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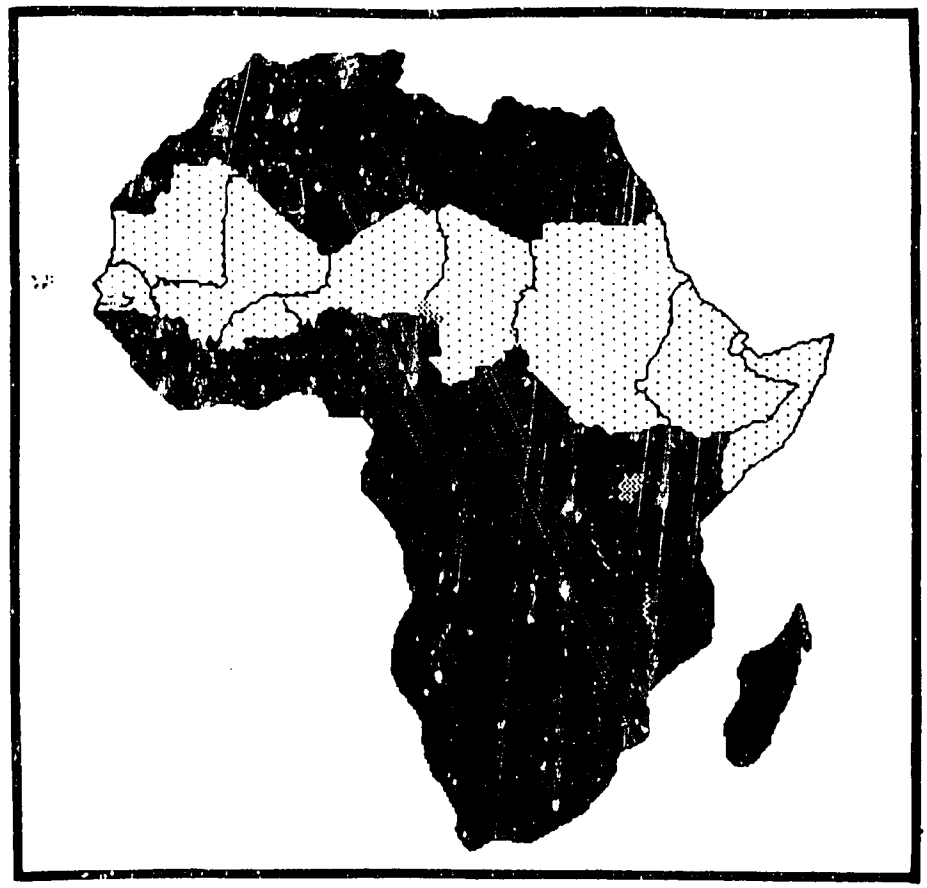
SPECIAL CLIMATE IMPACT ASSESSMENT
SUB-SAHARAN AFRICA



NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA)
NATIONAL ENVIRONMENTAL SATELLITE, DATA, AND INFORMATION SERVICE (NESDIS)
ASSESSMENT AND INFORMATION SERVICES CENTER (AISC)

PREPARED IN SUPPORT OF THE UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT

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INTRODUCTION

This is the second in a series of monthly Climatic Impact Assessment Reports issued for the Sahel/Horn countries of Africa during the crop growing season by the NOAA/NESDIS Assessment and Information Services Center (AISC). These special reports are based on state-of-the-art techniques to: (1) use daily meteorological satellite and weather station data for determining rainfall patterns and vegetation/biomass conditions, (2) detect drought and assess weather impacts on agriculture, and (3) present this information in a format that is useful for both non-technical and technical users. They are part of a USAID sponsored program designed to significantly improve the capability of the Sahelian countries, Sudan, Somalia and Ethiopia to assess the impact of weather on agriculture (food crops and rangeland) and use the assessments as input for decision making.

These reports are intended to provide advanced warning of drought induced crop failures and should facilitate early planning for food crisis amelioration and drought/famine relief.

The special assessments, which are air-expressed or hand-carried to U.S. Missions in the field, contain satellite images, narrative analyses of all pertinent data, crop and rangeland maps, and various tables and maps depicting weather impacts on agriculture and containing rainfall statistics.

Rainfall amounts used in these reports are preliminary estimates and may vary greatly from values published elsewhere. The quality of the data received via the WMO Global Telecommunications System (GTS) ranges from good in Senegal, Burkina, and Niger to non-existent in Chad and Sudan. Rainfall data from Somalia, Gambia, and Cape Verde are extremely scarce. Data from Mali, Mauritania, and Ethiopia range from fair to poor. Satellite cloud imagery from Meteosat is used to estimate rainfall where surface reports are missing or appear inaccurate or unrepresentative. Satellite vegetation images from NOAA-9 are used to further adjust the rainfall data. The term "normal rainfall" generally refers to 1951-83 mean rainfall. Readers should keep in mind that rainfall amounts have averaged 15 to 25 percent less since the late 1960's in the Sahel zone.

The AISC Special Assessment Reports will be updated every 10 days by cable. Assessment of quantified weather impacts on 1985 millet and sorghum yields (by major administrative region) will be provided by cable about August 20, 1985. AISC's quantified assessments focus only on weather factors affecting yield, not such non-weather factors as seed availability for planting, losses due to pests/diseases, affects of fertilizer, or farmer's decisions which determine planted area or shifts from one crop to another. Such information can best be determined in the field.

This assessment represents the synthesis and evaluation of all available data. Although some of the pertinent input data are included for use by other analysts, all data sets are modified in some way by AISC and no single data set can be used alone. Apparent discrepancies between data sets or between the enclosed data and the analysis can result from the analysis process, which combines all data and analyst experience to produce the best possible assessment.

AISC welcomes comments or suggestions on these reports. Feedback from U.S. Missions is appreciated and has already helped to improve this assessment service. Contact: Douglas LeComte E/AI42, NOAA/NESDIS/AISC, Page Bldg. #2, Room 130, 3300 Whitehaven St., NW, Washington, D.C. 20235. Phone (202) 634-1822.

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REGIONAL ANALYSIS

OVERVIEW

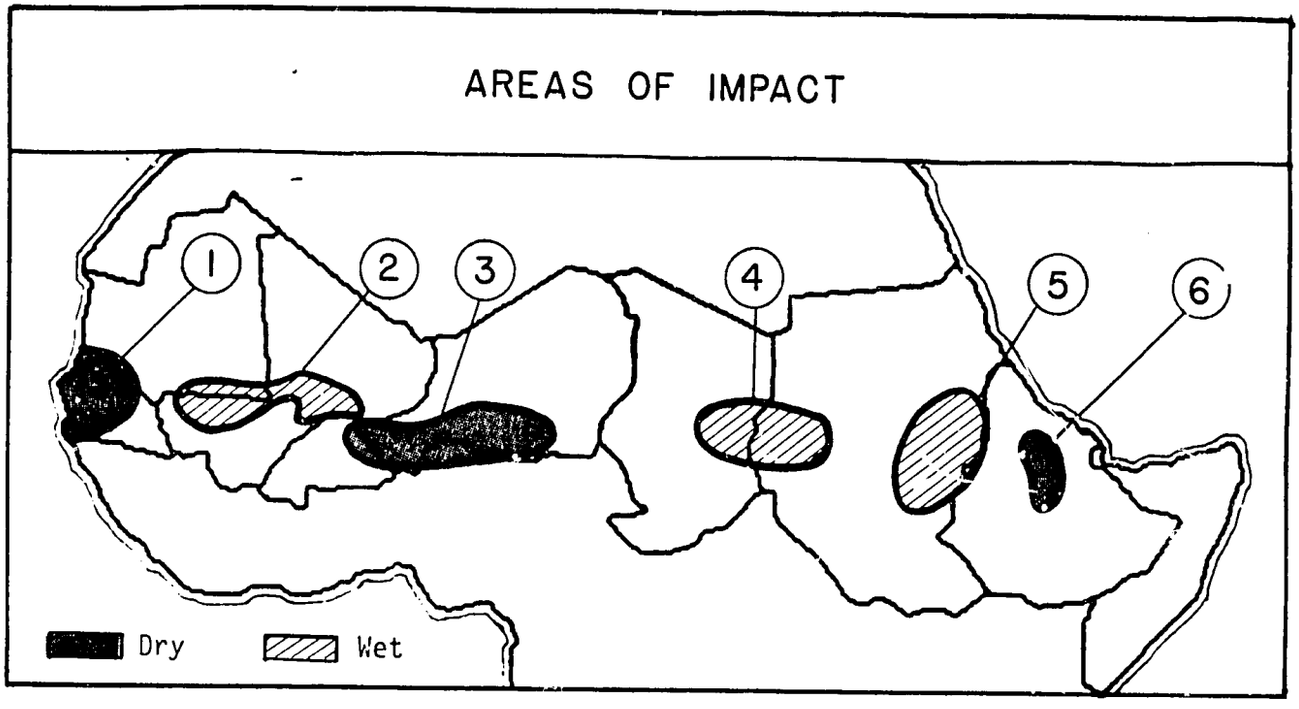


Figure 1

Crop and pasture conditions are much improved over the previous two years across the Sahel/Horn region, as July rainfall helped to offset earlier dryness. Normal to above-normal rainfall in Chad, Mali, Burkina Faso, and Sudan hampered food relief efforts but increased crop yield potential, suggesting an easing of food shortages late this year. Pasture conditions throughout the region improved markedly from June, though they remain below normal in Niger, Senegal, and Gambia. Crop conditions are normal to above normal in Mali, Burkina, Chad, and Sudan. Conditions in Mauritania, Senegal, Gambia (fig. 1, No. 1), and Cape Verde are somewhat unfavorable due to a late beginning of the rainy season, but plentiful rainfall throughout the remainder of the season would produce average crop yields. In Ethiopia, heavy rains have benefitted crops in western areas, but more rain may be needed in some central and northern areas (fig. 1, No. 6). Overall rainfall across the Sahel/Horn region (fig. 3) ranges from 80 to 120 percent of the long-term mean so far this year, except for parts of Niger, Senegal, Gambia, and Mauritania, where rainfall is 60 to 80 percent normal. The Intertropical Discontinuity (fig. 2) was south of normal in April and May, accounting for the slow start of the rainy season in West Africa. During July, the ITD moved sharply northward to the 20th parallel, bringing much heavier rains to the region compared to last year. The ITD remained south of normal throughout the important growing period in 1984, resulting in one of the worst droughts this century.

The following paragraphs briefly describe areas highlighted in figure 1. Note that 1984's AVHRR image (fig. 5) has a 20-km resolution, whereas the 1985 image (Global Area Coverage, or "GAC") has a 5-km resolution. GAC coverage is not available for last year.

Area 1. In Senegal, Gambia, and adjacent areas of Mauritania, below normal June rainfall delayed planting to some extent, but near normal July rainfall improved prospects in most areas. Satellite indices (fig. 4) and imagery (fig. 6) suggest unfavorable biomass conditions, except in extreme southeast Senegal. Cloud "contamination" makes this year's image in figure 6 difficult to interpret, but "greening" appears to be farther north in the 1984 image (fig. 5).

Area 2. The 1985 satellite image (fig. 6) shows a marked improvement in biomass in Sahelian areas of Mali and adjacent areas in Mauritania compared with last month. Note, especially, the bright yellow hue along the Mali-Mauritania border.

Area 3. Overall crop and livestock prospects remain below average in Niger, though better than last year. Higher rainfall and lower temperatures in July boosted cereal and pasture growth following hot, dry weather in June.

Area 4. Normal to excessive rains interfered with surface transport of relief aid to drought victims in Chad and Sudan, though the moisture should ensure improved crop production this year (subject to availability of seeds). Heavy showers damaged roads in Sudan's Darfur province, hindering food supplies shipped by truck.

Area 5. Satellite data show substantial biomass improvement this year in eastern Sudan (figs. 4, 5 and 6), where the bulk of the country's cereals are grown. Crop yields should be much greater than 1984's drought-reduced levels.

Area 6. Abundant rains have favored main season crops over much of Ethiopia, especially in the west, but satellite biomass conditions do not appear good in parts of Wollo and Tigray in the north, as well as Shoa and Sidamo in the center. Cloud "contamination" may be a problem in interpreting the image. This area should be monitored closely for signs of dryness in August.

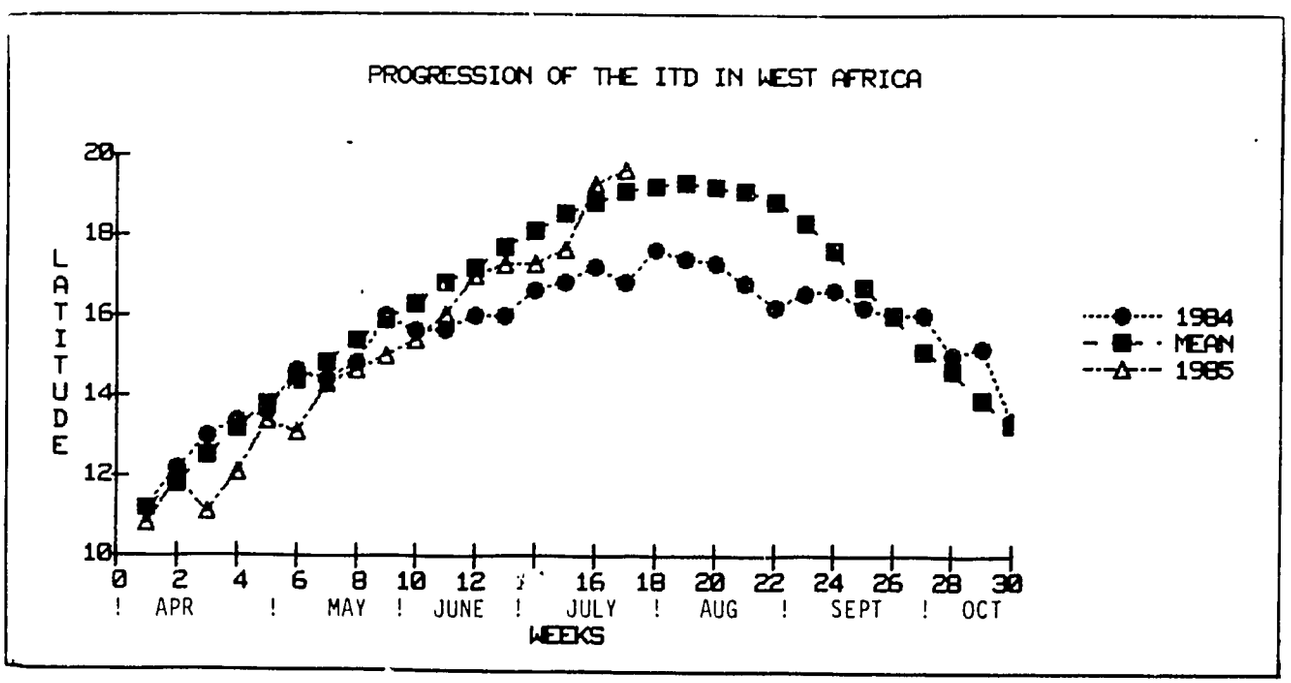


Figure 2

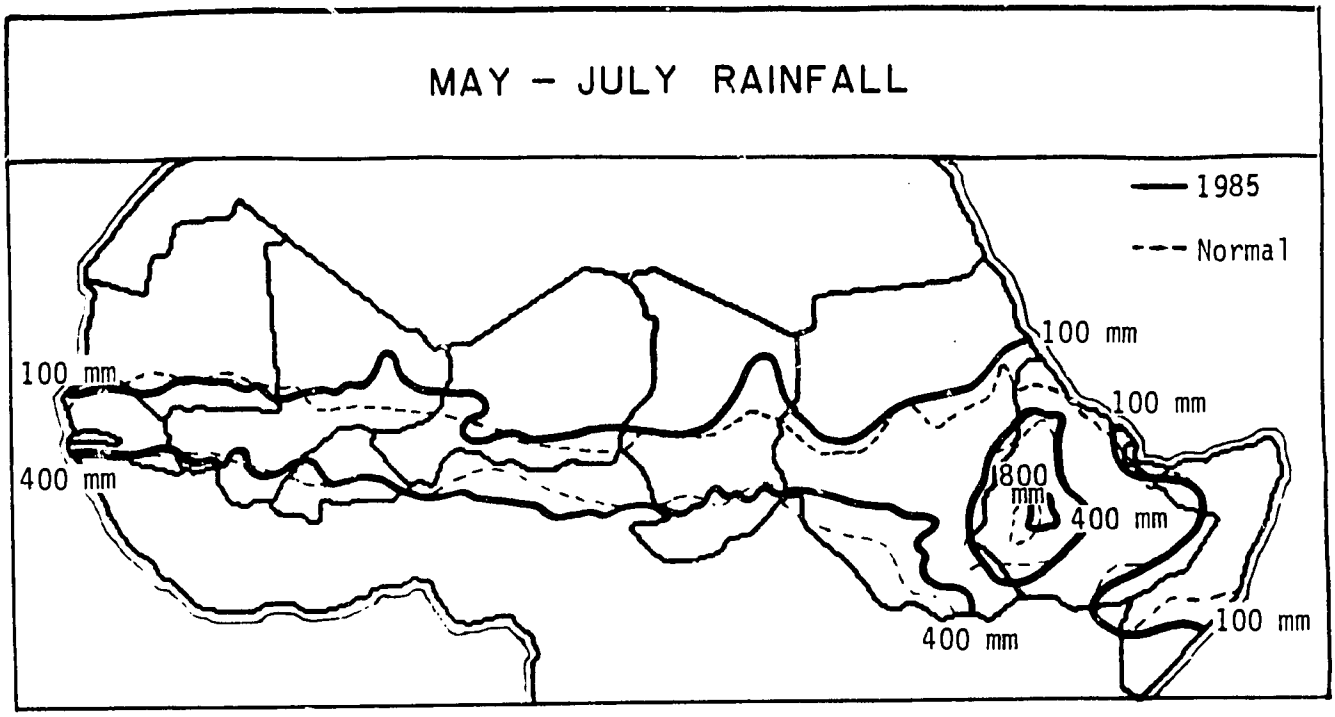


Figure 3

The northern edge of the rains (100 mm isoline) was south of normal in Mauritania, but north of normal in Mali, parts of Niger, eastern Chad, and Sudan. Heavier rains (400 mm) were north of normal in southwest Burkina and southern Sudan.

NOAA SATELLITE VEGETATION/BIOMASS INDEX
NORMALIZED AVHRR DATA

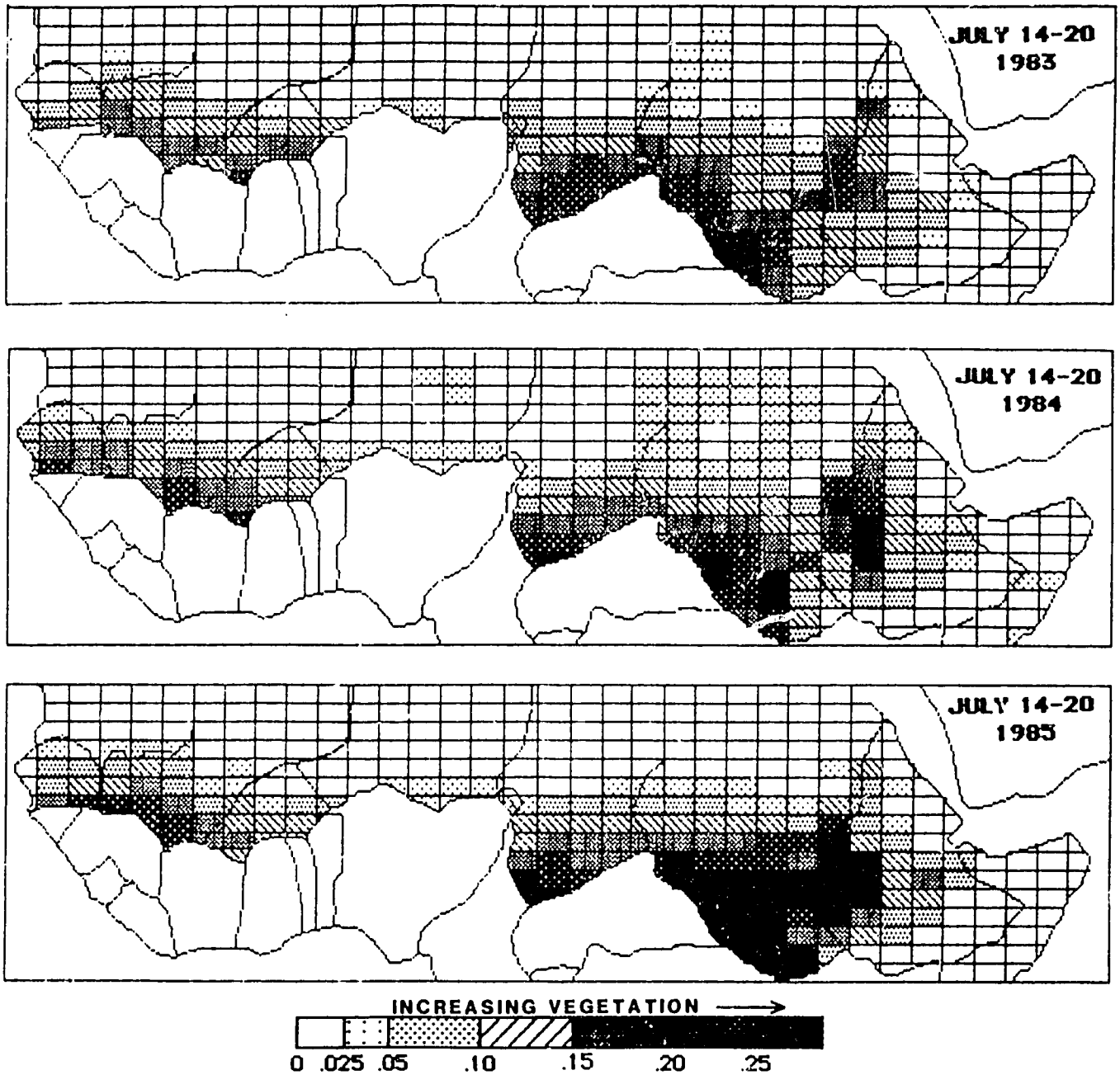


Figure 4

NOAA AVHRR IMAGE 1984

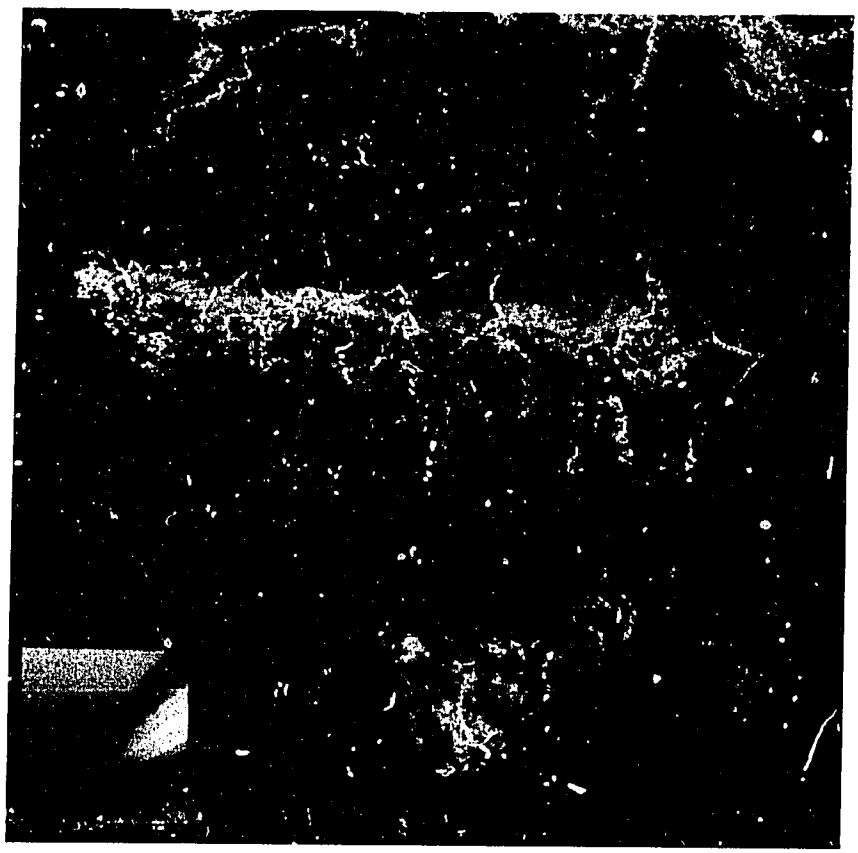


Figure 5

NOAA AVHRR IMAGE 1985

Figure 6

NOAA AVHRR IMAGE 1985

figure 6

NOAA AVHRR IMAGE 1985

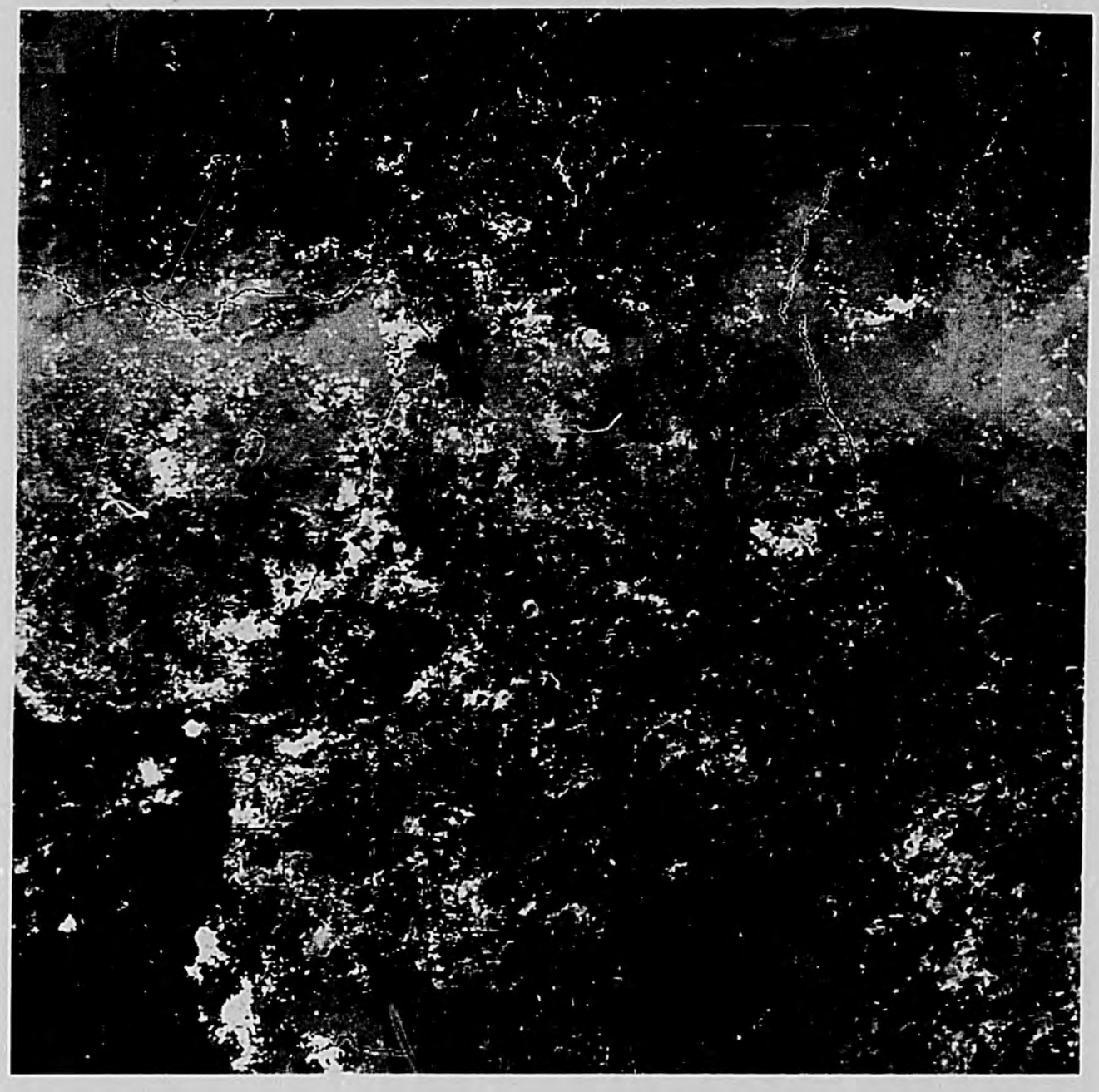


figure 6

BACKGROUND ON ASSESSMENT METHODS

DATA

The NOAA/NESDIS Assessment and Information Services Center (AISC) uses a combination of meteorological satellite products and weather data as the primary inputs for these Special Climatic Impact Assessments. Operational rainfall reports are received daily through the WMO Global Telecommunications System (GTS) and ten day reports are received from some host-countries and the Regional AGRHYMET Center in Niamey. AISC uses data from ESA's Geo-stationary Meteorological Satellite (METEOSAT) and the NOAA-9 daily polar orbiting satellite. METEOSAT photographs are used as one method to assess regional rainfall and to monitor large-scale weather patterns, e.g., the Inter-tropical Discontinuity (ITD). NOAA-9 data are used to assess vegetation/biomass patterns and to estimate rainfall.

NOAA SATELLITE ANALYSIS

The NOAA satellite provides daily data from the Advanced Very High Resolution Radiometer (AVHRR) which has a spatial resolution of one kilometer. The satellite receives radiation signals (e.g., from the ground and clouds) and immediately re-transmits one kilometer resolution data which can be received by local field stations as the satellite passes in the vicinity. The satellite can also record a limited amount of the one kilometer data; recorded data are termed LAC for Local Area Coverage. As they are received, the one kilometer radiation signals are sampled to obtain four kilometer resolution data (termed GAC for Global Area Coverage) which is stored internally.

The NOAA satellite products for 1985 in these special assessments are primarily based on 1985 GAC data (as available, AISC will include special LAC scenes). The 1984 and 1983 satellite images have a more coarse resolution on the order of 20 kilometers. Although these images have larger pixels, users can still compare 1985 conditions with those of previous years.

AISC obtains daily four kilometer resolution GAC data consisting of three radiation channels: Channel I (visible reflected solar radiation), Channel II (near infrared reflected solar radiation) and Channel IV (thermal infrared radiation). These three channels are composited over 10-15 day periods to remove most of the clouds from the image and produce the color-coded NOAA satellite images and vegetation/biomass index products contained in this report.

NOAA Satellite Images

The Ambroziak Color Coordinate System (ACCS), used to produce the satellite images in this assessment, shows the health of the vegetation using colors designed to maximize the information content and minimize the analysis time. Different hues (red-orange-yellow-green-cyan-blue) separate vegetation and water from soil and clouds using the visible and the infrared portions of the sunlight reflected from the surface. Saturation (red-pink-white) is used to identify clouds using the emitted thermal infrared radiation. Clouds are usually colder than the surface and they become white when the saturation of the colors is reduced for pixels with low temperatures.

The colors of the ACCS display a continuum of hue and intensity which matches both the data and the mind's perception system. Sharp boundaries on the image, shown as large changes in hue, indicate actual sharp changes in surface vegetation. The colors can be generally interpreted as follows:

HUE	INTENSITY: Dark	INTENSITY: Bright
red	wet or dark soil*	sand or low clouds
yellow	emerging or sparse plant cover over wet or dark soil*	emerging or sparse plant cover over sand or under scattered clouds
green	very healthy plants combined with standing water or forest	healthy field crops or similar plants
cyan (greenish-blue)	dense forest	dense forest, maize, or rice cover
magenta (purplish-red)	clear shallow or slightly turbid water	highly turbid, very shallow, or partially cloud covered water

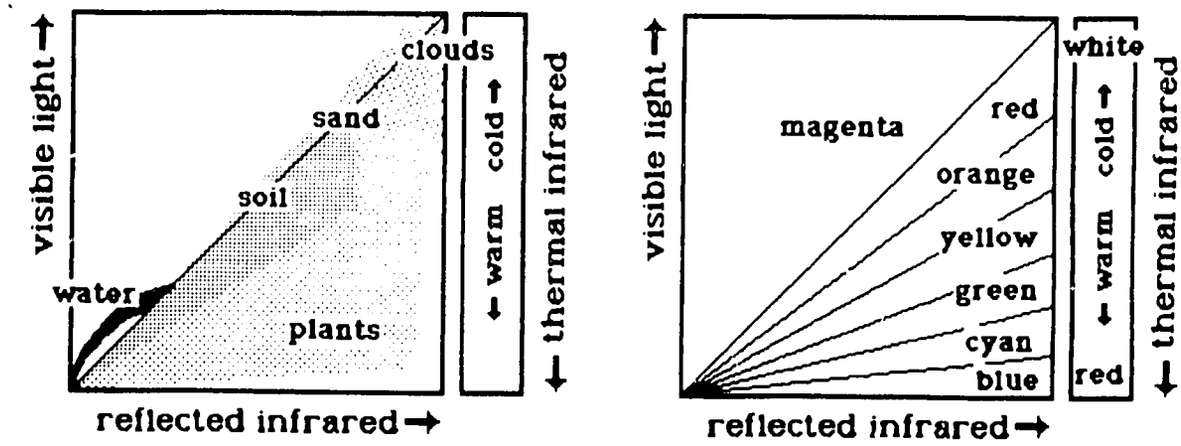
COLORS WITHOUT HUE

black	clear deep water or dark shadow
white	clouds, snow, or colder high terrain

*Dark reds, oranges, and yellows are shades of brown.

Ambroziak Color Coordinate System

colors and meanings



Vegetation/Biomass Index Products

The Vegetation/Biomass Index products contained in this assessment are derived from the following formula:

$$NVI = \frac{\text{Channel II} - \text{Channel I}}{\text{Channel II} + \text{Channel I}}$$

where: NVI stands for the Normalized Vegetation Index

Vegetation/biomass index values are calculated for each day of the week and cloud-free pixels are averaged to produce a weekly mean vegetation index. Weekly values are further averaged for one degree latitude and two degree longitude areas. The NVI is a measure of the amount of vegetation or biomass on the ground. The index ranges from 0 (no vegetation) to +1 (intense vegetation); however, for areas assessed in this report, the highest NVI value was +.365. These indexes can show the progress of vegetation/biomass conditions through the growing season. Conditions at any one time within the season can be compared to those at the same time in previous years. The index can be placed on a map or graphed as a time-series.

ASSESSMENT PROCESS

NOAA/NESDIS AISC uses all available satellite products and weather station reports to assess climatic impacts on agriculture (crops and rangelands). AISC focuses on the weather factors which affect crop yield, not non-weather factors that may also be important such as effects of fertilizer or losses due to pests and disease. AISC does not measure planted or harvested crop area.

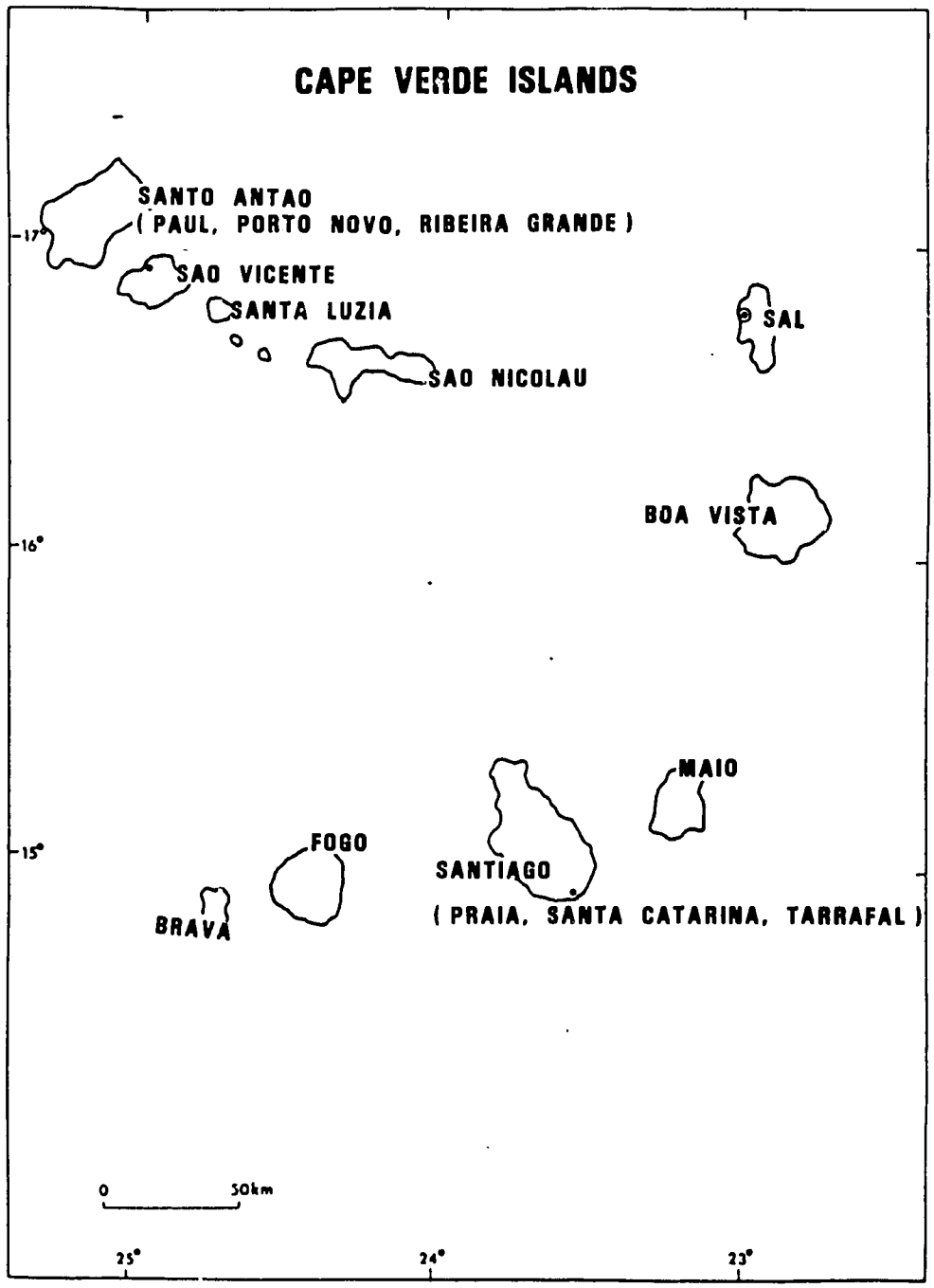
The AISC Assessment Process involves: 1) estimation of daily rainfall, 2) analysis of rainfall patterns, and 3) assessment of weather impacts on crops and rangelands. Rainfall assessments are based on daily weather reports, METEOSAT photographs, NOAA-9 photographs and AISC/ACCS color-coded satellite images. Ten day and monthly rainfall amounts are determined for weather reporting stations and crop regions. Ten day, monthly and seasonal rainfall are analyzed for the current crop season and with respect to conditions during the previous 30 years. AISC uses various agroclimatic and satellite models to assess the impact of rainfall on crops and rangelands. These include ten day, monthly and seasonal agroclimatic/crop condition models used in combination with each other; the NOAA satellite images; and vegetation/biomass index products.

The assessments in this report are subdivided into four components: 1) Overview, 2) Rangeland Vegetation/Biomass Conditions, 3) Agricultural Crop Conditions and 4) Rainfall Analysis.

COUNTRY ANALYSES

NOTE: The following is a compilation of the country analyses delivered to USAID missions in Africa. The only parts omitted are the NOAA AVHRR satellite photographic images for the individual countries, which are referred to as "fig. 2" or, in the case of the African Horn, "fig. 2" (1984) and "fig. 3" (1985). However, the Regional Analysis section near the beginning of this report contains broad scale images for the entire region (figs. 5 and 6). These are, in most cases, as detailed as the country images trasmitted to the AID missions.

CAPE VERDE ISLANDS ASSESSMENT



The first significant rains fell on July 20, 1985, followed by additional rains several days later. As precipitation was not widespread, corn and bean crops need additional moisture for favorable development.

Last year maize was damaged by a combination of dry weather in July and August and torrential rains in mid-September.

Though rainfall conditions have not been especially favorable so far this season, periodic, moderate rainfall from now into October would produce a much better harvest in November than during the preceding two years. During recent years, the growing season has been characterized by the absence of regular rainfall.

SENEGAL ASSESSMENT

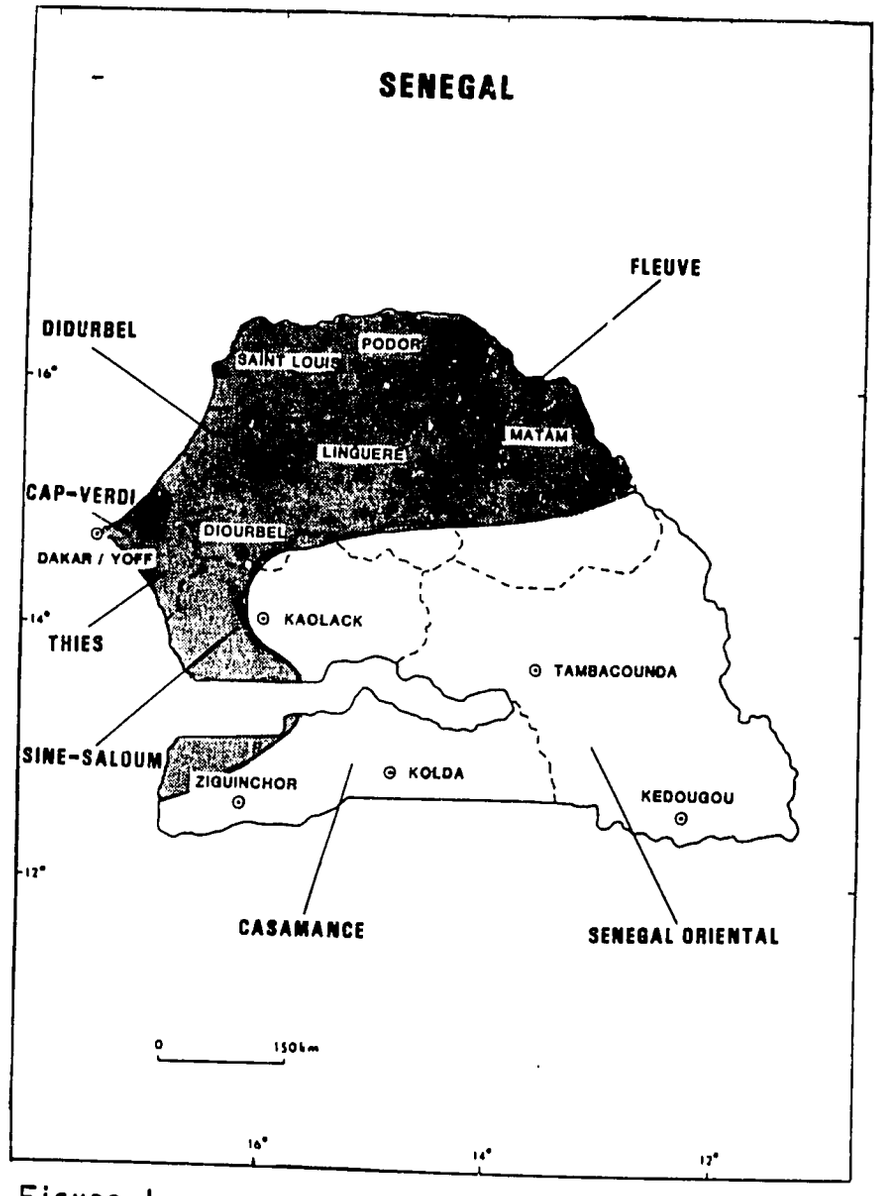


Figure 1

Overview

Beneficial July rainfall improved crop and rangeland conditions and created favorable planting conditions in the north. It is still early in the growing season, but the overall crop situation for 1985 looks good throughout the country. However, the delay in the 1985 seasonal rains until late June has led to slow development of vegetation/biomass patterns, particularly in northern administrative regions (fig. 1). Adequate, timely rainfall during August and September will be essential for the success of the 1985 crop season.

Rangeland and Vegetation/Biomass Conditions

Satellite derived vegetation/biomass indexes (fig. 3) through mid-July suggest that conditions for 1985 are generally not as good as those for the same period in 1984. In particular, satellite images (fig. 2) and indexes for northern Senegal (i.e., Diourbel, Thies and Fleuve administrative regions) suggest low biomass patterns. However, biomass conditions should improve due to beneficial rains during July.

Crop Conditions

Crop conditions as of early August look favorable throughout the country. In the southern regions, crops planted from mid to late June received adequate rainfall during July to meet water needs. Beneficial rains during early July permitted planting throughout most of northern Senegal. However, timely and adequate rains during August and September will be essential for the success of the 1985 crop.

Weather Analysis

Rainfall conditions after June have been generally good throughout most of Senegal except within portions of the central and southeast, which are dry. July 1985 rainfall (Table 1) was near normal throughout most of the country except for Diourbel (around 70 mm, 54% normal), Tambacounda (about 110 mm, 55% normal) and Kolda (170 mm, 61% normal). May-July cumulative rainfall (Table 2) at these three locations is 40-60 percent of normal. So far, moisture conditions for 1985 are better than those in 1984 and 1983 within Thies, Sine-Saloum, Diourbel and Fleuve Administrative regions. The 1985 rainfall totals for Casamance and Oriental regions are comparable to those for 1984.

NOAA SATELLITE VEGETATION/BIOMASS INDEX
NORMALIZED AVHRR DATA

THIRD WEEK OF JULY

SENEGAL

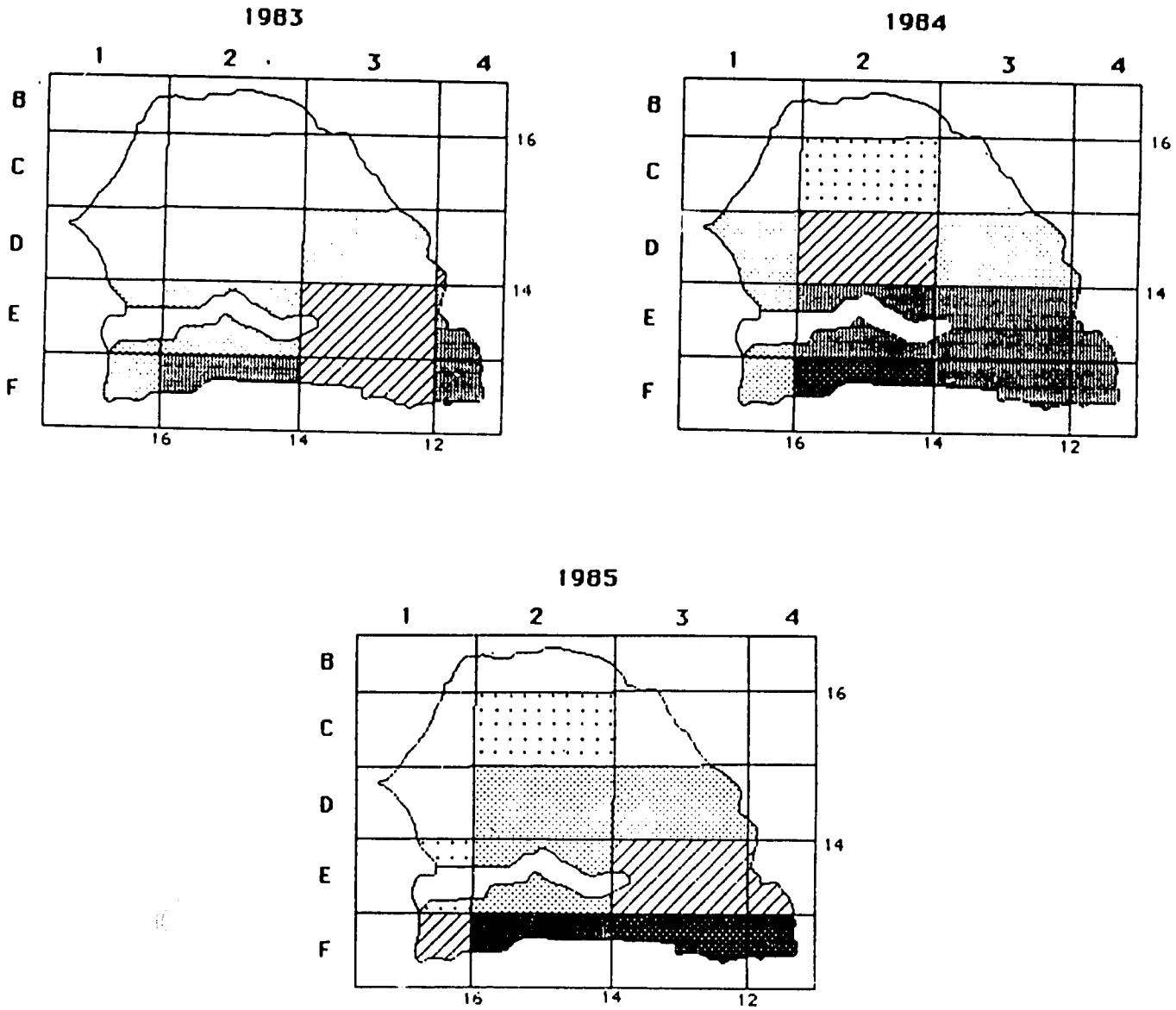


Figure 3

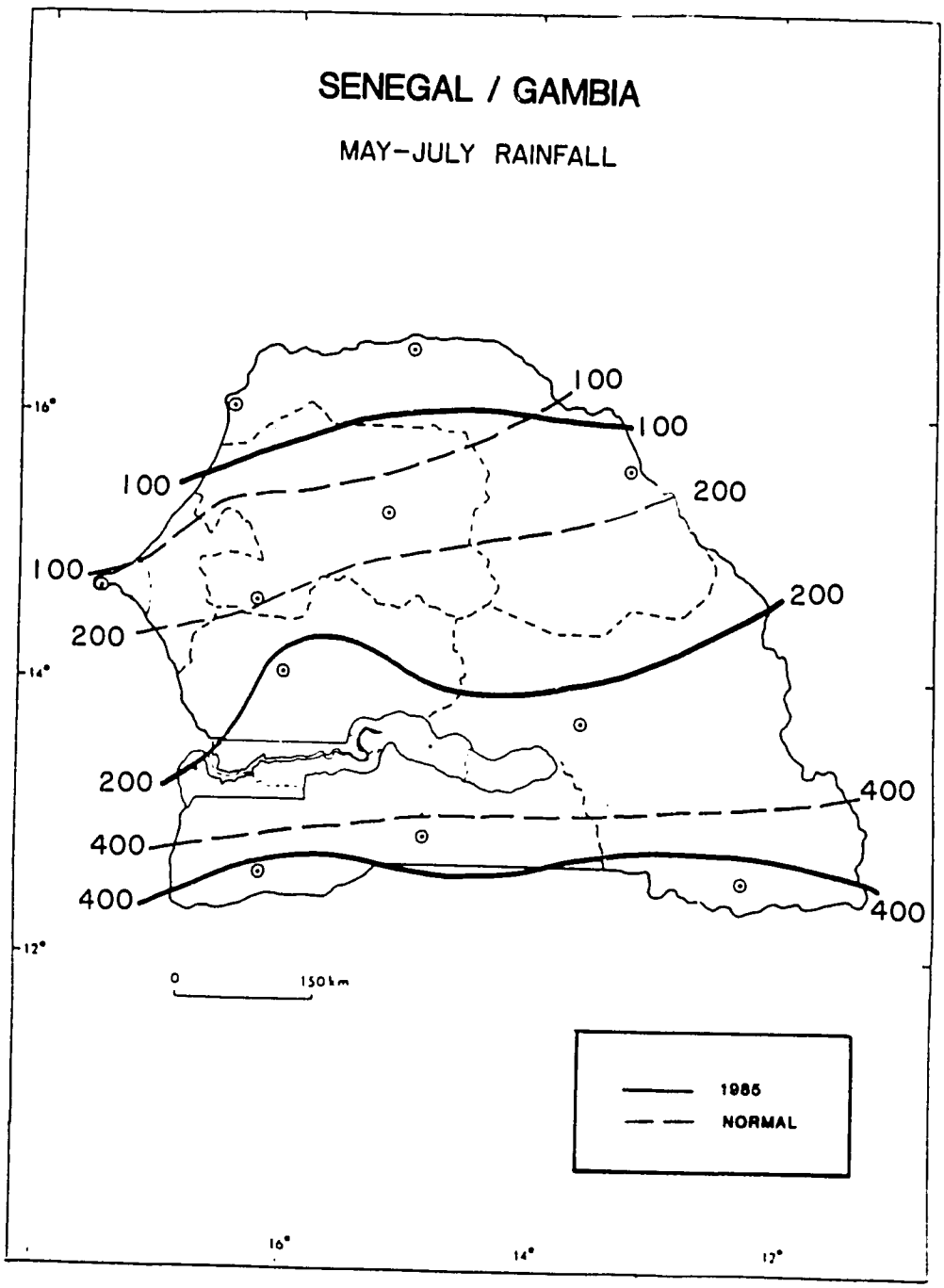

SENEGAL / GAMBIA
MAY-JULY RAINFALL
100
100
100
100
200
200
200
200
400
400
400
400
16°
14°
12°
0
150km
1985
NORMAL
16°
14°
12°

Figure 4

MONTHLY RAINFALL TABLE

Expressed in Millimeters (mm), Percent of Normal (%) and Percentiles
(Rnk, on Scale of 0 to 100)

Country: Senegal Year: 1985

Station	May (5)			June (6)			July (7)		
	mm	%	Rnk	mm	%	Rnk	mm	%	Rnk
Saint Louis	0	???	3	4	57	38	31	70	50
Podor	0	0	3	0	0	3	44	85	53
Linguere	0	0	3	18	67	50	89	91	56
Matam	0	0	3	20	69	39	119	110	58
Dakar/Yoff	0	0	3	14	140	78	67	85	58
Diourbel	0	0	3	20	56	33	107	85	47
Kaolack	1	20	75	31	63	42	246	173	89
Tambacounda	0	0	3	21	21	3	143	71	17
Ziguinchor	0	0	3	51	46	22	381	119	64
Kolda	0	0	3	104	86	47	165	60	22
Kaolack	4	9	6	188	104	56	254	93	39

Notes:

" " = No data for calculations.

"???" = Percent of normal not calculated because average rainfall is zero.

"***" = Percentiles not calculated because less than 15 years of historical data exist on file.

Table I

CUMULATIVE RAINFALL TABLE

Expressed in Millimeters (mm), Percent of Normal (%) and Percentiles
(Rnk, on Scale of 0 to 100)

Country: Senegal Year: 1985

Station	May (5)			May - Jun (5-6)			May - Jul (5-7)		
	mm	%	Rnk	mm	%	Rnk	mm	%	Rnk
Saint Louis	0	???	3	4	57	56	35	69	47
Podor	0	0	3	0	0	3	44	65	42
Linguere	0	0	3	18	62	44	107	84	42
Matam	0	0	3	20	65	39	139	100	47
Dakar/Yoff	0	0	3	14	127	75	81	90	61
Diourbel	0	0	3	20	50	33	127	77	33
Kaolack	1	20	75	32	59	36	278	142	83
Tambacounda	0	0	3	21	17	3	164	51	6
Ziguinchor	0	0	3	51	43	17	432	99	47
Kolda	0	0	3	104	77	39	269	65	17
Kedougou	4	9	6	192	85	33	446	90	31

Notes:

" " = No data for calculations.

"???" = Percent of normal not calculated because average rainfall is zero.

"***" = Percentiles not calculated because less than 15 years of historical data exist on file.

Table 2

GAMBIA ASSESSMENT

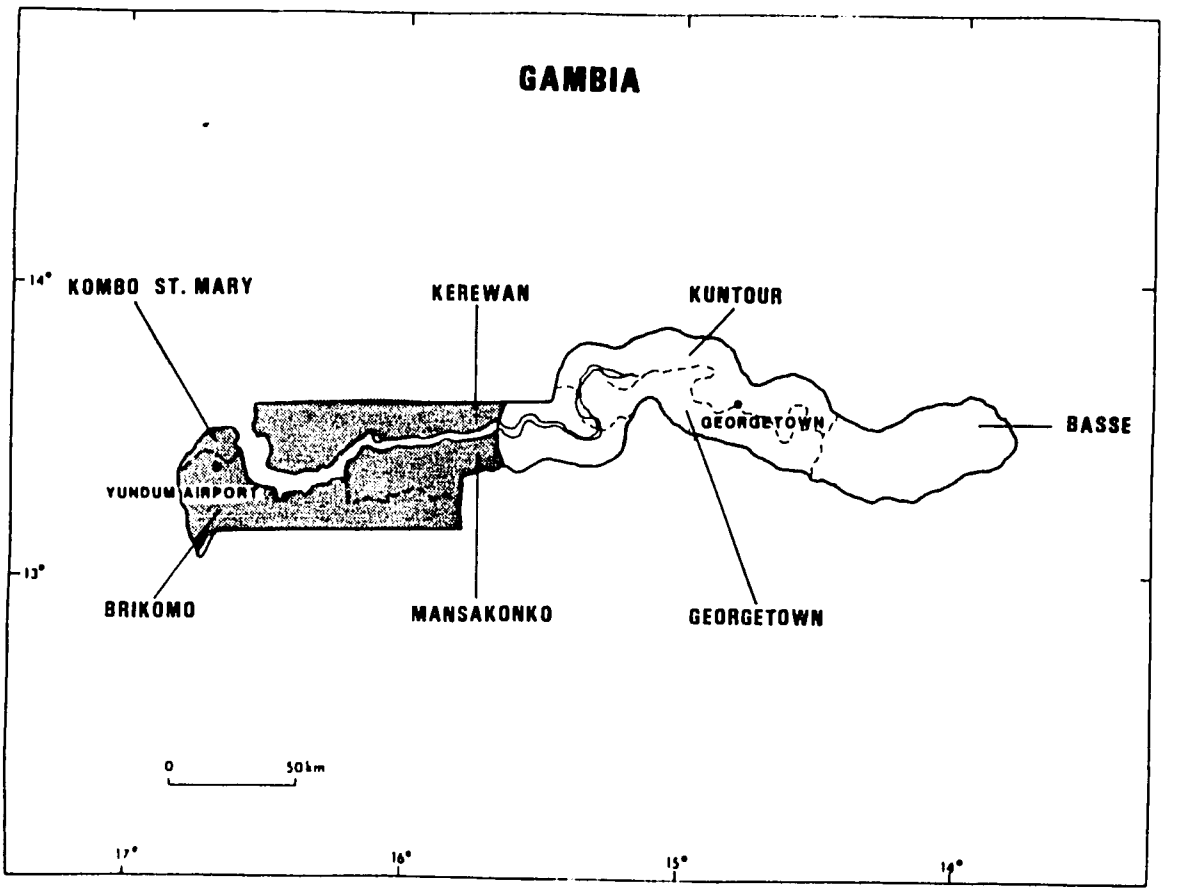


Figure 1

Overview

Rangeland and vegetation/biomass conditions for 1985 are worse than those in 1984 or 1983. Early June planted agricultural crops in western Gambia (fig. 1) are experiencing moisture stress, but late June/early July planted crops are in satisfactory condition throughout Gambia. These conditions reflect the delayed beginning of the 1985 rainy season (until late June) and below normal July rainfall in western Gambia. Agricultural crop prospects for 1985 will depend on timely, adequate rainfall during August and September.

Rangeland Vegetation/Biomass Conditions

Satellite derived vegetation/biomass indexes suggest that overall rangeland conditions are below those in 1984 and 1983. The indexes reflect the delayed beginning of the 1985 rainy season and below normal June 1985 rainfall. Note: as indicated on the satellite image (fig. 2), there was significant cloud cover during the period July 11-24, 1985. As a consequence, satellite derived indexes (fig. 3) must be carefully analyzed because sub-pixel cloud contamination tends to falsely lower the index.

Crop Conditions

Crops planted in early June are experiencing moisture stress (particularly in western Gambia), but crop conditions are generally satisfactory for crops planted in late June or early July. Overall the 1985 crop prospects will depend on timely, adequate August and September rainfall.

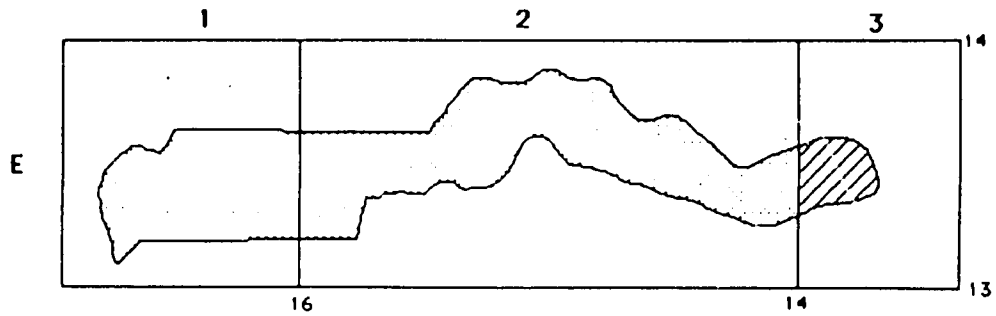
Weather Analysis

Western Gambia is experiencing drought conditions. Following a delayed beginning of the 1985 rainy season until late June, rainfall during July (Table 1) was below normal throughout most of the western portion of the country, but near normal in the east. Decadal rainfall for July ranged from 40-60 mm (50-60% normal) at Yundum to 40-80 mm (80-100% normal) at Georgetown. July 1985 rainfall at Yundum was 52% normal (18th percentile) and 92% normal at Georgetown (44th percentile). The July 1984 rainfall was 50% of normal at these same two stations. Cumulative May-July rainfall (fig. 4) for 1985 was in the 13th percentile range at Yundum and 30th percentile range at Georgetown.

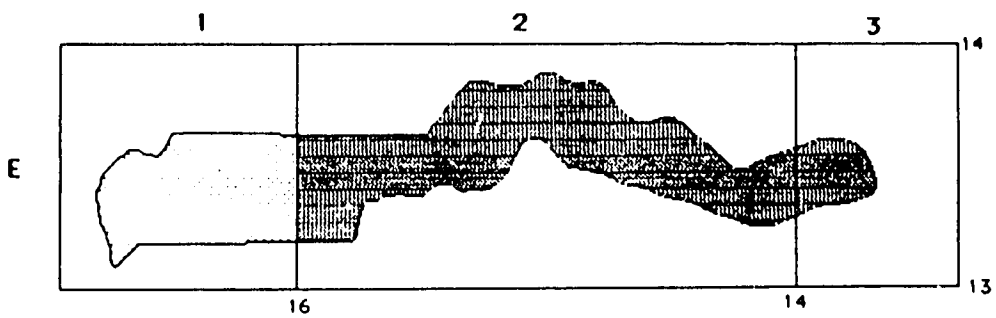
NOAA SATELLITE VEGETATION/BIOMASS INDEX
NORMALIZED AVHRR DATA
THIRD WEEK OF JULY

GAMBIA

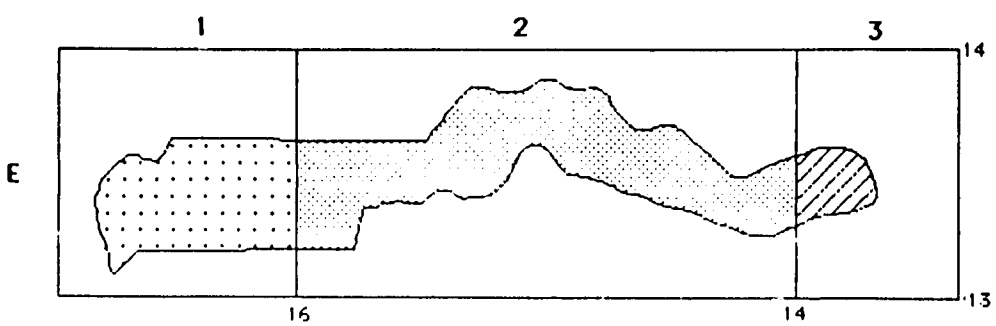
1983



1984



1985



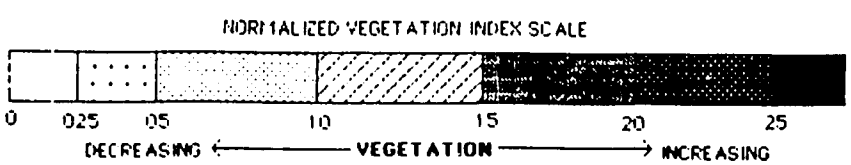


Figure 3

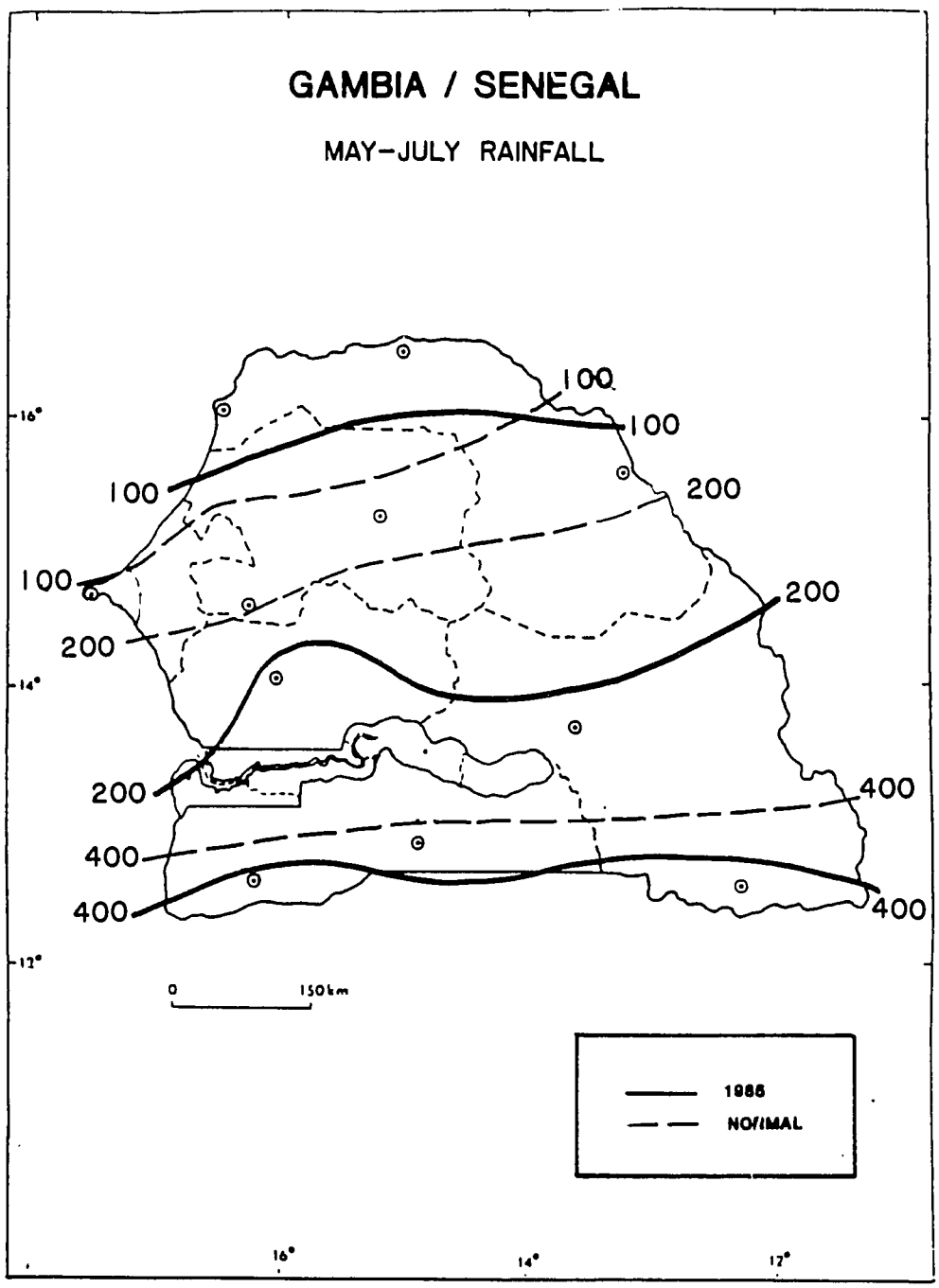

GAMBIA / SENEGAL
MAY-JULY RAINFALL
100
100
100
100
200
200
200
200
400
400
400
400
16°
14°
12°
0
150km
1986
NORMAL
16°
14°
12°

Figure 4

MONTHLY RAINFALL TABLE

Expressed in Millimeters (mm), Percent of Normal (%) and Percentiles
(Rnk, on Scale of 0 to 100)

Country: Gambia Year: 1985

Station	May (5)			June (6)			July (7)		
	mm	%	Rnk	mm	%	Rnk	mm	%	Rnk
Bathurst/Yundum	0	0	3	29	41	20	138	52	18
Georgetown	0	0	3	48	46	19	190	92	44

Notes:

" " = No data for calculations.

"???" = Percent of normal not calculated because average rainfall is zero.

"***" = Percentiles not calculated because less than 15 years of historical data exist on file.

Table I

CUMULATIVE RAINFALL TABLE

Expressed in Millimeters (mm), Percent of Normal (%) and Percentiles
(Rnk, on Scale of 0 to 100)

Country: Gambia Year: 1985

Station	May (5)			May - Jun (5-6)			May - Jul (5-7)		
	mm	%	Rnk	mm	%	Rnk	mm	%	Rnk
Bathurst/Yundum	0	0	3	29	39	22	167	49	13
Georgetown	0	0	3	48	42	16	238	75	28

Notes:

" " = No data for calculations.

"???" = Percent of normal not calculated because average rainfall is zero.

"***" = Percentiles not calculated because less than 15 years of historical data exist on file.

Table 2

MAURITANIA ASSESSMENT

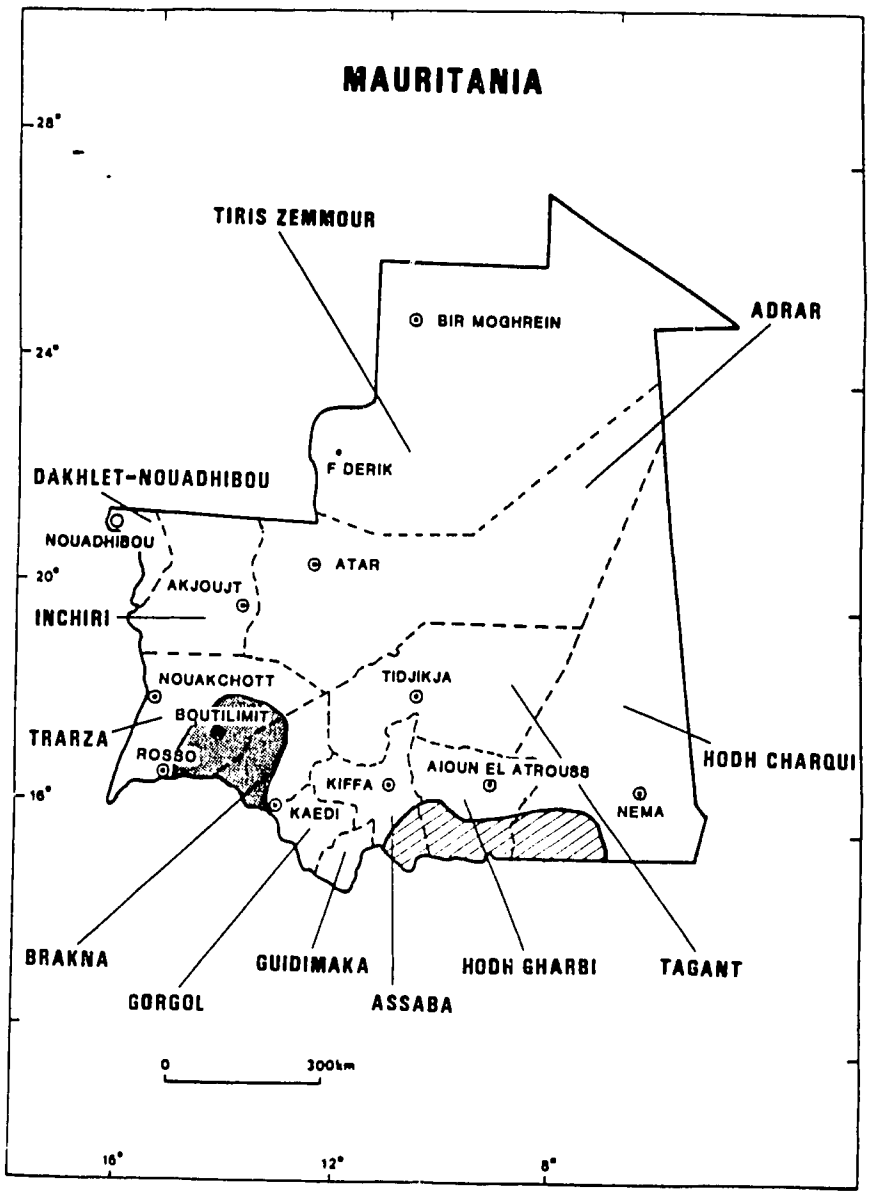


Figure 1

Overview

Timely rains during the second and third decades of July were very beneficial for crop planting activities throughout southern Mauritania, but some moisture stress is indicated in the southern Trarza and Brakna Departments (fig. 1). Overall, 1985 rangeland conditions throughout southern Mauritania are improved over those for 1984 or 1983. The agricultural/rangeland conditions look optimistic as of late July, but timely adequate rainfall during August is essential and will determine 1985 crop prospects.

Rangeland Vegetation/Biomass Conditions

Satellite derived vegetation/biomass imagery (fig. 2) and indices (fig. 3) suggest that overall rangeland conditions in 1985 are similar to those in 1984 and 1983 except for a narrow region along the border between Mali and southern Mauritania (fig. 1). Specifically, rangeland conditions look very good throughout southern portions of Assaba, Hodh Gharbi and Hodh Charqui Departments. Favorable vegetation indices (fig. 3) in these areas reflect a surge of July rainfall.

Crop Conditions

Crops (millet and sorghum) planted in the second and third decades of July received beneficial rainfall, except for southern Trarza. These conditions were favorable for germination of seeds (if they were available). Soil moisture indices in the Trarza Department indicate mild moisture stress, particularly in the vicinity of Rosso and Boutilimit. Along the southern border between Mauritania and Mali, favorable conditions are assessed for July planted millet and sorghum. However, it is very early in the growing season and this year's crop will be critically dependent on timely, adequate rainfall during August and September.

Weather Analysis

Following light and widely scattered showers during early July, the 1985 rainy season began in earnest during the second decade of July. Decadal rains were still unevenly distributed ranging from 0-44 mm at Rosso (0-293% normal, 4-46 mm at Kaedi (15-124% normal), 10-46 mm at Kiffa (40-130% percent normal), and 5-40 mm at Nema (20-120% normal). Rains were generally good throughout southern portions of the country except in southern Trarza, where there is moderate drought. Overall, July 1985 total rainfall was 60-70 percent of normal (Table 1). Cumulative May-July rainfall (Table 2) is generally in the 30-50 percentile range.

NOAA SATELLITE VEGETATION/BIOMASS INDEX
NORMALIZED AVHRR DATA
THIRD WEEK OF JULY

MAURITANIA

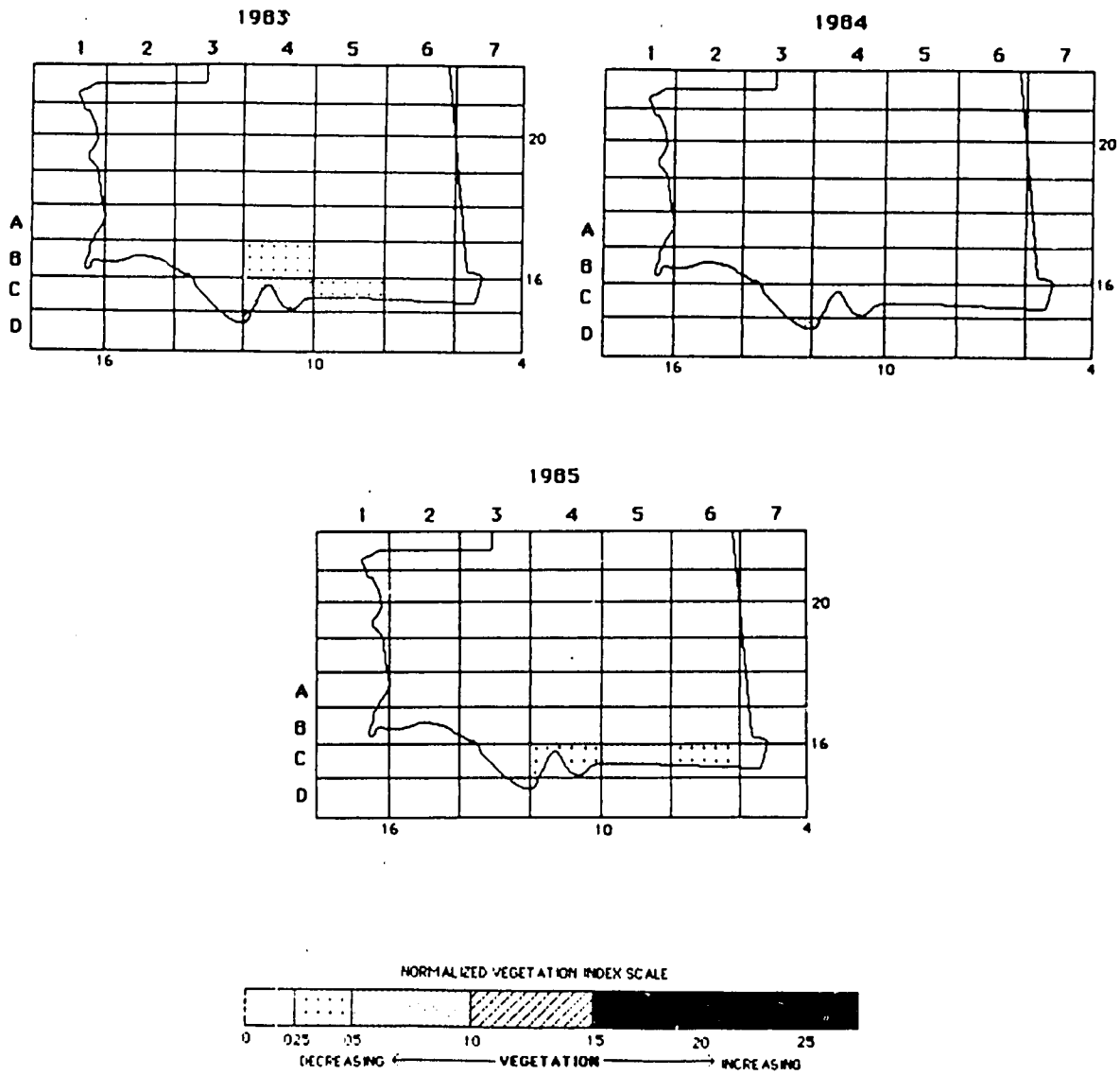


Figure 3

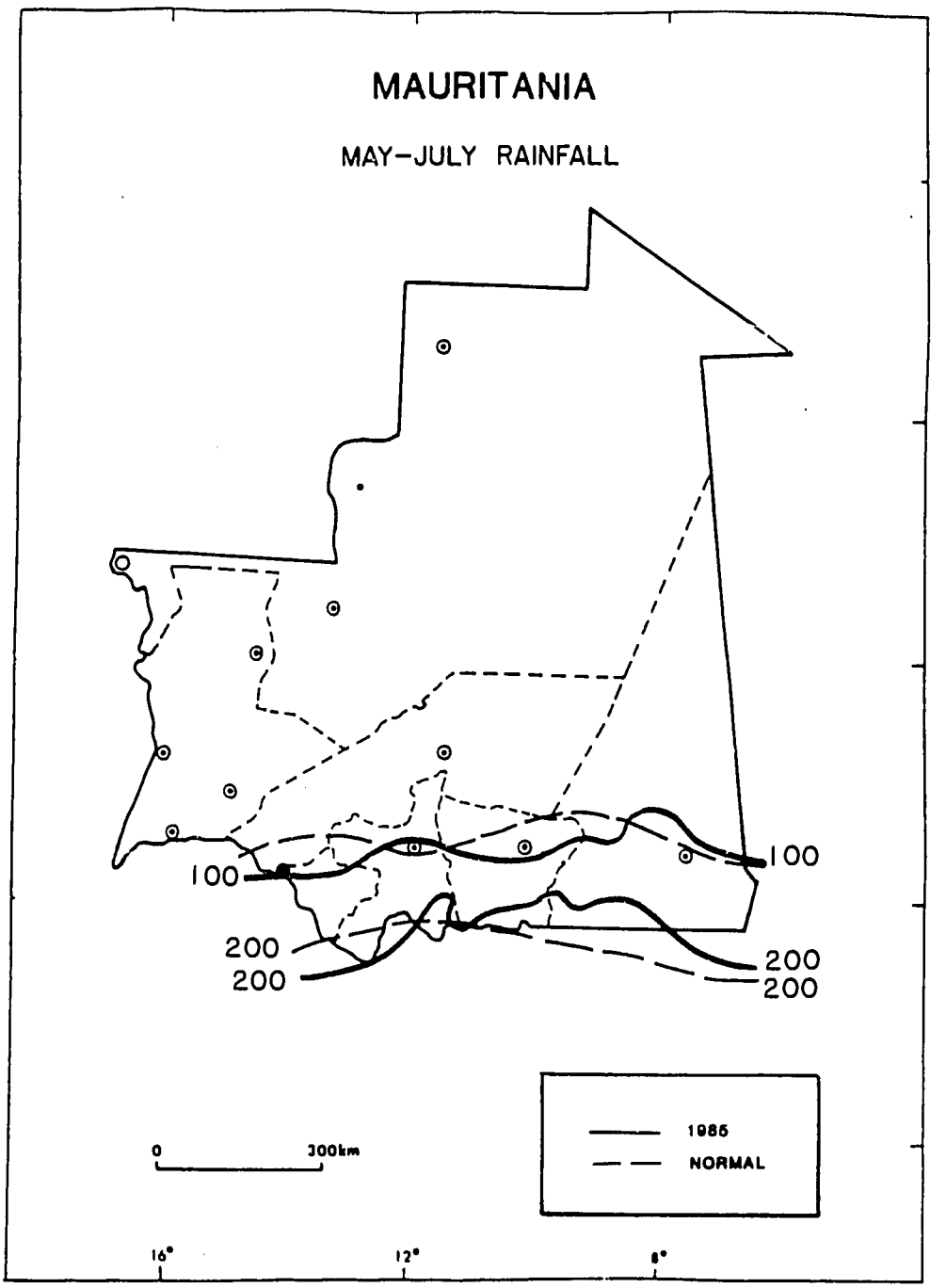

MAURITANIA
MAY-JULY RAINFALL
100
100
200
200
200
200
0
300km
1985
NORMAL
16°
12°
8°

Figure 4

MONTHLY RAINFALL TABLE

Expressed in Millimeters (mm), Percent of Normal (%) and Percentiles
(Rnk, on Scale of 0 to 100)

Country: Mauritania Year: 1985

Station	May (5)			June (6)			July (7)		
	mm	%	Rnk	mm	%	Rnk	mm	%	Rnk
Nouakchott	0	???	3	0	0	3	7	50	44
Boutilimit	0	0	3	0	0	3	3	10	28
Rosso	0	0	3	0	0	3	44	94	63
Kaedi	0	0	4	1	3	12	78	93	60
Nema	0	0	3	4	14	9	68	93	54
Kiffa	0	0	3	14	58	39	67	93	53

Notes:

" " = No data for calculations.

"???" = Percent of normal not calculated because average rainfall is zero.

"***" = Percentiles not calculated because less than 15 years of historical data exist on file.

Table I

CUMULATIVE RAINFALL TABLE

Expressed in Millimeters (mm), Percent of Normal (%) and Percentiles (Rnk, on Scale of 0 to 100)

Country: Mauritania Year: 1985

Station	May (5)			May - Jun (5-6)			May - Jul (5-7)		
	mm	%	Rnk	mm	%	Rnk	mm	%	Rnk
Nouakchott	0	???	3	0	0	3	7	47	45
Boutilimit	0	0	3	0	0	3	3	8	15
Rosso	0	0	3	0	0	3	44	76	52
Kaedi	0	0	4	1	3	13	79	69	38
Nema	0	0	3	4	12	9	72	68	28
Kiffa	0	0	3	14	54	33	81	83	36

Notes:

" " = No data for calculations.

"???" = Percent of normal not calculated because average rainfall is zero.

"***" = Percentiles not calculated because less than 15 years of historical data exist on file.

Table 2

MALI ASSESSMENT

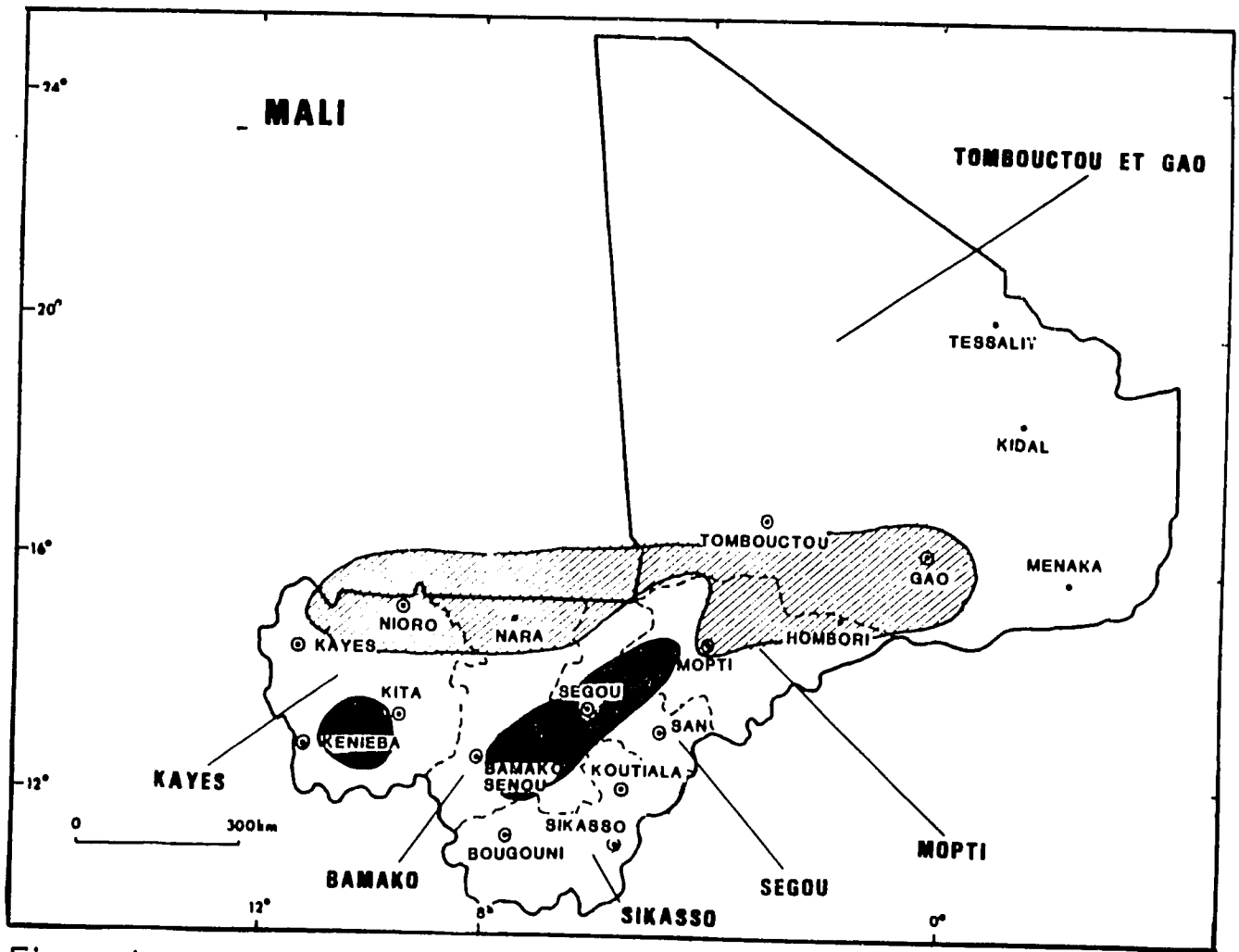


Figure 1

Overview

Abundant and timely rainfall during July contributed to excellent food crop and rangeland growing conditions throughout most of the country. Subject to the availability of seeds for planting, crop prospects for the 1985 season look very promising. Vegetation/biomass conditions for 1985 are improved over those in 1984. Exceptionally good seasonal rainfall will benefit rangeland conditions throughout the Sahel zone of the country as well as within southern Segou, southern Mopti and northeastern Sikasso. Timely rainfall during August and early September will be essential to continued good crop and rangeland development.

Rangeland Vegetation/Biomass Conditions

Satellite derived vegetation/biomass maps suggest that conditions as of mid-July 1985 are improved over those in 1983 and 1984 in the Sikasso, Bamako and Kayes regions (see fig. 3). Satellite imagery suggests conditions are comparable to 1983 and 1984 in the Segou and Mopti regions (fig. 2 and 3). However, extensive "greenup" can be anticipated throughout the Sahel zone, southern Segou, southern Mopti and northeastern Sikasso due to favorable 1985 seasonal rainfall.

Crop Conditions

Crops throughout the country are benefitting from favorable rainfall conditions except possibly in southern Kayes, Segou, and southern Bamako (fig. 1 and 2), where rainfall has been below normal (fig. 5). Ten day and monthly agroclimatic assessment models suggest exceptionally good crop conditions in the Sahel zone (locations to the north of the east - west line from Kayes to Mopti to Menaka) for millet and sorghum crops planted in the third decade of June and first decade of July (fig. 1). Crop conditions at these locations are in the 80th percentile range. Crops (millet, sorghum and groundnuts) planted from mid to late June are in excellent condition at San (80-90th percentile range). Crops planted from mid-May to mid-June are experiencing good to excellent growing conditions at Koutiala and Sikasso. Crop water requirements for millet, sorghum and groundnuts (where appropriate) have been more than adequately met at each of the above locations. Favorable weather conditions for crop planting did not occur until the first decade of July at Segou but crops planted at this time are in excellent condition. However, any crops (e.g., groundnuts, millet and sorghum) planted at Segou from early to mid-June are experiencing moisture stress (crop index at the 15th percentile level). Although water requirements have been met, seasonal rainfall has been about 20 percent below normal at Kita, Bamako, Bougouni and Kenieba. As a result, crops at these three locations must be carefully monitored during the next two decades of August when adequate rainfall will be essential during the critically important crop flowering stages. This is particularly true for maize crops grown in the regions near Kenieba and Bougouni. In general, 1985 crops are about one month behind development in 1984 within the Kenieba, Bamako and Segou areas (i.e., mid-June planting in 1985 versus mid-May planting in 1984). In contrast, 1985 crops in the Sahel zone (Nara and Hombori) are one month ahead of 1984 when favorable weather for crop planting did not occur until late July, if at all. The 1985 crop planting and development season at San (late June planting), Koutiala (mid-May planting), Sikasso (mid-May) and Bougouni (early May) is similar to 1984.

Weather Analysis

Decadal rainfall during July was normal to above normal throughout the country. Plentiful rains were received within the Sahel zone, i.e., Kayes, Nioro, Nara, Mopti, Hombori and locations to the north and northeast. Rainfall conditions for July at Kenieba (60-70% normal) and Bougouni (70-80% normal) were drier; (Table 1) however, decadal rainfall amounts of 60-70 mm were adequate for crops and pastures. Total July rainfall was generally in the 50th to 80th percentile range indicating average to well above average rainfall throughout most of the country, particularly in the Sahel zone. Note: An 80th percentile indicates that only 2 out of 10 years would be wetter than 1985. July total rainfall was in the 25-30th percentile range for Kenieba, Kita, Bougouni, Bamako and Segou indicating some dryness relative to the past 30 years. May-July seasonal rainfall at these locations (Table 2) was in the 15-30th percentile range, in part because the rainy season was delayed in May. However, May-June seasonal rainfall at all other locations was normal to above normal (i.e., in the 50-80th percentile range).

In comparison to recent years, July 1985 was significantly wetter than either 1983 or 1984 throughout most of the Sahel zone: Kayes (67th percentile for 1985 compared to 26th/1983 and 9th/1984), Nara (89th/1985, 19th/1984, 38th/1983), Hombori and Menaka (75th/1985 and 3rd for 1983 and 1984). Elsewhere, July 1985 was about the same as 1983 and 1984 at Kenieba and Bougouni (20th-30th percentile range all 3 years); slightly improved for Kita and Bamako (30th/1985 and 5th/1983 and 1984); improved over 1984 at Koutiala (50th/1985, 3rd/ 1984) and at Segou (22nd/1985 and 3rd/ 1984).

NOAA SATELLITE VEGETATION/BIOMASS INDEX
NORMALIZED AVHRR DATA
THIRD WEEK OF JULY

MALI

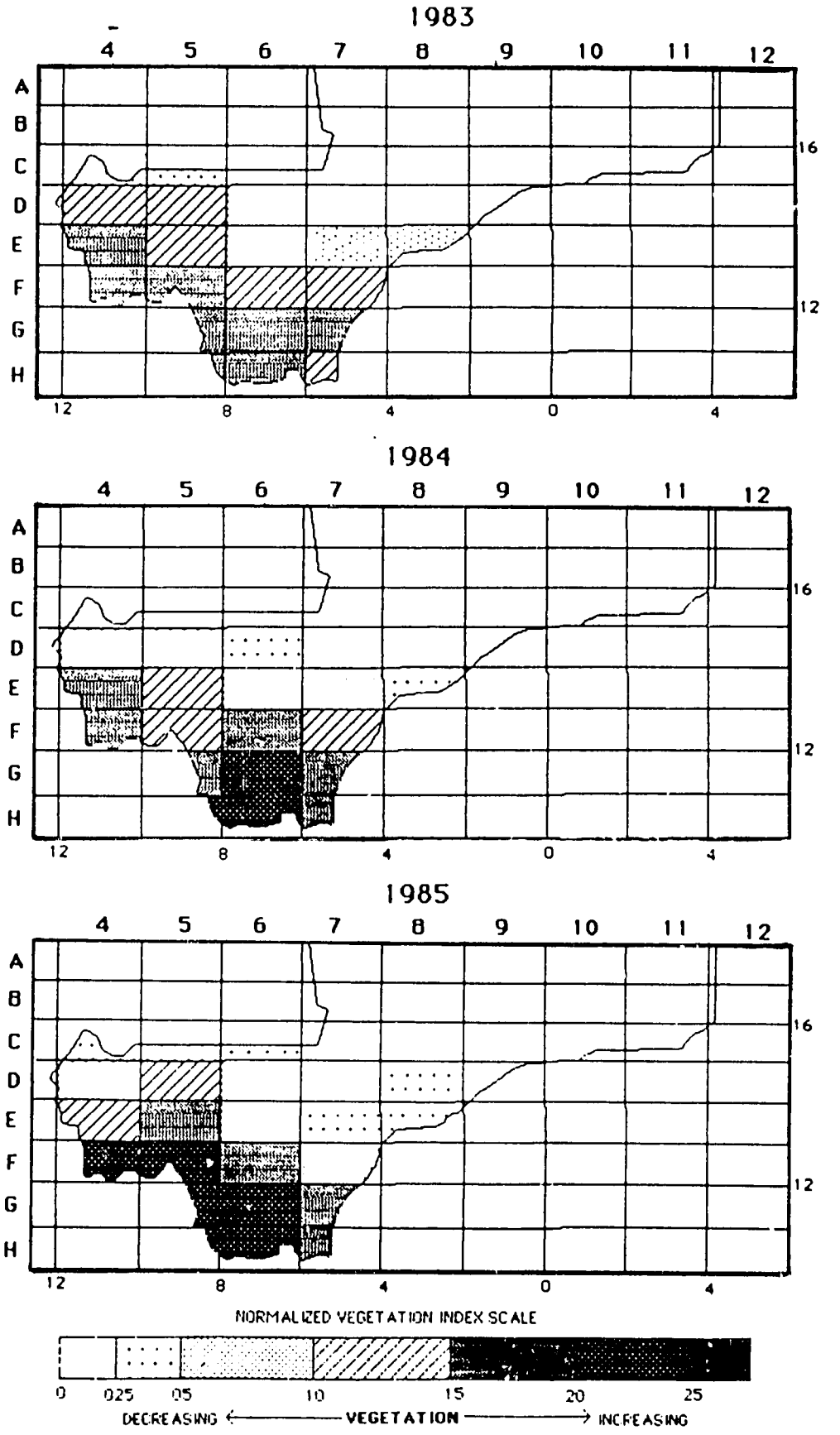


Figure 3

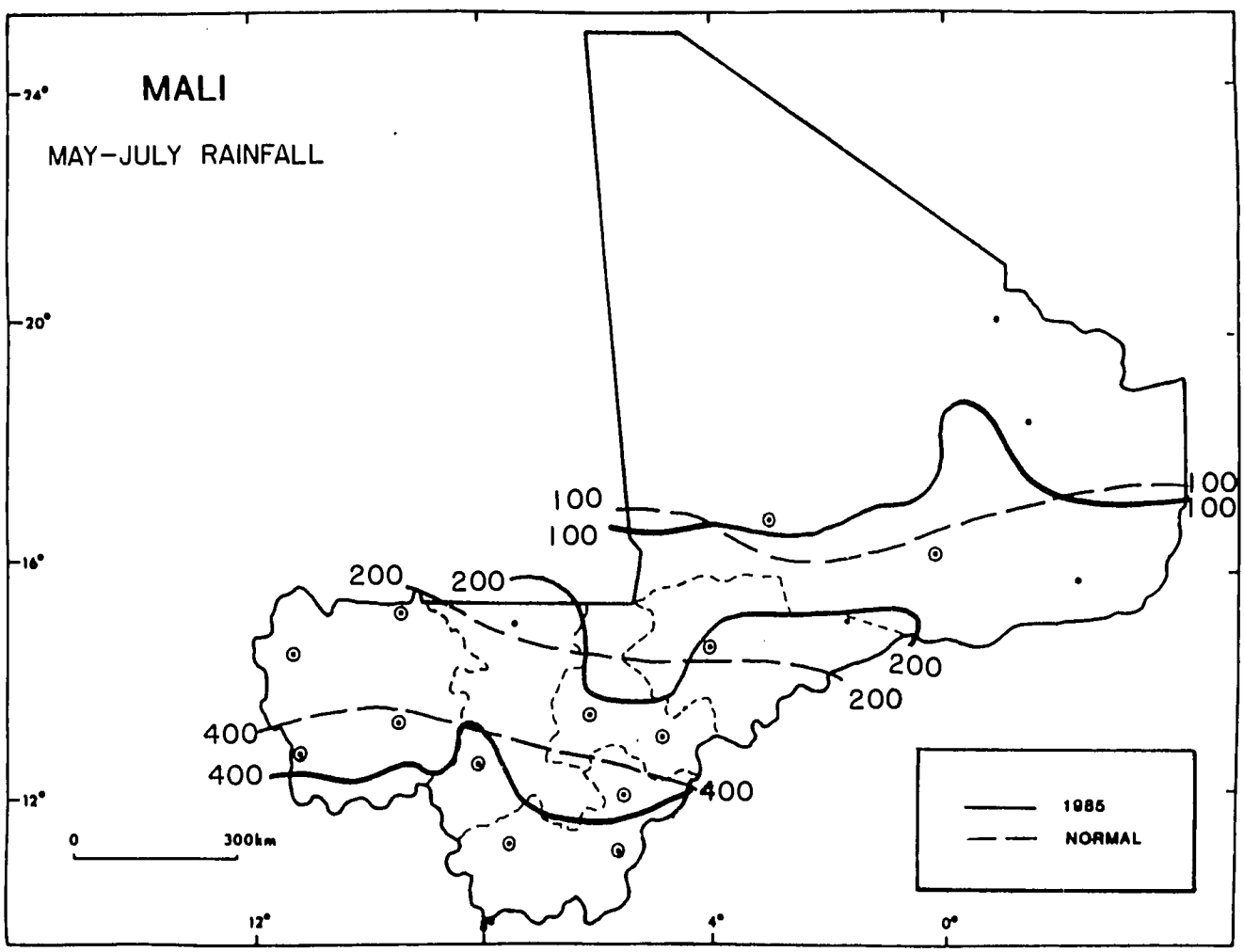

MALI
MAY-JULY RAINFALL
24°
20°
16°
12°
12°
4°
0°
100
100
100
100
200
200
200
200
400
400
400
0
300km
1985
NORMAL

Figure 4

MONTHLY RAINFALL TABLE

Expressed in Millimeters (mm), Percent of Normal (%) and Percentiles
(Rnk, on Scale of 0 to 100)

Country: Mali Year: 1985

Station	May (5)			June (6)			July (7)		
	mm	%	Rnk	mm	%	Rnk	mm	%	Rnk
Kidal	0	0	3	0	0	3			
Tombouctou	0	0	4	23	177	75	72	176	79
Gao	0	0	3	62	248	89	98	142	81
Nioro du Sahel	2	20	28	65	135	75	190	125	72
Nara	2	18	33	40	82	48	197	163	89
Homoori	0	0	3	60	128	78	105	88	44
Menaka	0	0	3	0	0	3	80	103	56
Kayes	2	15	22	57	67	31	183	109	67
Mopti	0	0	3	52	83	36	141	97	47
Kita	25	54	25	131	90	46	200	91	39
Sagou	12	39	17	36	44	6	141	77	25
San	20	43	17	94	98	47	211	118	72
Kaniecoa	15	29	19	103	61	19	133	69	19
Bamako/Senou	25	52	22	135	109	64	234	97	50
Koutiala	45	62	19	73	36	8	285	128	83
Bougouni	60	56	14	123	84	39	206	78	33
Sikasso	60	57	17	128	85	33	309	123	78

Notes:

" " = No data for calculations.

"???" = Percent of normal not calculated because average rainfall is zero.

"***" = Percentiles not calculated because less than 15 years of historical data exist on file.

Table I

CUMULATIVE RAINFALL TABLE

Expressed in Millimeters (mm), Percent of Normal (%) and Percentiles
(Rnk, on Scale of 0 to 100)

Country: Mali Year: 1985

Station	May (5)			May - Jun (5-6)			May - Jul (5-7)		
	mm	%	Rnk	mm	%	Rnk	mm	%	Rnk
Kidal	0	0	3	0	0	3			
Tombouctou	0	0	4	23	144	71	95	167	83
Gao	0	0	3	62	188	86	160	157	89
Nioro du Sahel	2	20	28	67	116	61	257	122	72
Nara	2	18	33	42	70	44	239	132	78
Hombori	0	0	3	60	102	61	165	92	53
Menaka	0	0	3	0	0	3	80	72	36
Kayes	2	15	22	59	60	19	242	91	44
Mopti	0	0	3	52	57	14	193	81	36
Kita	25	54	25	156	81	25	356	86	36
Sagou	12	39	17	48	43	6	189	64	11
San	20	43	17	114	80	39	325	101	58
Kenieba	15	29	19	118	53	6	301	62	3
Bamako/Senou	25	52	22	160	93	47	394	95	44
Koutiala	45	62	19	118	58	3	403	95	44
Bougouni	60	56	14	183	72	11	389	75	11
Sikasso	60	57	17	188	74	14	497	98	47

Notes:

" " = **No data for calculations.**

"???" = Percent of normal not calculated because average rainfall is zero.

"***" = Percentiles not calculated because less than 15 years of **historical data exist on file.**

Table 2

BURKINA FASO ASSESSMENT

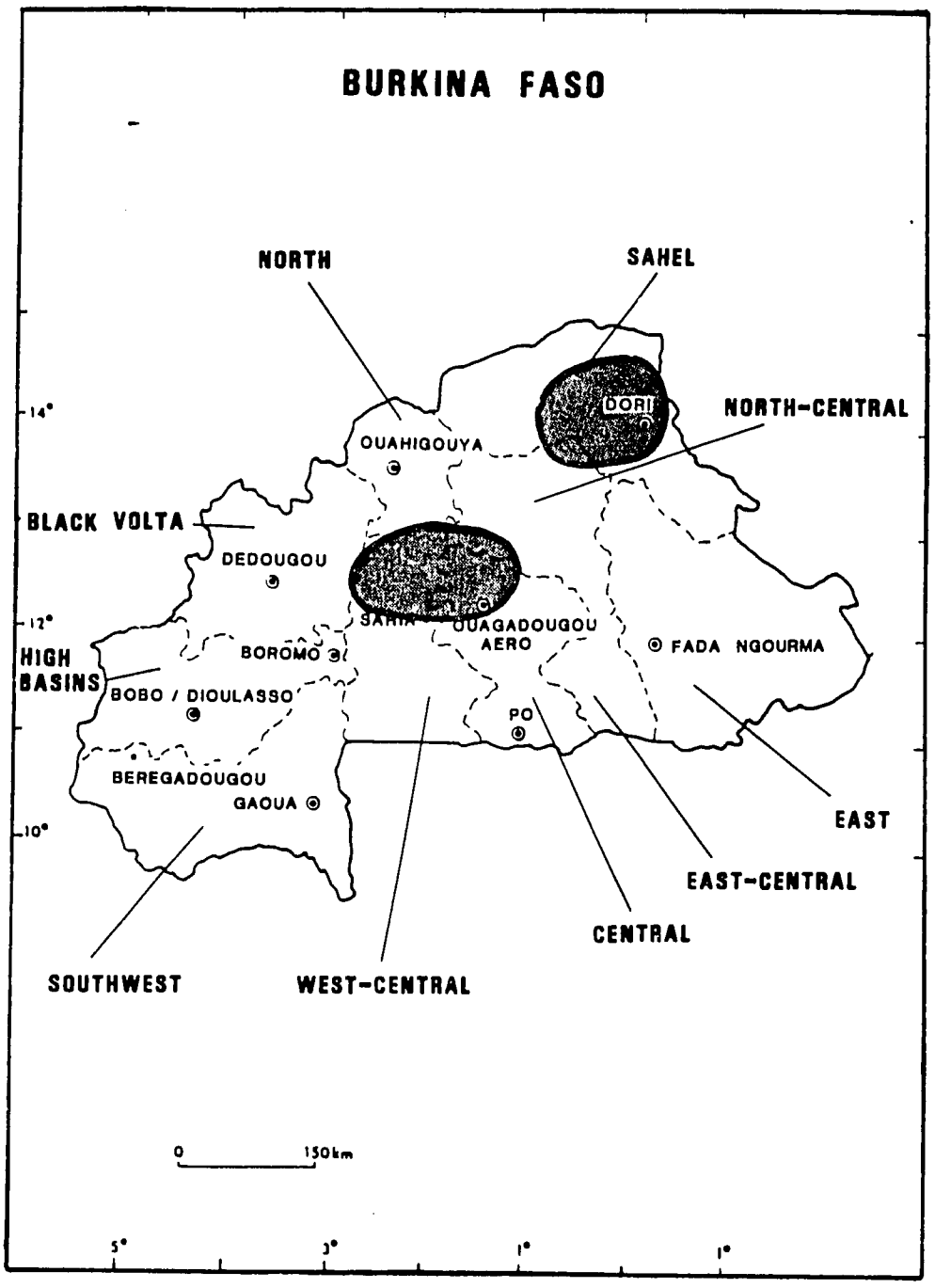


Figure 1

Overview

Following a delayed beginning of the 1985 rainy season, abundant rainfall during June and July has been favorable for agricultural crop development and rangeland growth throughout most of Burkina Faso. Subject to the availability of seeds for planting (e.g., there are continuing reports of serious millet seed shortages in the Sahel Department), the overall crop conditions are good and the prospects for the 1985 crop harvest are optimistic. However, seasonally good rainfall during August and early September will be essential for continued crop development.

Rangeland Vegetation/Biomass Conditions

Seasonal rainfall analysis, and satellite images suggest that rangeland/ biomass conditions for 1985 are good in comparison to those in 1984. Although widespread rainfall conditions during late June and throughout July bode well for improved rangeland conditions in the northern half of the country, conditions are still below normal due to low rainfall in May and early June (fig. 1 and 2). Note: Care must be exercised in the interpretation of the satellite derived vegetation/biomass index maps (fig. 3). As indicated in the color-coded satellite image for July 1985 (fig. 2), there are extensive cloud cover conditions (even evident in 15 day composites of daily satellite data). Most of the cloud cover effect is removed from the index calculations. However, residual cloud effects tend to lower the index and falsely suggest reduced biomass conditions. This illustrates the necessity of using all of the information together rather than in isolation.

Crop Conditions

Crops (e.g., millet, sorghum, and maize) throughout Burkina Faso are benefitting from highly favorable 1985 rainfall (table 1 and 2). Ten day and monthly agroclimatic assessment models indicate crop condition indexes in the 70-90th percentile range (scale 0 to 100) as a result of exceptionally favorable growing conditions. However, crops near Ouagadougou (Central Region) have probably experienced moderate moisture stress as crop indexes are below normal (fig. 1). Good August rainfall conditions are essential for sustained crop development in the Central Region. The 1985 crop planting dates in Southern Burkina were delayed 2-3 weeks in comparison to 1984 (i.e., 1985 planting dates ranging from mid-May to early June). However, 1985 crop planting at Dori was possible during the first decade of July; this contrasts with the much worse situation in 1984 when favorable planting did not occur until early August.

Weather Analysis

The 1985 rainfall season is much improved over the 1983 and 1984 seasons. Rainfall for each decade of July was generally normal to above normal throughout Burkina Faso except for the Sahel Department, e.g., Dori, where rainfall in each of the last two decades of July was 40 mm (70-80% of normal). Decadal rainfall elsewhere ranged from 40-90 mm in the first decade of July to 60-100 mm in the last decade. Total July rainfall (Table 1) was 90-120% of normal throughout most of the country (e.g., 252 mm at Boromo, 165 mm at Ouagadougou). Percentile ranks for July rainfall were in the 50-80th percentile range everywhere except at Ouagadougou (33rd percentile range on a scale of 0-100). Cumulative rainfall for May-July (Table 2) ranged from 635 mm at Bobo/Dioulasso (89th percentile, indicating wet conditions) to 340 mm at Ouagadougou (44th percentile) and 176 mm at Dori (25th percentile). Thus, 1985 May-July cumulative rainfall was normal to above normal throughout most of Burkina Faso, except in the north. In comparison to 1983 and 1984, July rainfall and May-July cumulative rainfall totals for 1985 were much higher in the Sahel, North and Northcentral, High Basins and Southwest regions (60-80th percentile range in 1985 vs 10-20th percentile range for 1983 and 1984). At Ouagadougou, 1985 rainfall amounts were comparable to those in 1983 and 1984.

NOAA SATELLITE VEGETATION/BIOMASS INDEX
NORMALIZED AVHRR DATA
THIRD WEEK OF JULY

BURKINA FASO

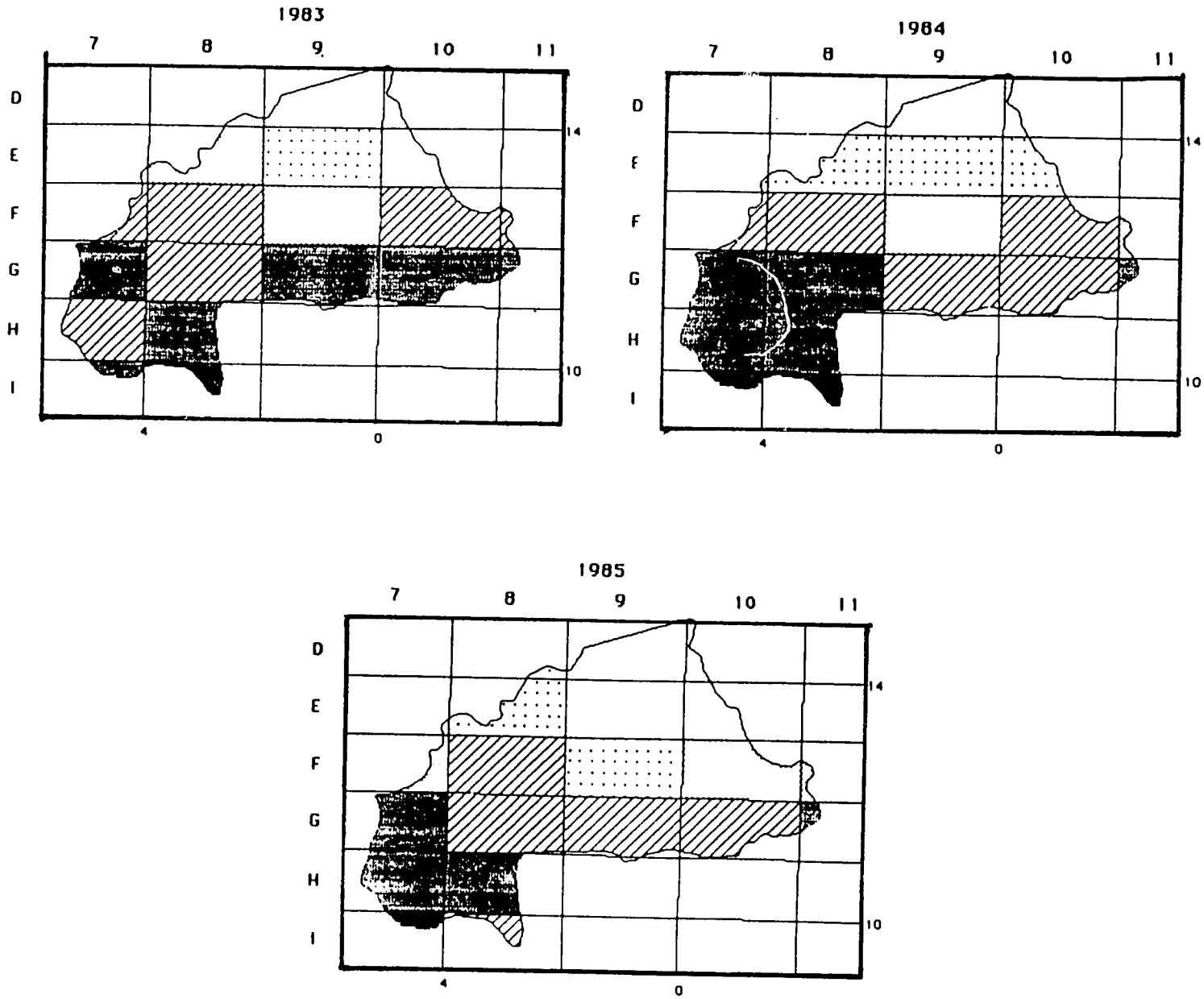


Figure 3

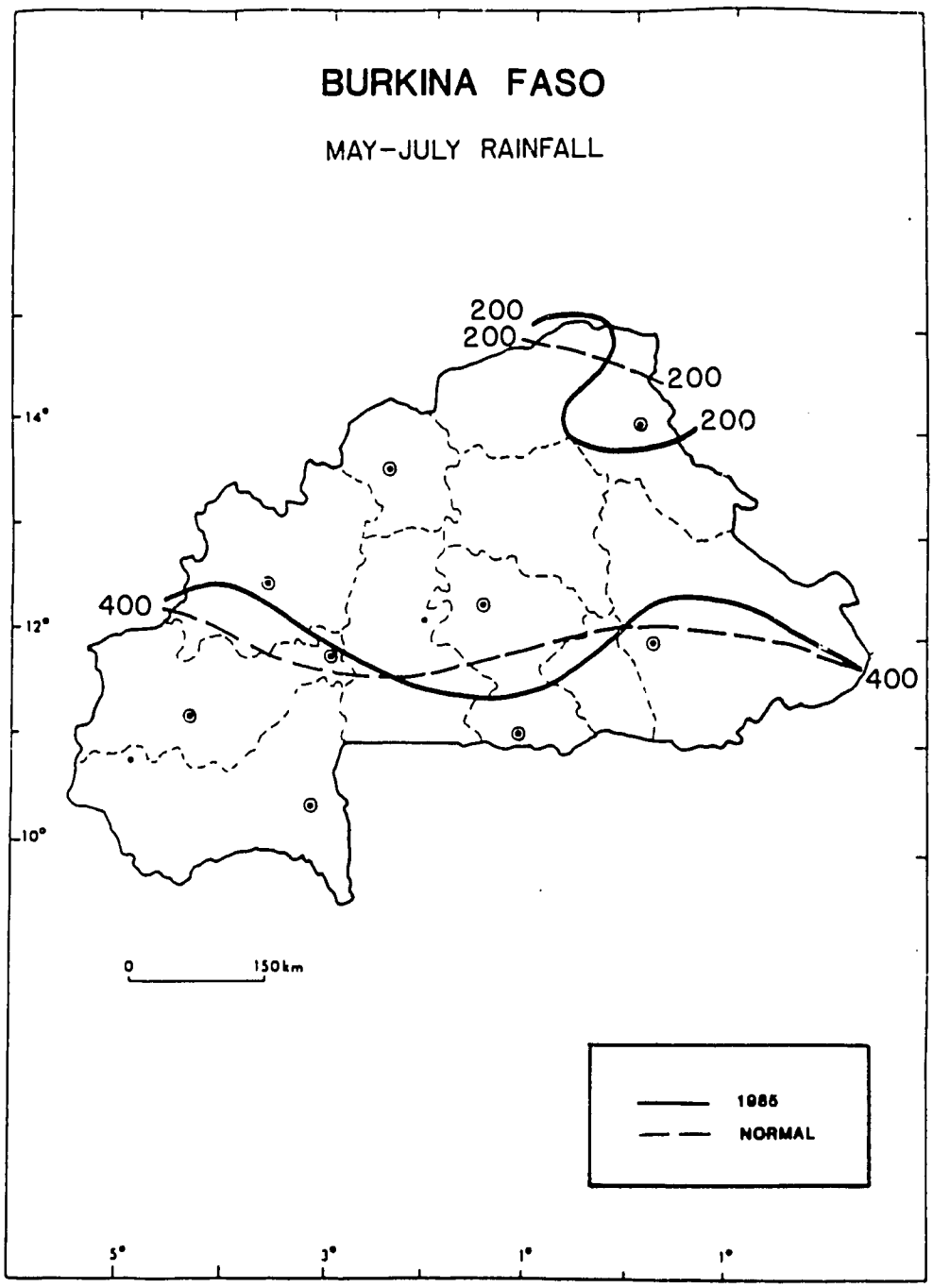

BURKINA FASO
MAY-JULY RAINFALL
200
200
200
200
400
400
14°
12°
10°
0
150km
1985
NORMAL
5°
3°
1°
1°

Figure 4

MONTHLY RAINFALL TABLE

Expressed in Millimeters (mm), Percent of Normal (%) and Percentiles
(Rnk, on Scale of 0 to 100)

Country: Burkina Faso Year: 1985

Station	May (5)			June (6)			July (7)		
	mm	%	Rnk	mm	%	Rnk	mm	%	Rnk
Dori	31	129	69	35	46	22	110	74	29
Ouahigouya	11	31	25	74	84	44	190	110	67
Ouagadougou Aeroport	86	101	50	89	76	33	179	96	39
Pada-N'Gourma	49	58	17	176	144	81	193	94	53
Bobo-Dioulasso	140	128	75	203	161	97	273	121	78
Gaoua	33	37	8	167	145	89	230	121	78
Gaoua	81	69	25	214	156	94	155	85	47

Notes:

" " = No data for calculations.

"???" = Percent of normal not calculated because average rainfall is zero.

"***" = Percentiles not calculated because less than 15 years of historical data exist on file.

Table I

CUMULATIVE RAINFALL TABLE

Expressed in Millimeters (mm), Percent of Normal (%) and Percentiles
(Rnk, on Scale of 0 to 100)

Country: Burkina Faso Year: 1985

Station	May (5)			May - Jun (5-6)			May - Jul (5-7)		
	mm	%	Rnk	mm	%	Rnk	mm	%	Rnk
Dori	31	129	69	66	66	36	176	71	25
Ouahigouya	11	31	25	85	69	28	275	93	50
Ouagadougou Aeroport	86	101	50	175	87	47	354	91	47
Fada-N'Gourma	49	58	17	225	109	64	418	102	61
Bobo-Dioulasso	140	128	75	343	146	92	616	134	86
Boromo	33	37	8	200	98	47	430	109	64
Gaoua	81	69	25	295	116	69	450	103	53

Notes:

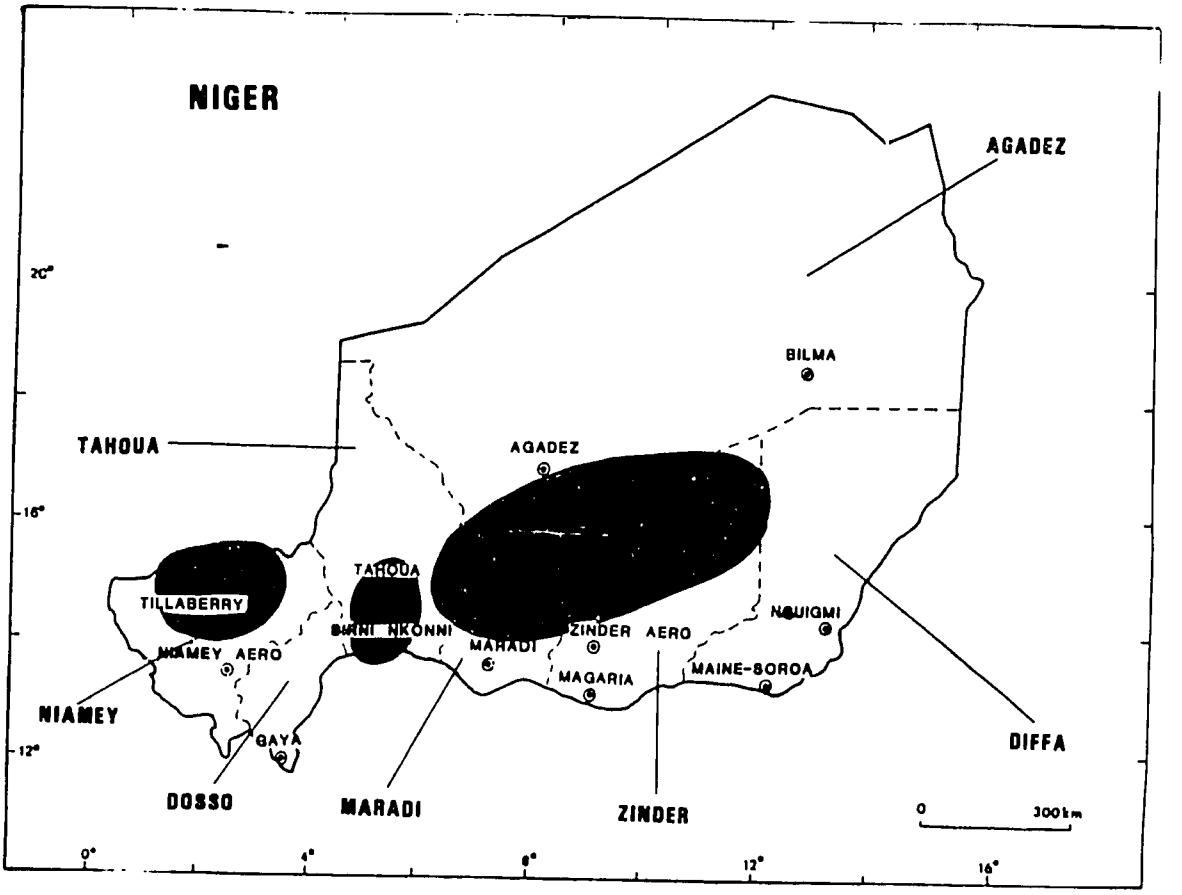
" " = No data for calculations.

"???" = Percent of normal not calculated because average rainfall is zero.

"***" = Percentiles not calculated because less than 15 years of historical data exist on file.

Table 2

NIGER ASSESSMENT



Overview

Figure 1

Agricultural crop and rangeland/vegetation conditions for 1985 are generally improved over those in 1984. After a delay in the beginning of the 1985 rainy season, satellite imagery for July (fig. 2) clearly shows rangeland and vegetation patterns throughout the country. Rangeland conditions are very poor in northern Niamey Department, central and northern portions of Maradi and Zinder Department and southern Agadez Departments (fig. 1). Rangeland conditions in Tahoua and southern Niger are comparable to those in 1984. Except for drought stressed crops in northern Niamey Department and southern Tahoua Department, agricultural crops look generally good throughout most of southern Niger. In addition to arriving late, seasonal rains are still below normal and rainfall during July was erratic. The success of the 1985 crop season in Niger is going to be heavily dependent on good rainfall during August and early September. This is especially true for late planted crops in the western portions of the country.

Rangeland Vegetation/Biomass Conditions

For the first time this year, satellite imagery (based on daily data from the period July 11-24) clearly shows the development of vegetation patterns within southern Niamey Department, Dosso Department, Tahoua Department, and across the southern portions of Maradi, Zinder and Diffa Departments. The delay in the beginning of the rainy season (until late June and early July) is evident in weekly satellite derived vegetation indexes (fig. 3) for Tahoua, Dosso and Niamey Departments, i.e., 1985 vegetation indexes for these regions were well below indexes for 1983 and 1984 until the third week of July this year. As of July 14-20, satellite derived vegetation/biomass indexes for southern Niger are comparable to those in 1984, but worse than those in 1983. The 1985 biomass conditions in central Niamey and Dosso Departments are worse than those in 1984. Satellite images (fig. 2) show an appreciable lack of vegetation in northern Niamey Department, major portions of central and northern Maradi and Zinder Departments, and southern Agadez Department up to the city of Agadez. Because rainfall arrived very late in northern Niamey Department (favorable crop

planting conditions did not exist until late July), there has been insufficient time for "greenup" to be detected by the satellite. Rangeland conditions for 1985 near Agadez are worse than those in 1984 according to vegetation indexes. Satellite derived rainfall totals suggest potential drought problems in the aforementioned low biomass regions of Agadez, Maradi and Zinder Departments. Finally, analysis of satellite imagery and satellite derived vegetation/biomass indexes is consistent with rainfall analysis based on reports from 1983 through 1985.

Agricultural Crop Condition Analysis

Agricultural crops are experiencing drought induced water stress throughout the northern portions of Niamey Department (Tillabery to Filingue and to the north) and throughout southern Tahoua Department (Birni Nkonni and Tahoua). Crop conditions are generally good throughout the other regions in southern Niger except for localized drought problems. Because the 1985 rainfall season began late and season totals are generally below the 30 year mean, agricultural crops are going to be critically dependent on adequate rainfall during August. In Niamey Department, favorable planting conditions were not realized in the northern areas (e.g., Tillabery) until the last decade of July. Although this is an improvement over last year, early planted crops have experienced water stress and late planted crops are vulnerable to an early end of the rainy season. Crop conditions near Niamey are average for early June planted crops and excellent for late June planted crops. Crop conditions in the southern areas of Niamey Department look very favorable (late May planting). Crops in the Dosso Department have benefitted from good rains since June. In Tahoua Department, early to mid-June planted crops have experienced moisture stress due to low rainfall. However, crops planted in early July look good. Crop conditions throughout southern Maradi, Zinder and Diffa Departments have benefitted from generally favorable rainfall during July.

Weather Analysis

Overall rainfall conditions as of the end of July 1985 are improved over those in 1984, but there are still indications of drought. July rainfall was essentially normal throughout Niger (Table 1) except in the central portion of the country defined by the triangular region determined by Birni Nkonni, Tahoua and Magaria. July rainfall was 60 percent of normal at these locations. The 1985 seasonal rains did not begin until late June and rainfall has been spotty and erratic, particularly in the aforementioned central region. Decadal rainfall analysis indicates 100-200% normal rainfall during the first ten days of July for southern Niger to the east of Birni Nkonni. Rains during July 1-10 were only 40-60% normal at locations to the west and north: Tillabery, Niamey and Tahoua. Except for Niamey (142% normal), Gaya (90% normal), and Maine-Soroa (124% normal), rainfall during July 11-20 at other locations was only 40-60% normal. Assessed rainfall for the last decade of July was 40-60% of normal at most locations except for near normal rains at Tillabery, Maradi, Nguigmi and Maine-Soroa. July rainfall percentile ranks in the 20-30th percentile range within the Birni Nkonni, Tahoua and Magaria triangle suggest moderate drought and unfavorable crop growing conditions. July rainfall percentile ranks in the 40-50th range (i.e., normal conditions) may be misleading because of the uneven distribution through the month. Because of the delay in the beginning of the rainy season and continued dryness into July, seasonal rainfall for the May-July period (Table 2) is well below normal at Tillabery (21st percentile), Niamey (30th percentile), Birni Nkonni (8th percentile and Magaria (20th percentile). Near normal seasonal rainfall conditions existed at other locations. However, the 1985 seasonal rainfall through July is still much better than 1984, when May-July cumulative rainfall was extremely low and in the 10-20th percentile range throughout the entire country except near Maine-Soroa and Nguigmi.

NOAA SATELLITE VEGETATION/BIOMASS INDEX
NORMALIZED AVHRR DATA
THIRD WEEK OF JULY

NIGER

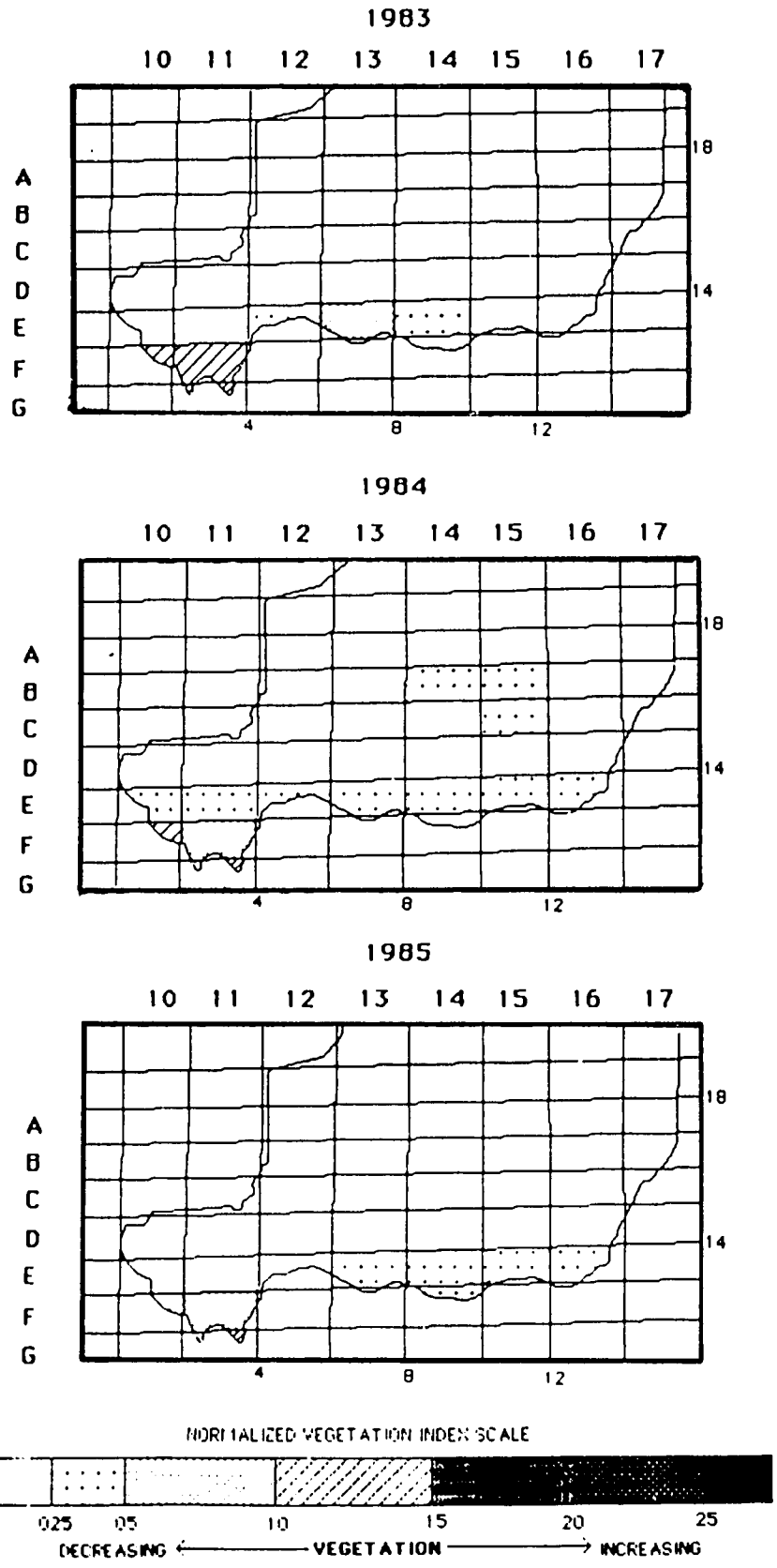


Figure 3

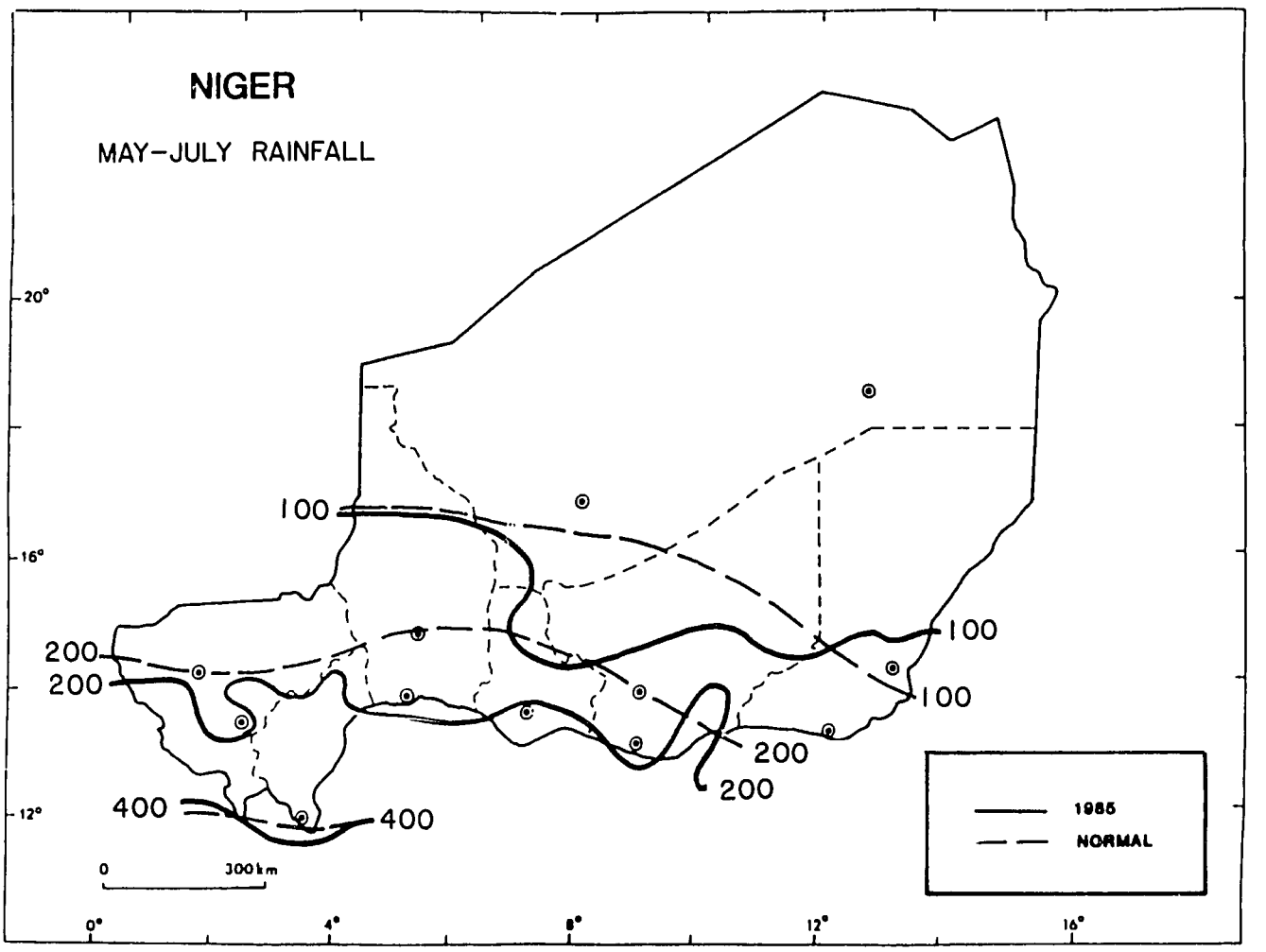

NIGER
MAY–JULY RAINFALL
20°
16°
12°
0°
4°
8°
12°
16°
100
100
100
200
200
200
200
400
400
0
300 km
1985
NORMAL

Figure 4

MONTHLY RAINFALL TABLE

Expressed in Millimeters (mm), Percent of Normal (%) and Percentiles (Rnk, on Scale of 0 to 100)

Country: Niger Year: 1985

Station	May (5)			June (6)			July (7)		
	mm	%	Rnk	mm	%	Rnk	mm	%	Rnk
Agadez	0	0	3	11	92	67			
Tillaberi	0	0	3	21	42	21	90	71	31
Tanoua	0	0	3	33	58	22	69	59	17
N'Guigmi	5	71	69	32	320	92	65	107	67
Niamey Aeroport	0	0	3	69	91	53	132	79	33
Birni N'Konni	1	3	6	12	18	3	99	70	31
Maradi	5	21	17	71	108	61	132	86	44
Zinder Aeroport	36	157	81	20	43	28	132	99	56
Magaria	7	25	22	58	95	53	117	66	25
Maine-Soroa	0	0	3	34	103	61	105	99	47
Gaya	59	82	42	85	67	22	216	113	64

Notes:

" " = No data for calculations.

"???" = Percent of normal not calculated because average rainfall is zero.

"***" = Percentiles not calculated because less than 15 years of historical data exist on file.

Table 1

CUMULATIVE RAINFALL TABLE

Expressed in Millimeters (mm), Percent of Normal (%) and Percentiles
(Rnk, on Scale of 0 to 100)

Country: Niger Year: 1985

Station	May (5)			May - Jun (5-6)			May - Jul (5-7)		
	mm	%	Rnk	mm	%	Rnk	mm	%	Rnk
Agadez	0	0	3	11	55	44			
Tillaberi	0	0	3	21	30	7	111	57	14
Tahoua	0	0	3	33	44	17	102	53	8
N'Guigmi	5	71	69	37	218	81	102	131	69
Niamey Aeroport	0	0	3	69	61	22	201	71	28
Birni N Konni	1	3	6	13	13	3	112	46	6
Maradi	5	21	17	76	84	50	208	85	42
Zinder Aeroport	36	157	81	56	81	56	188	93	47
Magaria	7	25	22	65	73	42	182	68	19
Maine-Soroa	0	0	3	34	79	47	139	93	53
Gaya	59	82	42	144	73	31	360	92	44

Notes:

" " = No data for calculations.

"???" = Percent of normal not calculated because average rainfall is zero.

"***" = Percentiles not calculated because less than 15 years of historical data exist on file.

Table 2

CHAD ASSESSMENT

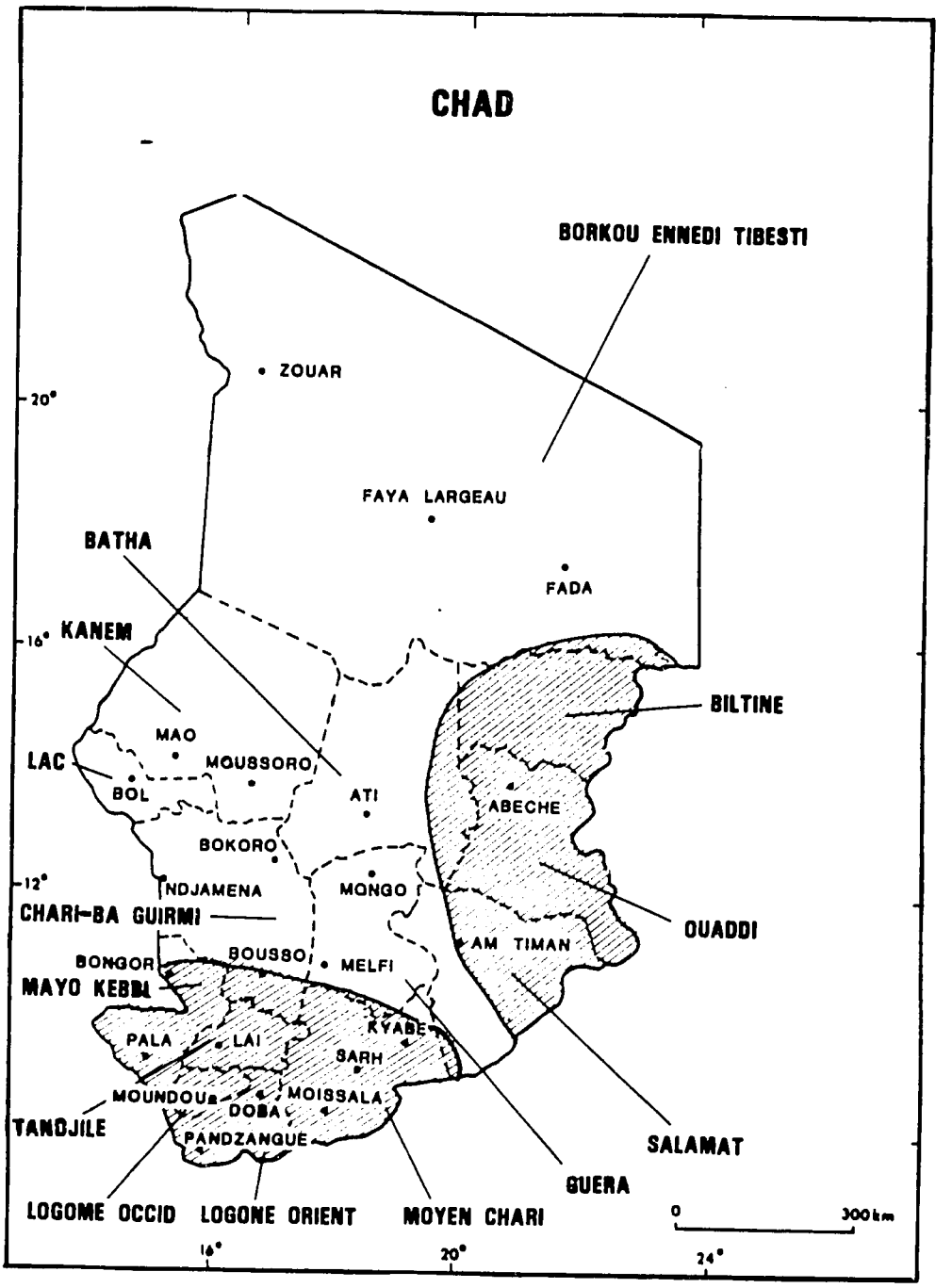


Figure 1

Overview

Seasonally good rainfall during July has improved overall rangeland and agricultural crop conditions throughout Chad. Current conditions are much better than those at the end of July in 1984. The outlook for agriculture in Chad is very optimistic depending on the availability of seeds for planting. Cumulative seasonal rainfall (May-July) was normal to above normal and approaches mid-1960's levels, particularly in eastern Chad. Heavy rainfall has caused transportation problems, particularly in Biltine, Ouaddai, Guera and Salamat regions (see fig. 1).

Rangeland and Vegetation/Biomass Conditions

Note: The existence of cloud contaminated pixels in the satellite image (fig. 2), even after compositing daily data (July 11-24), provides an indication of the widespread rainfall within Chad this year. The satellite image can be analyzed by "looking through" the clouds; however, regional satellite derived vegetation/biomass indexes (fig. 3) must be carefully interpreted. Most cloud contaminated pixels are screened from the index calculations, but sub-pixel contamination tends to falsely lower the index.

Satellite imagery, rainfall analysis and derived vegetation/biomass indexes suggest that overall rangeland conditions are at least as good as those in 1984. Furthermore, exceptionally good July rains will lead to further improvements in rangeland conditions which tend to lag rainfall by 10-14 days.

Crop Conditions

Due to abundant seasonal rainfall, overall crop conditions are above normal and the prospects for the 1985 crop yields are good throughout the country. Abundant rainfall has benefitted agricultural crops throughout most of southern Chad. Groundnuts, maize, millet and sorghum crops planted during May in extreme southern Chad, including Mayo Kebbi, Logone Occid., Logone Orient, Tandjile and Moyen Chari (fig. 1) administrative regions should be in very good condition. Subject to seed availability, crop prospects appear favorable as the crops enter their critical reproductive growth stages during August. Further north, where crops such as groundnut, sorghum and millet were planted in June, conditions also look very promising. Ten day and monthly agroclimatic crop condition indices indicate that crop water needs have been met. Favorable soil moisture for July planted millet is also indicated within Kanem, Batha and Biltine districts of central Chad.

Weather Analysis

Good July rains overcame early season drought reported in central Chad and the 1985 season (fig. 4) is much improved over 1983 and 1984. Based mainly on satellite estimates, July rainfall was essentially normal throughout most of Chad except in central and eastern administrative regions (Batha, Guera, Salamat and Ouaddai) where rainfall was estimated to be 125-150 percent of normal. July rainfall amounts were estimated at 250 mm in the south at Sarh and Moundou, 200 mm in west central regions, 100-150 in Kanem and Batha districts, 245 mm at Am Timan and 185 mm at Abeche. July rainfall totals at Batha and Abeche are in the 80th percentile range, representing some of the largest monthly rains since the mid-1960's. May-July seasonal rainfall is now normal to above normal throughout the entire country, particularly in eastern districts of Salamat and Ouaddai (75th percentile range). Seasonal rainfall totals throughout southern and eastern Chad are comparable to early-mid 1960's levels.

NOAA SATELLITE VEGETATION/BIOMASS INDEX
NORMALIZED AVHRR DATA
THIRD WEEK OF JULY

CHAD

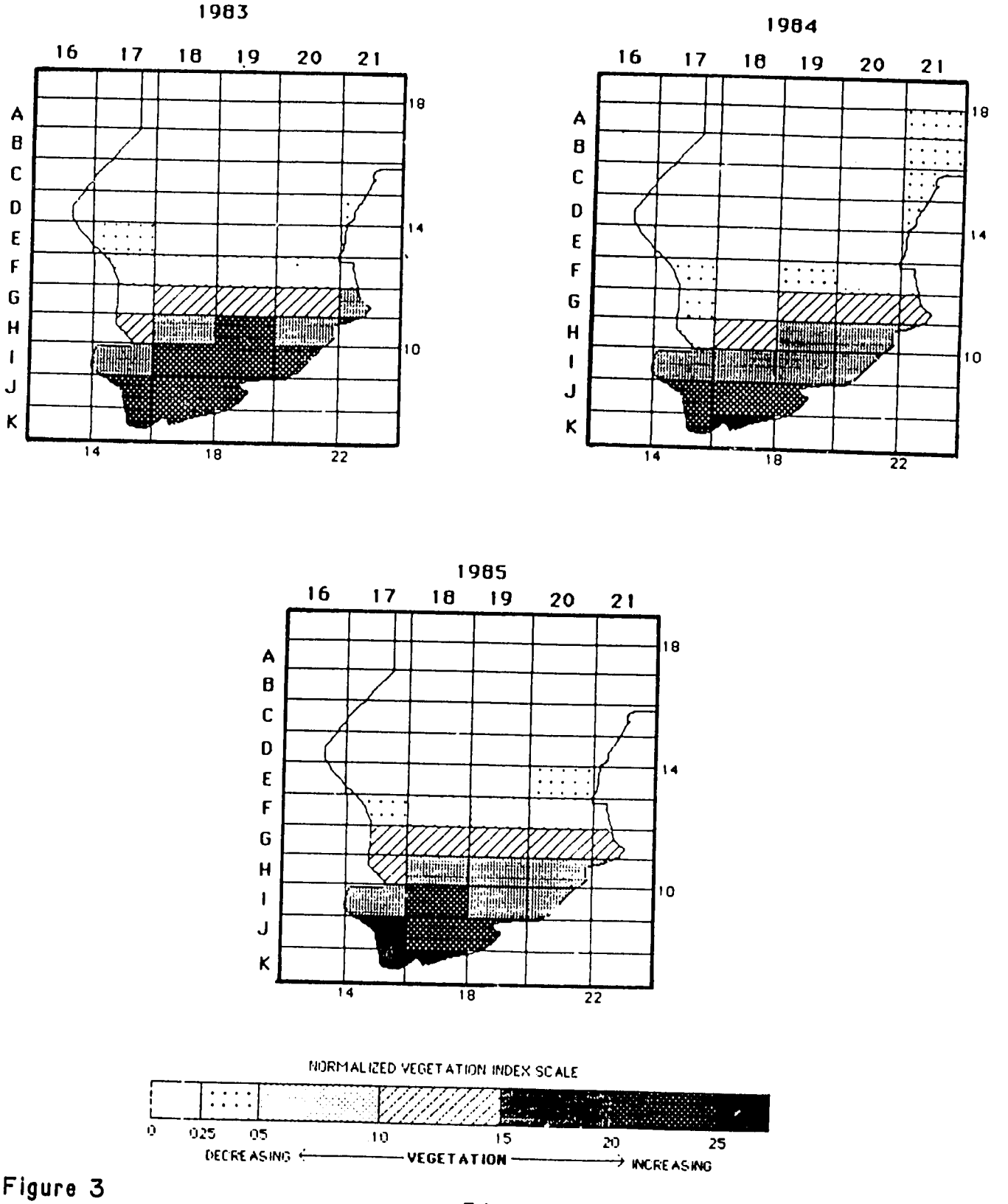


Figure 3

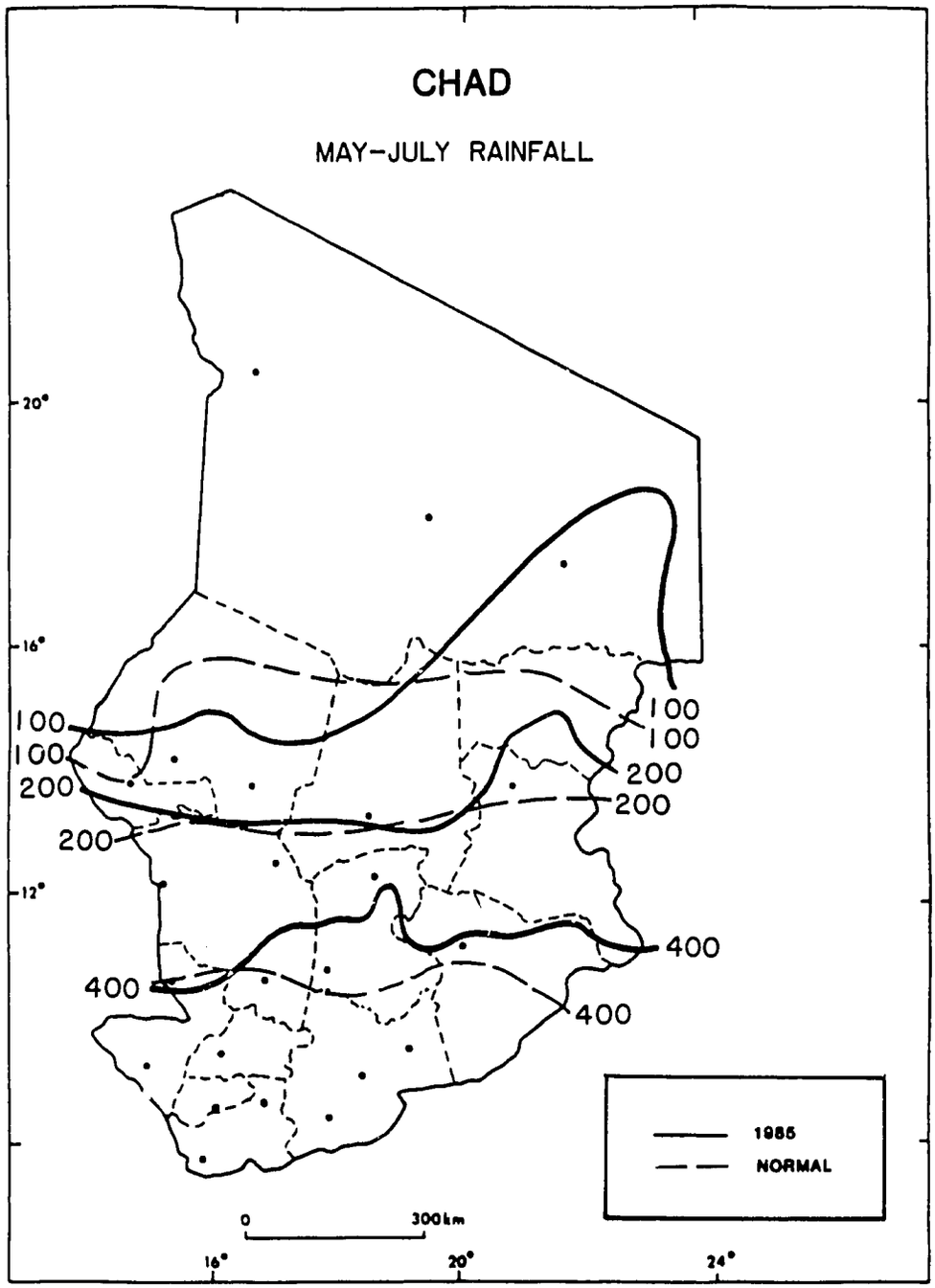

CHAD
MAY-JULY RAINFALL
20°
16°
12°
100
100
200
200
100
100
200
200
400
400
400
1985
NORMAL
0
300km
16°
20°
24°

Figure 4

SUDAN ASSESSMENT

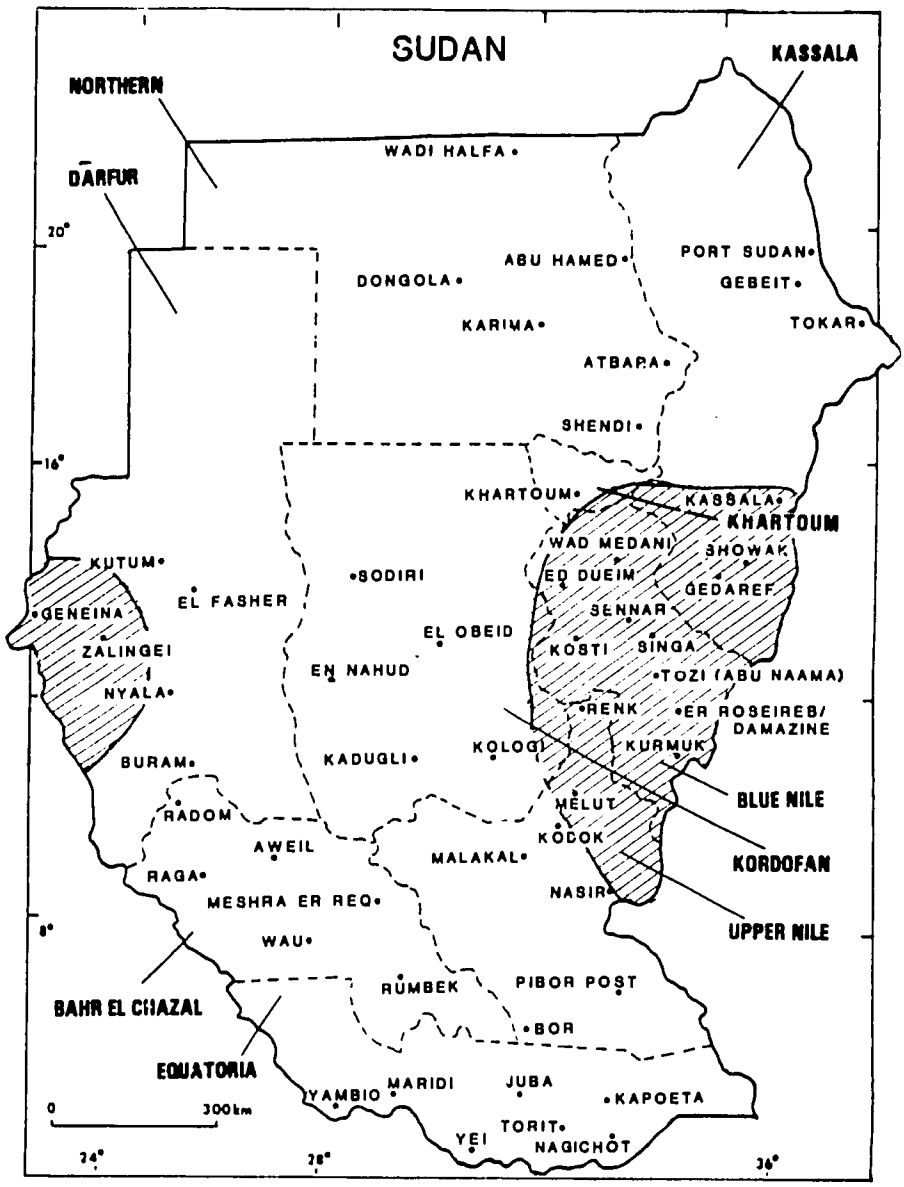


Figure 1

Overview

Due to abundant 1985 seasonal rainfall, rangeland and crop conditions are well above average. The outlook for the 1985 crop season is very optimistic, subject to the availability of seeds for planting. Satellite imagery and vegetation/biomass indexes clearly show that conditions for 1985 are vastly superior to those for 1984 or 1983. Satellite derived rainfall estimates suggest normal to above normal rainfall amounts throughout central and southern Sudan. Excessive rainfall has caused transportation problems associated with relief efforts in western Darfur Department (fig. 1). Abundant 1985 seasonal rains throughout the catchment areas of the Nile River Basin (fig. 1) should substantially increase river flow and help mitigate downstream concerns about potential water crises resulting from 1983 and 1984 drought conditions.

Rangeland and Vegetation/Biomass Conditions

Satellite indices and imagery (figs. 2-3) show vast improvements of 1985 rangeland conditions over those in 1984 throughout central and southern Sudan (south of 14 degrees north latitude). However, just to the north (14-16 degrees north latitude), in central Darfur and northern Kordofan regions, the vegetation/biomass indexes suggest that conditions are comparable to those in 1984.

Crops

The crop situation is good and the outlook for the 1985 season is optimistic, subject to the availability of seeds for planting. Rainfed crops, including sesame planted in May and June along the White Nile River, benefitted from the above normal rainfall (fig. 4). Elsewhere, the moisture situation for sesame and groundnuts is also favorable in the Kordofan and Bahr El Chazal regions. However, above normal moisture conditions could also lead to losses due to pests and diseases. The millet growing areas in western Bahr El Chazal and Equatoria regions have also received favorable moisture and prospects appear excellent at this time.

Weather Analysis

July 1985 rainfall amounts were assessed as normal to above normal throughout central and southern portions of the country. July rainfall totals for the Kordofan, Blue Nile and southern Kassala regions ranged from 150-190 mm, representing conditions in the 70th to 90th percentile range. Such rainfall totals are comparable to those in the relatively wet early-1960's. The May-July cumulative rainfall totals for the central/eastern central portions of Sudan also approach 1960's levels.

NOAA SATELLITE VEGETATION/BIOMASS INDEX
NORMALIZED AVHRR DATA
THIRD WEEK OF JULY

SUDAN

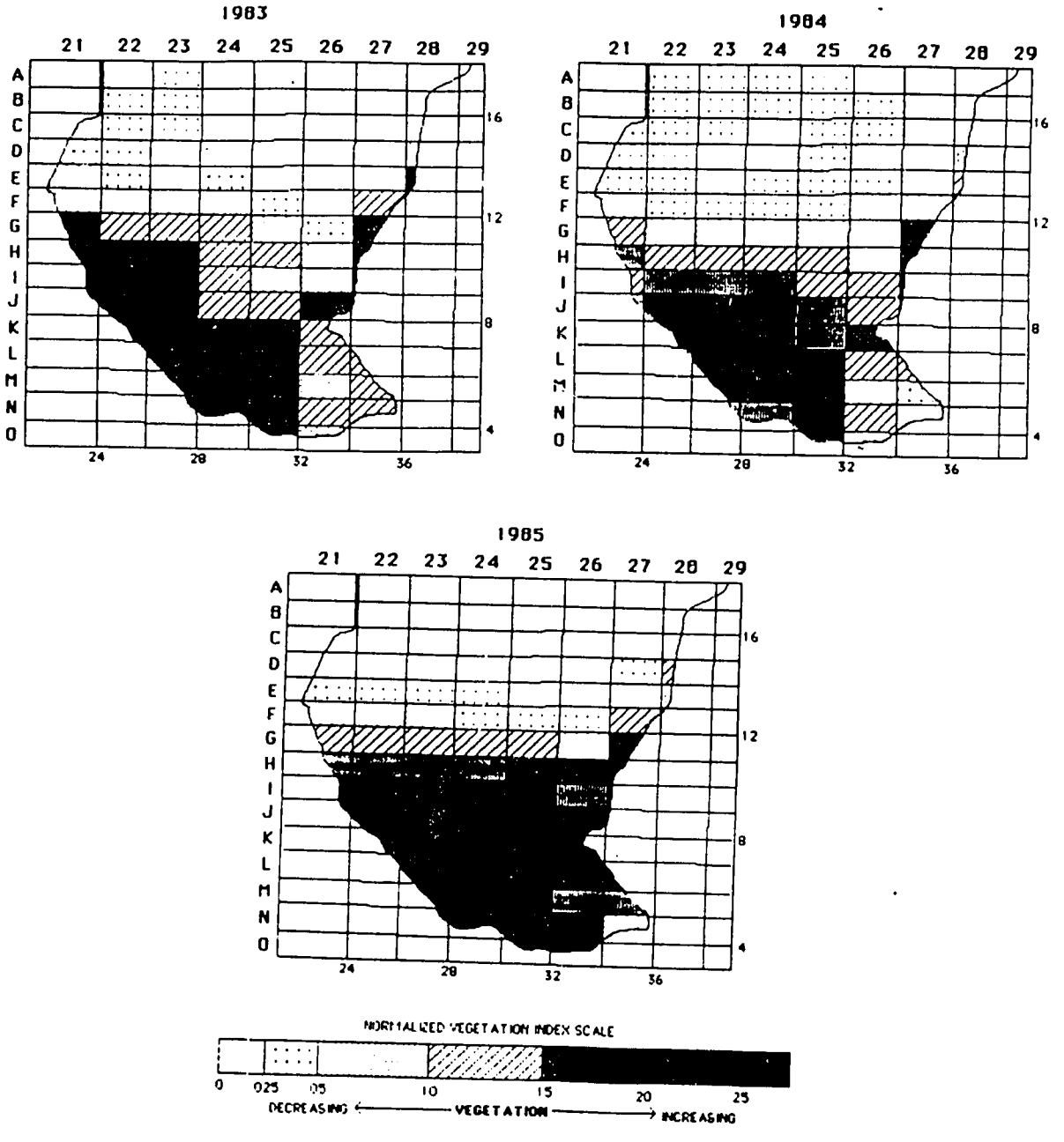


Figure 3

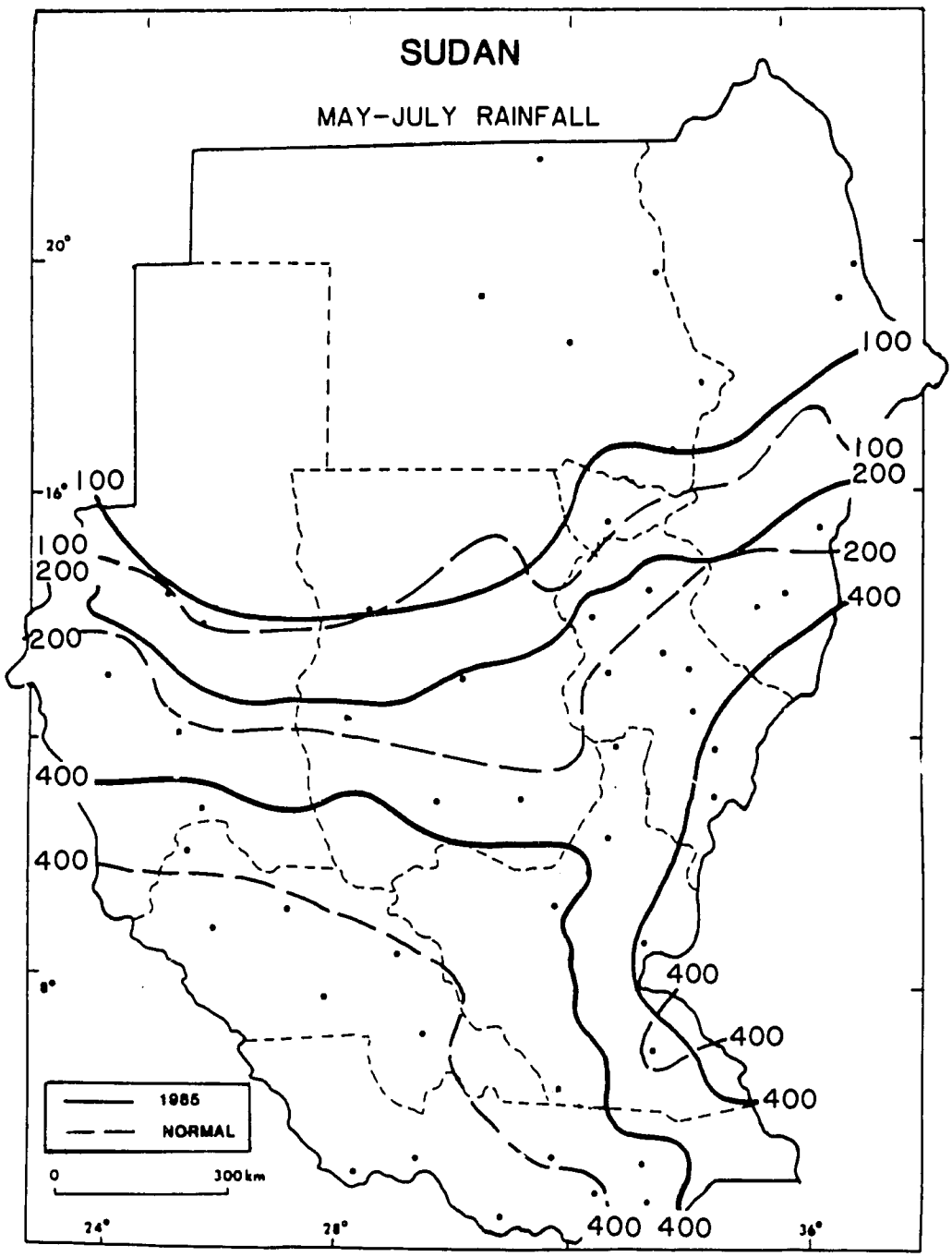

SUDAN
MAY-JULY RAINFALL
20°
16°
8°
24°
28°
36°
100
100
200
100
200
200
200
400
400
400
400
400
400
400
400
400
1985
NORMAL
0
300km

Figure 4

ETHIOPIA ASSESSMENT

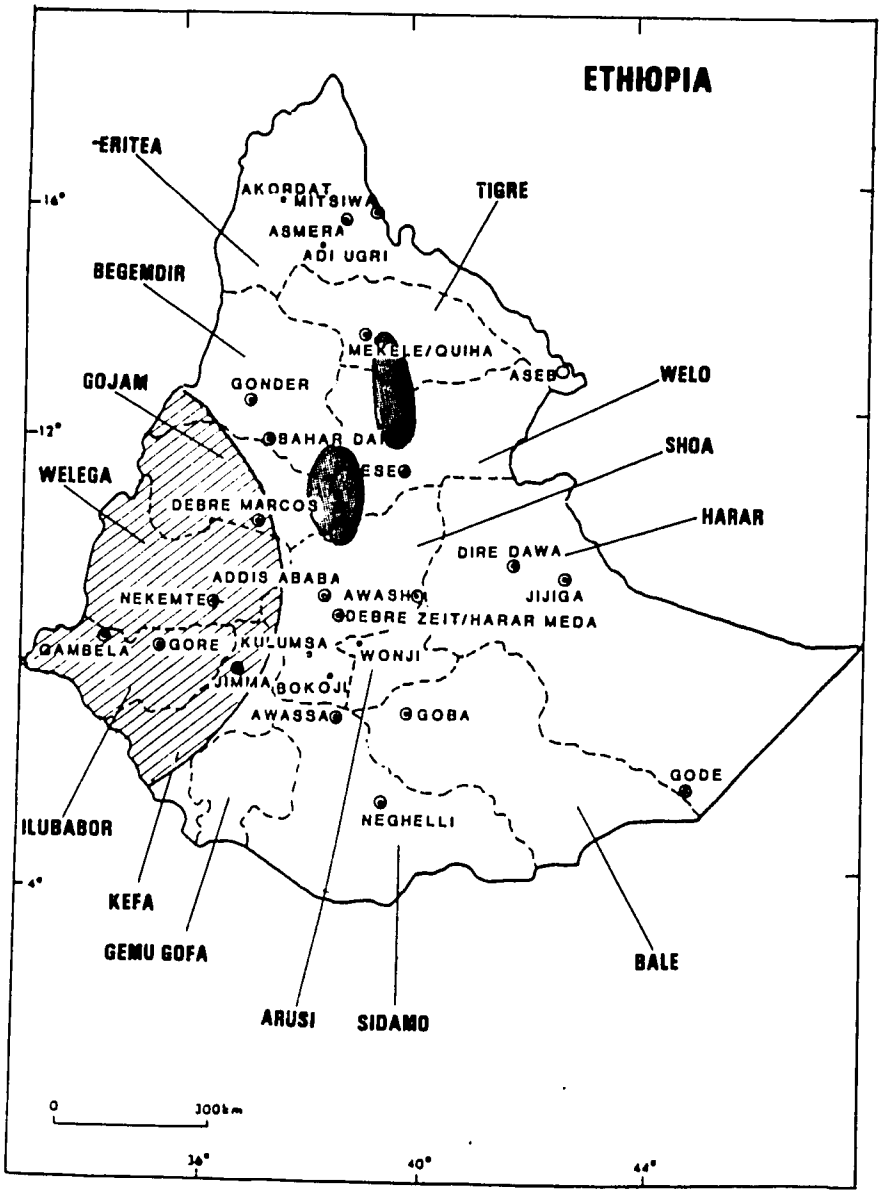


Figure 1

Overview

Due to good seasonal rains beginning in May, crop conditions for the 1985 main growing season (June-July planting) look generally good throughout Ethiopia except for some central and northern areas. Specifically, satellite imagery and rainfall index models suggest moderate drought stress for crops grown in northern Shoa (north of Addis Ababa), western Welo (e.g., Dese) and southern Tigray (e.g., Mekele, see fig. 1). Prospects for crops throughout Ethiopia, including aforementioned moderate drought stressed areas, will be dependent on timely, adequate rains during August and September. (Note: this analysis will be updated by cable within ten days). In addition, dryness in March and June caused below-average secondary crop yields, especially in parts of Welo and Shoa.

Crop Conditions

Crops throughout Ethiopia have benefitted from seasonally good May-July rainfall except for portions of northern Shoa, western Welo and southern Tigray Provinces, where July rainfall was 60-70 percent of normal. Agroclimatic/crop condition indexes based on 1985 rainfall reports suggest moderate moisture stress for June-July planted crops at Dese and Mekele. Satellite imagery (fig. 2) and satellite derived vegetation/biomass indexes (fig. 3) tend to confirm dryness in these areas as biomass conditions for 1985 are not as good as those for 1984 (see following section). Satellite imagery also suggests extremely low biomass conditions along the eastern slope of the Eastern Escarpment within Welo and Tigray Provinces. The satellite imagery suggests isolated pockets of low biomass conditions within the Great Rift Valley; however, evidence is not sufficient to indicate drought. In particular, isolated pockets of low biomass are located just to the north and south of Awassa and just to the northwest and southeast of Wonji. Secondary (belg) crops planted in March and harvested in July were adversely affected by a late beginning of the belg rains and dry weather in June. In particular, the unfavorable weather conditions likely hurt crops in the highlands of Welo and Shoa Provinces, which are major belg-producing areas. However, even with favorable rainfall conditions, the belg crop was not expected to contribute more than a small percentage (less than 10 percent) of Ethiopia's total food production this year, due to such non-meteorological factors as lack of seed, plow ox mortality, and population displacement.

Satellite Imagery/Vegetation Index Analysis

Satellite derived vegetation/biomass indexes suggest that 1985 biomass conditions are generally better than those for 1984 except in northern Shoa, western Welo and southern Tigray. This area of low biomass is generally defined within the rectangular box determined by 10 degrees north latitude, 40 degrees east longitude, 14 degrees north latitude and 38 degrees east longitude. The satellite image tends to confirm low biomass conditions for this rectangular sized region. The image indicates that biomass conditions are good for most of Gojam and the southwest (fig. 1) and that cloud cover (after daily compositing) precludes biomass assessment for west/central Begemdir. The satellite image also suggests very low biomass/very dry conditions along the eastern slopes of the Eastern Escarpment through central Tigray and Welo Provinces. The image shows low biomass at isolated locations within the Great Rift Valley, southern Sidamo and southeastern Ethiopia. Moderately good biomass conditions are indicated to the east of the Great Rift Valley, i.e., the mountains to the northeast and the Ahmar Mountains.

Rainfall Station Report Analysis

July rainfall (Table 1) was essentially normal throughout Ethiopia except for portions of northern Shoa, western/central Welo, southern Tigray and central Begemdir Provinces. Based on available rainfall reports, July rainfall was 77 percent of normal at Addis Ababa (14th percentile), 60 percent of normal at Dese (12th percentile), and 67 percent normal at Mekele (16th percentile). July rainfall reports from weather stations located in other portions of the country were normal to above normal. In June, recently received data (not reflected in Table 1) shows below normal rainfall was reported from Dese (5 mm vs normal of 32 mm) and Mekele (11 mm vs 33). Cumulative May-July 1985 rainfall is exceptionally good for western provinces. (Note: The network of reporting weather stations is too sparse for identification of isolated drought pockets. NOAA/NESDIS could provide a much more detailed analysis if timely ten day rainfall reports were available. Above rainfall totals, except where noted, are estimates based on incomplete reports supplemented by satellite cloud data).

NOAA SATELLITE VEGETATION/BIOMASS INDEX
NORMALIZED AVHRR DATA
THIRD WEEK OF JULY

ETHIOPIA

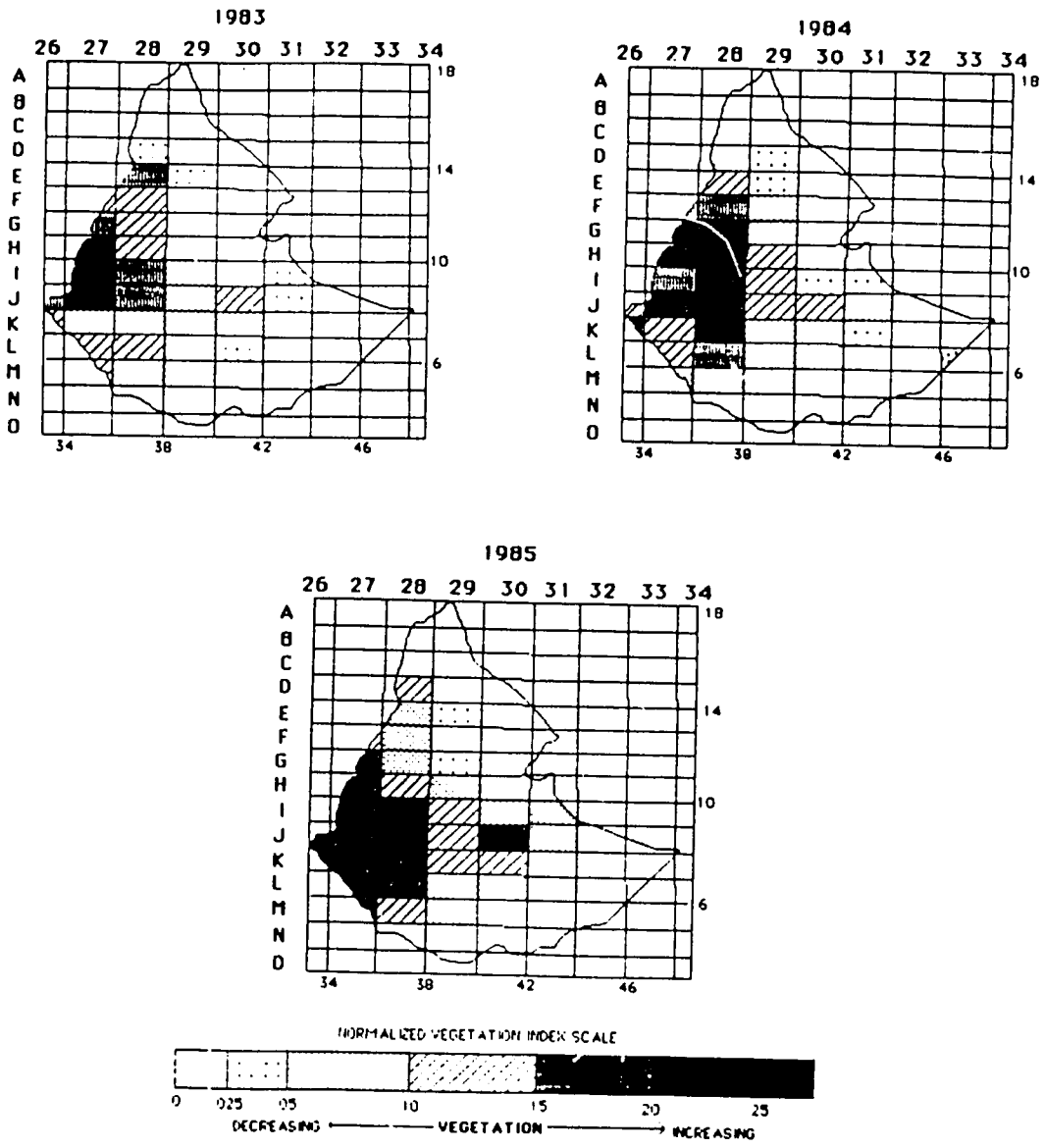


Figure 4

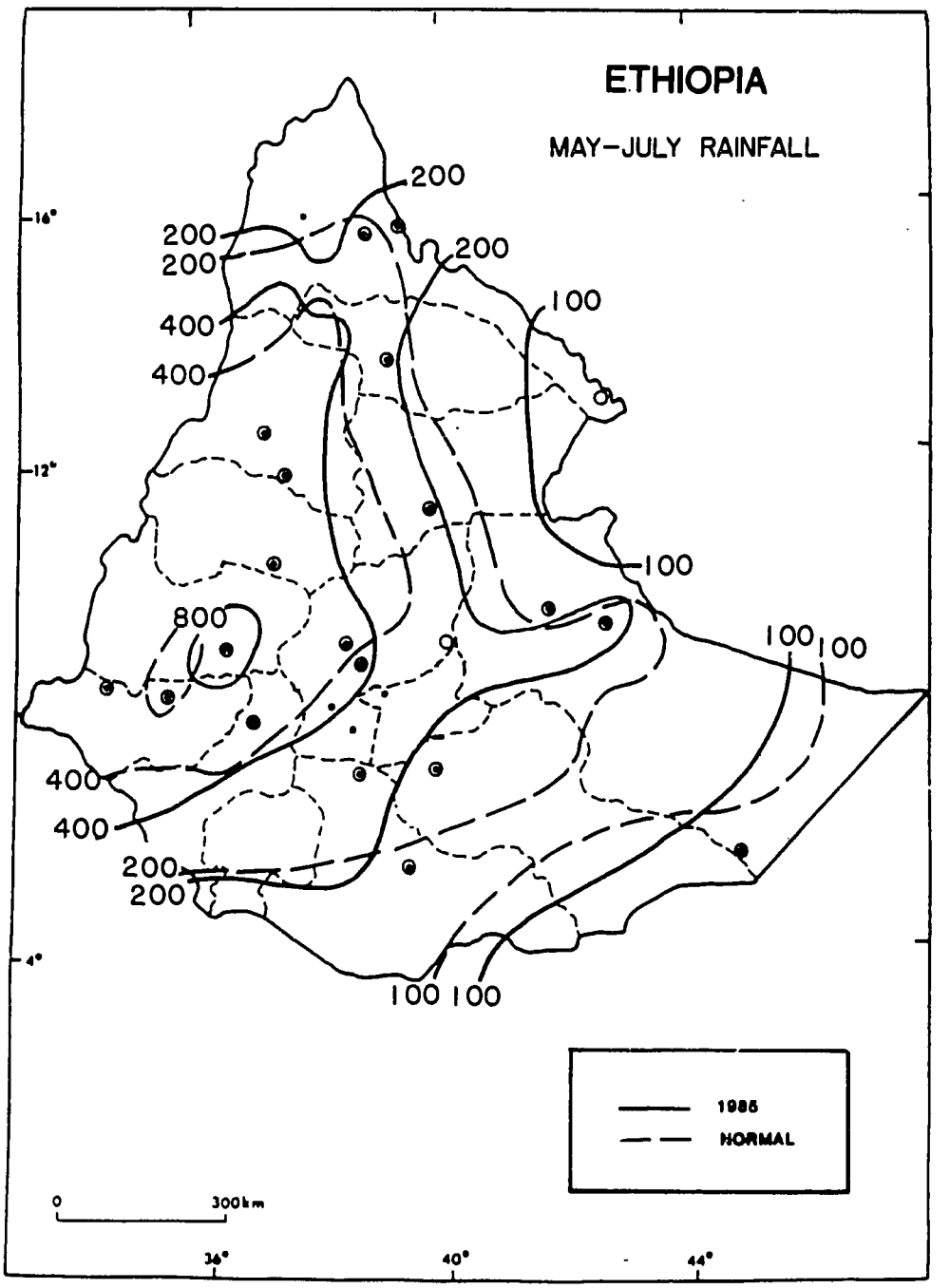

ETHIOPIA
MAY–JULY RAINFALL
200
200
200
200
400
400
100
100
800
100
100
400
400
200
200
100
100
1986
NORMAL
0
300km
16°
12°
4°
36°
40°
44°

Figure 5

MONTHLY RAINFALL TABLE

Expressed in Millimeters (mm), Percent of Normal (%) and Percentiles
(Rnk, on Scale of 0 to 100)

Country: Ethiopia Year: 1985

Station	May (5)			June (6)			July (7)		
	mm	%	Rnk	mm	%	Rnk	mm	%	Rnk
Akordat									
Asmara	92	236	89	94	235	86	158	82	46
Massawa (Mitsiwa)									
Quiha (Mekele)	46	184	81	33	100	55	145	67	16
Gonder	121	141	78	121	77	34	319	98	45
Bahar Dar	145	177	83	120	67	26	318	69	13
Dese (Dessie/Combolc	56	100	59	32	100	62	161	60	12
Debre Marcos	175	192	94	200	128	81	297	100	59
Lekemti	216	89	***	320	87	***	295	74	***
Jima	193	120	66	218	100	50	203	96	47
Gore	274	120	74	322	100	53	265	82	18
Addis Ababa	117	156	80	155	138	86	191	77	14
Harar Meda (Debre Ze	114	278	89	77	96	50	214	98	61
Awash	117	418	***	35	113	***	165	134	***
Awassa	82	67	***	125	136	***	130	98	***
Dire Dawa	45	115	62	25	104	62	120	132	79
Jijiga	58	60	32	67	103	68	105	122	65
Goba	100	95	43	38	64	22			
Gode	43	67	61	2	200	74	2	???	95
Neghelli	166	102	64	13	108	67	1	11	9

Notes:

" " = No data for calculations.

"???" = Percent of normal not calculated because average rainfall is zero.

"*" = Percentiles not calculated because less than 15 years of historical data exist on file.**

Table 1

CUMULATIVE RAINFALL TABLE

Expressed in Millimeters (mm), Percent of Normal (%) and Percentiles
(Rnk, on Scale of 0 to 100)

Country: Ethiopia Year: 1985

Station	May (5)			May - Jun (5-6)			May - Jul (5-7)		
	mm	%	Rnk	mm	%	Rnk	mm	%	Rnk
Akordat									
Asmara	92	236	89	186	235	97	344	126	86
Massawa (Mitsiwa)									
Quiha (Mekele)	46	184	81	79	136	61	224	82	35
Gonder	121	141	78	242	100	56	561	98	55
Bahar Dar	145	177	83	265	101	57	583	81	22
Dese (Dessie/Comoolc	56	100	59	88	100	53	249	70	18
Debre Marcos	175	192	94	375	152	97	672	123	88
Lekemti	216	89	***	536	88	***	831	83	***
Jima	193	120	66	411	108	63	614	104	63
Gore	274	120	74	596	108	74	861	99	53
Addis Ababa	117	156	80	272	145	86	463	107	66
Mahar Meda (Debre Ze	114	278	89	191	158	89	405	119	61
Awasa	117	418	***	152	258	***	317	174	***
Awassa	82	67	***	207	56	***	337	97	***
Dire Dawa	45	115	62	70	111	59	190	123	65
Jijiga	58	60	32	125	77	47	230	93	50
Goba	100	95	43	138	84	26			
Gode	43	67	61	45	69	61	47	72	61
Neghelli	166	102	64	179	102	64	180	98	61

Notes:

" " = No data for calculations.

"???" = Percent of normal not calculated because average rainfall is zero.

"***" = Percentiles not calculated because less than 15 years of historical data exist on file.

Table 2

SOMALIA ASSESSMENT

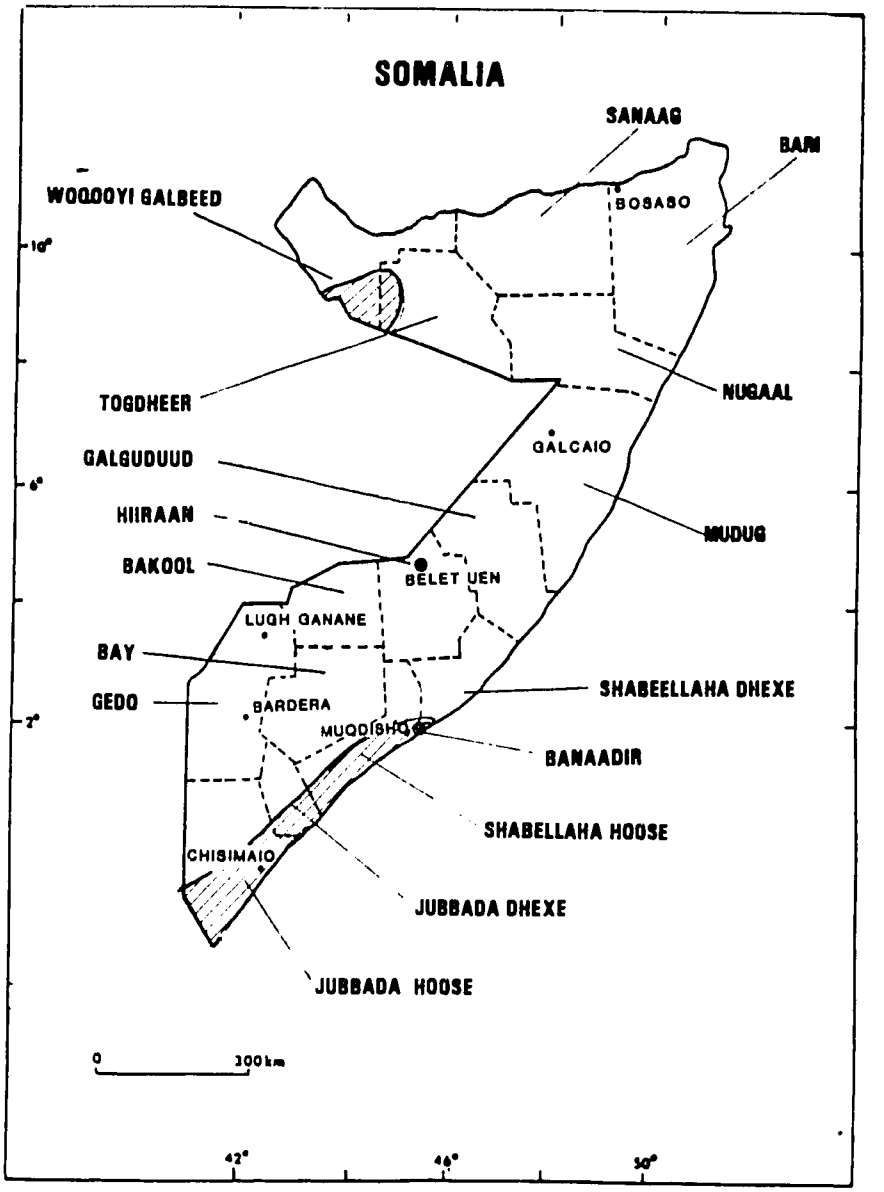


Figure 6

Overview

NOAA satellite imagery composited from daily data (July 11-24, 1985) indicates exceptionally good biomass conditions within extreme southern Somalia (fig. 2). Vegetation is also indicated within coastal areas along the Schebelle River and in the Northwest Department in the vicinity of Hargeism (fig. 5). Vegetation in extreme southern Somalia is believed to primarily represent forest cover (comments will be appreciated). Coastal vegetation can be discerned in the image by "looking through" the clouds located over Mogadeshu. More current cloud-free images clearly indicate extensive vegetation in this river basin area. The residual cloud cover existing even after daily compositing of satellite data suggest continued shower activity in coastal areas. (Note: satellite derived vegetation/biomass indexes will include southern Somalia within the next assessment. If cloud-free conditions exist, NOAA/NESDIS will process a special set of one kilometer satellite data for use in the next assessment. Assessments could be substantially improved if decadal rainfall data could be regularly cabled to NOAA/NESDIS. Data would help in calibration of AISC methods for estimating Somalian rainfall from satellite data).

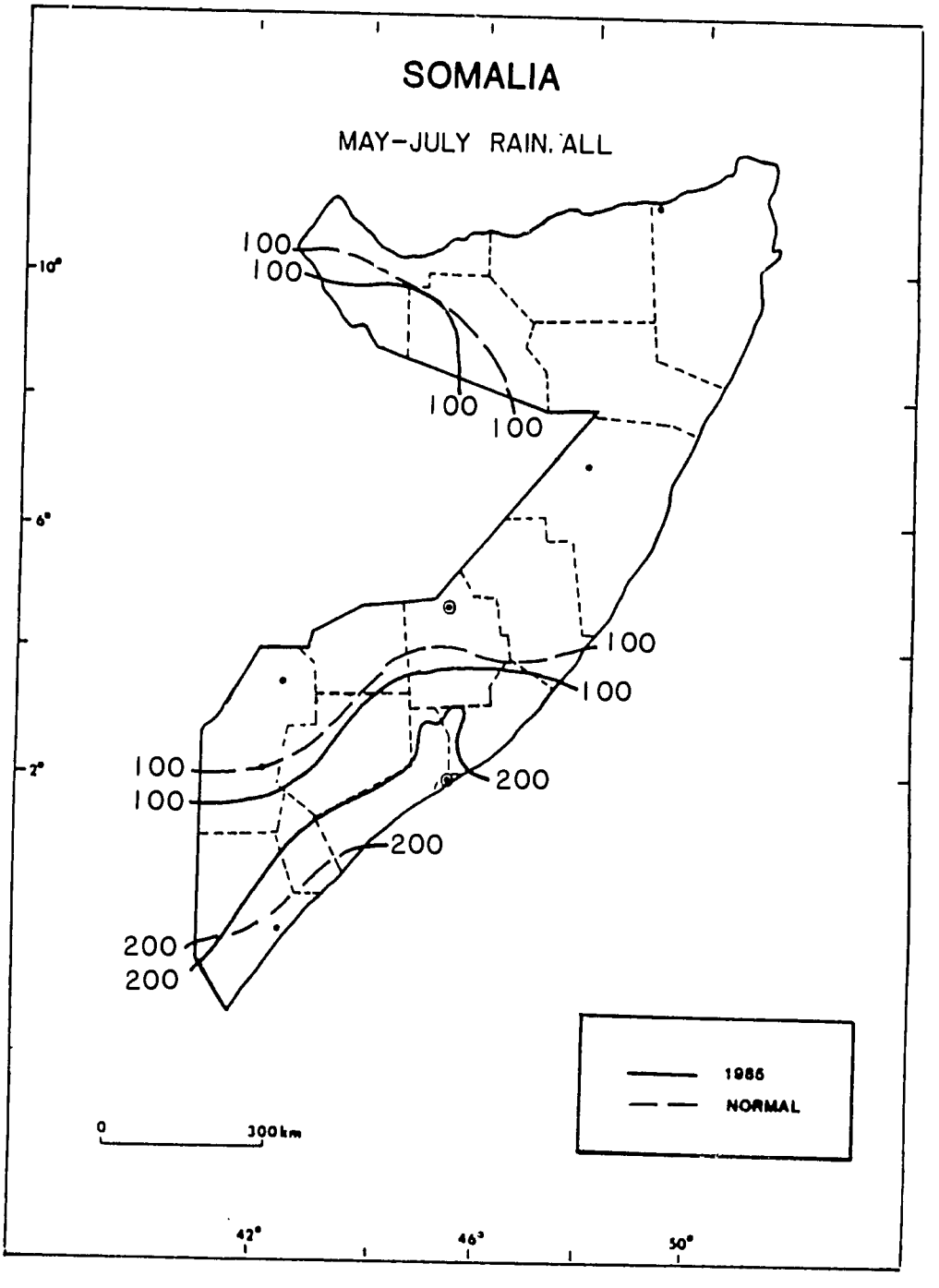

SOMALIA
MAY-JULY RAIN. ALL
100
100
100
100
100
100
100
100
200
200
200
200
10°
6°
2°
42°
46°
50°
0
300km
1985
NORMAL

Figure 7