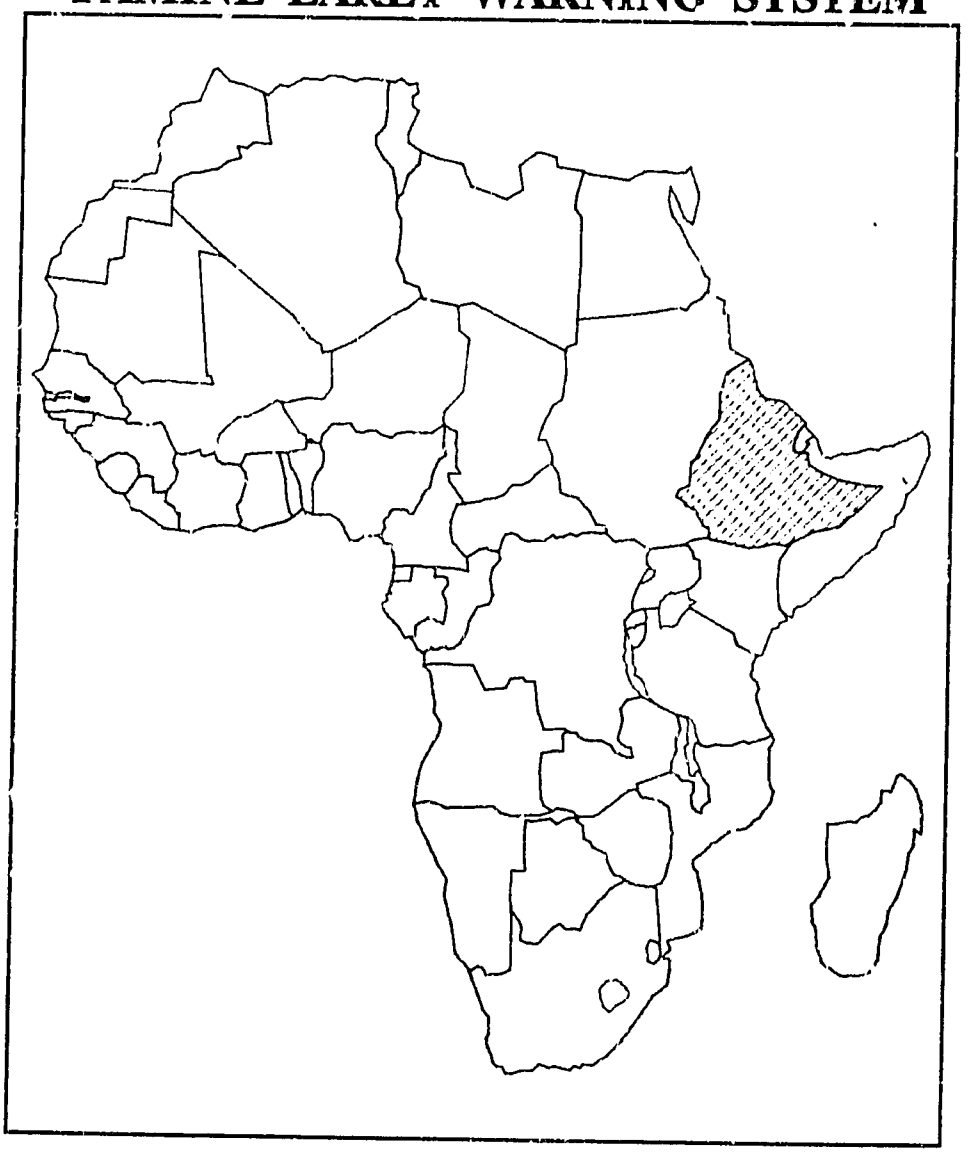
ETHIOPIA

VULNERABILITY ASSESSMENT

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 U.S. Agency for International Development (USAID)'s Africa Bureau. 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**	• **Mozambique**	• **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 (for more information on FEWS publications turn to the back inside cover of this report); 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.

****

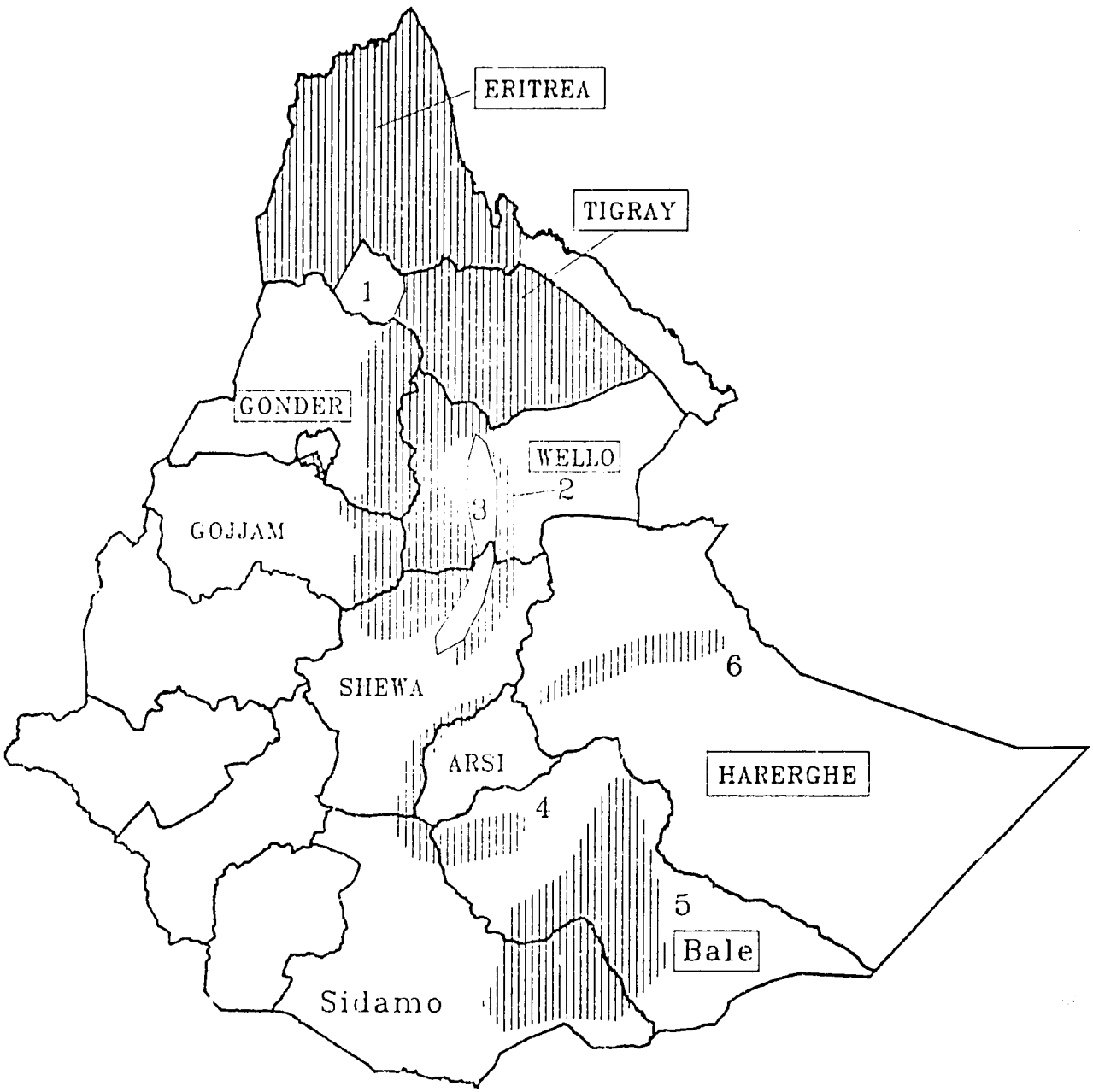
FEWS Country Reports, Bulletins, Alert Memoranda, and other special studies are prepared for USAID's Africa Bureau by **Price, Williams & Associates, Inc.**

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.

Map 1

High Current Vulnerability to Food Shortage and Famine



High current vulnerability

Bale — Medium to high regional vulnerability

1 Shire Awraja
2 Mid-altitudes and lowlands
3 Belg areas
4 Agricultural Bale
5 Pastoral Bale
6 Agricultural Harerghe

FEWS/PWA, June 1988

ETHIOPIA

Vulnerability Assessment

June 1988

Contents

Vulnerability Assessment

SUMMARY

There is probably not another country in the world in which the current level of vulnerability to famine is greater than in Ethiopia. A poor harvest in 1987, the lingering impact of the disastrous 1984 drought, and major civil warfare have rendered at least five, to over seven, million people dependent upon emergency food assistance during 1988. In the last three months, poor Spring rains have reduced the *belg* harvest by at least 25%, and poor main-season rainfall already appears to be jeopardizing the planting of maize and sorghum. Although all estimated 1988 emergency food needs could be met with current donor pledges and deliveries of food aid, rising conflict has reduced the ability to deliver food to those who need it.

The burden of current food shortages is not shared equally all across Ethiopia. Even with relatively limited and poor quality data, an assessment of relative vulnerability produces a map of significant differences in causes and consequences of food shortage. The data do not, in most cases, permit an objective examination of all indicators of vulnerability on a level below that of the regional-level administrative unit. This is a major handicap when the sub-regional variations in almost any characteristic are so great. Nevertheless, while the conclusions of the assessment will not surprise close observers of the situation in Ethiopia, they do confirm reasons to closely monitor certain, less generally acknowledged areas of food shortage and vulnerability to famine. Three categories of current vulnerability are described in this assessment.

(1) High current, and continuing vulnerability on a regional basis: Eritrea and Tigray (see Map 1). Well-known for their continuing problems of food production, and the crippling impact of a long-running war, these regions have low food stocks, rising strife, and little occasion to replenish their food supply through production in 1988.

(2) Medium-to-high current vulnerability, with recurring food supply problems on a regional basis: Wello, Gonder, Bale, and Harerghe regions. These regions have limited food stocks and diminished prospects for food production in 1988. Wello and Gonder are increasingly coming under siege from the rising level of conflict in the North. All normally experience limited success in meeting their food needs in any given year.

(3) Sub-regional areas where current vulnerability differs from that of neighboring areas in degree or characteristics:

- Medium vulnerability: Tigray's Shire Awraja and the *belg* highlands of Wello and Shewa;

- **High vulnerability:** the lowland awrajas of eastern Gonder and eastern Gojjam; the lowlands and slopes of northeastern Shewa and Wello; agricultural zones of Harerghe, Sidamo, and Bale; lowland Arsi; and pastoral Bale. Available food stocks from 1987 are limited, present prospects for agricultural production appear diminished, and food production options are normally limited in their success. Several other pastoral zones may belong in this category, although a lack of data on pastoral conditions restricts the ability to draw such a conclusion.

CURRENT SITUATION

Emergency food aid distributions in the North continue to be insufficient for identified needs. Nevertheless, food distributions by the Ethiopian Government, private voluntary (PVO) and non-governmental organizations (NGO), and dissident cross-border operations may be feeding well over half of all those requiring assistance. The ebb and flow of control over many war-torn areas render impossible any predictions about how well food needs will be met. Axum (see Appendix I), Adwa, and parts of southern Eritrea and northern Tigray are back under government control and deliveries of food by the Joint Relief Partnership and the government's Relief and Rehabilitation Commission are being readied. In Gonder, Wello, and Harerghe, deliveries of emergency food stocks are becoming harder to assure as the needs are increasing. The rising level of conflict, the departure of the International Committee of the Red Cross (ICRC), and difficulties in offtake of food from the ports of Djibouti and Asseb all contribute to the increasing problem of reaching those who need emergency assistance. The early prognosis for progress in main-season planting is one of diminished potential due to widespread low rainfall, particularly in lowland areas.

ASSESSMENT OF VULNERABILITY TO FAMINE

The purpose of this report is to define characteristics and relative degrees of vulnerability to famine within Ethiopia. Much of the data critical to such an assessment do not exist, and other data are not yet accessible. These two limitations impede a measurement of vulnerability below the level of the administrative region. Clearly, a summary of vulnerability at the regional level will sometimes poorly describe the wide range of conditions found among awrajas within any region. In this light, the present assessment has limited goals. It is an initial attempt to apply a framework of vulnerability assessment over available data, describing critical data needs and indicating the basis on which rainy-season events can be interpreted for significance. The assessment has three broad objectives:

- indicate what food security-related data are currently available to FEWS for regional administrative units;

- examine the continuing causes of vulnerability to famine and their characteristics; and,

- describe, within the limitations imposed by the data, the current conditions of food security in these areas and the possible impacts of differing main agricultural season events.

The assessment will first examine and map indicators of current and recurring vulnerabilities to famine. Recent manifestations of food shortage will be compared with these maps to see how they correspond. Finally, the vulnerabilities shown by the indicators, and reinforced by the manifestations of food shortage, will be subjectively summed, and greater and lesser degrees of relative vulnerabilities will be noted by region (or awraja, where possible). Definitions of and assumptions used in measuring vulnerability to famine, upon which this assessment is based, are found in Appendix 2.

Current Regional Vulnerabilities

The assessment of current vulnerability presented below will examine current food stock levels, prospects for replenishing food stocks with current production, and other resources that are immediately available to acquire food. Critical data needed for this assessment are lacking or relatively unreliable, limiting the resolution of this vulnerability assessment to a broad, regional level, with occasional references to smaller areas. The unreliability of much of the data is cause for caution when making conclusions about current vulnerability. Nevertheless, this assessment assumes that there is a "signal within the noise", that is, that there are underlying realities that are distinguishable to some degree within the poor data available.

Food Stocks - The level of current household food stocks is critical to an assessment of vulnerability. An ideal assessment would measure all such stocks. In Ethiopia, as elsewhere in Africa, little reliable information is available on household stock levels. In the absence of these data, one might then seek surrogate measures that can help to establish possible ranges of stock quantities, and thus allow a broad understanding of the current situation.

Map 2 presents one surrogate measure for household cereal stocks. Net 1987 cereal and pulse production has been compared with 1988 net food requirements, assumed for this analysis to be 160 kilograms (kg) per capita. This shows how well minimal food needs would have been met if 1987 production had gone totally to stocks. If no other stocks existed from prior production or purchase, this amount would represent the maximum quantity of grain in stock for use during 1988. Assuming these stocks were consumed at the rate of 13.33 kilograms per month (160 kg divided by 12 months) per person, Map 2 indicates the month by which all stocks would be consumed. Major portions of the country would have already depleted all their stocks. As would be expected, Eritrea and Tigray would be among the earliest. Bale, with its marginal agriculture and small farming population, would soon follow. Wello, Harerghe, Sidamo, and Gamo Gofa are able to cover less than half of their annual needs with 1987 production. Gojjam, which produced over 185 net kilograms per person in 1987, would have reserves well after the next harvest.

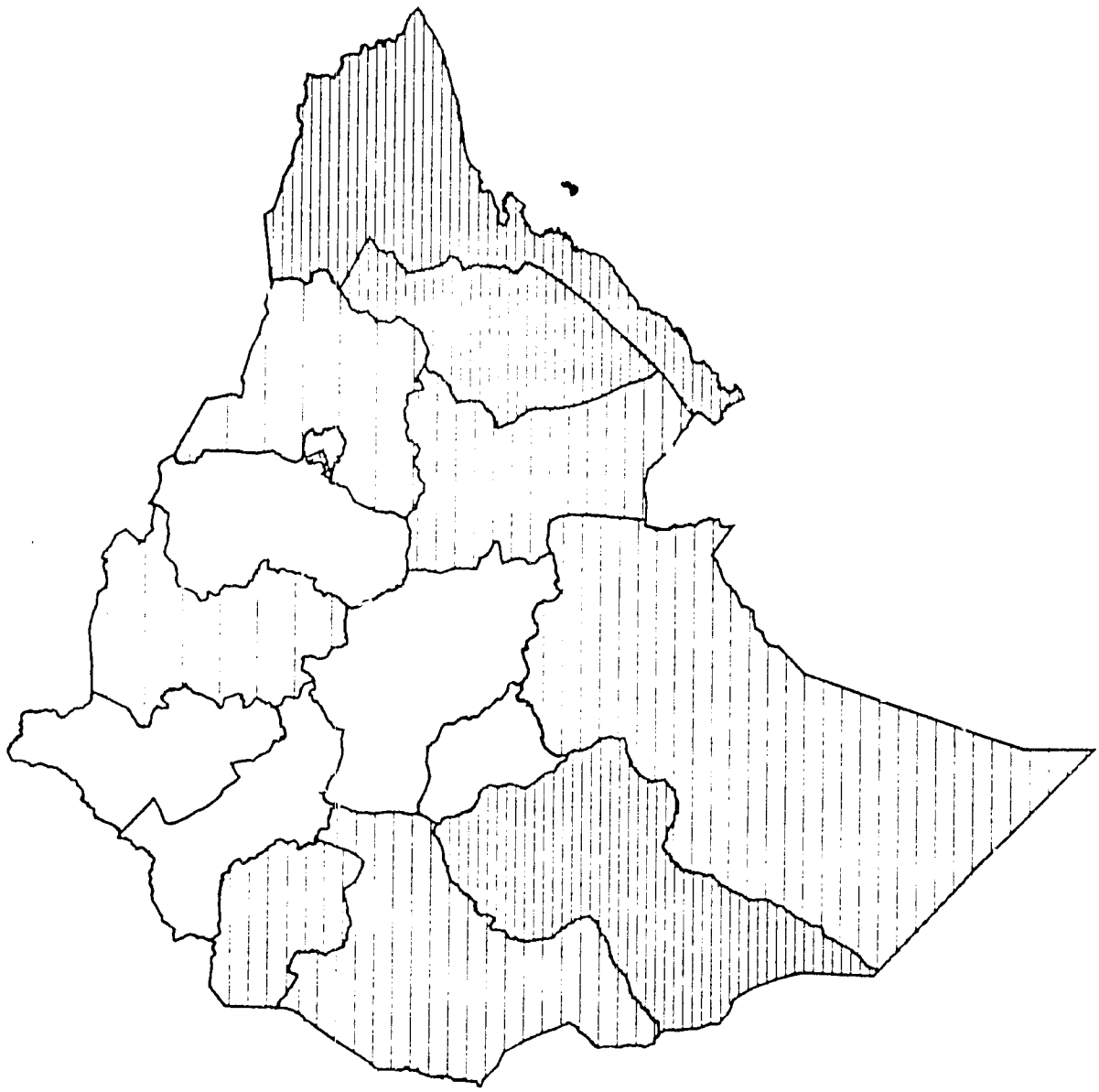
It is likely that in some areas there were household food stocks carried into 1988 from the relatively good 1986 harvest, which would modify the picture presented above. The locations and quantities of these carry-over stocks cannot be specified. It is unlikely, however, that the areas shown with least current stocks in Map 2 would have had significant quantities of carry-over stocks.

Current Agricultural Production - Crops being harvested or currently in the field also represent some potential amount of food stocks. The recent *belg* harvest was, from all reports, a mediocre one, with total crop failures in many lowland areas, and significant yield reductions at higher altitudes. Of the 200,000 to 300,000 metric tons (MT) that a *belg* harvest could potentially provide, loss estimates range from 50,000 to 100,000 MT. The losses will be particularly felt in Wello and Shewa. Nevertheless, another 25,000 to 50,000 MT will be available to each of these regions as a result of this harvest. While this is a significant contribution to local food resources, it does not appreciably change the regional picture presented so far in the maps.

The main agricultural season began with some early planting in April and May. Through the end of June, rainfall was below average and late in most lowland cropping areas (see Map 3). Planting was delayed in many areas, and where planting occurred, there was considerable stress from lack of moisture. These conditions are found particularly in extensive agricultural areas of Wello, Gonder, and Shewa, and to a lesser degree in Gojjam, Harerghe, and parts of Arsi and Bale. The upper valleys of both the Blue Nile and the Tekeze Rivers are particularly affected by the poor rainfall. Negele and Gode, in the extreme pastoral south of the country, appear to have had record low rainfall (30 year

Food Need Months Covered by 1987 Main Season Cereal and Pulse Production

Net Production / 13.33 Kg



March 1988

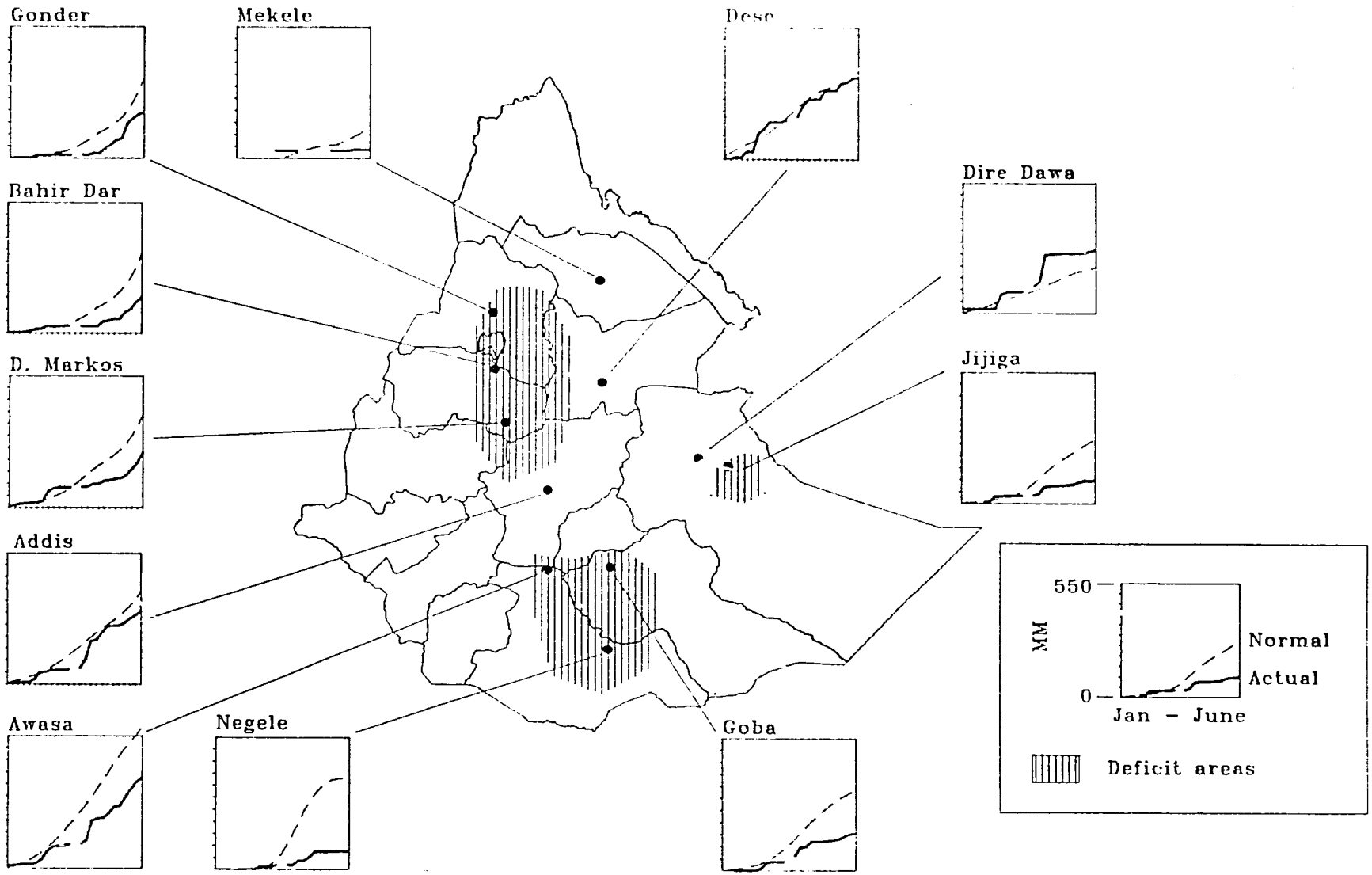
June

September

After September

Source: Production: Central Statistical Office
Population: FEWS
FEWS/PWA, June 1988

Cumulative Rainfall Deficits
January 3, 1988 to June 25, 1988



Source: NOAA Climate Analysis Center
FEWS/PWA, June 1988

history) during the first half of their 1988 rainfall season. The second rainy season, in the Fall, will be especially important for each area to maintain pasturage and well levels.

Satellite imagery of vegetation conditions through June 20th, 1988, confirms that vegetation has been persistently below average along the lowlands of the eastern edge of the Central Highlands in Wello and Shewa (see Map 4), in southeastern Gonder, most of western Wello, northwestern Shewa, eastern Gojjam, and in a band stretching from the highlands of Bale over into Harerghe. The large "island" of average conditions in northeastern Shewa and just over the border into Wello seems to be associated with relatively high elevations (greater than 2,500 meters, including the western slopes of Mt. Abuye Meda at 4,305 meters). The rainfall totals and the confirming patterns seen in this imagery suggest that the below-average areas are currently vulnerable to yield losses or diminished pasture, if not total crop or grassland failure.

The rising level of warfare impedes, to varying degrees, the agricultural production process in major parts of Eritrea, Tigray, Wello, and Gonder Regions. The general areas affected by warfare are shown on Map 5.

Food Acquisition Resources - Current wealth (savings, livestock, crafts, jewelry) or immediate access to other resources (wages, familial gifts, food aid distributions, food-for-work projects) allows people to acquire food independently of their own production. Most urban residents acquire food in this manner. To some degree, almost all rural residents also acquire some of their food in this way. To determine the level of current vulnerability to famine, access to food acquisition resources should be measured. This is particularly true when assessing groups of people whose potential food production cannot yet be measured. Typically, however, such resources, or wealth, are not measured because of obvious difficulties with the invasive nature of such measurements, as well as the cost. In Ethiopia, as in many other places in Africa, regularly collected data of this type are scarce.

Some resources are less personal and theoretically easier to measure. Limited data on food aid distributions are available, although the figures are of questionable reliability and difficult to apportion to sub-regional geographic or administrative units. Through June, food aid already distributed in Eritrea and Tigray by all government, PVO/NGO, and cross-border operations may have surpassed 300,000 MT. Even in this quantity, the number of people not presently receiving assistance may be higher than 500,000 (the number of people requiring assistance will increase in coming months). The recent Leeds University report on the food supply in Eritrea contains a fairly detailed and, possibly, relatively accurate survey of food requirements down to the awraja level. Although not available for this assessment, this type of information is required for each region in order to prepare better estimates of vulnerability to famine.

In general terms, the lack of data on so important an aspect of the food acquisition process is an important impediment in assessing vulnerability. To mention the lack of this data here is to acknowledge its fundamental importance to the assessment, to stress the need for such data, and to qualify the conclusions that will be made on the basis of such information.

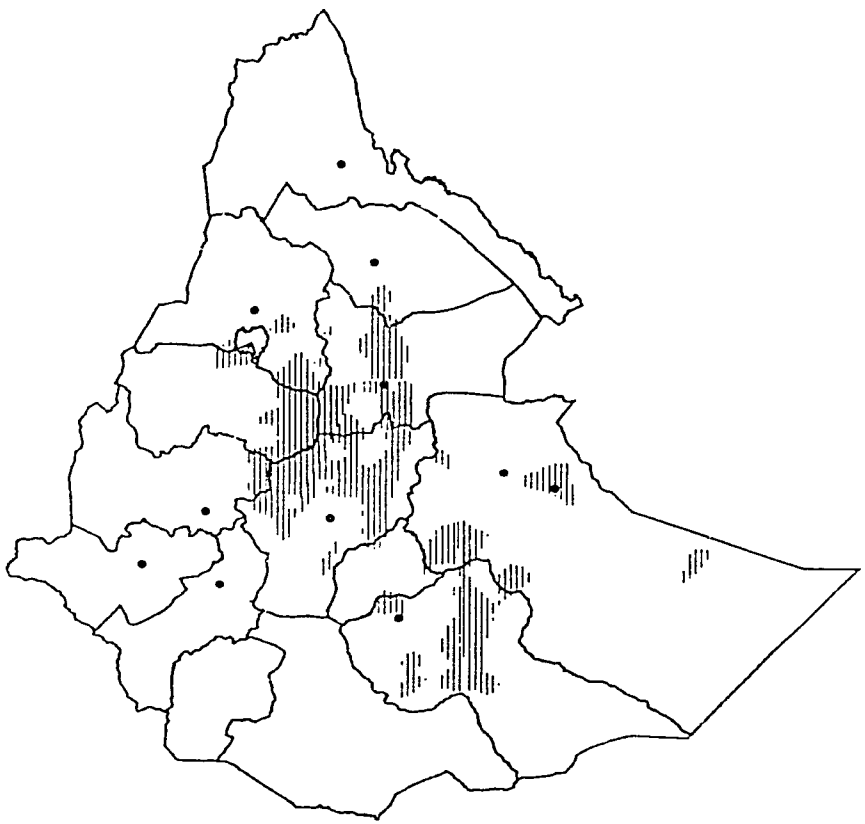
Recurring Features of Vulnerability

The regularity and usual level of performance of local food production processes (agriculture, herding, fishing, or other) are critical measures of the historical causes of vulnerability to famine in a rural society. The advantages and disadvantages that regularity and sufficiency reflect, help to define the degree to which the person, family, or society can depend upon itself for its own food security. In the

Map 4

Areas of Below-Average Vegetative Index

As of June 20, 1988

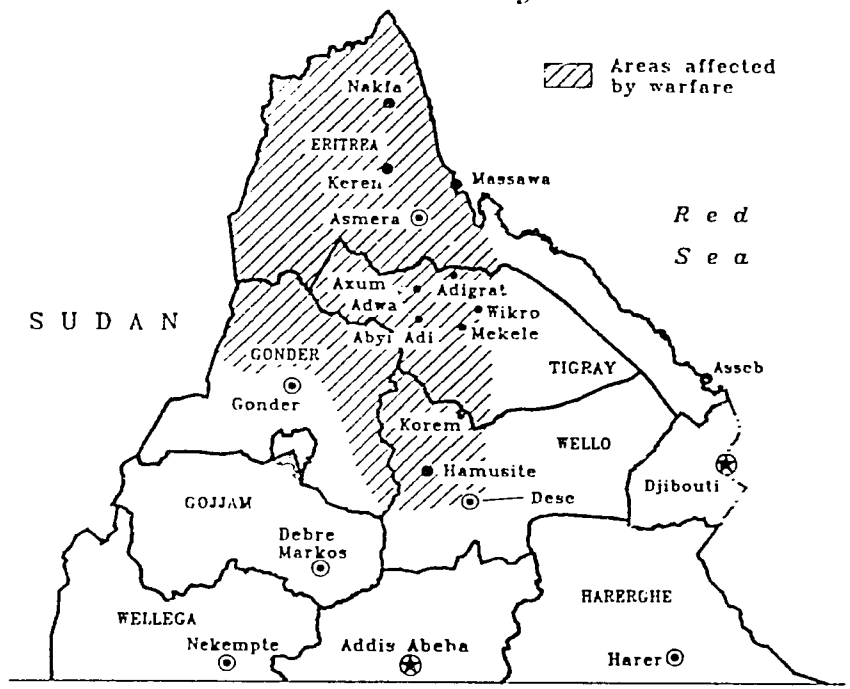


▨ .03 Below the 1982–1987 average NDVI

Source: NASA derived NDVI
FEWS/PWA, June 1988

Map 5

Areas Affected by Warfare



absence of a reliable and productive food production system, opportunities must be sought to acquire food by other means. If such opportunities are available, then food security may be relatively assured. The causes of current vulnerability to food shortage or famine will frequently, but not always, reflect recurring causes of deficiencies in food production or food acquisition opportunities.

Opportunities for Food Production - Map 6 summarizes the dependability and usual level of regional agricultural production. It is compiled from information presented in Maps 7, 8, 9 and 10. A recent assessment of the "structural" deficit (that is, the regularly occurring national shortfall of production relative to requirements) indicates that at current rates of growth, Ethiopia may suffer from a two million MT structural deficit by as early as the 1990's. Very few of Ethiopia's major administrative regions regularly produce enough cereals and pulses to meet their populations' net annual food needs (assumed here to be 160 kilograms per person). Arsi, Shewa, Welega, and Gojjam are the only regions in which agricultural production is relatively reliable (yearly harvest sizes varied relatively little from their 1980-87 average). Their annual net production has also, on average, been sufficient to provide at least 160 kilograms per capita of cereals and pulses. Those regions in which agricultural production is usually variable and insufficient may produce, as Wello does, large quantities of food per capita in good years, and very little food at all in bad years. (Wello is, in this sense, a particularly important place to monitor closely from year to year, as its success in agriculture is difficult to predict in any given year.) Or, as in Eritrea, Tigray, Bale, and Gamo Gofa, agriculture may be only marginally successful even in the best of years, and extreme variations in harvest size still only relate to small and insufficient harvests.

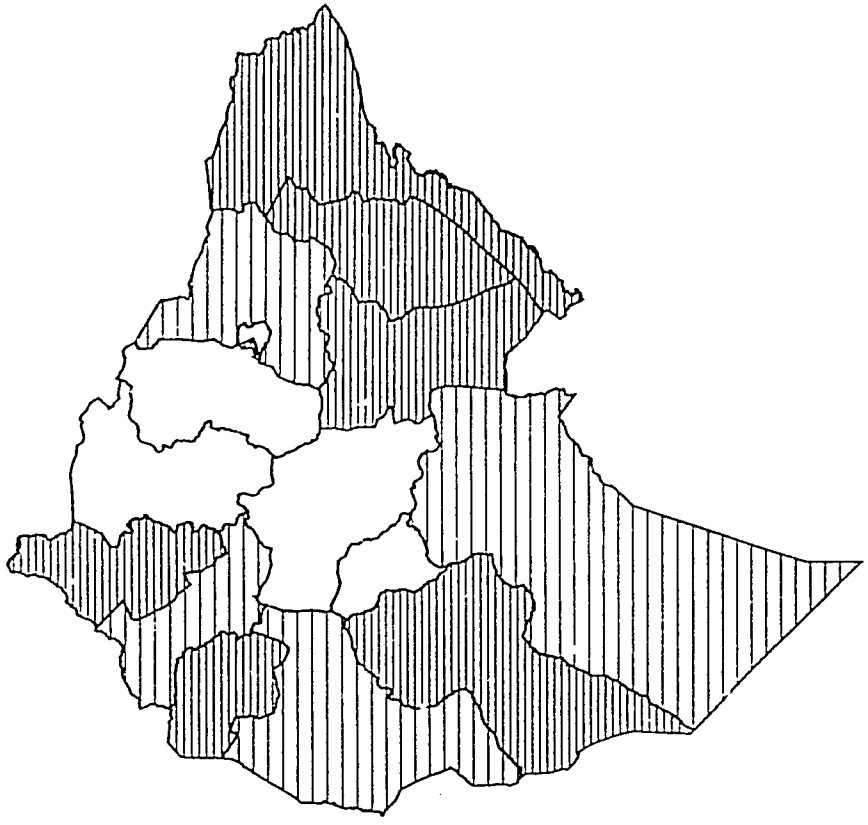
Reliance upon oxen and other draught animals for farming is an important feature of the fragility underlying many farming areas in Ethiopia. In good years, the use of oxen allows more effective use of the limited agricultural potential of places like the northern regions. After a series of dry years, when oxen are weakened or have been sold rather than allowed to perish from lack of feed or water, the farming system is put at great, and self-perpetuating, disadvantage. Without the oxen, less can be planted, and harvests are smaller. When harvests are smaller, there is less feed and more livestock must be sold or consumed. This appears to be an important feature of current and continuing vulnerability, particularly in Eritrea and Tigray.

Several data weaknesses limit our ability to ascribe other than broad levels of relative vulnerability to the different regions in Map 6. What little statistical data exist for the agricultural sector are of limited quantity and reliability, and cover few crops. The lack of data on food production other than the major cereals and pulses (meat, milk, root crops, etc.) especially limits the ability to measure food production opportunities for pastoral areas. Population data, underlying the measurement of sufficiency of production, is also of questionable accuracy. Notwithstanding the recent date of the national census (1984), huge, undocumented population movements have occurred in the intervening years.

Sub-regional variations in the food production process can be surmised from some other measures. Map 7 uses satellite imagery of vegetation conditions (see explanation of NDVI on inside back cover) to suggest the levels of variation in conditions for agriculture across a region (covering the periods of July through October 1982-87). This map is based on information presented in Maps 11, 12, 13, 14 and 15. The hatched areas in Map 7 are those that are normally lightly vegetated, and in which there have been significant changes in the amount of vegetation from year to year. In agricultural areas, low levels of vegetation and high inter-annual variability of vegetation may indicate areas of fragile farming potential. In pastoral zones, as in the south, great inter-annual variations may show less dependable grazing areas. Particularly notable in Map 7 is the pattern that covers large parts of the highlands of Tigray, Wello, Shewa, and Harerghe regions. By all reports, these hatched areas closely align with many of those areas currently considered at highest risk of food shortage and famine.

Map 6

Variability and Sufficiency of Agricultural Production



Variable/Insufficient

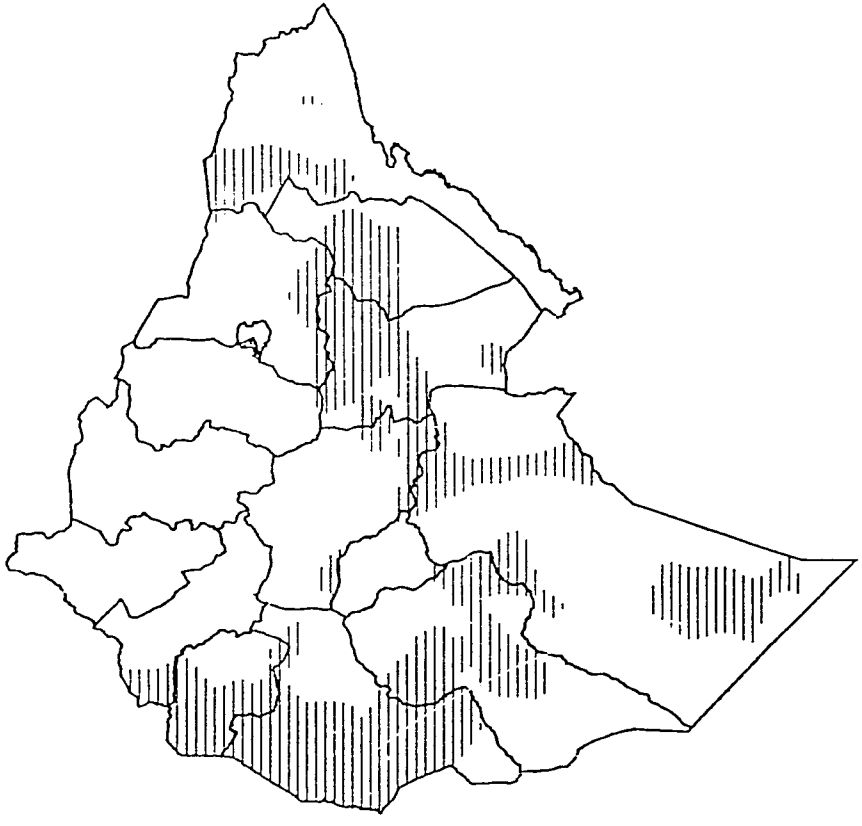
Stable/Sufficient

Stable/Insufficient

FEWS/PWA, June 1988

Map 7

Fragile Agricultural or Pastoral Potential



Inter-annual average btween .05 and .3, and Inter-annual variability >.05 from average

Source: NASA derived NDVI
FEWS/PWA, June 1988

Map 8 gives a broad, regional picture of absolute and per capita cereal and pulse production from 1980 to 1987. Four administrative regions, Arsi, Shewa, Gojjam, and Wellega, have the highest per capita production and are quite important nationally in terms of absolute production. Shewa's average cereal and pulse production, at 1,650 MT, is as high as the national production of some Sahelian West Africa countries covered by FEWS. Map 9 indicates the number of years, out of the eight examined here, in which net cereal and pulse production was insufficient to provide at least 160 kilograms per capita. As can be seen, even in the relatively favored Shewa and Gojjam, there were years of insufficient agricultural production. In some of the regions in which agricultural production was never sufficient, there may be, nevertheless, root crops, livestock, or other sources of locally-produced food that are available, but not reflected on this map.

Map 10 reflects the amount of variation in the size of cereal and pulse harvests between 1980 and 1987. Wello has experienced great swings in agricultural production during this period. Gojjam, Wellega, and Shewa have maintained the most stable agricultural production levels. Despite the relatively small absolute sizes of their harvests, Eritrea and Tigray have been subject to widely varying production levels. The agricultural data from these two regions are less well estimated than in other regions because of ongoing warfare. The Leeds University study estimates that Eritrean farmers can only produce 55% to 60% of their food needs in a good year (220,000 MT to 250,000 MT). Central Statistical Office data, which form the basis for the maps presented here, estimate 67,000 MT as thebest harvest in Eritrea in the last eight years.

Maps 11 and 12 display the average index values (NDVI) for main-season (July through October) vegetation seen in satellite imagery. Higher values generally reflect better vegetation conditions and lower ones, poorer vegetation conditions. Ongoing research indicates that agricultural potential generally increases as NDVI values go up. The low index values shown on Map 11 (below .3 NDVI) indicate relatively low quantities of vegetation in the north, east, and south. Were a sufficiently detailed elevation map available to lay over this map, it would be seen that NDVI values frequently rise as altitude increases (as average temperatures drop and less moisture is lost to evaporation). Those values in Map 12 (above .3 NDVI) show higher levels of vegetation in the west, and along the westernmost spine of the southern highlands. The Rift Valley and the southern highlands are particularly evident in these maps.

Maps 13 and 14 show the relative variation in inter-annual NDVI values during the July through October period. The hatched areas in Map 13 show where the vegetation index displays high inter-annual variation in value. The non-hatched areas include the most continuously vegetated lands, and the desert areas, where vegetation levels are relatively stable from year-to-year. As can be seen, all the agricultural areas of Wello vary greatly in inter-annual NDVI value. Referring back to Map 10, one will recall that Wello Region also displays the highest variability in inter-annual agricultural production levels. Map 14 underscores the pattern of variability just seen in Maps 10 and 13. The large semi-circular pattern covering much of northwestern Wello is an area of quite high inter-annual variation (greater than .08). It principally covers the river valleys of two Tekeze River tributaries. Map 15 combines Map 11 with Map 13 to highlight areas with both low average NDVI values and relatively high inter-annual variability, conditions that suggest some inherent fragilities of the agricultural base. The areas where both conditions exist are shown in Map 7.

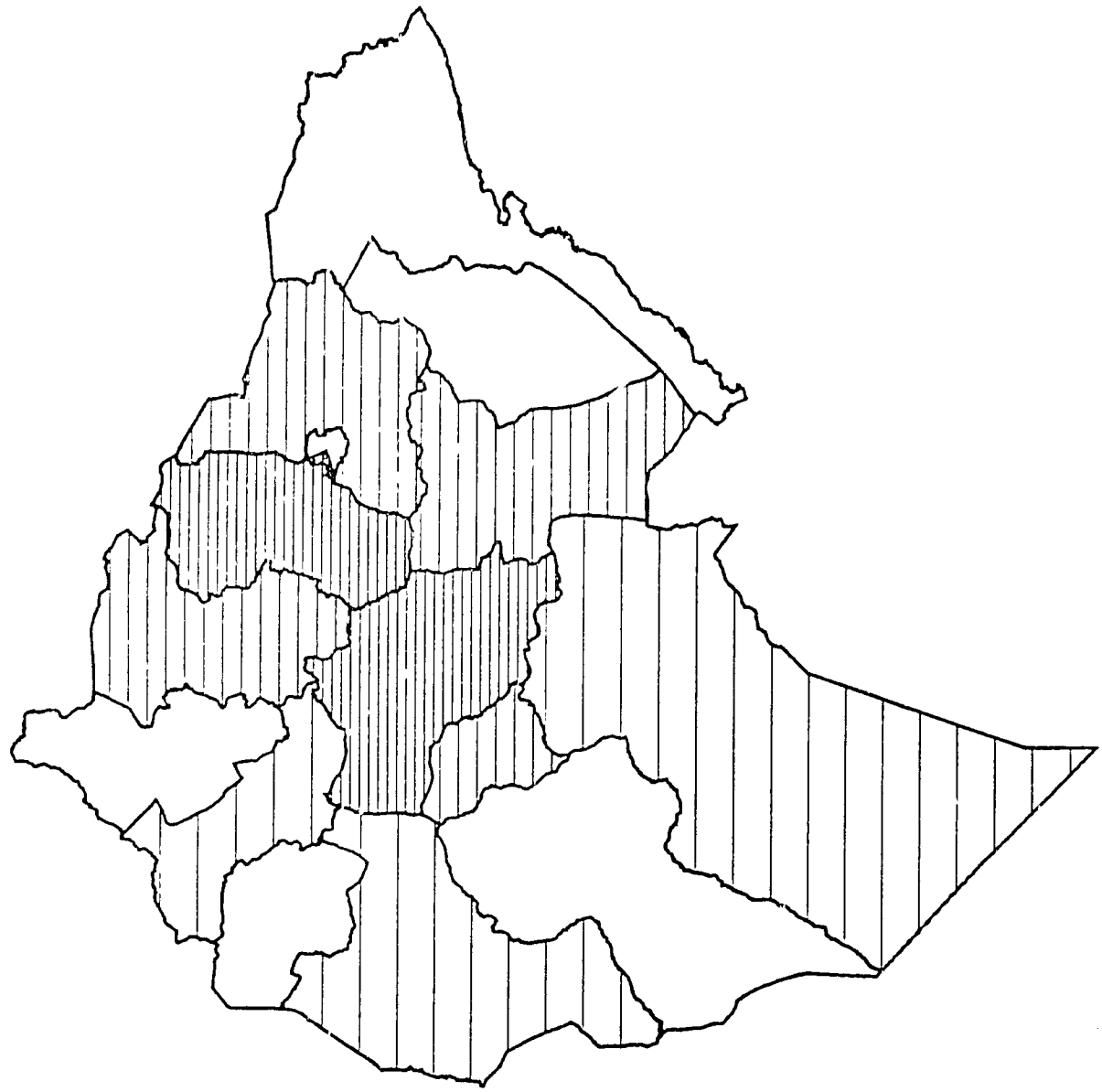
Maps 16 and 17 show Sahel-wide pictures of the average level and range of inter-annual variability of NDVI. As can be seen, Ethiopia and Sudan display much more complex patterns than in the Western Sahel.

Usual Opportunities for Food Acquisition - Most Ethiopians regularly rely, to some degree, upon opportunities other than their own production to acquire the food that they require. Government employees, many urban residents, military and police, and a small group of private sector employees

Map 8

Average Annual Cereal and Pulse Production 1980–87

In Metric Tons



	0 to 200
	200 to 400
	400 to 600
	600 to 1850

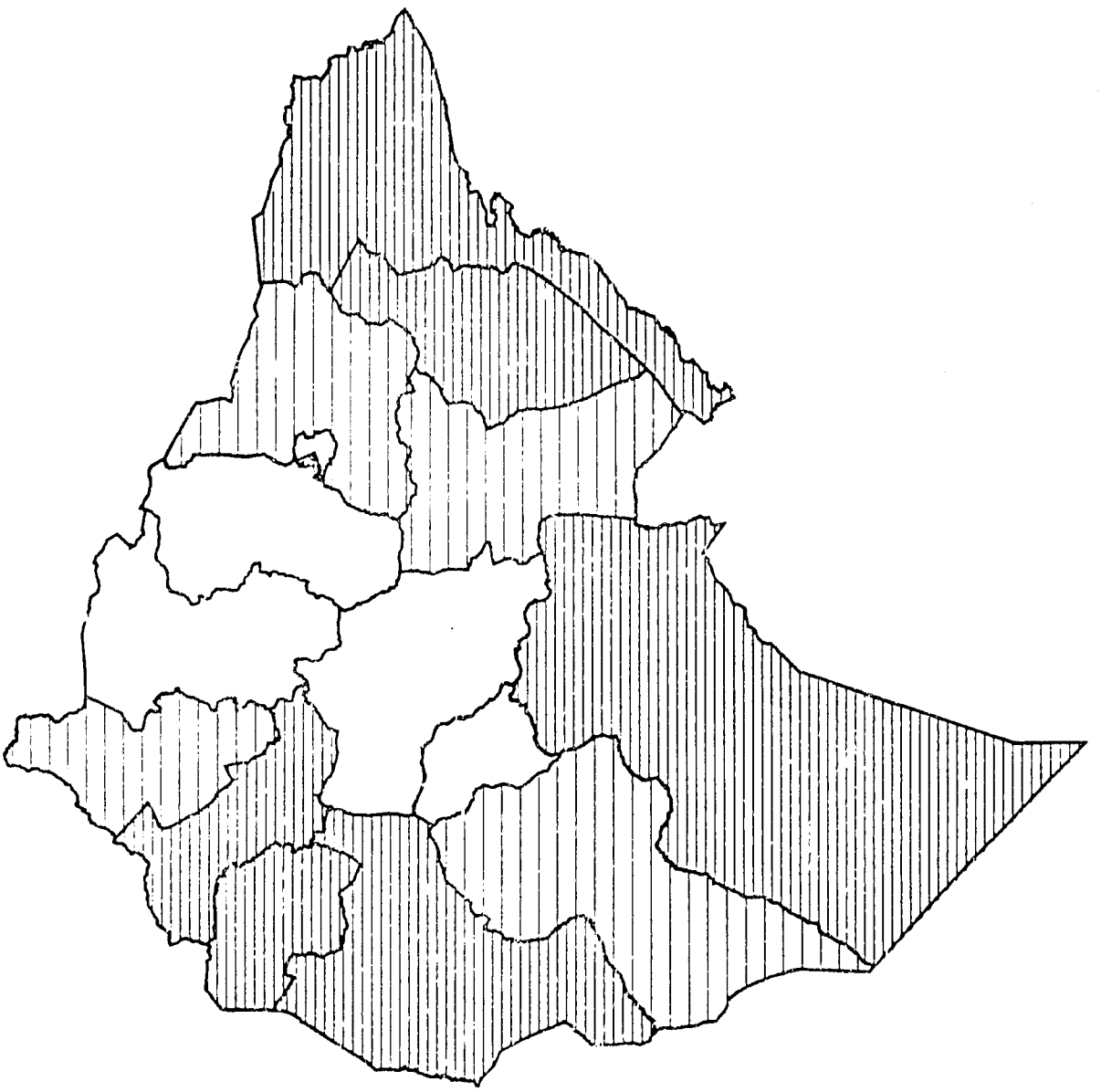
Source: Production 1980–87: CSO productio
1985: USAID/ADDN population derived from
1984 Census by FEWS

FEWS/PWA, June 1988

Map 9

Frequency of Insufficient Crop Production 1980-87

Net Per Capita Production < 160 Kg



Number Of years in 8

- 0 to 4
- 5 to 7
- 8

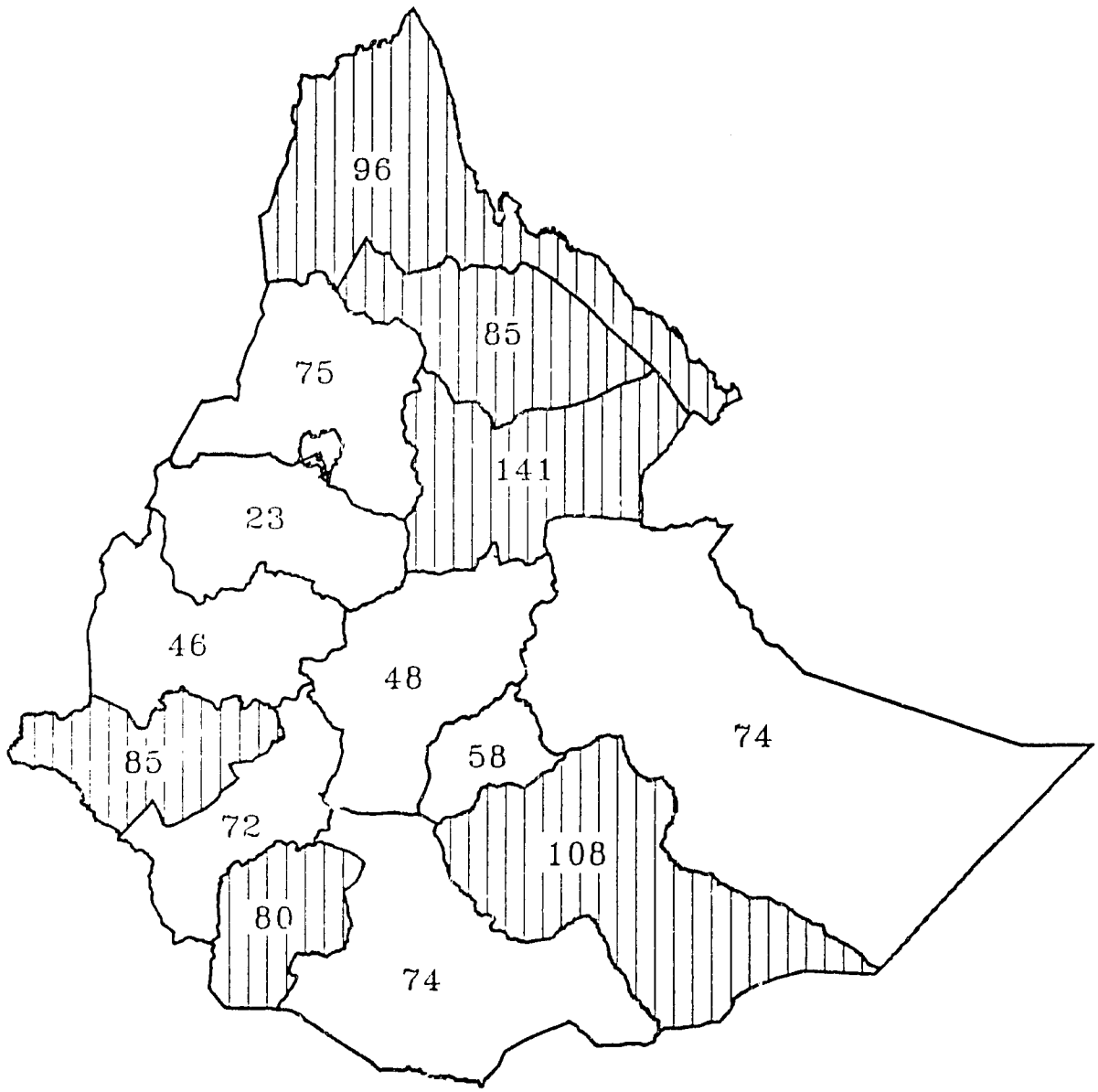
Source: Production 1980-87: CSO productio
1985: USAID/ADDN population derived from
1984 Census by FEWS

FEWS/PWA, June 1988

Map 10

Variability of Cereal and Pulse Production 1980-87

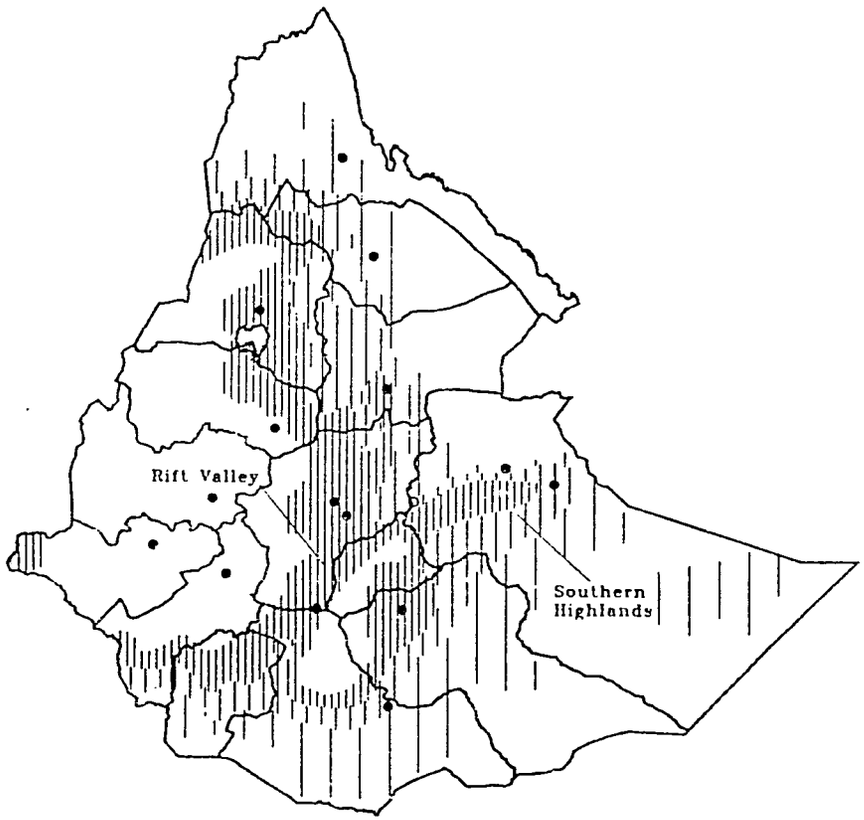
Best Year-Worst Year/Average Year



Source: Production 1980-87: CSO productio
1985: USAID/ADDN population derived from
1984 Census by FEWS
FEWS/PWA, June 1988

Map 11

Low Average Main Season NDVI
July–October



NDVI Value

0 – .05 or .4

.05 – .1

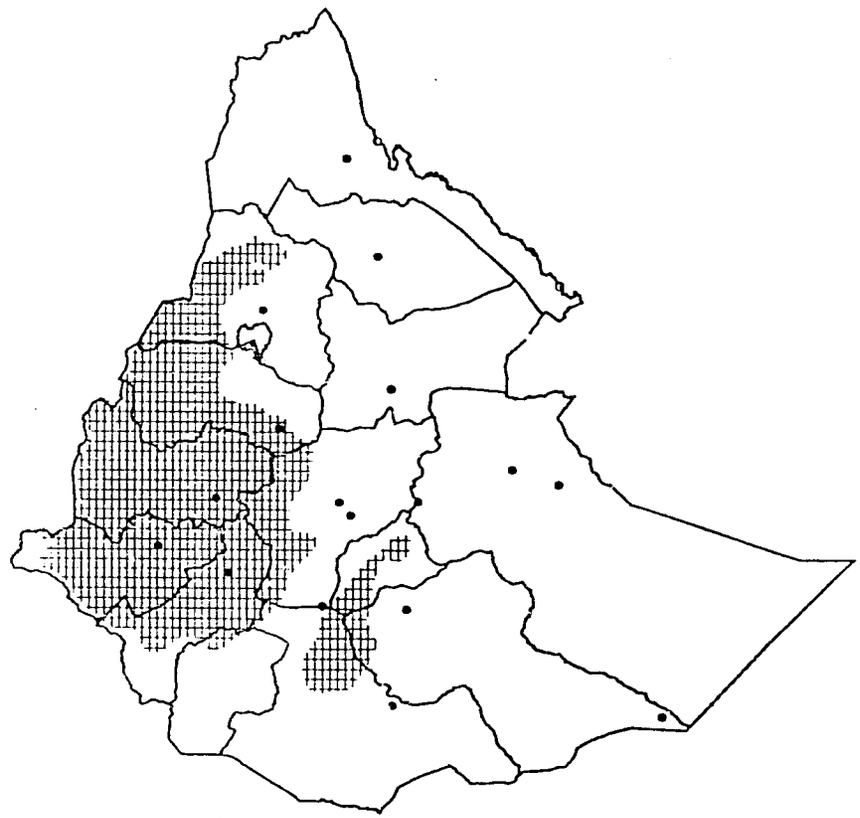
.1 – .2

.2 – .3

Source: NASA derived NDVI
FEWS/PWA, June 1988

Map 12

High Average Main Season NDVI
July–October



NDVI Value

<.3

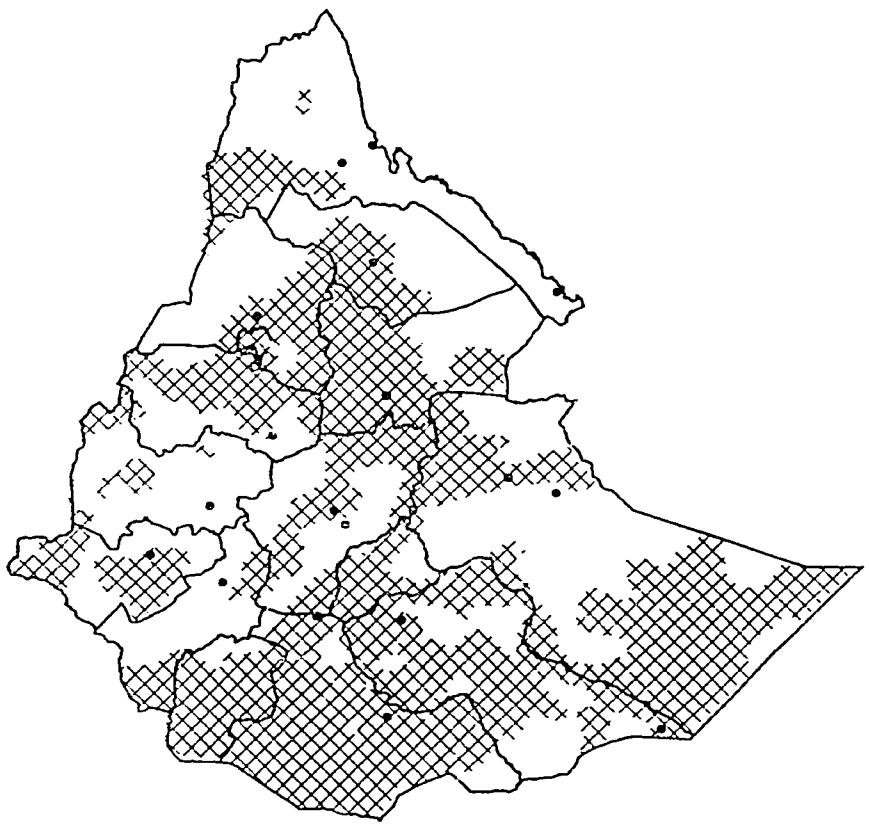
>.3

Source: NASA derived NDVI
FEWS/PWA, June 1988

Map 13

High Inter-Annual Variation in Main Season NDVI

July-October



Variation

>.05

<.05

Source: NASA derived NDVI
FEWS/PWA, June 1988

Map 14

Highest Inter-Annual Variation in Main Season NDVI

July-October

Variation

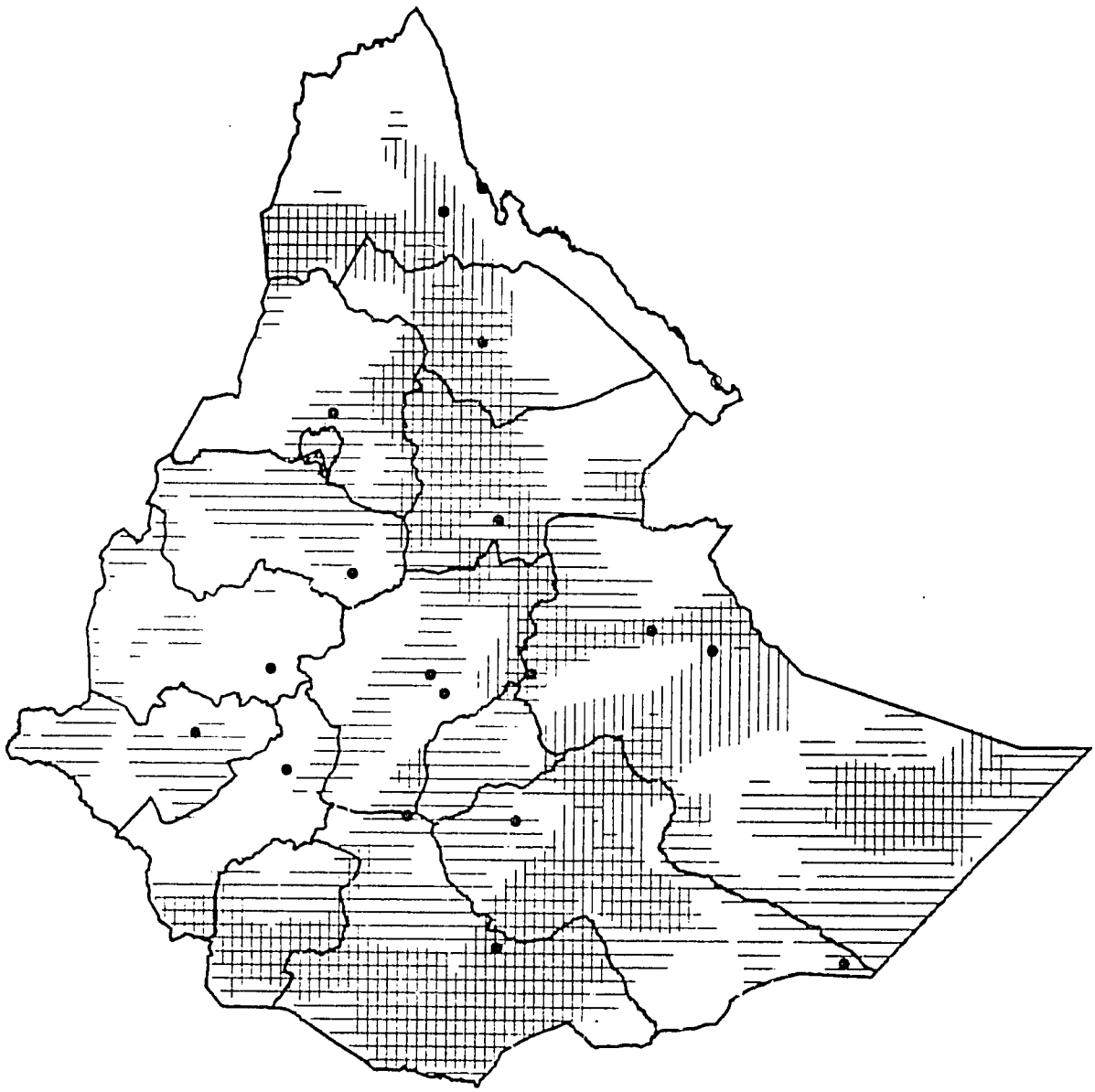
<.08

>.08

Source: NASA derived NDVI
FEWS/PWA, June 1988

Map 15

High Inter-Annual NDVI Variation and Low Average NDVI



Low average NDVI .05-.3

Variable NDVI >.5

Source: NASA derived NDVI
FEWS/PWA, June 1988

Map 16

Average Growing Season NDVI

Based on Indices for 1982–1987

< 0.05 -- less than minimal vegetation

0.05 - 0.3

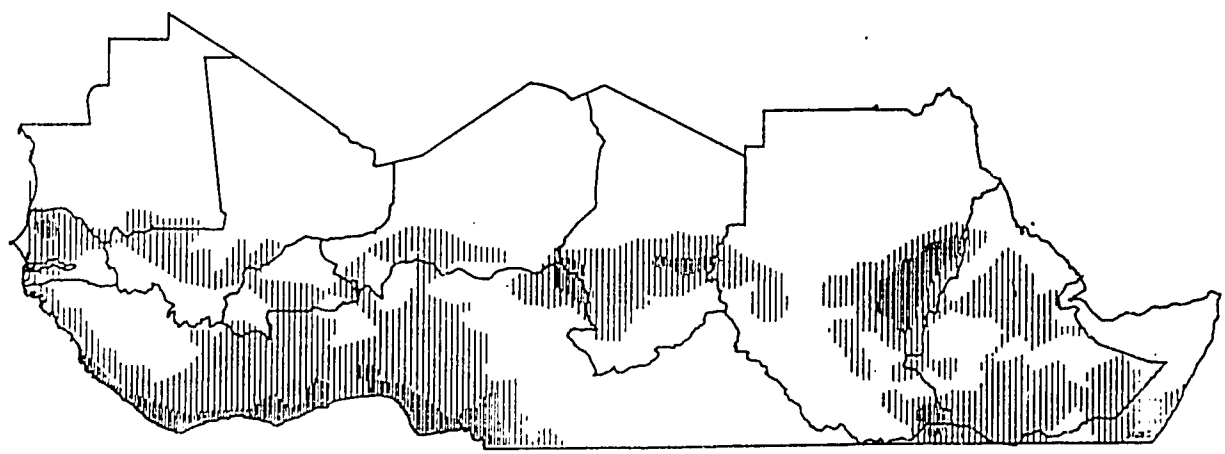
0.3 - 0.4

> 0.4 -- dense vegetation

Map 17

Variability of Growing Season NDVI

1982 to 1987



High Variability

Highest Variability

FEWS/PWA, June 1986

largely purchase or trade for much of their food supplies. Many, if not most, rural agriculturalists also rely upon wages from field labor, migrant remittances, gifts, food aid, and non-agricultural economic activity to supplement that part of their diet they cannot meet through their own production. In good times, wages, savings or other non-essential resources are normally used to purchase food. In bad times, the liquidation of productive and essential resources (herds, personal items, farm implements) has always been a classic indicator of great stress on the food supply. Recourse to less desirable food acquisition strategies (consumption of famine foods, migration of families, etc.) also clearly indicates great stress.

Little sub-national level data are available that measure the normal contribution of these opportunities to the food available in specific regions, or even nationally. What data exist are usually the product of one-time studies and surveys. These data are typically point-specific, dated, and difficult to extrapolate to other, even neighboring, areas. Past reliance upon food aid is somewhat better documented on a regional basis, although the information is fragmented among agencies, and beyond the scope of this assessment. Particularly where agricultural and pastoral food production never meets minimal requirements, systematically-collected information about food acquisition opportunities is needed to better understand current responses to food shortage and incipient famine.

Manifestations of Vulnerability

The consequences of an existing food shortage should be manifest in various physical, social, and economic indicators (e.g., malnutrition, migrations, and high food prices, respectively). Although the information the indicators provide may only help to identify where physical, social, or economic harm has already occurred from food shortage, these "late" indicators are frequently the most up-to-date available in an information-poor environment. Nevertheless, there is an inherent difficulty in using these indicators to confirm the presence of food shortages: they usually reflect much more complex circumstances than simply the scarcity of food. Malnutrition can also be the result of disease, migrations the result of the "pull" of opportunities (as well as the "push" of food shortage), and rising grain prices the result of organized purchasing of surplus crops (as well as of local food shortage). For this reason, the fluctuations of such indicator values can be difficult to interpret as a manifestation of current food stress.

In Ethiopia, at least three such indicators of manifest food shortage can be identified: malnutrition surveys, grain prices, and historic patterns of food shortage and famine. In the same vein as the indicators examined in the preceding section, the first two of these indicators reflect current problems, and the last provides a picture that may illuminate recurring patterns or provide a context.

- **Malnutrition surveys** - Although nutritional survey data are available from many sources in Ethiopia, little data are comparable due to differences in data collection methodology and reliability. Successive samples may not relate to similar populations, and surveys usually only measure people directly touched by distribution programs. People outside of the range of such programs, who may have the worst overall access to food, are often not surveyed. According to USAID/Addis, the "rapidly changing situation in Northern Ethiopia, and consequent reduced relevance of dated nutritional data, preclude accurate statistical analysis of health status of vulnerable populations."

  In most cases, such data can provide only questionable indicators of general areas with possible malnutrition problems -- yet these data cannot be dismissed under current circumstances. Reports of nutrition surveys administered between March and May indicate a number of areas of concern. The eastern area of Gonder Region, particularly the lowland awrajas of Wegera, Semen, Libo, and Gayint, appear to be suffering declining levels of nutrition. The departure of the International Crescent of the Red Cross (ICRC) in May means that as many as 300,000 people are no longer

served by food aid distributions. These conditions, plus general inaccessibility and a rising level of conflict, raise the possibility of further significant increases in malnutrition due to shortage of food. Malnutrition in Wello also appears to be increasing. Save the Children/UK reported in May that, except in the awrajas of Wag and Lasta, where surveys were not performed, levels of nutrition were still acceptable, but declining. Nutrition in the Korem camp, whose population is composed of many people from Wag and Lasta, was also deteriorating. The poor 1987 harvest, rising conflict, the inadequate yet potentially significant Korem health survey information, and a virtual absence of aid distributions point to a precarious food supply situation in Wag and Lasta. Else- where, the limited amount of current malnutrition data indicates that the only other places of concern due to high malnutrition levels may be the Sudanese refugee camps in the West.

- **Grain Prices** - A limited amount of current grain price data is available, along with prices from previous years, which provide an historical context. Recent price data from Wello, Shewa, and Harerghe show that grain prices have risen, as is normal for the pre-harvest season, yet prices are still well below 1984 and 1985 levels. The dampening impact of large, early distributions of food aid is suspected to have played a role in the moderate increases noted to date. Reports of more significant and worrisome price increases have recently come from western Wello (Borena, Were Ilu, and Were Himeno), possibly reflecting a worsening food supply picture (and apparent poor main season prospects).

- **Recurring Patterns of Famine** - Map 18 indicates the historic frequency of awraja-level famine conditions, based on a study of the 20-year period from 1958 to 1977. As can be seen, very few awrajas have been exempt from famine problems. Conversely, several awrajas have experienced famine over 50% of the time during this period. Some of these included Wag Awraja in Wello, Enderta and Raya and Azebo Awrajas in Tigray, southern Kefa Region, and the pastoral areas of both Bale and Sidamo. The fragility of the rest of Tigray and most of Eritrea and Wello is also apparent.

RELATIVE VULNERABILITIES TO FAMINE IN ETHIOPIA

Even with substantial problems of poor current and historic data, it is apparent from this assessment, as well as from local monitoring and reporting, that some regions and awrajas of Ethiopia are currently unable to cover their food needs for the rest of the year. In others, significant questions about the current food supply cannot be answered due to lack of data. The following categories of vulnerability have been subjectively created based on the examination of the indicators discussed above:

High Current Vulnerability, Long-Term Food Problems

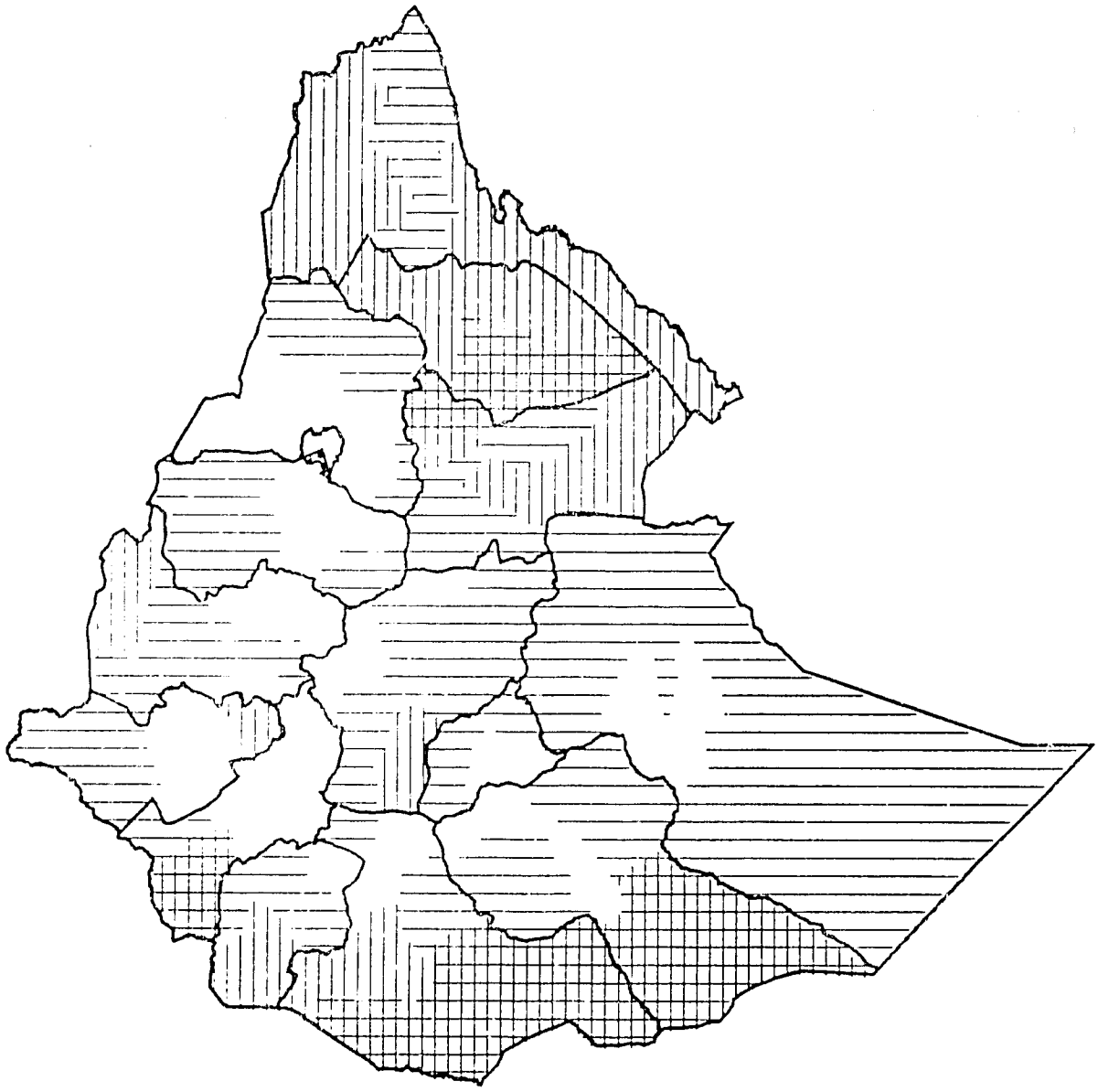
Eritrea and Tigray are the most vulnerable. These regions currently suffer from the consequences of an extremely poor harvest in 1987, the lingering impact of the 1984 famine, and fragile agricultural potential. The warfare these areas have experienced for 25 years has recently intensified, and in many cases overshadows the impact of the recent droughts on the food supply.

Medium-to-High Current Vulnerability, Recurring Food Problems

Wello, Gonder, Bale, and Harerghe vary from year to year in their success at acquiring food. All suffer from a fragile agricultural potential, and Bale and Harerghe also have only limited success in maintaining viable pastoral conditions. This year, all have limited food stocks, and early-season agricultural and pastoral prospects have been jeopardized by recent poor rainfall. Wello and Gonder have recently become far more exposed to the destruction wrought by the expanding conflict in the north.

Map 18

Number of Years of Famine Between 1958-77



Years of Famine

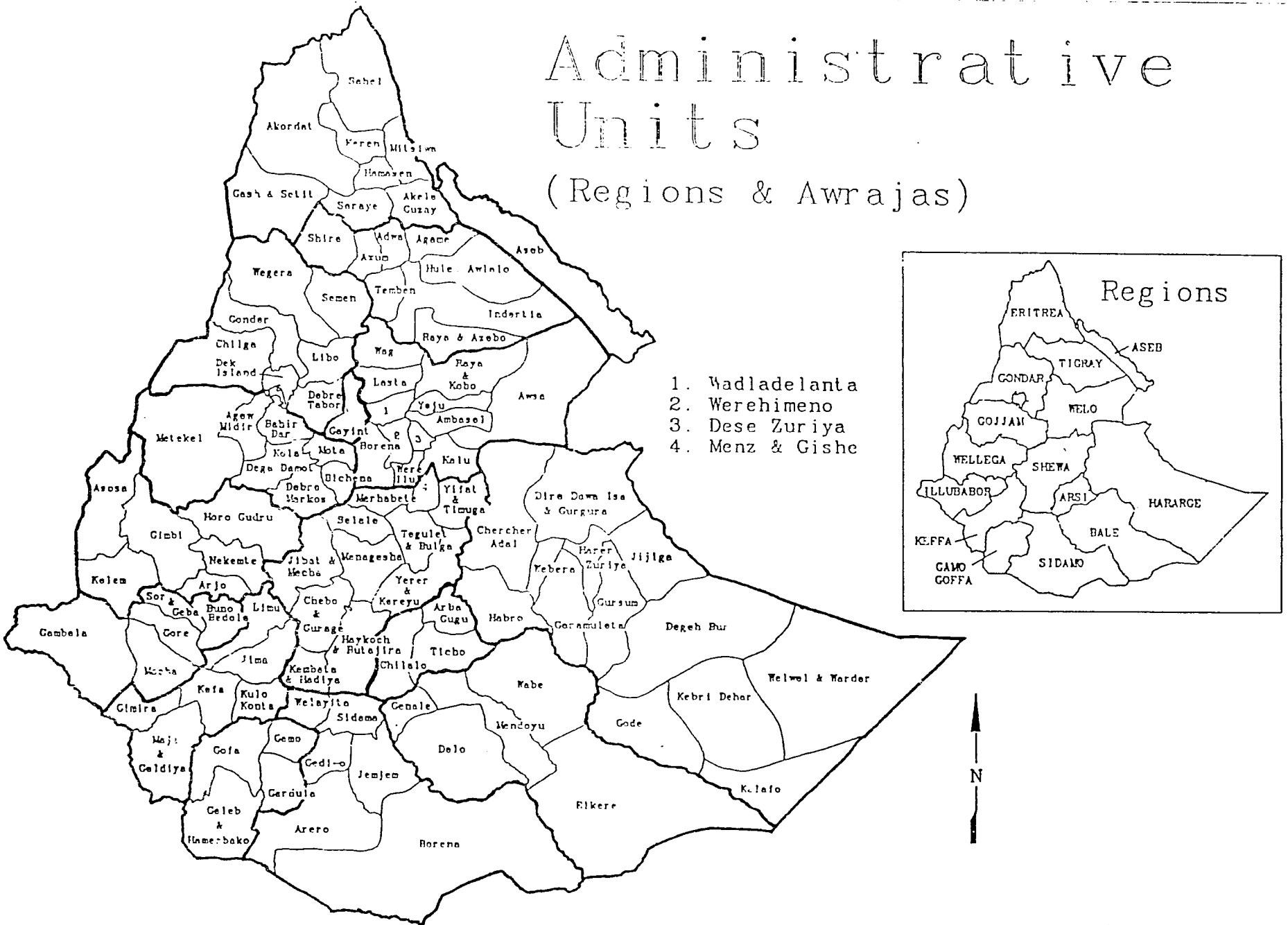
- 0 to 2
- 3 to 6
- 7 to 9
- 10 to 13

Source: Mesfin Wolde-Mariam
FEWS/PWA, June 1988

Locally Differing Vulnerability

There are many sub-regional areas that differ from their surrounding areas in degree or characteristics of vulnerability. Some that currently display more or less vulnerability, or differing causes of vulnerability, than their close neighbors include: Shire Awraja of Tigray (medium vulnerability); the *belg* highlands of Wello and Shewa (medium vulnerability); the lowland awrajas of eastern Gonder; the slopes and lowlands of northeastern Shewa and Wello; the agricultural zones of Harerghe, Sidamo, and Bale; lowland Arsi; and pastoral areas of Bale (all more vulnerable). Although the data available at this time do not support extensive assessment of these areas, it is clear that a regional-level assessment poorly describes the range of conditions extant in these and other areas. For this category of vulnerability, as well as for those above, the conclusions of vulnerability need to be qualified with explicit acknowledgement of the limitations of available data.

APPENDICES


Administrative Units
(Regions & Awrajas)
1. Wadladelanta
2. Werehimeno
3. Dese Zuriya
4. Menz & Gishe
Regions
ERITREA
ASEB
TIGRAY
GONDAR
WELO
GOJJAM
WELLEGA
SHEWA
ILLUBABOR
ARSI
HARARGE
KEFFA
BALE
GAMO GOFFA
SIDAMO
Sahel
Akordat
Keren
Hamasen
Gash & Setit
Sheraye
Akele Guzay
Shire
Adwa
Agame
Axum
Asob
Wegera
Hule
Awlalo
Semen
Temben
Gonder
Indertia
Chilga
Raya & Azebo
Libo
Wag
Dek Island
Lasta
Raya & Kobo
Awsa
Debre Tabor
Yeju
Ambasel
Agew Midir
Babir Dar
Gayint
Borena
Metekel
Kola
Mota
Kalu
Dega Damot
Bichena
Were Ilu
Asosa
Debre Markos
Merhabete
Yifat & Timuga
Dire Dawa Isa & Gurgura
Horo Gudru
Selale
Tegulet & Bulga
Chercher
Adal
Gimbi
Nekemte
Jibat & Mecha
Menagesha
Harer Zuriya
Jijiga
Kebera
Kelem
Arjo
Yerer & Kereyu
Sor & Geba
Buno Bedele
Limu
Chebo & Gurage
Arba Gugu
Habro
Gursum
Gambela
Gore
Haykoch & Butajira
Tiebo
Gemuleta
Degeh Bur
Jima
Kembela & Hadiya
Chilalo
Mocha
Kefa
Kulo Konta
Welayita
Genale
Wabe
Kebri Dehar
Welwel & Warder
Gimira
Sidama
Mendoyu
Gode
Maji & Geldiya
Gofa
Gemo
Delo
Gedi-o
Jemjem
Kelafo
Gerdula
Celeb & Hamerbako
Arero
Elkere
Borena
N
FEWS/PWA, June 1988

APPENDIX 2

Model Used for Vulnerability to Famine

Over the centuries there have been many descriptions of famine. Evocative though they are, most poorly describe the complexity of the conditions that lead to that state. The concept of measuring a population's vulnerability to famine is a newer one, still without a generally-accepted methodology. Early warning systems, particularly those dealing with Africa, have begun to search for a set, or sets, of indicators of pre-famine conditions. FEWS assessments of vulnerability to famine form part of a continuing effort by USAID to identify incipient famine conditions, and to define important features of that process (the number of people involved, their location, and the nature of the problem). The mandate of the Famine Early Warning System is to provide an operational analysis of immediate use to decision-makers. The methodology used in this type of environment will continue to evolve.

Definitions of Famine and Vulnerability

- Famine is a sustained period during which large numbers of people consume less food than they require, giving rise to harmful physical and social consequences.

- Vulnerability to famine is the degree to which the available food, from any source, does not meet a population's requirements over a period of time. Highly vulnerable populations (those "at risk" of famine) currently are, or soon will be, unable to meet their food needs during a sustained period of time. This will result in substantial harm to individuals and their society. Other, less vulnerable populations either currently appear to be meeting their minimal requirements, or are likely to fall below minimal levels for a limited period of time (i.e., they may experience a food shortage, which may also cause harmful physical and social consequences). In the Sahel, virtually all rural populations are "vulnerable" to some degree.

General and Site-Specific Vulnerability Assessment

At the most general level, access to food can be described in the same terms everywhere. Food is made available by:

(1) producing it (agriculture, herding, fishing, etc.) and

(2) acquiring it by other means (purchase, gift, trade).

An assessment of any population's current vulnerability to famine requires a measurement of the current condition and/or performance of these two basic processes. Famines do not usually occur without a preceding period in which coping mechanisms are derived and used, and resources to avoid famine are gradually exhausted. An historical context that describes recurring causes of food shortage, recent food reserves, and the intensity of use of coping mechanisms, is required to give a perspective on the significance of current conditions.

In each place, the relative degree of dependence upon either of the individual processes is determined by a host of local environmental, social, and economic opportunities. The operation and performance of the two processes are site-specific, and can only be measured accurately in the context of their many interactions. There is also a site-specific temporal dimension as an assessment of vulnerability to famine must be sensitive to the season in which it is made. The available food supply, particularly in agricultural areas, will be highly dependent upon proximity to the harvest(s).

Methodology of the Ethiopia Vulnerability Assessment

The FEWS assessment of vulnerability to famine in Ethiopia attempts to identify both the recurring characteristics of food shortage and current relative levels of vulnerability to famine by answering four questions.

- What are the levels of current food stocks (from local production or elsewhere)?
- What other food acquisition resources are currently available?
- Based on the past, what is the likelihood that a "normal" food production process will occur, and what is the quantity of food it may produce?
- Based on the past, what other opportunities are normally available for acquiring food?

The first two questions establish the presence or absence of food, and determine the level of current vulnerability to famine. Some indicators that might be examined in order to respond to these questions include surveys of household stocks, agrometeorological reports of progress in planting, inventories of public food assistance stocks, and reports of work-related migrations. This type of data is frequently difficult to compile or is simply not available. In that case, one may have to seek less direct, surrogate, measures of this information. The last two questions help to establish the inherent strengths and weaknesses of site-specific food production capabilities and food acquisition opportunities. They also provide a context against which to measure the significance and possible impact of actual food reserves and food acquistion opportunities that are currently being employed.

Examining the varying pictures of relative vulnerability that are produced by each indicator, a ranking of their significance is then necessary. The weights assigned to indicators at this point are necessarily subjectively determined. Finally, regions of relative vulnerability are built based on the convergence of indicators examined.

A final step is then to compare areas currently revealing signs of stress on the food supply (food prices, malnutrition surveys, etc.) with the areas judged to be currently vulnerable, to see whether or not the judgements are confirmed. Indicators of "revealed stress," such as these, are notoriously difficult to relate to present food supply. Typically, they tend to be "late" or very indirect indicators of the amount of food available and have to be used cautiously in this sense.

Restrictions of Data

Most of the data available for Ethiopia are collected down to the level of the region, which is the geographic level of this analysis. Compared to other Sahelian countries, the geographic resolution of this data is normal, but still difficult to use successfully to describe other than very broad patterns that often relate very poorly to sub-regional conditions. Much of the data required for an assessment of vulnerability to famine in Ethiopia is either lacking, or of insufficient quality to be used with confidence. The FEWS principle of using a convergence of evidence (comparison of many flawed indicators that, nevertheless, sometimes show a consistent and intuitively meaningful pattern) is intended to pick up the "signals in the noise", reflections of reality that emerge, despite problems of data quality and inadequate resolution of data.

APPENDIX 3

List of Figures

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.

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) approximately 4 km resolution images 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 infrared wavelengths respectively, and the remaining 3 bands sense emitted radiation in 2 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.

FEWS Publication Schedule

Country Reports

FEWS Country Reports will be published monthly during the growing season and bimonthly during the rest of the year. A preliminary harvest assessment issue will be published toward the end of the growing season for each country.

GC - General Coverage GS - Growing Season Monitoring PHA - Preliminary Harvest Assessment

	Jul	Aug	Sep	Oct
Mauritania	GS	GS	GS	PHA
Mali	GS	GS	GS	PHA
Burkina	GS	GS	GS	PHA
Niger	GS	GS	GS	PHA
Chad	GS	GS	GS	PHA
Ethiopia	GS	GS	GS	PHA
Sudan	GS	GS	GS	PHA
Mozambique		GC		GC

Bulletins

FEWS Bulletins are published every ten days during the Sahelian and East African growing season. Twelve Bulletins [*] are published annually starting with the 20th of June.

FEWS Bulletins	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Sahel & East Africa	**	***	***	***	*		