Agency, within the eight countries, and among the broader donor community, so that they can take appropriate actions to avert a famine.

FEWS relies on information it obtains from a wide variety of sources including: USAID Missions, host governments, private voluntary organizations, international donor and relief agencies, and the remote sensing and academic communities. In addition, the FEWS system obtains information directly from FEWS Field Representatives currently assigned to six USAID Missions.

FEWS analyzes the information it collects, crosschecks and analyzes the data, and systematically disseminates its findings through the following publications:

- FEWS Country Reports - produced monthly during the growing season, and bimonthly during the rest of the year, and
- FEWS Bulletins - produced every ten days during the growing season.

In addition, FEWS serves the USAID staff by:

- preparing FEWS Alert Memoranda for distribution to top USAID decision-makers when dictated by fast-breaking events;
- preparing Special Reports, maps, briefings, analyses, etc. upon request; and
- responding to special inquiries.

FEWS Country Reports, Bulletins, Alert Memoranda, and other special studies are prepared for USAID’s Africa Bureau by Price, Williams & Associates, Inc.

The work of the FEWS Field Representatives is coordinated by Tulane University's School of Public Health and Tropical Medicine.

NOTE: This publication is a working document and should not be construed as an official pronouncement of the U.S. Agency for International Development.
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December 1988

ERRATA

Maps 2 and 3 are illegible due to a printer's error. Vegetation throughout Sudan was generally better than in 1987 and showed greenup farther north than usual.

Contents

Summary 3
People At Risk of Famine 6
Summer 1988 Emergency Food Aid Distributions 6
Comparison with June Assessment 6
Agricultural Production and Harvest Prospects 6
Rainfall and Vegetation 7
Constraints on Production 7
Socio-Economic Indicators 10
Implications For Vulnerability 10
Regional Summary 11

List of Figures

Map 1 Summary Map 2
Table Displaced Population 5
Map 2 1988 Growing Season NDVI vs 1987 8
Map 3 Cumulative 1988 Growing Season NDVI 9
Map 4 Regional NDVI 12
Sudan Summary

Legend
- National capital
- Towns
- International boundaries
- National & regional boundaries

Important concentrations of displaced people
Important concentrations of Sudanese refugees

FEWS/PWA, December 1988
SUDAN

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Summary

People displaced from the Southern Region of Sudan continue to be at risk of famine, but recent international attention holds the promise of increased relief assistance. While relief efforts to support displaced people in Kordufan and Sudanese refugees in Ethiopia are showing results, food security problems and threat of physical harm continue to plague people displaced within the Southern Region as well as rural people remaining in place there. Both sides in the conflict have finally allowed the International Committee of the Red Cross (ICRC) to launch relief efforts within the Region. In contrast to the bleak situation in the south, northern Sudan should see record-breaking harvests this year.

With some localized and minor exceptions, harvests in northern Sudan will be exceptionally good. This year's production will far exceed that of any previous year. Production was fueled by an explosive expansion of acreage planted and good-to-excellent yields. Sorghum production alone has been estimated at 5 million metric tons -- 1.4 million metric tons (MT) higher than the previous record. It is likely that some of this bounty will remain unharvested (one estimate is 20%) due to price disincentives. Satellite imagery of vegetation had indicated historically high agricultural potential (based on the inferred timing and amounts of rainfall), and actual rainfall reports later supported that finding.

The primary constraint on agricultural production in Sudan is warfare in the Southern Region. Desert Locusts proved to be of limited consequence this year. They are estimated to have consumed no more than 10% of the crop in the most highly infested provinces, which in June were also judged the areas most vulnerable to famine. Overall, locust damage is less than 2% of total production. Flooding of agricultural land along the Nile in August also apparently had little negative impact on production.

Grain prices have begun to drop precipitously. Labor is in short supply in the most productive areas, suggesting that the price of labor will rise. Poor nutrition is reported only among displaced Southerners and southern townspeople.

With the notable exceptions of two groups, displaced Southerners currently experiencing famine and former nomadic herders (now dependent on food aid) in Red Sea Province, no area in northern Sudan will be vulnerable after this year's harvest. Populations identified in June as vulnerable (i.e., at risk if a poor harvest occurred) have experienced excellent harvests. Indeed, some areas of chronic need are now reported to have produced up to a three-year supply of their populations' grain requirements.
This excellent production will foster further declines in the price of sorghum and will be a disincentive for farmers to plant sorghum in 1989, especially on eastern mechanized farms.

**People At Risk of Famine**

Famine appears rampant among displaced people from the Southern Region. Displacement is an indicator of extreme stress in rural areas of the Southern Region, especially the central core. Nevertheless, very little is known of conditions in rural areas of the Southern Region. Recent international attention by the media, congress, and private voluntary organizations could have positive benefits for the relief effort.

The US government and other donors have made commitments to provide relief assistance to displaced people, especially in Kordufan. The ICRC appears to have been able finally to begin relief operations in centers within both government and SPLA-controlled areas. Talks between one of the government's coalition partners and the Sudanese People's Liberation Army (SPLA) in Addis Ababa resulted in an agreement that may, ultimately, lead to a cease-fire. The need for relief is thought to be so great in the rural Southern Region that, should there be a cease-fire, the government of Sudan (GOS) and donors would be hard-pressed to assemble and transport the necessary relief supplies.

Relief barges for Malakal should depart from Kosti soon. A relief train for Aweil is reported to have departed from Kosti and may also depart soon from Babanusa. Relief flights continue to arrive in Juba, and Norwegian People's Aid continues its effective operations in SPLA-controlled Kapoeta, serving over 100,000 displaced people.

One of the highest priorities for assistance has been the town of Aweil in Bahr El Ghazal Province in the Southern Region. The plight of displaced people there had been long known, but little could be done. A technical team flew there (recently) and found: no displaced people -- they had all been asked to leave because of inadequate food in the town; high malnutrition levels among the remaining children of townspeople; reports of 8,000 deaths, especially among the children of townspeople and displaced people during July, August, and September; and a fear that rural people will once again converge on Aweil in the Spring.

SPLA activities have increased the number of refugees and displaced people in East Equatoria and Upper Nile provinces. The SPLA appears to have extended its control in Upper Nile Region, now said to include up to 75% of that region (recent refugee arrivals in Ethiopia are from this region) and most of rural East Equatoria Province. In Kapoeta in East Equatoria, over 100,000 displaced people are under the control of the SPLA. In the northern part of the Southern Region, armed tribal government militias appear to continue the abuse of both settled and displaced Southerners.

Relief efforts continue to focus on concentrations of displaced people in South Kordufan Province. These people have generally escaped from bordering areas in the northern part of the Southern Region. The human suffering there is well publicized. Additional relief efforts continue to supply Juba and other urban centers in the Southern Region. Airdrops are contemplated for SPLA-besieged Torit, where food stocks are reported to be depleted.

A recent survey of the displaced in Khartoum revealed childhood malnutrition rates of up to 43% (below 80% of the median weight-for-height). Limited feeding programs have been established by various private voluntary organizations (PVOs). The technical survey team that visited Aweil found 50% of children were malnourished, including almost all of those under the age of five.
Recent Estimates of the Displaced Population of Sudan

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TOTAL 1,460,480

SOURCE: USAID MISSION in Khartoum, except for information on Kapoeta.

\(^1\) Others estimate 100,000 people displaced in Juba, 500,000 people displaced in all of East Equatoria.

\(^2\) Under the control of the SPLA, not reported from Khartoum.

\(^3\) Others estimate 75,000 people displaced in Wau.

\(^4\) A recent technical survey team visit to Aweil revealed no displaced people. They appear to have dispersed into the countryside, moved north, or died. There are still 30,000 people living in Aweil.

\(^5\) Refugees in camps under the Authority of the United Nations High Commissioner on Refugees (UNHCR).
Summer Emergency Food Aid Distributions

Programmed food aid for people (residents) at risk of famine in Darfur and Kordufan Regions had not reached programmed levels by summer when delivery became much more difficult due to road washouts. There is no information available on the consequences of this shortfall -- no nutrition surveys were undertaken to monitor areas at risk. The excellent rains of the summer, however, benefited the supply of wild foods that are collected for both consumption and sale.

Flooding in Khartoum during early August was the major international media event of the summer. Efforts at relief were immediately undertaken by donors, and a long term plan for rehabilitation has been implemented. Feared epidemics (especially cholera) and famine have, luckily, not occurred. Malaria, however, is reported to be especially virulent this year, probably as a consequence of the rains.

Flooding along the Blue Nile, White Nile, Nile, and A:bara rivers had, apparently, little effect on health or agriculture. Indeed, it was suggested at the time of the floods (August) that they would increase the fertility of already highly productive irrigated acreage. One exception has been reported along the White Nile in Upper Nile Province, where flooding may have limited production. Little is known of the situation due to insecurity there.

Among the Sudanese most at risk of famine during the summer were Sudanese refugees in Ethiopia. These people apparently received adequate assistance from the UNHCR, with help from the government of Ethiopia. During the summer, however, there were times when it seemed as if whole camps would be cut off by the rains and be left without any food stocks. Relief always appeared at the last minute.

The summer saw massive numbers of deaths among displaced people in camps and in the countryside. Relief efforts to Southern cities continued through the summer -- but only at inadequate levels, at best. SPLA attacks on relief planes and convoys slowed relief efforts. In the absence of military escorts, some relief shipments did not occur.

Comparison with June Assessment

The June FEWS Vulnerability Assessment did not anticipate emergency needs associated with flooding in Khartoum or flooding along the major rivers of Sudan. Findings that labeled Darfur, and to a lesser extent Kordufan, as vulnerable were probably accurate. Since little is known of the effect of food aid delivered, or not delivered, in these areas, FEWS cannot judge the accuracy of its forecasts there. FEWS did note that the "Southern Region is the area most vulnerable to famine in Sudan, primarily due to high levels of insecurity and armed conflict." This situation continues today. The June FEWS Vulnerability Assessment also stated that publicly held grain stocks would be -- at best -- sufficient only until harvest of this year. In fact, public stocks still exist -- partly due to poor distribution. Privately held stocks, however, were greater than inferred from estimates of previous years' agricultural production.

Agricultural Production and Harvest Prospects

The Ministry of Agriculture reports that 1988 was a year of record grain production in Sudan. Its preliminary estimates suggest that acreage devoted to sorghum in the rain-fed mechanized areas will total some 10 million feddans (1 feddan = .42 hectares or 1.04 acres), compared to 5.3 million last year. The area planted to sorghum in the traditional rain-fed sector is estimated at about 3 million feddans compared to 2 million last year. Production in the rain-fed mechanized sector is expected to be about 3.3 million MT (compared to .9 million last year) and in the traditional sector, about 0.8 million MT (compared to 0.16 million last year). With the addition of an estimated .9 million MT from
the irrigated sector, the total sorghum harvest is estimated at about 5 million MT. Millet production, meanwhile, is estimated at .6 million MT, a major increase from last year's 153,000 MT. This combined production represents about 200% of Sudan's national requirement. Price disincentives are expected to limit the sorghum harvest to only 80% of production. (The World Food Program (WFP) reports that a crop assessment team from the Food and Agriculture Organization (FAO) estimates a harvest of 4.3 million MT of coarse grains. It is not clear whether this estimate includes production from the irrigated sector.)

The reported failure of the millet crop in a few sparsely inhabited areas of far northern Darfur Region is an anomaly. While some limited relief efforts will be made to a few villages in Mellit District, this is an area where millet is usually a garden crop. The area is primarily dependent on pastoralism.

Pasturage was good throughout northern Sudan this year, and livestock should be in excellent condition entering the dry season. Livestock prices are rising in general -- although limited reports of livestock in good condition do not support the inference that the rise in price is due to short supply.

Rainfall and Vegetation

Satellite imagery of vegetation (NDVI, see inside back cover) supported a forecast of exceptional yield potential throughout the growing season. The exceptional, rapid, and enduring green-up lead to great optimism for agriculture throughout Sudan. In most of northern Sudan, vegetation reached levels higher than seen in 1987 (see Map 2). Rainfall reports, although not as timely as satellite imagery, confirmed the record-breaking potential throughout the growing season. Indeed, rainfall approached or surpassed the 30-year average almost everywhere in Sudan.

Map 3 shows the cumulative NDVI levels for 1988 in Sudan. While the Southern Region shows the greatest absolute vegetative potential, warfare there has severely disrupted both agriculture and herding. In general, these levels have all shifted northward from their historic positions.

The only areas that showed a potential problem early in the agricultural season were in Jongoli Province of the Southern Region. This does not appear to be a problem for agriculture; historically low NDVI values in these sparsely inhabited areas are believed to be due to traditional burning practices of herders.

Constraints on Production

Pests do not appear to have been a significant constraint on agricultural production this year. Desert Locusts bypassed crops in favor of native grasses. In the areas most densely infested (North Darfur, North Kordufan, and Northern provinces), no more than 10% of the crop is estimated to have been consumed by Desert Locusts. Overall, only 2% of national production is estimated to have been consumed by locusts. Experts believe that in any year, in areas with endemic Desert Locusts, 20% of the crop is usually lost to pests of all types. In North Darfur, locusts were secondary to other pests in areas surveyed. Both North Darfur and North Kordufan are agriculturally marginal. Losses there would have very little impact on national production, although locally these losses could be severe. While extensive effort went into locust control activities, these activities were seen by many observers during the season as too little too late, given the massive infestations.

Flooding along the Nile and its tributaries during August and September apparently had little effect on agricultural potential in Sudan (with the possible exception of areas outside government control around Malakal in Upper Nile Province of Southern Region). While estimates of riverine agricultural production are not available (harvest occurs early in 1989), there is no indication of any potential problem. Indeed, some observers suggest that flooded fields will respond with excellent yields this year.
1988 Growing Season
NDVI vs 1987

Higher cumulated NDVI than in 1987
Map 3

Cumulative 1988 Growing Season NDVI

Moderate cumulated NDVI, probable limit of grass lands

Most cumulated NDVI

FEWS/PWA, December 1988
It is clear from limited reports that war severely disrupted agricultural and pastoral production this year in the Southern Region. Upper Nile and Equatoria regions appear to have been the most affected this year, although little is known of the rural situation in the rest of the Southern Region.

**Socio-Economic Indicators**

Prices for grain have declined rapidly, in some places to below the cost of production. This conforms to the general finding of record production. The cost of producing a 90 kg bag of sorghum is estimated at 80 Sudanese pounds. In Gedaref, sorghum is selling for 50 pounds per bag, and in Renk it sells for 30 pounds.

Prices for grain, especially millet, declined from their record highs by about 50% between August and October in most surveyed areas of North Darfur. This precipitous decline has not ended, but prices might remain relatively high as millet is withheld from market to replenish on-farm stocks.

Nutrition surveys in Sudan have only been reported for displaced people. Limited nutritional information restricts assessments on the effectiveness of food aid flows, or changes in vulnerability.

In North Darfur, markets are described as full of cultivated, commercial, and wild food stuffs. Grain sorghum is being sold as animal fodder. The observed diversity and availability of food in North Darfur markets is just one more sign of an exceptional agricultural year.

**Implications for Vulnerability**

The June 1988 FEWS Vulnerability Report for Sudan emphasized the inadequacy of production in 1987, which resulted in very low public and private (especially in western Sudan) food stocks. Production in 1988 appears to have reversed that situation. The report also emphasized the variability of agricultural production from year to year throughout the country as an *a priori* measure of vulnerability. It also emphasized the extreme variability of NDVI from year to year, especially in Sudan's most agriculturally productive areas. The excellent NDVI values and generally good to excellent rainfall levels throughout the country this season are indicators that were validated in the record production of both food and cash crops throughout northern Sudan.

Food production in Sudan is centered around sorghum crops on mechanized farms in eastern Sudan. For many people, especially in western Sudan, food is grown through traditional rainfed or wadi-recessional cultivation with the household as the central production unit. It is these latter people, especially in the northern reaches of Darfur Region, who were judged most vulnerable should the 1988 harvest be poor. The harvest of both food and cash crops, however, has been excellent. People in these areas were at risk and required food aid during the agricultural season, prior to harvest. There is no recent nutritional information available to indicate the sufficiency of food aid delivered to these people. The excellent rainfall, however, did promote the growth of wild foods to supplement existing stocks and relief food.

Nutrition, which is used as an indicator of vulnerability, was poor in Darfur and other northern regions during June. No data on current nutrition among settled northerners are available to judge whether there has been any improvement or decline. Data on grain prices, on the other hand, are available. Prices show a recent decline that should reduce vulnerability and food stress potential. Current prices for sorghum (at least in the eastern mechanized areas) are lower than the cost of production.

Agricultural potential in the Southern Region was very high during the growing season, as is generally the case there. True famine continues in the Southern Region, however, with insecurity as the primary cause. Refugee movements from the central core of the region remain the single best indicator of
stress among people remaining there. The endemic malnutrition and malnutrition-related deaths among displaced Southerners are evidence of famine and the general failure of the government to alleviate that famine.

Except for Southerners and dependent former nomads in Red Sea Province, sufficient food should limit vulnerability in northern Sudan through harvest 1989 and well into 1990. Some villages in Mellit District (North Darfur Province), said to have experience millet crop failures, depend primarily on pastoralism. While found vulnerable in June, these people should be in relatively good condition due to excellent pasturage and the decline of grain prices. Nonetheless, these villages are targeted for some relief efforts by Sudanese relief organizations. Household food stocks are very good in western Sudan (where the 1988 harvest should meet consumption requirements of up to three years), and mechanized eastern production should produce a sorghum surplus of over 2 million MT available for consumption in 1990. Grain production in 1989 should be low, given a reduction in planting due to anticipated low grain prices. Nonetheless, that production plus 1988 surpluses should cover requirements through the 1990 harvest. Little of this production should be available to Southerners, either those displaced or those remaining in the countryside. It is likely that, as in 1987, overall production in 1989 will fall short of national requirements. Stocks, especially household stocks in the west, should limit the negative impact of that shortfall.

Regional Summary

From Mauritania east to Ethiopia, the countries monitored by FEWS report excellent rainfall (in terms of recent history) during the 1988 growing season. Satellite imagery showed vegetative potential to be very good, and in some areas better than the historical (1982-1987) maximum (see Map 4). While estimates vary, record production can be expected in Sudan, Chad, Niger, and Mali. Production is expected to be good or better in Ethiopia and Burkina. The only exception to this good agricultural year may be Mauritania, which is the only country where predictions of significant (at a national level) locust damage might be borne out. Mauritania, however, is a grain-importing nation even in the best of years.

The areas of greatest vulnerability currently lie where war and strife limit access to food. There is a famine among displaced people in and around the Southern Region of Sudan. In Ethiopia, civil war in Eritrea and Tigray continues to make populations there extremely vulnerable to famine. Elsewhere, vulnerable populations are more localized.
Regional NDVI Greater than Historical Maximum

Areas where 1988 NDVI reached levels significantly higher than the 1982-87 record

Historic northing of the 0.2 NDVI contour (which corresponds very closely with the 1988 contour)
Key Terms

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

Where possible, food needs estimates are included in the FEWS reports. It is important to understand, however, that no direct relation exists between numbers of persons at risk and the quantity of food assistance needed. This is because famines are the culmination of slow-onset disaster processes which can be complex in the extreme. The food needs of individual populations at risk depend upon when in the disaster process identification is made and the extent of its cumulative impact on the individuals concerned. Further, the amount of food assistance required, whether from internal or external sources, depends upon a host of considerations. Thus the food needs estimates presented periodically in FEWS reports should not be interpreted to mean food aid needs, e.g., as under PL480 or other donor programs.

ITCZ - The Intertropical Convergence Zone (ITCZ) is where the high pressure system originating in equatorial regions of the Atlantic (the St. Helena's High) collides with the Azores High descending from the north. The ITCZ tends to move northward during the spring and summer in response to normal global weather patterns. 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). These images are derived from Global Area Coverage (GAC) imagery (of approximately 4 km 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 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.