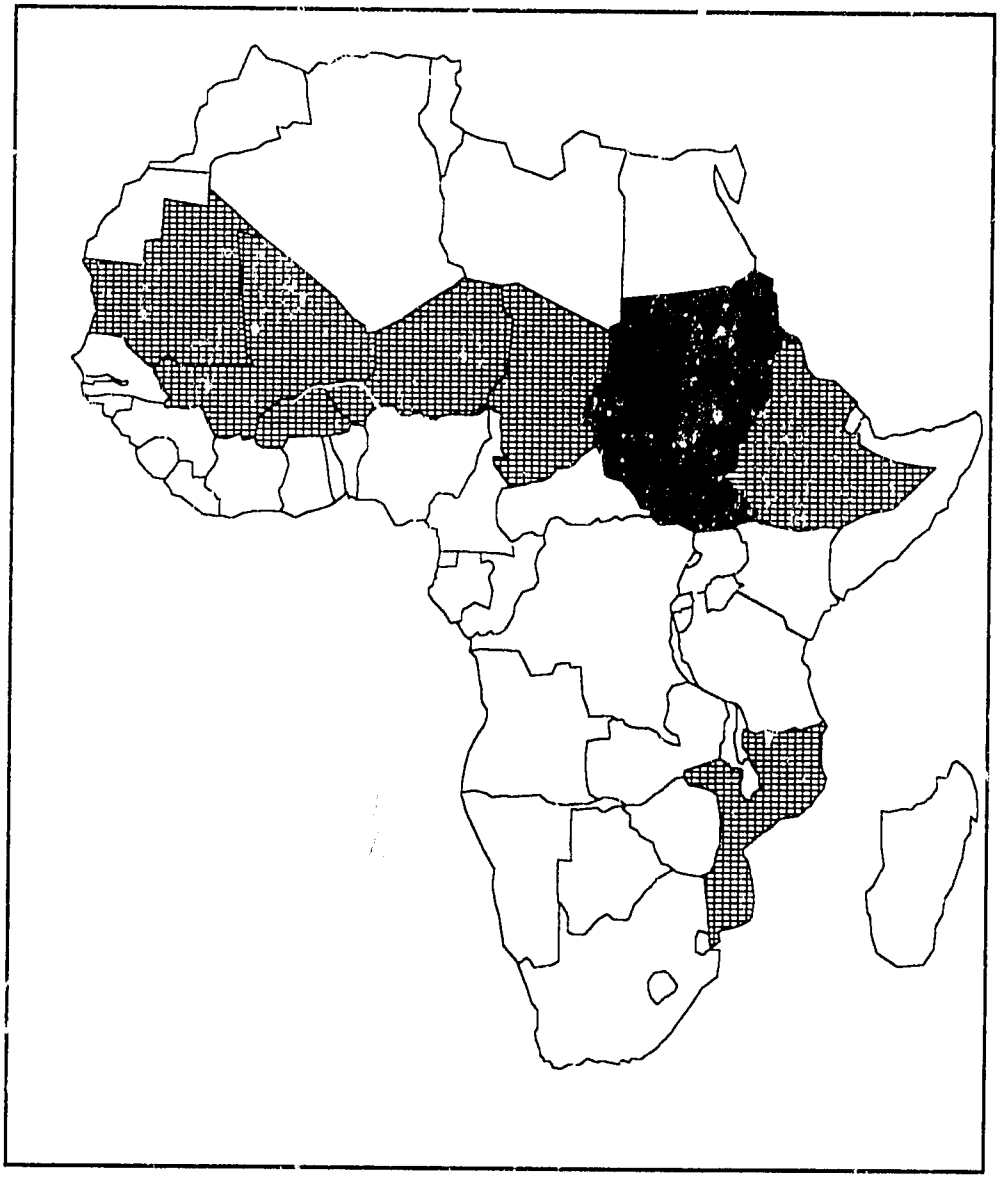
Report Number 15
September 1987

FEWS Country Report

SUDAN



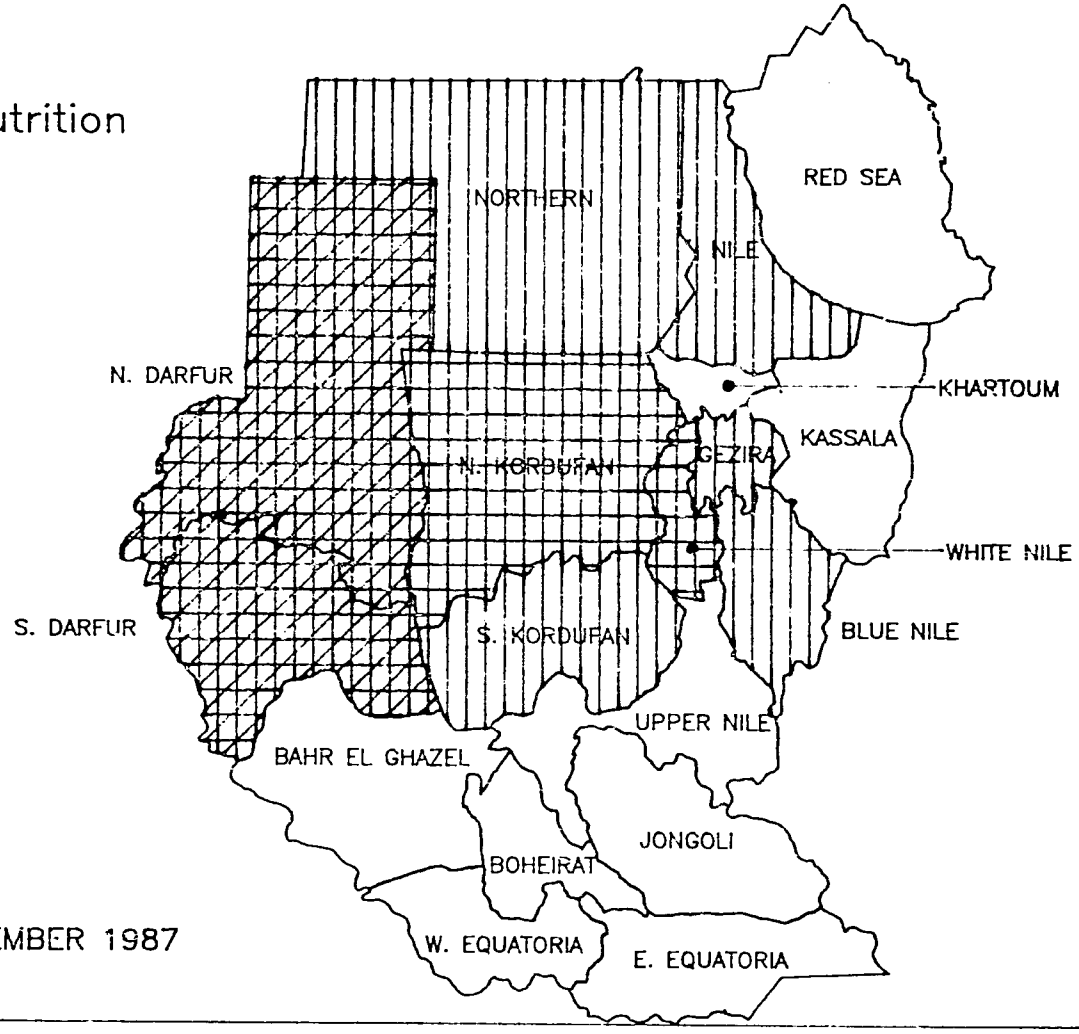
Africa Bureau
U.S. Agency
for International
Development

SUDAN: SUMMARY MAP

Very Poor Childhood Nutrition

Poor Crop Prospects

High Grain Prices



MAP: FEWS/PWA, SEPTEMBER 1987

Famine Early Warning System Country Report

SUDAN

Increasing Concern Over Western Sudan

Prepared for the
Africa Bureau of the
U.S. Agency for
International Development

Prepared by
Price, Williams & Associates, Inc.
September 1987

Contents

List of Figures

INTRODUCTION

This is the fifteenth in a series of monthly reports on Sudan issued by the Famine Early Warning System (FEWS). It is designed to provide decisionmakers with current information and analysis on existing and potential nutrition emergency situations. Each situation identified is described in terms of geographical extent and the number of people involved, or at-risk, and the proximate causes insofar as they have been discerned.

Use of the term "at-risk" to identify vulnerable populations is problematic since no generally agreed upon definition exists. Yet, it is necessary to identify or "target" populations in-need or "at-risk" in order to determine appropriate forms and levels of intervention. Thus for the present, until a better usage can be found, FEWS reports will employ the term "at-risk" to mean...

...those persons 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.

Perhaps of most importance to decisionmakers, the FEWS effort highlights the process underlying the deteriorating situation, hopefully with enough specificity and forewarning to permit alternative intervention strategies to be examined and implemented. Food assistance strategies are key to famine avoidance. However, other types of intervention can be of major importance both in the short-term and in the long run, including medical, transport, storage, economic development policy change, etc.

Where possible, estimates of food needs 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 the 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 estimates of food needs presented periodically in FEWS reports <u>should not</u> be interpreted to mean food aid needs, e.g., as under PL480 or other donor programs.

FEWS depends on a variety of US Government agencies, private voluntary organizations (PVO's), international relief agencies, foreign press and host government reports as sources of information used in the country reports. In particular, a debt of gratitude is owed to many individuals within various offices of the US Agency for International Development (USAID) who routinely provide valuable information: the offices of Food For Peace and Voluntary Assistance (FFP/FVA), and the Office of Foreign Disaster Assistance (OFDA). Additional useful information is also provided by the National Oceanic and Atmospheric Administration's National Environmental Satellite, Data, and Information Service (NOAA/NESDIS), the Cooperative Institute for Applied Meteorology at the University of Missouri (CIAM), the National Aeronautic and Space Administration (NASA), the UN Food and Agriculture Organization (FAO) Global Information and Early Warning System (GIEWS), the World Food Programme, and other U.N. agencies.

SUMMARY

Darfur Region in western Sudan continues to be an area of great concern with inadequate rainfall, high levels of childhood malnutrition, early pest infestations and high grain prices. A large proportion of its population is currently at-risk and a larger number could become at-risk during 1988 as the 1987 harvest is consumed. North Kordufan Province has received similarly inadequate rainfall, but has had lower levels of childhood malnutrition and greater access to cash crops. While vulnerable to a food emergency in 1988 and currently receiving food aid, the majority of the population of North Kordufan appears to have access to more resources than does the population of Darfur Region. Excellent vegetative vigor in the Central Region and Kassala Province suggest that Sudan will again produce a major surplus of sorghum, if not at the record levels that occurred in 1985. In western Sudan, especially those areas where crop prospects are considered poor, there has been a general, in some places dramatic, improvement in vegetative vigor, attributable to excellent rains in mid to late August. This improvement is unlikely to be reflected in significant improvement in crop prospects. Except for Darfur Region, pests should not be a great threat to agricultural production in Sudan. Reports of Desert locust infestations during August do not match the historical records of plague years and suggest that control efforts during the winter breeding season along the Red Sea coast of Sudan and Ethiopia were successful, and that early reports of swarms in Eritrea were exaggerated. Preliminary results of the fourth round (May-July) of child nutrition surveys show an overall decline for northern Sudan. Especially worrisome are large increases in the percentage of malnourished children in Northern, Red Sea, North Kordufan, South Kordufan and North Darfur Provinces.

Indicators

- Reports of Desert locust swarms in the central and eastern agricultural areas of Sudan during the first part of September would be a cause for concern. In the absence of swarms by mid-September, no significant damage to Sudan's major production areas should be expected.

- A continued rise of grain prices in Darfur Region would signal both that current supplies are even worse than currently believed and that harvest expectations continue to decline.

Issues

- The termination of large scale emergency food aid in Darfur Region last year was probably premature given high levels of childhood malnutrition and poor 1986 agricultural production.

- The improvement in natural vegetation in Darfur Region, during the first ten days of September, could result in the dispersal of Desert locust populations, and protect crops by providing alternative foods to locusts.

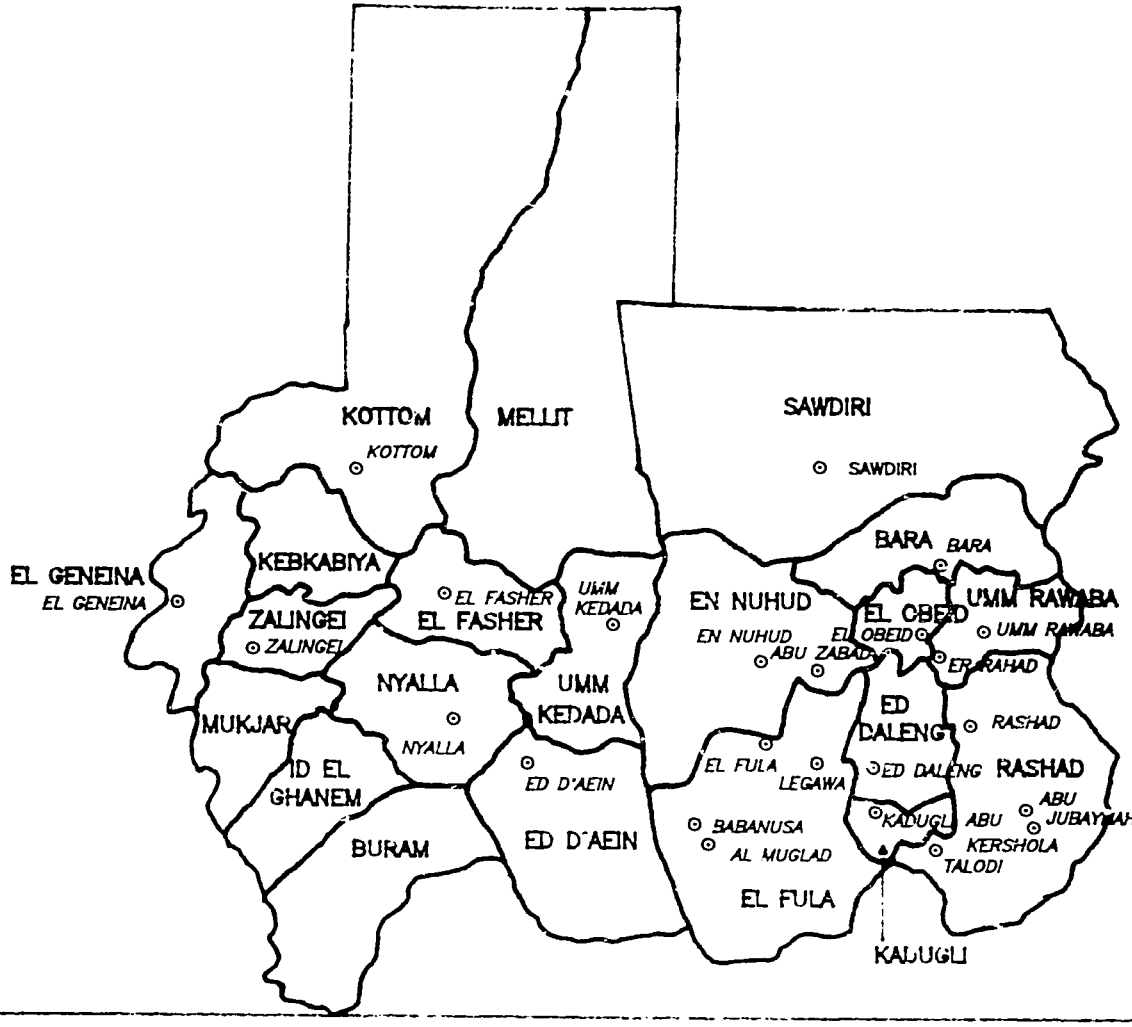
DARFUR REGION

Indicators point to many of the people in Darfur Region as currently at risk of a nutritional emergency and almost certainly at-risk after harvest in October. Satellite imagery, rainfall reports, levels of childhood nutrition and health, grain prices, reports of pests, reports of multiple replantings or late plantings and descriptions of stunted crops combine to paint a dismal picture of the current situation and of prospects for 1988. The number of people affected should increase in early 1988 as the 1987 harvest is exhausted. In the June 1987 Country Report, FEWS pointed out a variety of indicators that, taken together, described Darfur Region as especially vulnerable to a food emergency in 1988--if the 1987 agricultural season was poor. The 1987 harvest in Darfur will almost certainly be poor. (See Map 1 for District locations.)

Satellite imagery indicates vegetative vigor was late in starting and stayed below average throughout the period when crops normally attain their greatest vegetative growth (with the exception of parts of the Jabal Merra watershed, and in Buram and southern Ed D'aein Districts) (See Images 1 - 7). In the latest image, September 1-10, vegetative vigor has improved relative to previous years and to the long term average for the same period, presumably reflecting late August rainfall. El Fasher and Umm Keddada Districts in North Darfur and most of Nyala, parts of Ed D'aein and northern Mukjar Districts in South Darfur show continuing poor vegetative vigor. While in other districts, El Geneina in particular, dramatic increases in vegetative vigor have occurred--even to the extent of surpassing the historical maximum for that time period.

The average Normalized Difference Vegetation Index (NDVI, a measure of vegetative vigor derived from daily NOAA satellite imagery) for El Geneina District shows a rise that is unprecedented this late in the rainy season. Figure 1 displays the maximum, minimum and average historical (1981-86) NDVI measures for El Geneina District compared to those so far in 1987. Vegetative vigor actually declined in June and July, a time when positive vegetative growth would be expected. During August, vegetative vigor remained below average (and the average is dominated by poor years). It wasn't until September that vegetative vigor increased above the

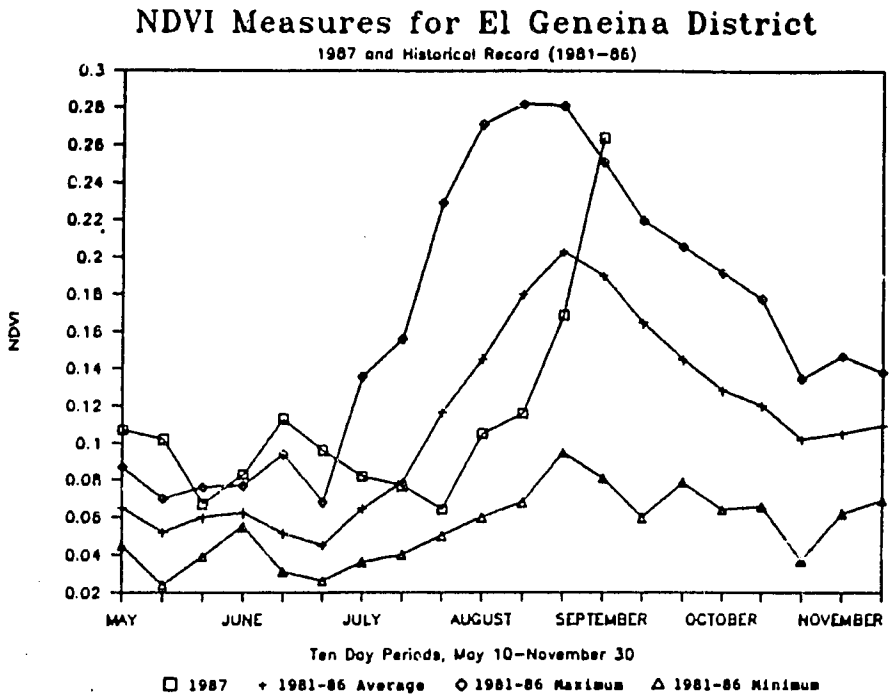
SUDAN: DARFUR AND KORDUFAN REGIONS
DISTRICTS AND TOWNS



MAP: FEWS, PWA

average--increased at such a rate that it is now above the historical maximum for the same period.

Figure 1



Measures of vegetative vigor from satellite imagery include both natural vegetation and crops. In western Sudan, especially, natural vegetation dominates the image. The late-season improvement in vegetative vigor, shown in the most recent image, certainly reflects the condition of natural vegetation, including forage, but does not necessarily reflect current crop conditions. The current NDVI readings suggest exceptional moisture availability during what would normally be the critical flowering stage of crops in the Region, although this may have little impact on this year's final production. Reports of late (August 1 in El Geneina, August 15 in El Fasher District) and repeated plantings (up to five times in Mellit District, a typical strategy for mitigating the effects of an early season drought), descriptions of stunted crops during August, poor rainfall earlier in the season, and an actual decline in NDVI during the usual phase of vegetative growth suggests that good yields are unlikely in much of the region (with the exception of the Jabal Merra and areas in southern South Darfur Province).

1. The success of late plantings (during August) is contingent upon the use of very short growing period varieties that do not depend on the length of day to

trigger flowering. It is also contingent upon the continuation of adequate rainfall well into October (in El Geneina District, October rainfall exceeded 5 mm in only 7 of the last 20 years, 90 day crop varieties would require rainfall until the end of October).

2. The yields of repeat plantings are additionally limited by soil nitrogen depletion due to previous plantings and leaching by rainfall earlier in the season. Those previous plantings also provided habitat for the multiplication of crop-specific pests that can further limit the potential yield of repeat plantings.

3. It is unlikely that crops, severely stressed (described as stunted) early in the season, will recover sufficiently to produce good yields.

The improvement in vegetative vigor is almost certainly good news for pastoralists. Adequate forage could be available in most of the region, and herds could be in good condition by the end of the rainy season.

The USAID Mission in Sudan reported (September 22) on the condition of crops and pasture in most of Darfur Region. The difficulties of communication within Sudan limit the timeliness of their descriptions (some dating from July), nonetheless, their report provides added detail and improves upon what is available from satellite imagery alone:

North Darfur	Crop and Pasture Condition
Mellit District	Good in the north, poor in the south.
Kottom District	Poor in the north, reasonable in the south.
Umm Keddeda Dist.	Poor in the north, good in the south (as of the end of July).
El Fasher District	Very poor.
El Geneina Dist.	Poor.

South Darfur	Crop and Pasture Condition
Jabal Merra Project	Reasonable.
Ed D'aien District	Poor.
Buram District	Reasonable.
Idd El Ghanem Dist.	Reasonable.
Nyala District	Poor

While 1985 and 1986 were good agricultural years for Sudan as a whole, in Darfur Region they were mediocre at best. Darfur Region did not share in the country's

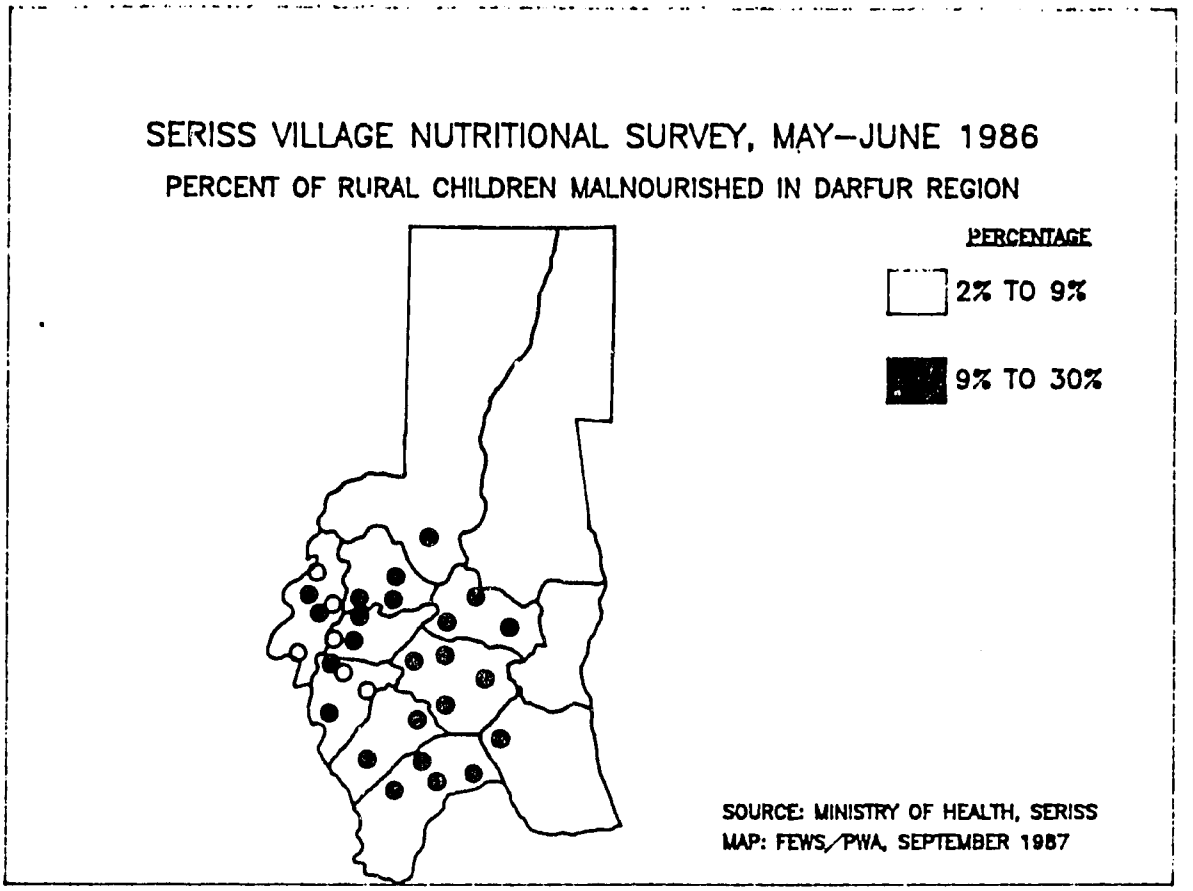
recovery from the 1982-84 drought (indeed, that drought extended into 1985 in western Sudan) and NOAA reports (based on MeteoSat images) that rainfall this year is less than 70% of normal in a band 150 km north and south of a line from El Geneina east (until Sennar in Blue Nile Province). Thus, the current poor prospects for agriculture in Darfur Region would make 1987 the sixth consecutive year in which production has been insufficient to feed the population. They cannot be expected to have many resources left to weather another poor harvest.

The rat problem is currently under control, but reports suggest that rats were a very large problem early in the growing season. In neighboring areas of Chad, more detailed reports, of the loss of three repeated plantings to rats, suggest similar losses in parts of Darfur Region. Rats are also believed to threaten the harvest and stored grain (both now and after harvest). In addition, the Sudanese Relief and Rehabilitation Commission reports that, due to early season dryness, sorghum around Nyala is currently infested with "African Worm" (African Armyworm?). Grasshoppers and Desert locusts could continue to threaten current growth and maturing grain, and could exacerbate the effects of poor rainfall on production.

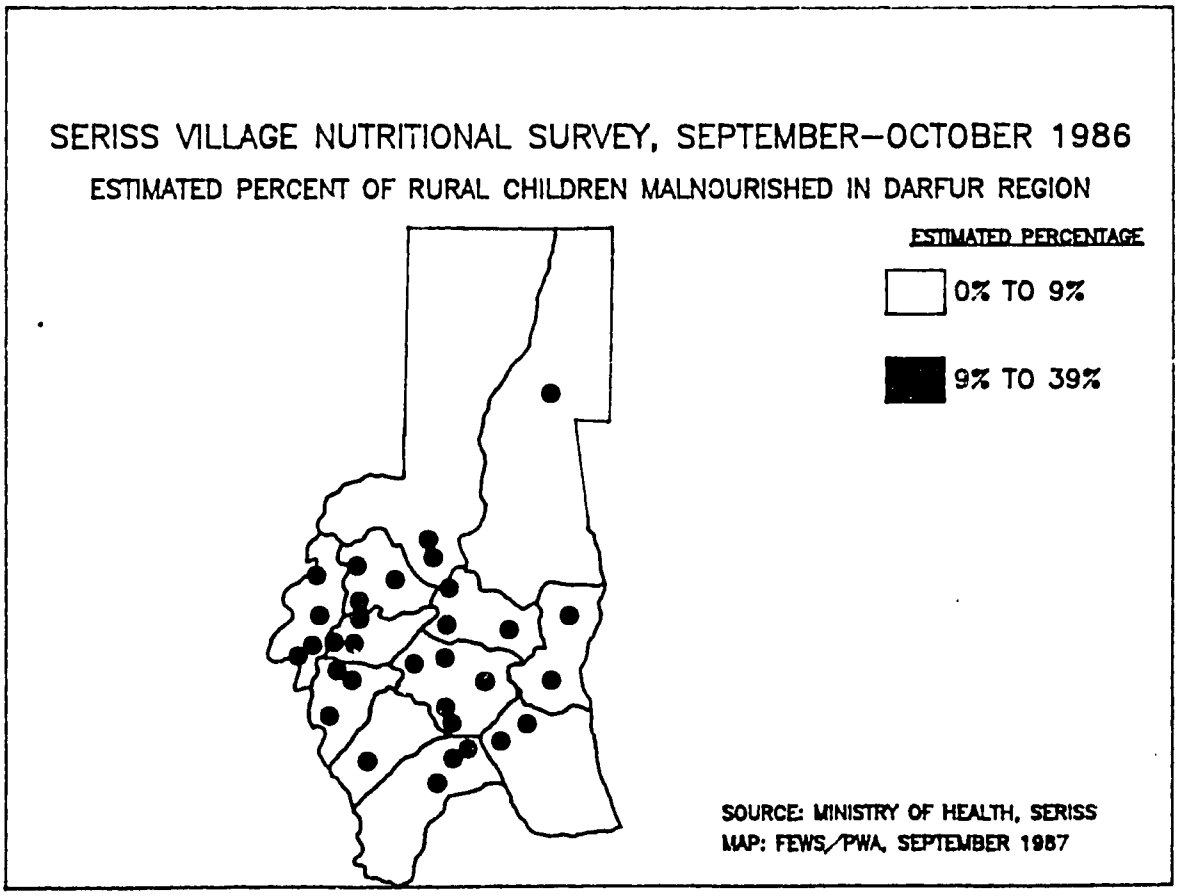
Childhood malnutrition measures from the three available rounds of the Sudan Emergency Rehabilitation Information and Surveillance System (SERISS) survey show continuing high levels of malnutrition before, during and after last year's harvest in most areas of Darfur Region (see Maps 2-4), levels of malnutrition that elsewhere would generate immediate intervention. Preliminary province-level results (just received) of the fourth round of the survey (May-July 1987) show a decline in nutrition since the third round (January-March) in North Darfur and no change in South Darfur. The third round was the post-harvest survey that was expected to capture the highest nutrition readings in the year-long series. Of particular concern are parts of the Districts of El Fasher and Umm Keddada (North Darfur) and Buram (South Darfur), where over 20% of children under 5 were found to be malnourished during the fourth round of the SERISS survey. The preliminary results, unfortunately, fail to differentiate between urban, rural and nomadic populations.

Refugees returning in large numbers to eastern Chad (reported by AEDES) add further confirmation to the picture of the declining fortunes of Darfur Region. Displacement of people within Darfur Region, on the contrary, has not been reported.

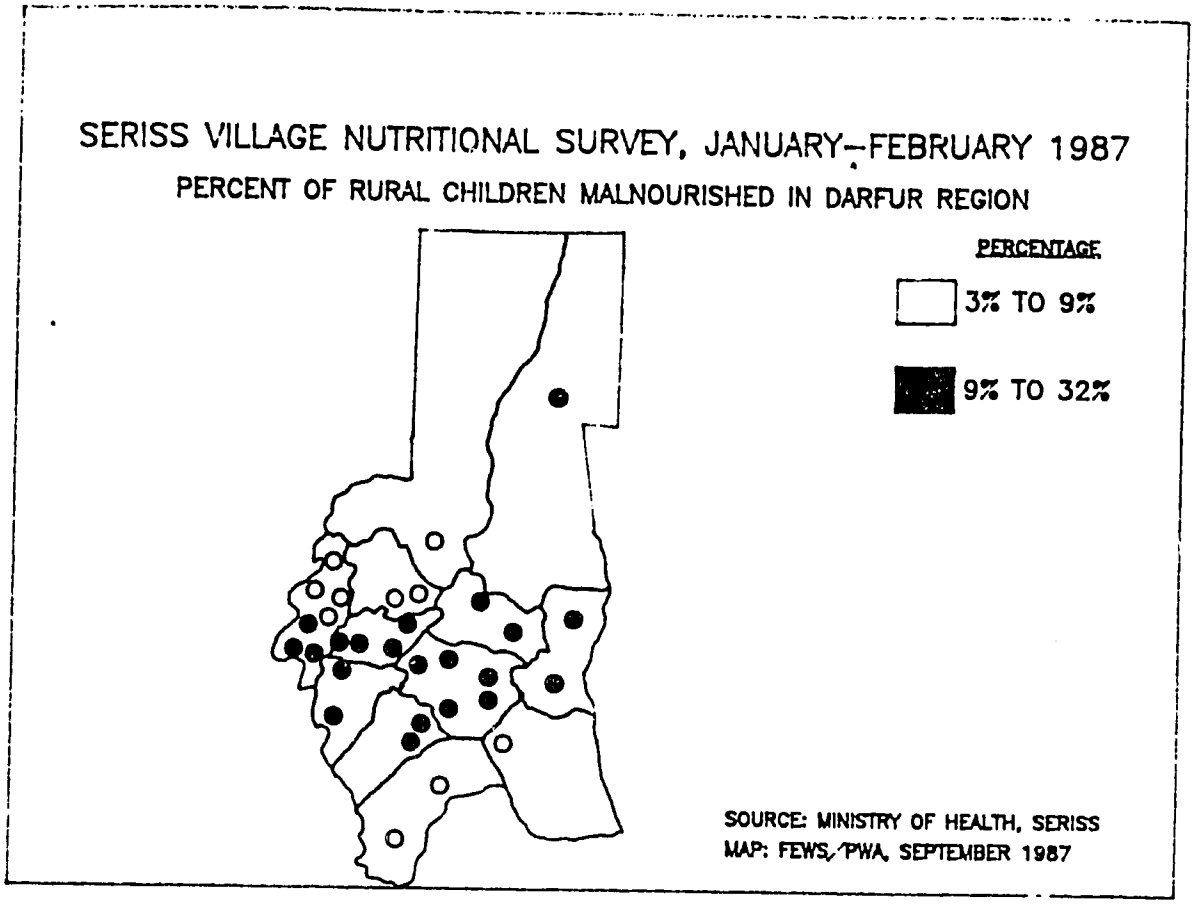
Map 2


SERISS VILLAGE NUTRITIONAL SURVEY, MAY–JUNE 1986
PERCENT OF RURAL CHILDREN MALNOURISHED IN DARFUR REGION
PERCENTAGE
2% TO 9%
9% TO 30%
SOURCE: MINISTRY OF HEALTH, SERISS
MAP: FEWS/PWA, SEPTEMBER 1987

Map 3


SERISS VILLAGE NUTRITIONAL SURVEY, SEPTEMBER–OCTOBER 1986
ESTIMATED PERCENT OF RURAL CHILDREN MALNOURISHED IN DARFUR REGION
ESTIMATED PERCENTAGE
0% TO 9%
9% TO 39%
SOURCE: MINISTRY OF HEALTH, SERISS
MAP: FEWS/PWA, SEPTEMBER 1987

Map 4


SERISS VILLAGE NUTRITIONAL SURVEY, JANUARY–FEBRUARY 1987
PERCENT OF RURAL CHILDREN MALNOURISHED IN DARFUR REGION
PERCENTAGE
3% TO 9%
9% TO 32%
SOURCE: MINISTRY OF HEALTH, SERISS
MAP: FEWS/PWA, SEPTEMBER 1987

Information on grain prices, albeit sparse, is still a key indicator for assessing risk in Darfur Region. In the capitals of North Darfur (El Fasher) and South Darfur (Nyala), sorghum prices increased during the last three weeks of July from an already high 65-75 Sudanese pounds per sack to 135 pounds in Nyala and 125 pounds in El Fasher. Prices in those cities increased further to a peak of 150 pounds during mid-August. In eastern Sudan, the post-harvest market price was in the low 20's. In contrast, livestock prices show no untoward decrease or increase. There is no indication of abnormal herd movements that might be construed as drought management on the part of nomadic and semi-nomadic herders. If reports of herd recovery last year are true, however, then livestock prices probably would not decline until 1988 or 1989 (from historical precedent) in any case.

The number of people currently requiring emergency food aid assistance has not been estimated recently. In December 1986 it was estimated that the population at risk in Darfur in 1987 would decline from the 1986 total of 895,000, but not significantly. In March 1987, a pre-harvest Save the Children (SCF) (UK) estimate was reported that pointed to a total of 444,000 people at-risk in North Darfur (which would have been a reduction of 210,000 people from the levels extant in 1986), 200,000 of whom would have required food aid. And, in May the Relief and Rehabilitation Commission reported that 724,000 people were affected in Darfur Region, a decline of 171,000 from the levels of 1986. While high levels of childhood malnutrition support the notion that people are currently at-risk in Darfur Region, the exact number and their food aid requirements are not known.

The FEWS field advisor reported a preliminary estimate from Sudan that 400,000 people in Darfur Region will run out of food early in 1988. Estimates of next year's needy are, by necessity, rough and ready. But, if the current population at-risk remains so after harvest in 1987 and additional numbers become at-risk during 1988, then the number of people at-risk in 1988 should certainly exceed 800,000 and could reach 1.2 million. A rough distribution of the affected people would allocate two-thirds of those affected to North Darfur and one-third to South Darfur.

The only island of relative prosperity in North Darfur after the 1986 harvest was El Geneina district, an area where the prospects for the 1987 harvest appear poor. In Kebkabiya District, however, childhood nutrition in January-March was as good as it was in El Geneina, and it is likely that it was better off after the 1986 harvest

than previously believed. All other districts in North Darfur failed to produce adequate grain supplies for their populations in 1986 and the potential deficit will probably increase following the 1987 harvest.

The situation in South Darfur was potentially better, with the Jabal Merra watershed in the north experiencing excellent production in 1986. Half of its grain is said to be in good condition so far this year, and truly excellent vegetative conditions are seen at its higher elevations. In the south, Buram District and the southern part of Ed D'aein District, along the Bahr El Ghazel border, should have adequate production--although little data is available. (January-March SERISS survey results showed childhood nutrition there as the best in the province, although May-June results showed 20% of the children under 5 years of age to be malnourished in parts of Buram district). The people at-risk in South Darfur are probably concentrated primarily in Nyala, Zalingei, and Mukjar Districts.

The 3rd round of the SERISS nutrition survey showed childhood malnutrition in South Darfur to be even worse than in North Darfur. And, while the 4th round showed no change in nutrition tin South Darfur (it was relatively better off than North Darfur), it is possible that the generally greater numbers of people described as at-risk in North Darfur is the result of focus, rather than a true difference.

A commonly used thumbnail method of estimating the amount of emergency food aid that might be required for 800,000 people, between harvest 1987 and harvest 1988, results in a figure of 60,000 MT. This implies that fully one-quarter of those estimated to be at-risk, in fact require no emergency food-aid, one-quarter require total assistance and the rest require intermediate levels of assistance. These rough estimates can be refined over time as more information on the status of people in Darfur becomes available. In 1986, 895,000 people, said to be at-risk, were the beneficiaries of approximately 80,000 MT of emergency food aid, which is known, from the levels of childhood malnutrition, to have been inadequate.

Due to inaccessibility and the endemic nature of malnutrition in the Darfur Region, there is a tendency to accept poor nutrition and poor agricultural production there as normal. However, the levels of childhood malnutrition found in Darfur are high enough that elsewhere they would cause serious concern. Further, 1987 will be the sixth consecutive year of inadequate

agricultural production in the Region. Darfur Region has lately been a food deficit region, ultimately dependent on grain from outside the Region. The proximate cause of this inability to feed its population is a long-term decline (since the mid-sixties) in total annual rainfall.

KORDUFAN REGION

Kordufan Region is generating more concern than previously with very high levels of childhood malnutrition in parts of Kadugli and Rahad Districts of Southern Kordufan and high levels throughout the Region. Satellite imagery shows generally high levels of vegetative vigor within South Kordufan over the course of the current agricultural season. In North Kordufan, however, vegetation appears less vigorous than average, with the exception of Sawdiri District. Additional information on crop conditions in North Kordufan could provoke an even higher level of concern. (See Map 1 for District locations.)

Much of the area currently showing very poor vegetative vigor in southern North Kordufan was earlier flagged as vulnerable. Nevertheless, this area had not experienced the extremely poor levels of childhood malnutrition seen in Darfur (although preliminary results of the fourth round of the SERISS survey suggest a gross decline). Indeed, emergency food aid distributions in 1986, coupled with regional government distributions in 1987 and, it is said, the greater reliance on cash crops (producing income for food purchases) left North Kordufan with the potential of weathering next year's shortage of endogenously produced food grain--with only relatively small amounts of outside assistance. However, the current gross decline in childhood nutrition suggests that present food aid distributions are inadequate and casts doubt on the success of the strategy of substituting cash crops for subsistence food production in years of poor rainfall.

Rainfall and vegetative vigor suggest that pasturage and, by inference, agriculture in North Kordufan (with the exception of Sawdiri District) will again be inadequate to feed the population. In addition, pests could be a major factor in limiting production, as they were last year.

In North Kordufan, the population at risk of a nutritional emergency in 1988, is probably higher than in 1987 and lower than in 1986. Estimates of the number of people at-risk in both those years were greatly exaggerated. In 1986 almost the entire population (1.59 million) was said to be at-risk, and in 1987 the Regional

government estimated 659,000 at-risk. Given the limited data, a good estimate of the populations at risk in 1988 and their locations is difficult. Interested parties might adopt a working number of 400,000 people at-risk in 1988 as a starting point, until additional information is available.

While agricultural prospects appear bright in South Kordufan, high levels of childhood malnutrition, reported in preliminary results of the 4th round of the SERISS survey, suggest that last year's estimates of surplus production were overstated. Additional information on food supplies in South Kordufan Province could lead to a re-evaluation of the vulnerability of its population to a food emergency early in 1988.

VEGETATION AND RAINFALL

Normalized Difference Vegetation Index (NDVI) images, derived from NOAA Advance Very High Resolution Radiometer (AVHRR) satellite data, show a great diversity throughout Sudan when compared to previous seasons. Vegetative vigor is excellent in the Southern Region from its western border with Chad, C.A.R., and Zaire, to the western borders of Jongoli, and Eastern Equatoria Provinces. Vegetative vigor is also excellent in the important grain-producing areas of Kassala and Blue Nile Provinces, as well as southern South Kordufan Province. While some dramatic increases are seen in the latest image, poor vegetative vigor occurred during most of the growing season in much of Darfur Region, North Kordufan Province, the eastern halves of Upper Nile, Jongoli and East Equatoria Region.

The cautious inference that may be drawn from high NDVI values in the important sorghum-growing areas of the Central Region and Kassala Province (where 86% of total sorghum production is concentrated), is that potential yield is good and could exceed that of 1985 and 1986 (all other factors being constant). While it is too early to attempt to forecast production, there is no reason to suspect any negative effects on sorghum yields in the eastern provinces. Once again, Sudan will probably generate a national surplus, adding to the existing national stocks.

Images 1-7 show the progression of vegetative vigor, for every 10 days of the current growing season, as compared to the 1981-86 average for those same periods. (The 1981 average includes two generally good years and four generally poor years.) The most recent available image (composite of September 1-10, 1987), when compared to the historical average (Image 7) generally supports the view

expressed above, but adds detail. Aweil District in Bahr El Ghazel Province shows below average vegetative vigor. Except in the most northerly areas of this district, however, the absolute vegetative vigor present would not lead one to suggest crop failure or significant reductions in yield. Southern White Nile Province, however, is below average, which could signify poor pasturage and rainfed agriculture. Areas usually under irrigated agricultural regimes, in and about Gezira Province, showing below average vegetative vigor are not of concern at the present time.

PESTS

The threat of Desert locust infestations that would cause a significant reduction in national production, has not materialized. Actual sightings do not match examples from the historical record of years of heavy infestation and plague. In particular, the threat of myriad swarms entering Sudan, from Eritrea Region in Ethiopia, has evaporated. Even if such swarms existed, each day that passes lessens the likelihood that they would enter important grain growing areas of Sudan. Reports out of Eritrea tend to be exaggerated.

SOUTHERN REGION

The entire Southern Region of Sudan continues to be of concern due to the security situation. In addition, poor vegetative vigor in the east, paralleling the Ethiopian border, adds to the vulnerability of agricultural and pastoral populations using that area.

The Sudanese People's Liberation Movement (SPLM), the Sudanese People's Liberation Army, AnyaAnya II, and the Sudan African parties--meeting in Addis Ababa at the end of August--issued a statement that included reference to the severe drought affecting most of the Southern Region. While no rainfall data is available, NDVI images do not support such a sweeping generalization. Image 7 shows the difference between the most recent satellite image and the 1981-86 average for the same period. Beyond some cloud effects in the central area of the Region, the only area with unusually low vegetation vigor is in Kaboyta District in E. Equatoria Province, and Akoba and Bybor Districts in Jongoli Province.

CHILDHOOD NUTRITION

Preliminary results from the 4th round (May-July) of the SERISS childhood nutrition surveys show a decline in nutrition since the 3rd round (January-March) throughout northern Sudan (with the exception of Khartoum and South

SUDAN: Current Agricultural Season

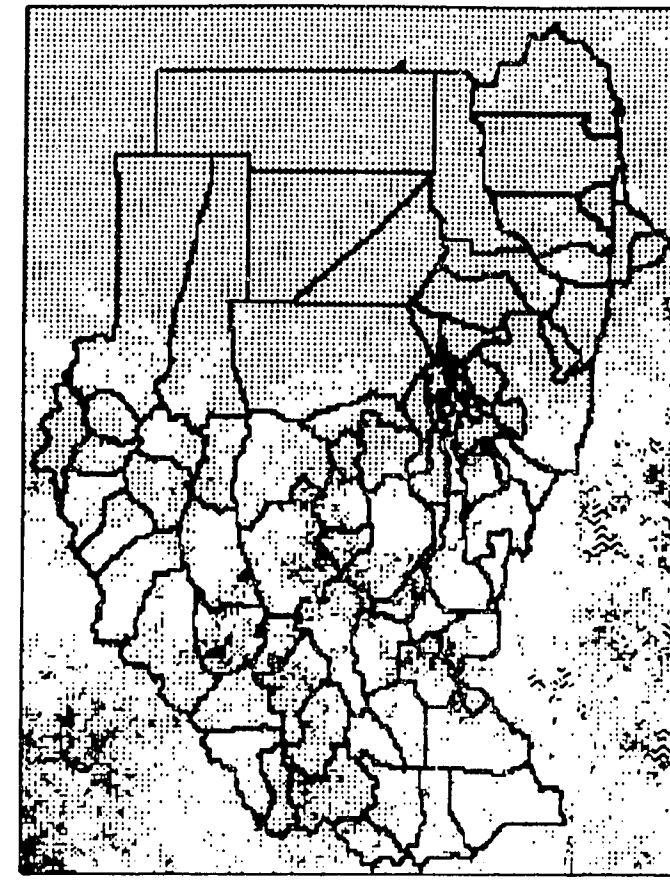
Normalized Difference Vegetation Indicies

1987 Compared to the Historical Average (1981-86)

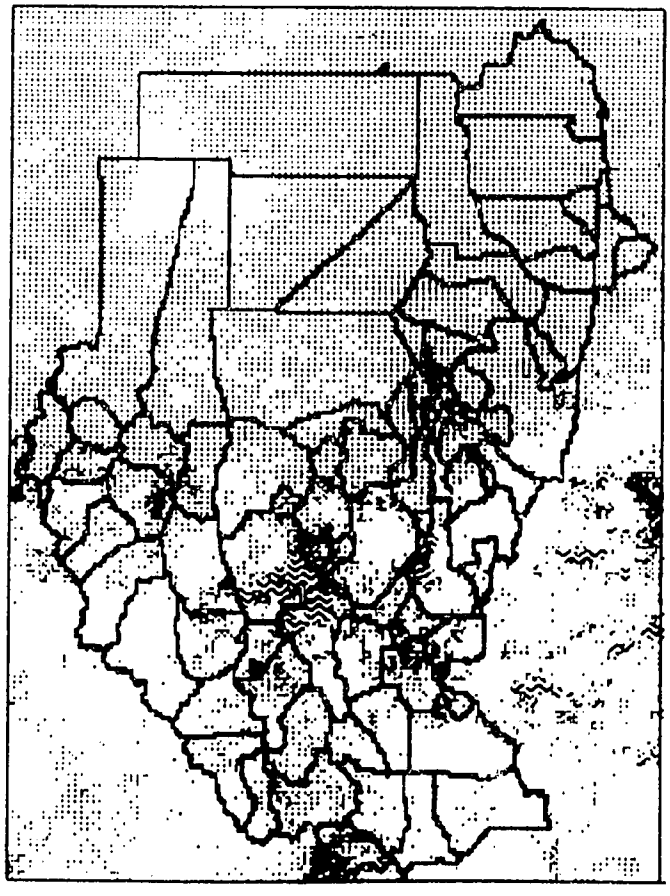
Clouds

Less Than 1981-86 Average

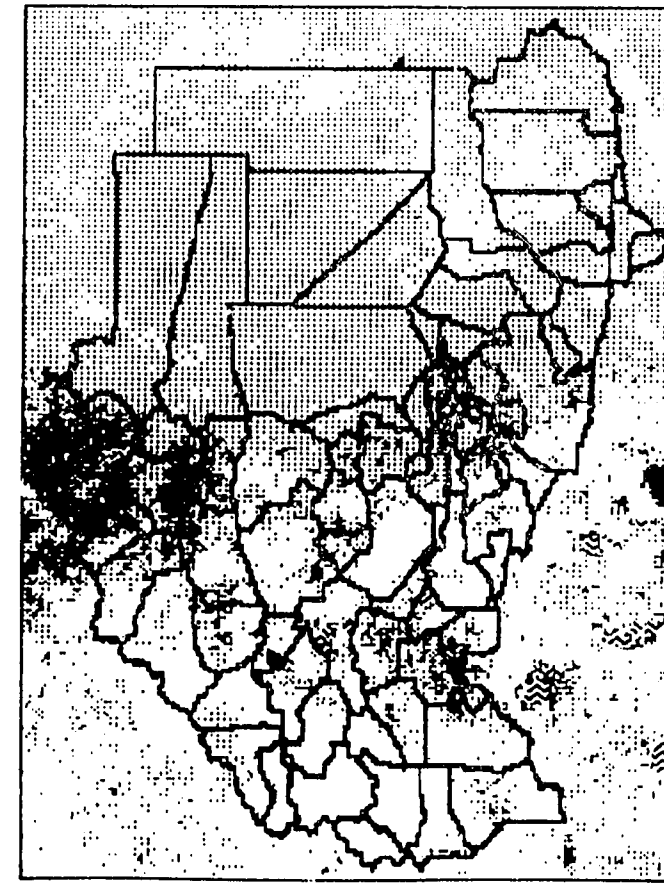
Same As 1981-86 Average



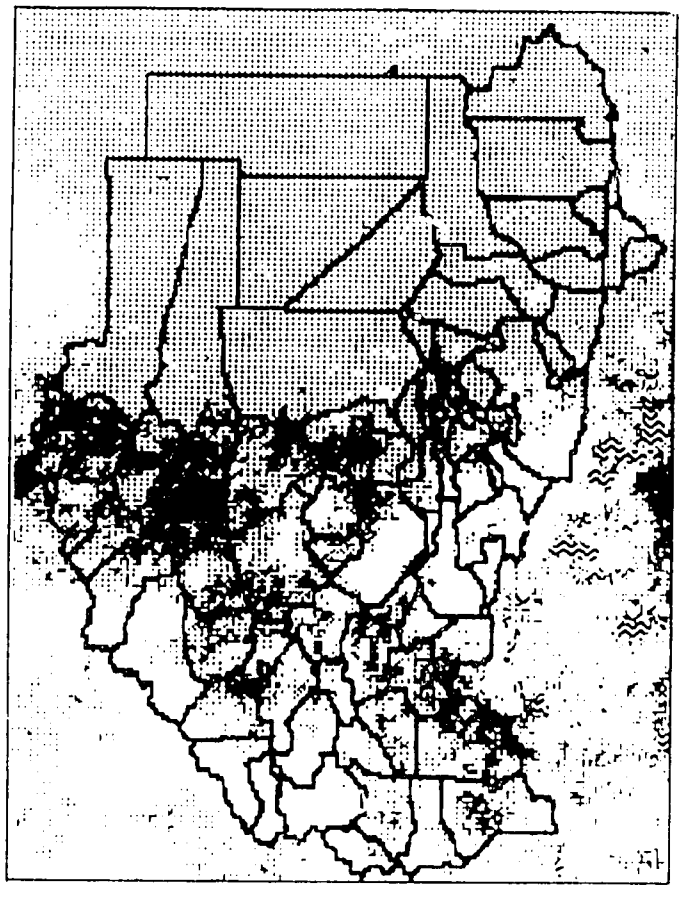
July 1-10 Image 1



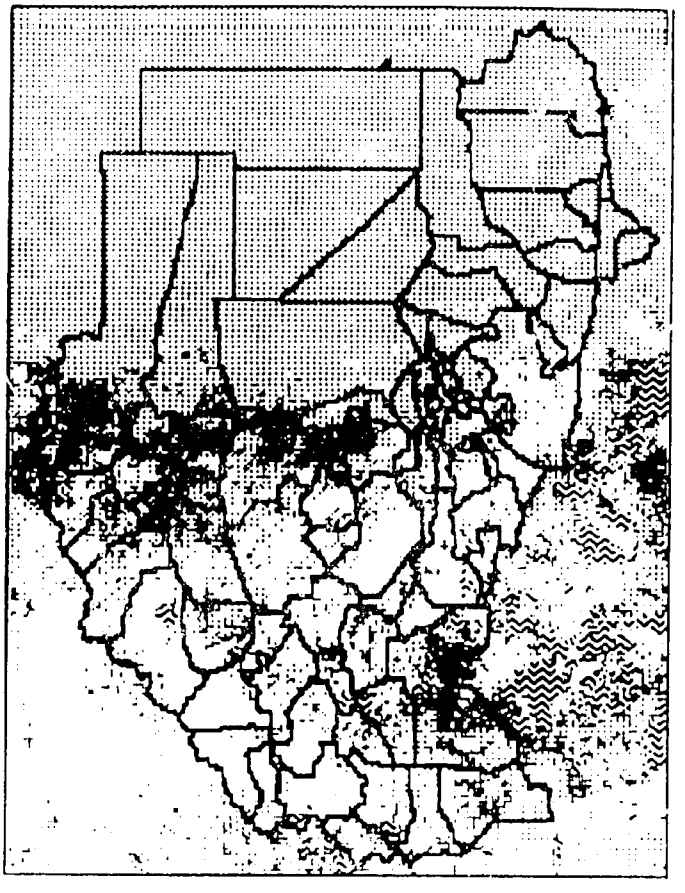
July 11-20 Image 2



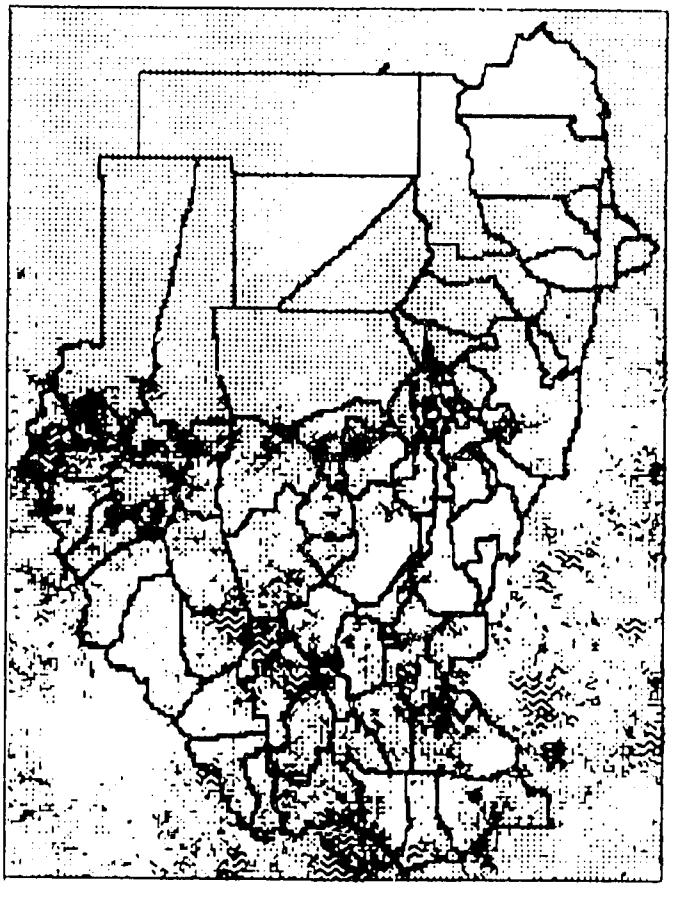
July 21-30 Image 3



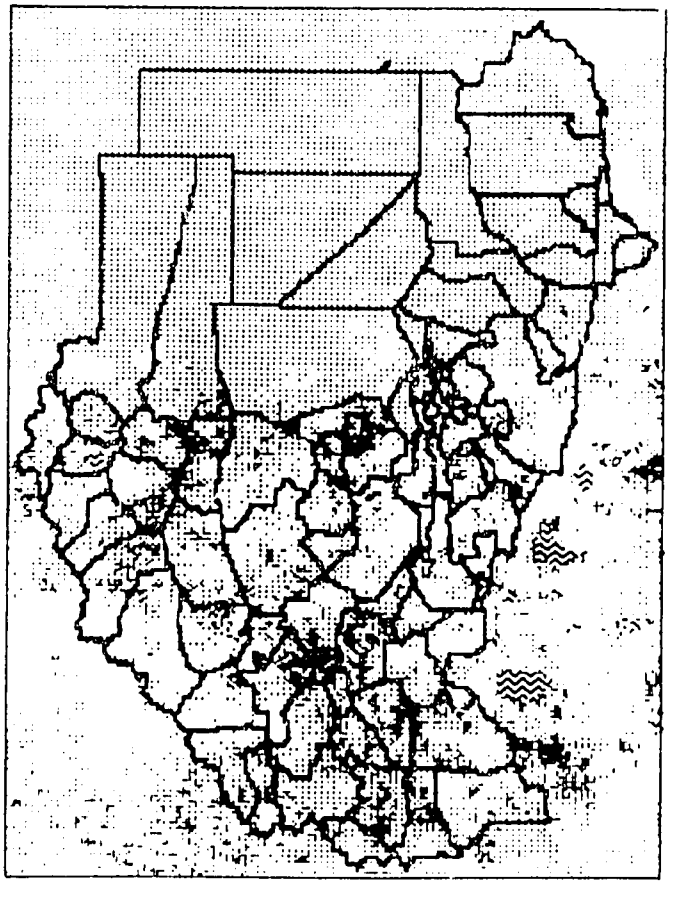
August 1-10 Image 4



August 11-20 Image 5



August 21-30 Image 6



September 1-10 Image 7

Darfur Provinces. High levels of childhood malnutrition are especially worrisome in Northern Province, Nile Province, Kordufan Region and North Darfur Province.

Table 1: Percentage of Children with Z-scores More than 3, and More than 2 Standard Deviations Below the International Standard, Mean Z-score of Weight/Height, International Standard Z-Score = 0.0.

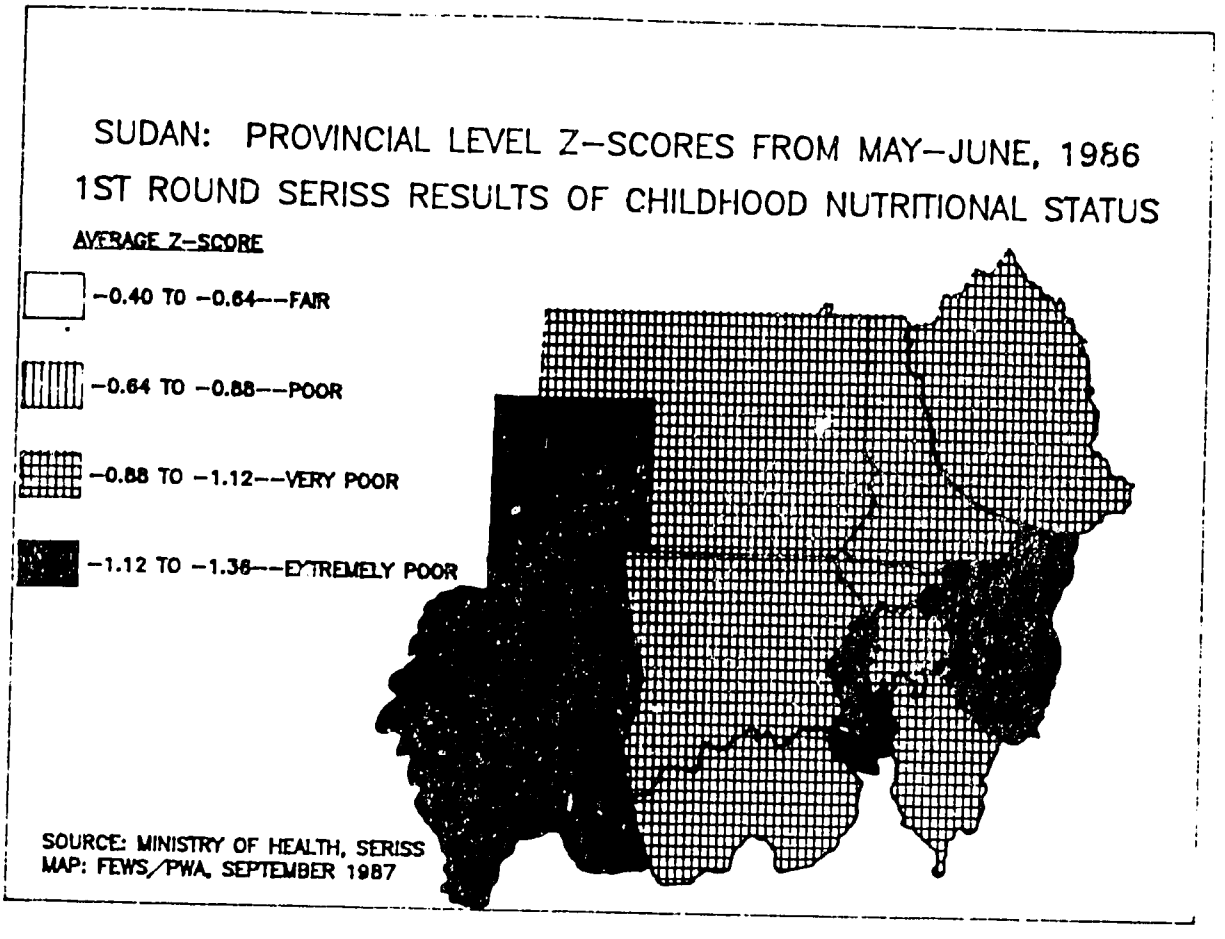
Province	Malnourishment Severe (-3SD)	Acute (-2SD)	Z-Score
Khartoum	1.1%	10.1%	-0.79
Northern	3.1%	16.9%	-1.02
Nile	2.8%	14.9%	-0.93
Red Sea	1.5%	9.0%	-0.71
Kassala	0.6%	9.5%	-0.80
Blue Nile	1.7%	13.7%	-0.94
Gezira	0.7%	9.1%	-0.88
White Nile	1.2%	14.2%	-1.02
North Kordufan	1.5%	13.4%	-0.97
South Kordufan	1.8%	15.5%	-0.99
North Darfur	1.7%	16.2%	-1.03
South Darfur	1.6%	12.4%	-0.96
North Sudan	1.4%	12.5%	-0.92

SOURCE: SERISS, Ministry of Health

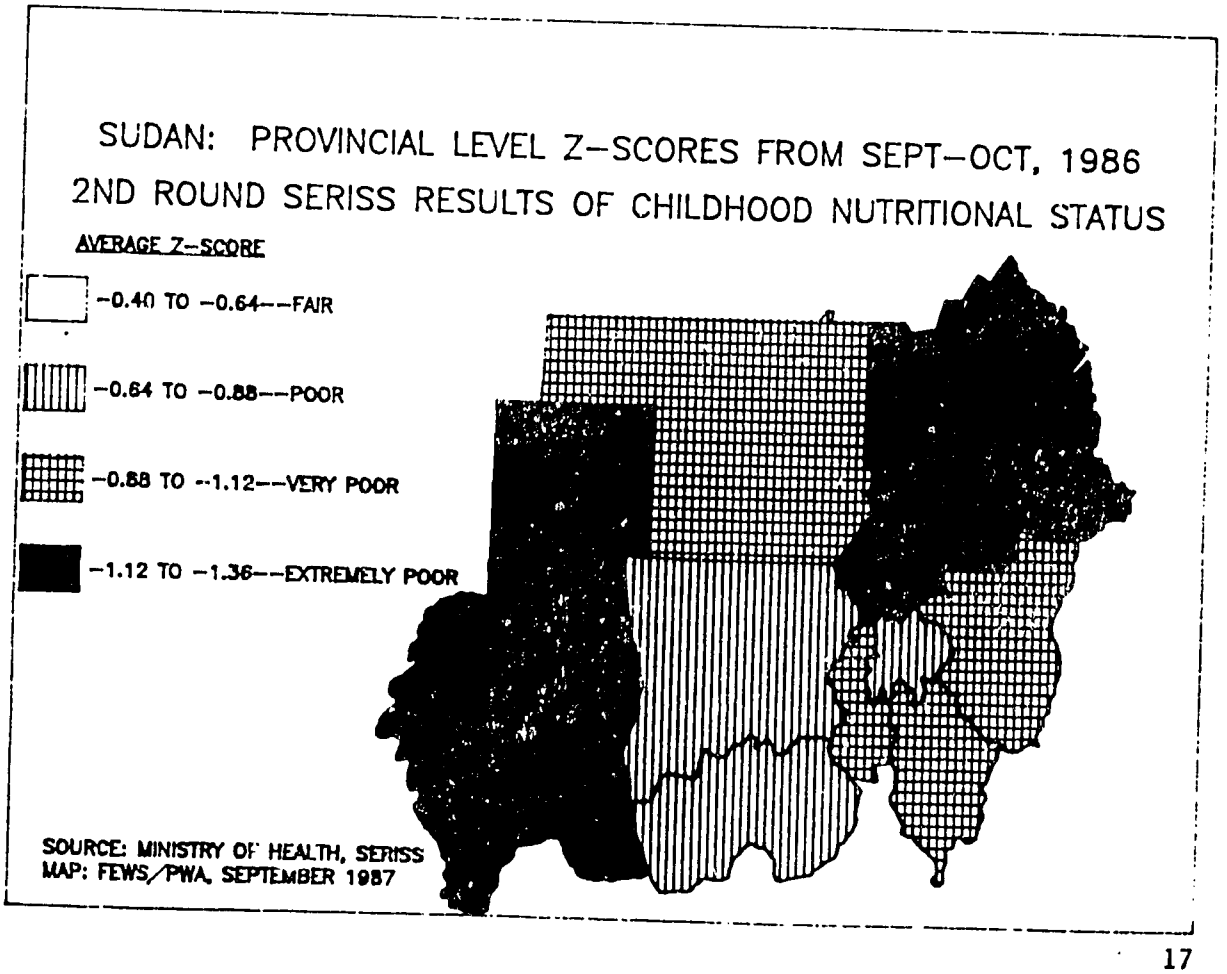
In an adequately nourished population, less than 0.5% of children (under five years of age) would be expected to be severely malnourished and only 2.5% would be expected to be acutely malnourished. The levels of malnutrition extant throughout all of Sudan are, therefore, of great concern.

Maps 5-8 present province level Z-Scores from all four rounds of the SERISS survey. The data to compare the percentage of malnourished children, across all four surveys, is not yet in hand.

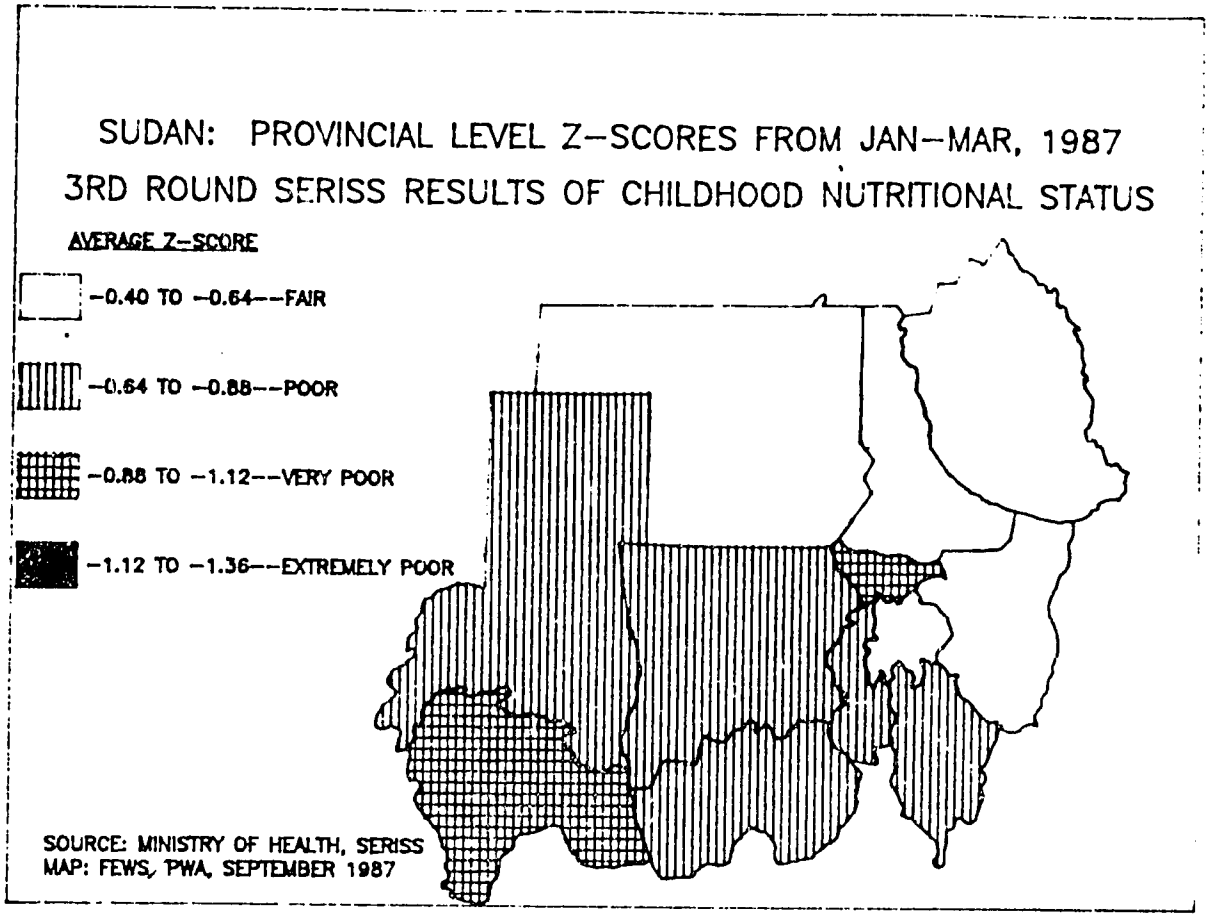
Map 5


SUDAN: PROVINCIAL LEVEL Z-SCORES FROM MAY-JUNE, 1986
1ST ROUND SERISS RESULTS OF CHILDHOOD NUTRITIONAL STATUS
AVERAGE Z-SCORE
-0.40 TO -0.64--FAIR
-0.64 TO -0.88--POOR
-0.88 TO -1.12--VERY POOR
-1.12 TO -1.36--EXTREMELY POOR
SOURCE: MINISTRY OF HEALTH, SERISS
MAP: FEWS/PWA, SEPTEMBER 1987

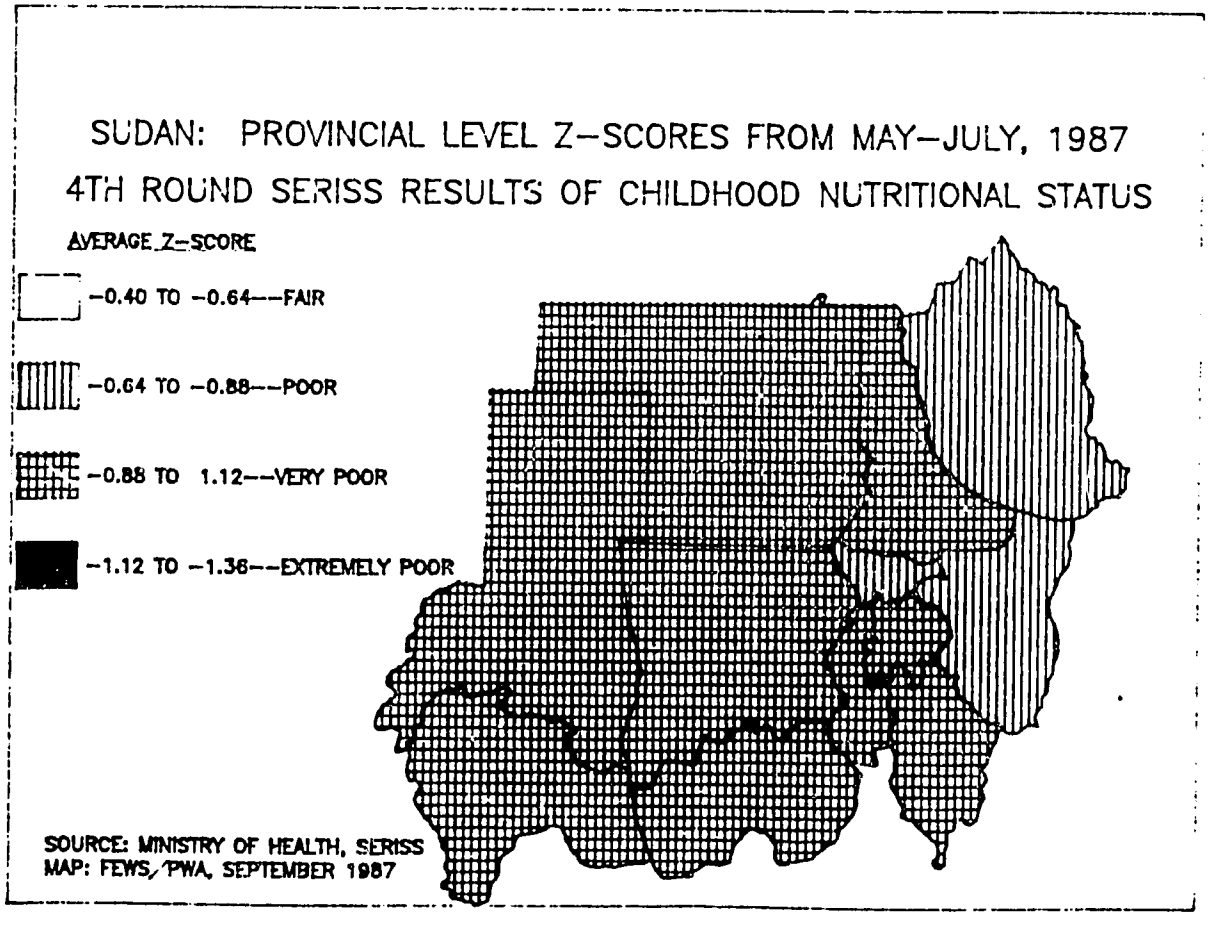
Map 6


SUDAN: PROVINCIAL LEVEL Z-SCORES FROM SEPT-OCT, 1986
2ND ROUND SERISS RESULTS OF CHILDHOOD NUTRITIONAL STATUS
AVERAGE Z-SCORE
-0.40 TO -0.64--FAIR
-0.64 TO -0.88--POOR
-0.88 TO --1.12--VERY POOR
-1.12 TO -1.36--EXTREMELY POOR
SOURCE: MINISTRY OF HEALTH, SERISS
MAP: FEWS/PWA, SEPTEMBER 1987

Map 7


SUDAN: PROVINCIAL LEVEL Z-SCORES FROM JAN-MAR, 1987
3RD ROUND SERISS RESULTS OF CHILDHOOD NUTRITIONAL STATUS
AVERAGE Z-SCORE
-0.40 TO -0.64--FAIR
-0.64 TO -0.88--POOR
-0.88 TO -1.12--VERY POOR
-1.12 TO -1.36--EXTREMELY POOR
SOURCE: MINISTRY OF HEALTH, SERISS
MAP: FEWS, PWA, SEPTEMBER 1987

Map 8


SUDAN: PROVINCIAL LEVEL Z-SCORES FROM MAY-JULY, 1987
4TH ROUND SERISS RESULTS OF CHILDHOOD NUTRITIONAL STATUS
AVERAGE Z-SCORE
-0.40 TO -0.64--FAIR
-0.64 TO -0.88--POOR
-0.88 TO 1.12--VERY POOR
-1.12 TO -1.36--EXTREMELY POOR
SOURCE: MINISTRY OF HEALTH, SERISS
MAP: FEWS, PWA, SEPTEMBER 1987