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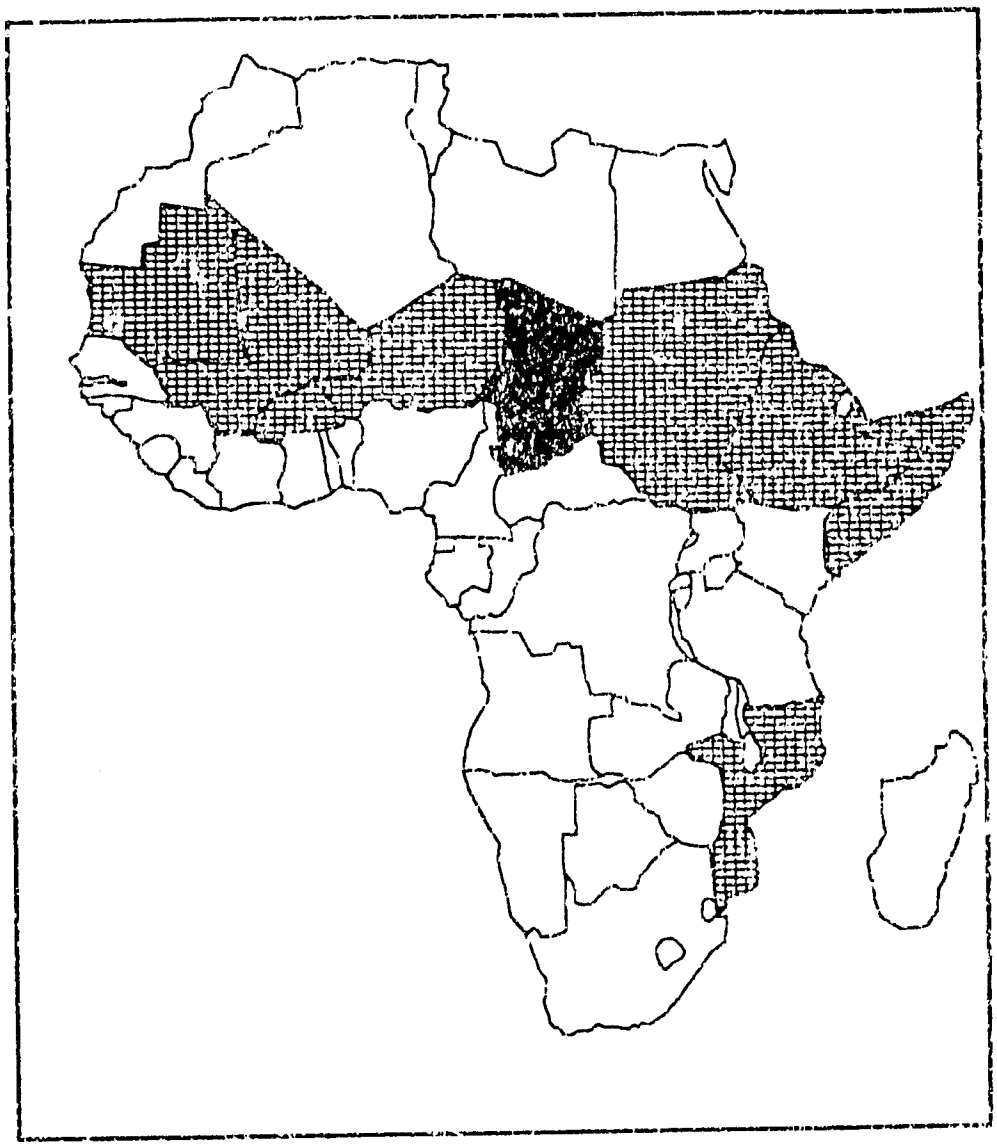
Report Number 4
September 1986

FEWS Country Report

CHAD



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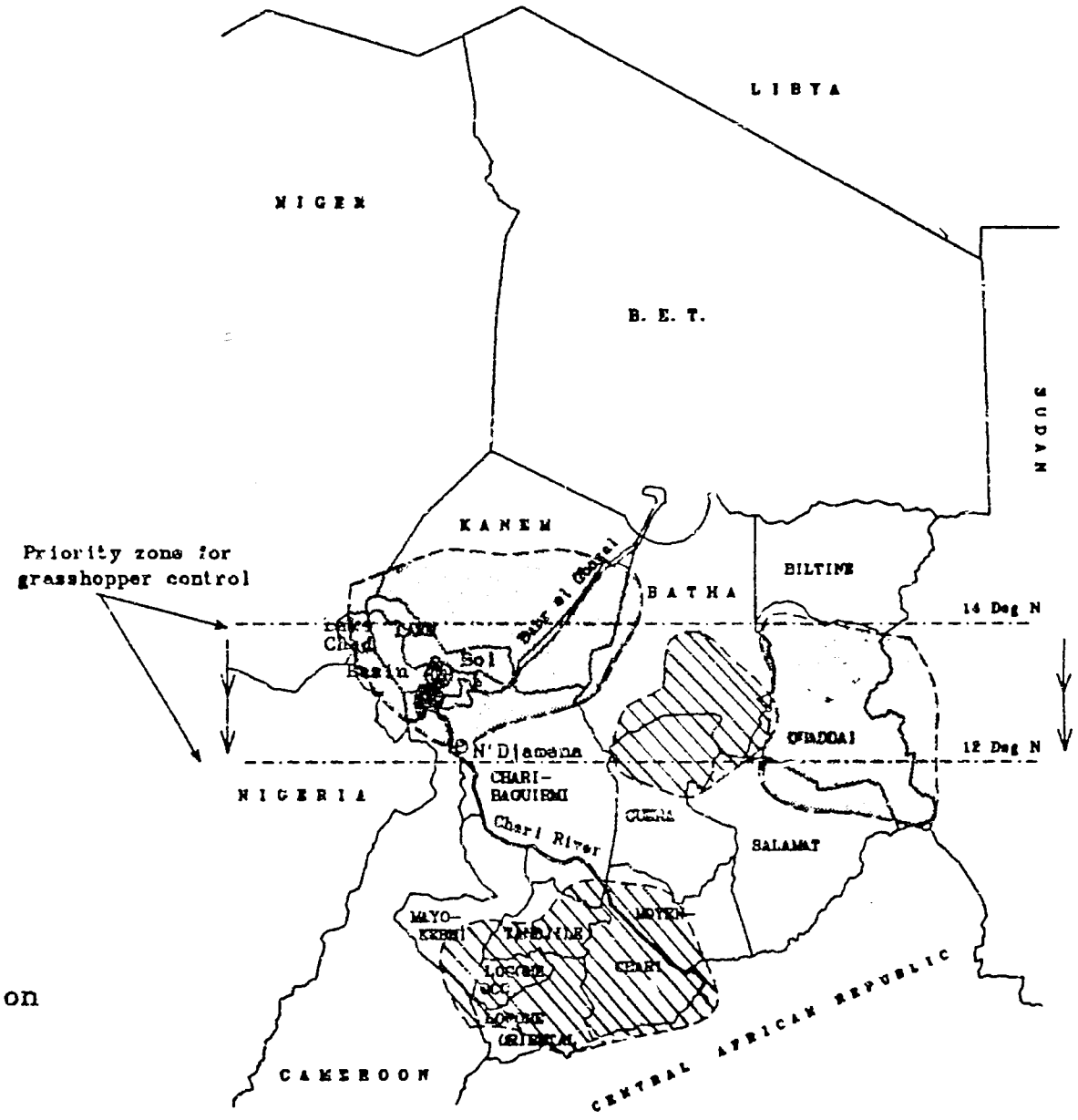
Map 1

CHAD: Summary Map



Areas of vegetation stress

Areas of strong vegetation growth

Current Migratory Locust infestation

Map: FEWS/PWA, September 1986

Famine Early Warning System Country Report

CHAD

Locust Threat Small, Grasshoppers Still Loom

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

Prepared by
Price, Williams & Associates, Inc.
September 1986

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INTRODUCTION

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

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

> ...those persons lacking sufficient food, or resources to acquire sufficient food, to avert a nutritional crisis, i.e., a progressive deterioration in their health or nutritional condition below the status quo and who, as a result, require specific intervention to avoid a life-threatening situation.

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

Where possible, 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.

FEWS is operated by AID's Office of Technical Resources in the Bureau for Africa in cooperation with numerous USG and other organizations.

SUMMARY

Rainfall in Chad this year is better than in 1985, but has not reached the 30-year average. Vegetative growth through 13 Degrees North Latitude was luxuriant at the end of July, but by late August, vegetation in central Chad was showing stress. Crop damage due to locusts will be minimal. Vigilance over the Migratory Locust outbreak area must be maintained through next spring, however, as the gregarization tendencies begun this year could continue. Grasshoppers may still cause problems north of 12 Degrees North Latitude.

Issues

- The Migratory Locust infestation in Lake Prefecture is small and can be controlled via the current plan.
- Grasshoppers continue to threaten this year's harvest, and control spraying has not yet begun. By the end of August, a spray plane had not yet been hired, stalling the control program further.

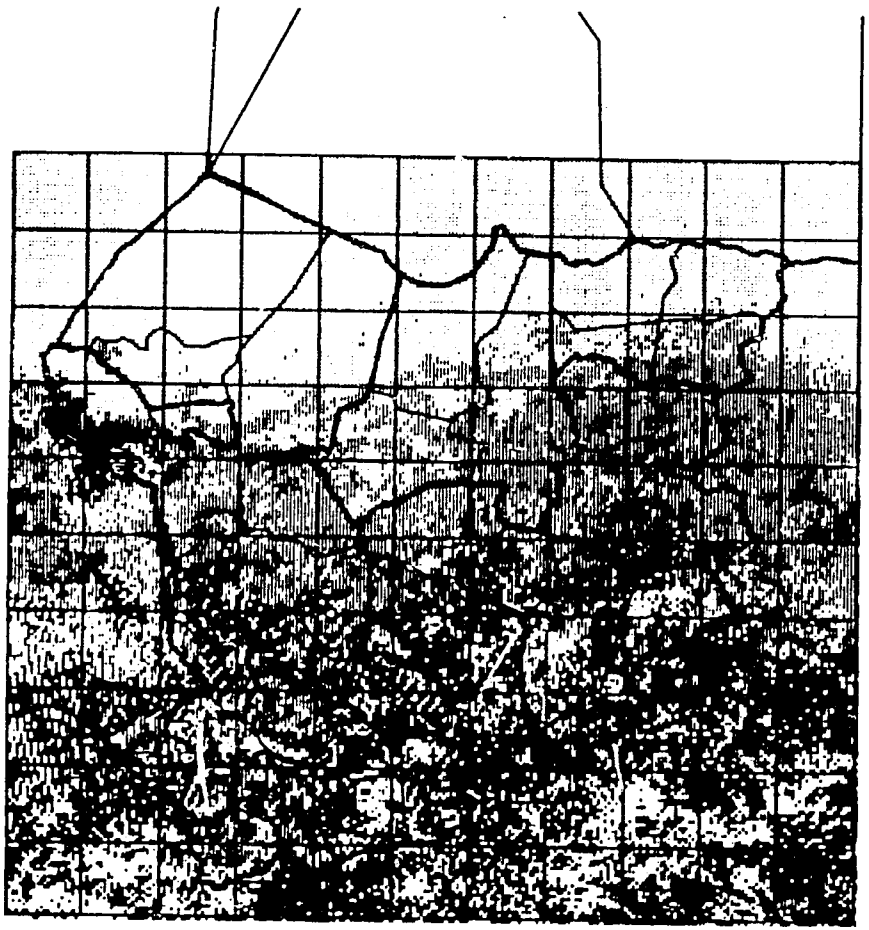
Key September Events

- The locust control program must start and finish before the September flooding of Lake Chad disperses the insects.
- Chad's rainy season will slow down, and should end in the northern parts of the Sahelian zone. This event coincides with the final maturation of wild grasses, making them unattractive to grasshoppers, and the ripening of cereal crops, which could become the grasshoppers' next target for food.
- By late September, the grasshopper control program should start, in the northern parts of the Sahelian zone, to limit possible crop damage.

RAINFALL AND AGRICULTURE

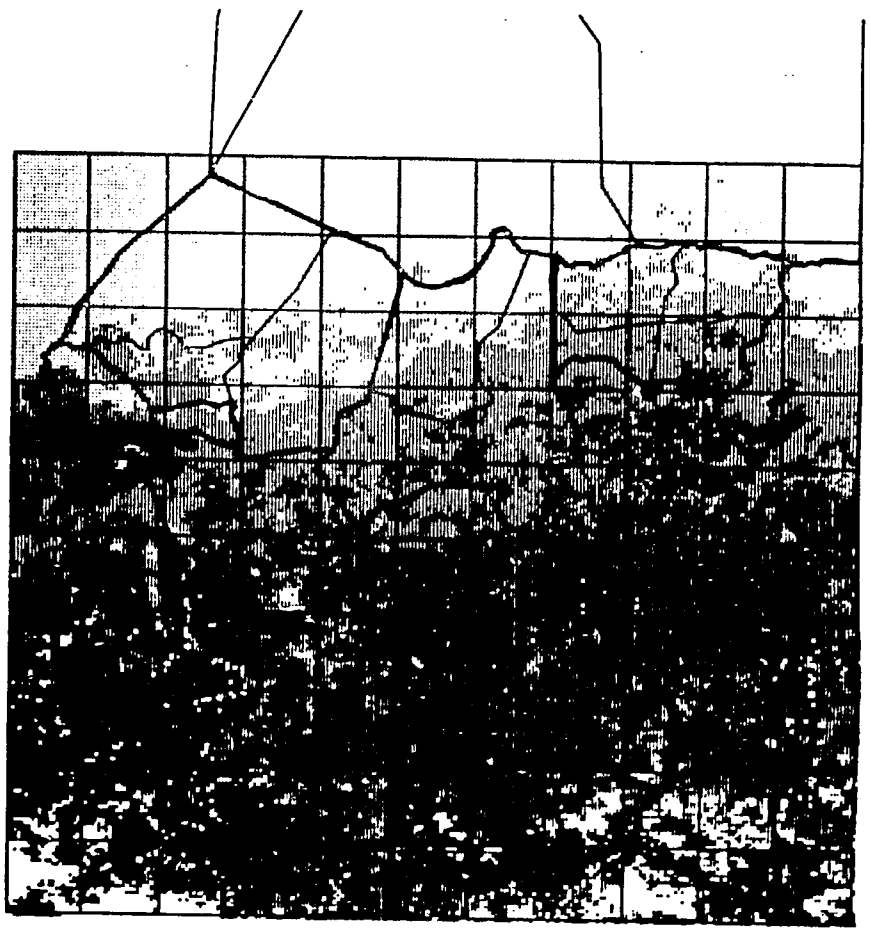
Rainfall has been favorable throughout the country during the period August 11-20, according to Agrhymet in Ndjamena. The rain has been better than that of last year, but most stations remain below the 30-year average on cumulative rainfall. This contrasts with the NOAA assessment for the same period, which put rainfall overall at 30 to 50% below the 30-year average. Satellite imagery for late July and mid-August show a substantial decrease in the amount of cloud cover over Chad (Figure 1). While the presence of cloud cover does not necessarily indicate the presence of rain, the lack of cloud cover does indicate a lack of rain, which bears NOAA's assessment out. The weather service in Chad is optimistic that widespread rainfall will continue through the end of August.

FIGURE 1: Chad, 7-17 Deg N by 13-24 Deg E, Vegetation Images, Late July and Mid-August, 1986



Chad, Vegetation Image, July 21-31, 1986

8499	15.9636%	Clouds
15555	29.2168%	Bare Soil
12646	23.7528%	Sparse Vegetation
14869	27.9282%	Vegetation
1633	3.0672%	Heavy Vegetation
38	0.0714%	Water, Mud



Chad, Vegetation Image, August 11-20, 1986

2104	3.9519%	Clouds
12566	23.6026%	Bare Soil
10283	19.3144%	Sparse Vegetation
24516	46.0481%	Vegetation
3740	7.0248%	Heavy Vegetation
31	0.0582%	Water, Mud

There was abundant and widespread rainfall in both the Sahelian and Sudanian zones during the last 10 days of July, and even more widespread and heavy rain during the first 10 days of August. The Chari River reached 224 cm on July 31, 1986 (compared to 266 cm by late July 1985), reflecting the low level of rainfall during June and early July in the Sudanian zone. The Agrhymet expects a sharp increase in river level following the late July heavy rainfall recorded in Sarh and Mondou.

Field data reported by Government of Chad (GOC) agriculture and livestock technicians showed that there was luxuriant growth through 13 Degrees North Latitude (Deg N) for the last part of July. Planted crops were at the tillering and heading stage in the Sudanian zone and at the tillering stage in the Sahelian zone. By mid-August, crop development in the central areas had become more advanced than in the previous two years. The acreage planted in cereals in the Sudanian zone is also larger than that planted last year. This is reflected in the satellite imagery (Figure 1, see APPENDIX I for further satellite imagery discussion).

PESTS

Locusts and Grasshoppers

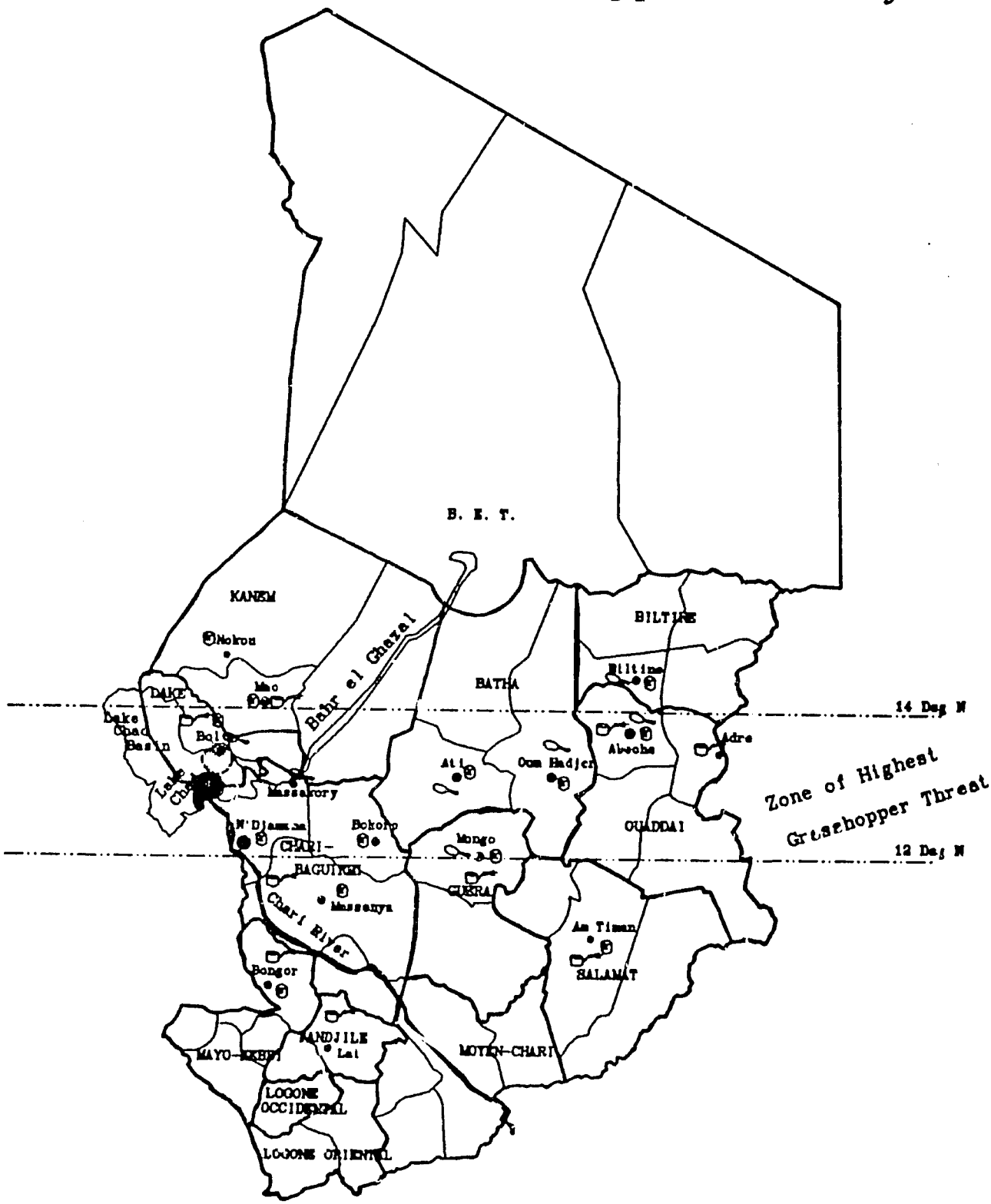
During late August, a joint US Agency for International Development (AID) Office for Foreign Disaster Assistance (OFDA)/UN Food and Agriculture Organization (FAO)/Chadian Crop Protection Service (CCPS) assessment team visited the Lake Chad, Lake Prefecture (western Chad), Abeche, Ouaddai Prefecture (eastern Chad) and Mongo, Guera Prefecture (central Chad) areas. In Abeche, the team spoke with a CCPS assessment team that had surveyed Biltine (Biltine Prefecture), Ati, Oum Hadjer (Batha Prefecture) and Abeche (Map 2).

The joint team confirmed the presence of Migratory Locusts in damaging numbers in millet and corn fields in one area near Lake Chad. In Ouaddai and Guera Prefectures, while there is no threat from Migratory Locusts, a future threat from grasshoppers was noted. On the trip to Lake Chad, the team saw grasshoppers but few locusts in Chari-Baguirmi Prefecture. The separate CCPS team found only a few Migratory Locusts, all solitarious, near Biltine and Oum Hadjer, indicating no locust threat for Batha or Biltine Prefectures.

In Lake Prefecture, the joint assessment team identified 4000 hectares (ha) in lake polders near the town of Bol which were infested with adult and nymphal (also called larvae or hoppers) Migratory Locusts. Overall, the insect density was less than that reported one month

Map 2

CHAD: Locust and Grasshopper Summary



Area of Current African Migratory Locust Outbreak

Sites Visited by Joint USAID/OFDA/FAO/CCPS and/or Independent CCPS Assessment Team

Equipment and Insecticide to be Prepositioned

Areas Targetted for Aerial Spraying

Map: FEWS/PWA, September 1986

earlier, perhaps due to migration to other areas around the lake (see APPENDIX III for density figures). The adult locusts were all solitarious; some, but not many, of the nymphs were in transition between the solitary and gregarious phases. (The presence of nymphs indicates that the locust population is still increasing in that area.) Inspection of eight additional sites along the southern and eastern edge of Lake Chad showed adult (all in solitary phase) and nymphal Migratory Locusts present in quite low numbers (0 to 0.23 insects per square meter). Soon after September 1, Lake Chad will rise and displace the locusts to surrounding millet crops to the north and east, or result in possible migration to the south along the Chari River Basin. (see APPENDIX II for a description of Migratory Locust ecology in Chad.)

In Ouaddai and Guera Prefectures, the presence of O. senegalensis (Senegalese Grasshoppers) and A. simulatrix (known to swarm on rare occasions) could become a threat at the end of rainy season in late September to mid-October, when wild grasses die and grasshoppers move into cultivated fields. If the infestations are large, this will negatively affect crop yield, as the end of the rainy season is coincident with the grain ripening stage.

Grasshopper and locust assessments continue with a joint team trip to Mao (Kanem Prefecture), Ati (Batha Prefecture) and Adre (eastern part of Ouaddai Prefecture). The results of this trip are not yet in.

Insect Control

Donors have been responsive to the call for aid for grasshopper and locust control, and virtually all of the $2 million control program has been financed. Pledged insecticide and equipment are arriving in Chad and are being prepositioned in Kanem, Lake, Biltine, Chari-Baguirmi, Mayo-Kebbi, Salamat, Batha, Guera and Ouaddai Prefectures (Map 2). The control program is to begin in late September through November in the various prefectures. As of August 28, the airplane under negotiation for use for locust and grasshopper spraying in Chad had been contracted by Niger. It is not known whether this will affect the start of the aerial spraying campaign.

In Bol Sub-prefecture, Lake Prefecture, the most recent plan is to spray 1500 ha of heavily infested wild grasses and cultivated fields via small airplane on September 17 to 19, and then instruct and equip farmers to carry out follow-up control activities on the ground. The total area around Bol to be treated for locusts is estimated at 4,000 ha. In addition to crop protection, the objective is to keep the total locust population low in order to

prevent further gregarization and any subsequent tendency to swarm. (Gregarization is a morphological change that is triggered by high locust density, and then by the presence of gregarious phase locusts. The change is passed from generation to generation unless a decrease in population density triggers a return to the solitarious phase.)

The resources mobilized by the AID grant, including the rental of a spray plane, will be needed by the GOC for grasshopper control from late September to mid November, the period when the threat from O. senegalensis and A. simulator will be most serious. Aerial spraying will be carried out in Lake, Kanem, Ouaddai, Guera, Chari--Baguirmi, Salamat, Mayo-Kebbi and Tandjile Prefectures, in that order, over an estimated 200,000 to 300,000 ha between 12 and 14 Deg N.

Rats

Rats are still a major pest problem in Lake Prefecture. In fact, BANDAID and Care/UK are providing rodenticide to prevent loss of seed to rats after next year's planting. In the Massaguet-Massakory area of Chari-Baguirmi Prefecture, rat damage reached 60% in selected sorghum fields, less than 20% in millet fields, and 25% on peanuts.

Implications for Chad Agriculture

The areas which are and will be experiencing locust and grasshopper infestations are not major crop producing areas for Chad. These areas are in the Sahelian zone (between 12 and 14 Deg N), where a mixture of herding and subsistence farming is practiced. Food is not generally imported from other areas, so that local cereal crops are the only grain source. APPENDIX III estimates the effect locusts will have on crops in Lake Prefecture, the only prefecture with substantial locust infestations. The figures are not in yet for densities of grasshopper infestations in the affected prefectures, so that no estimates of their affects on this years harvest can be made at this time.

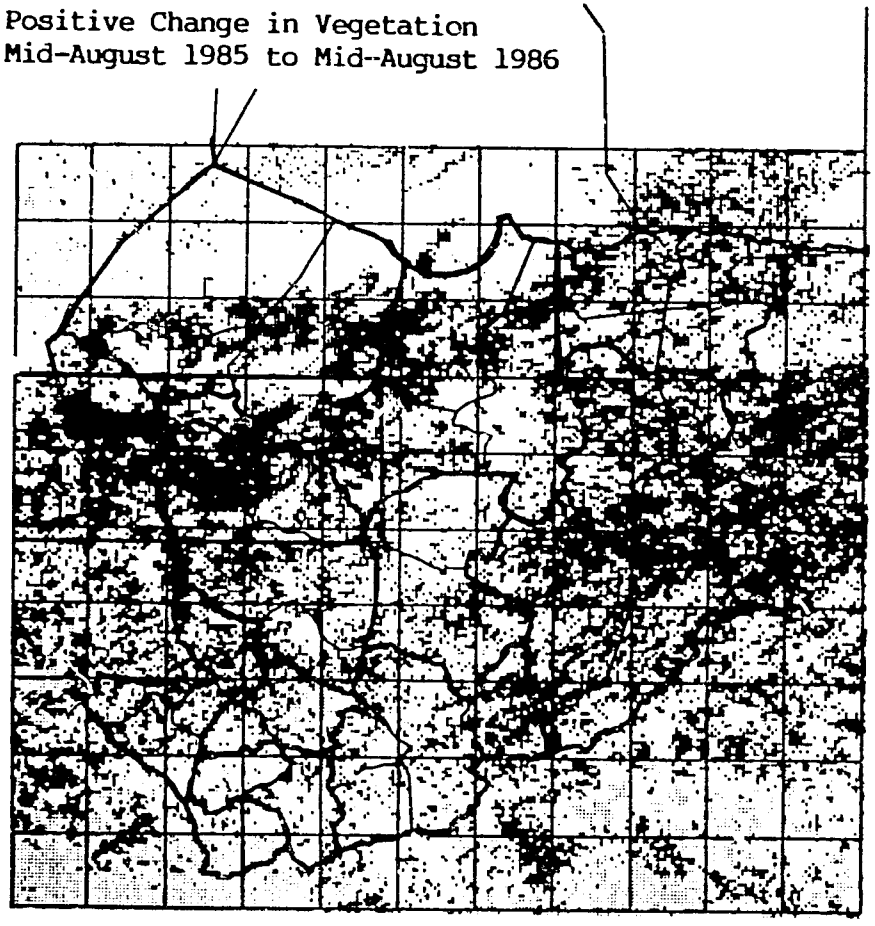
APPENDIX I
Satellite Vegetation Imagery

A look at satellite vegetation imagery for mid-August shows that the western areas (Lake, Kanem and Chari-Baguirmi Prefectures) and eastern areas (Biltine, Ouaddai and Salamat Prefectures) of Chad below 16 Deg N have a good bit more vegetation than last year, while the central and southeastern areas (southern Batha, Guera, Moyen-Chari, Logone Occidental and Logone Occidental Prefectures) are doing less well than last year (Figure 2).

In a closer look, it can be seen that the Lake and southern Kanem area got progressively greener from late June through early August, when the greening trend slowed down (Figure 3). This would imply that the rains have slowed down in that area since the beginning of August. In Ouaddai Prefecture, on the other hand, the greening trend has continued steadily (Figure 4). While southern Batha Prefecture is not as green as last year, there has been steady growth during the 1986 summer months (Figure 5), implying that the rains at least have been steady. In Moyen-Chari Prefecture, however, there have been periods of fast greening interspersed with periods of slow greening and even negative change, reflecting the uncertain rains that that area has experienced (Figure 6).

FIGURE 2: Chad, 7-17 Deg N by 13-24 Deg E, Change in Vegetation Image: Mid-August 1985 to Mid-August 1986

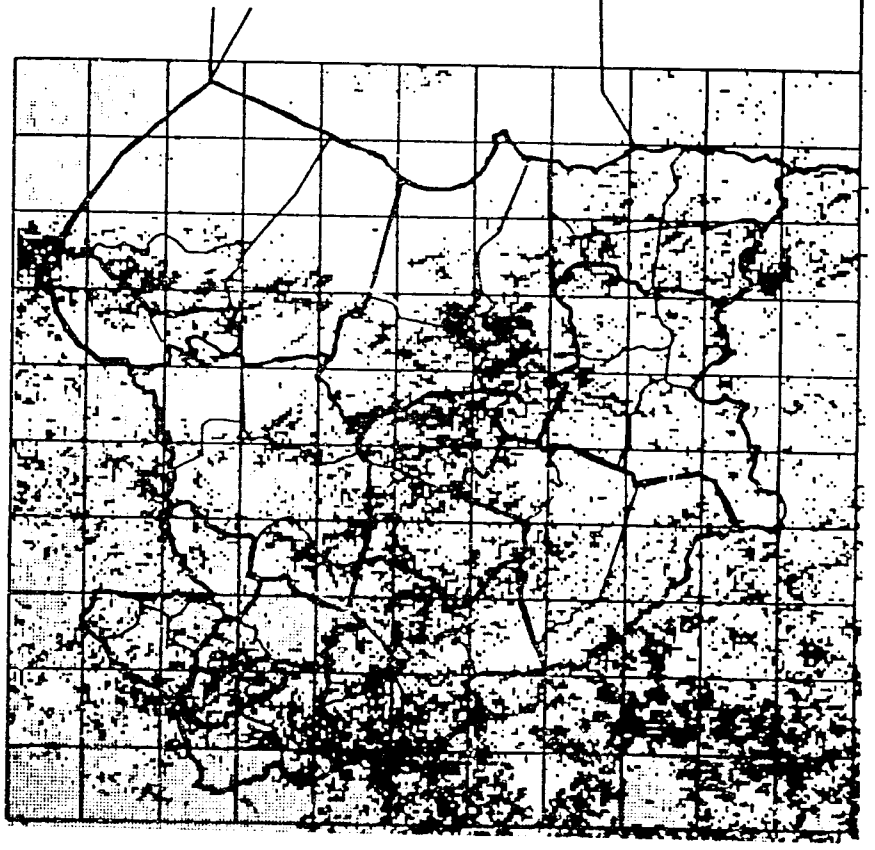
Positive Change in Vegetation
Mid-August 1985 to Mid-August 1986



Chad, Negative Vegetation Image, August 11-20, 1985-86

36097	67.8005%	No Change, or Positive Change
5184	9.7370%	Clouds in Either Image
5971	11.2153%	1 Category Decline
3191	5.9936%	2
1603	3.0109%	3
773	1.4519%	4
421	0.7908%	5 or more Category Decline

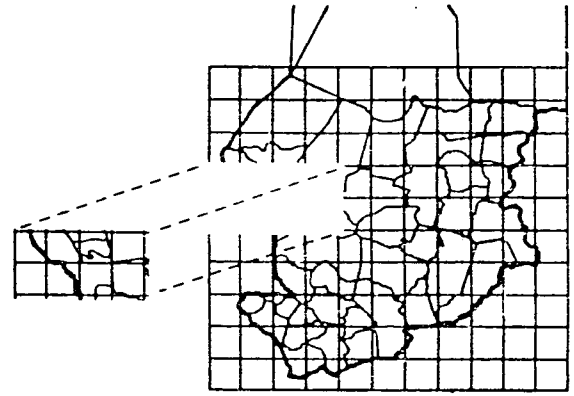
Negative Change in Vegetation
Mid-August 1985 to Mid-August 1986

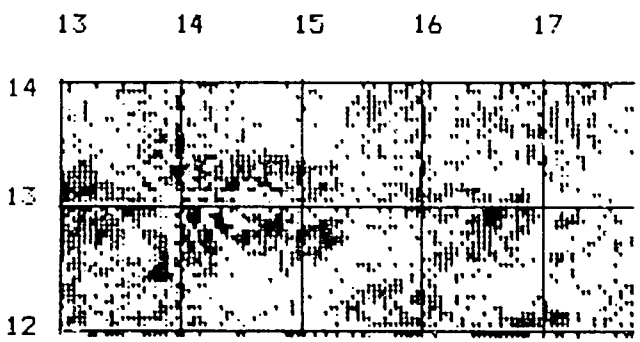


Chad, Positive Vegetation Image, August 11-20, 1985-86

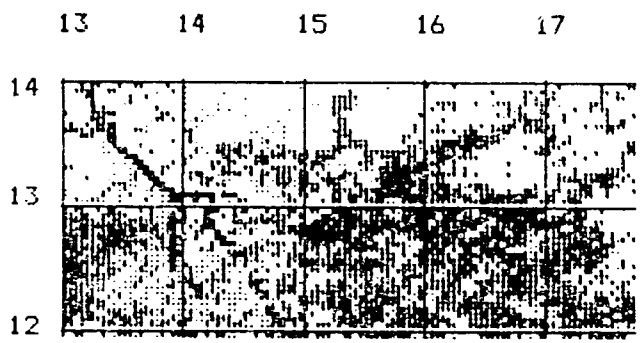
28764	54.0270%	No Change, or Negative Change
5184	9.7370%	Clouds in Either Image
10224	19.2036%	1 Category Improvement
5423	10.1860%	2
2319	4.3557%	3
818	1.5364%	4
508	0.9542%	5 or more Category Improvement

FIGURE 3: Lake, Southern Kamen and Northern Chari-Baguirmi Prefectures, Positive Change in Vegetation Image by Ten Day Period, Late June to August



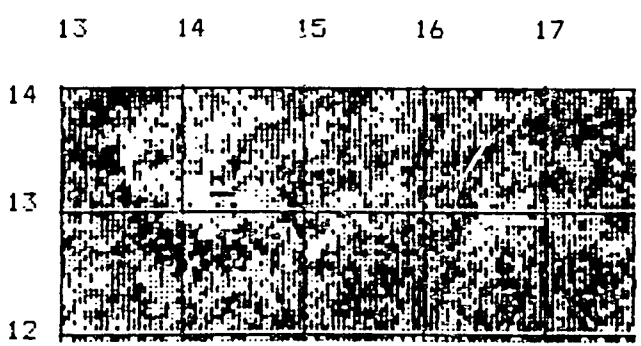


Positive Vegetation Change
June 21-30/July 1-10, 1986

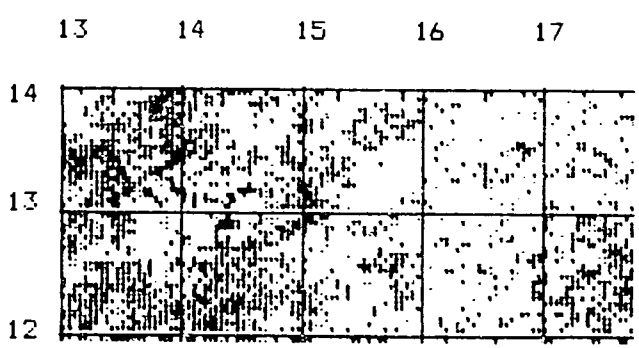


Positive Vegetation Change
July 1-10/July 11-20, 1986

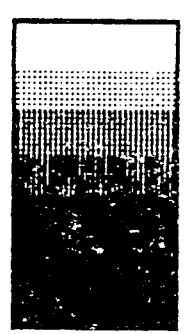
Positive Vegetation Change
July 11-20/July 21-31, 1986



Positive Vegetation Change
July 21-31/Aug 1-10, 1986

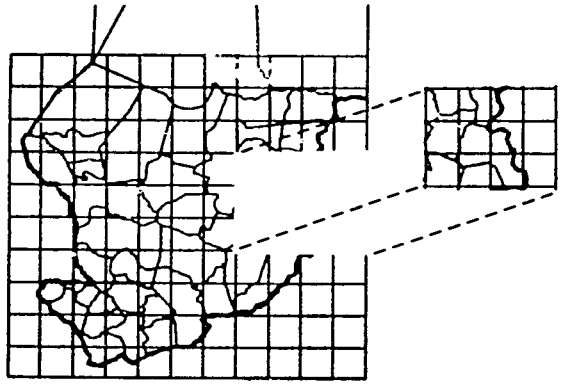


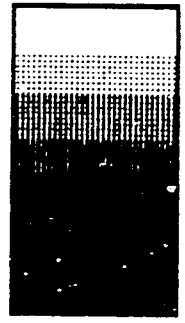
Positive Vegetation Change
Aug 1-10/Aug 11-20, 1986



No Change, or Negative Change
Clouds in Either Image
1 Category Improvement
2
3
4
5 or more Category Improvement

FIGURE 4: Ouaddai Prefecture, Positive Change in Vegetation Image by Ten Day Period, Late June to Mid-August





No Change, or Negative Change

Clouds In Either Image

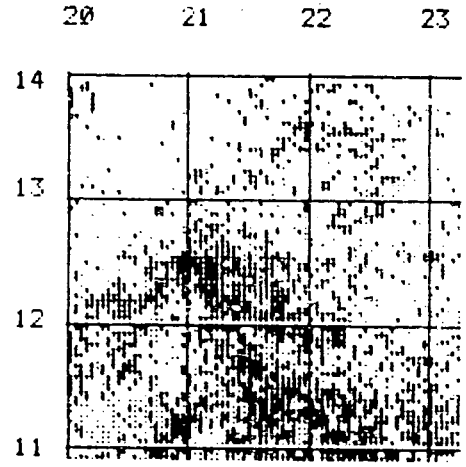
1 Category Improvement

2

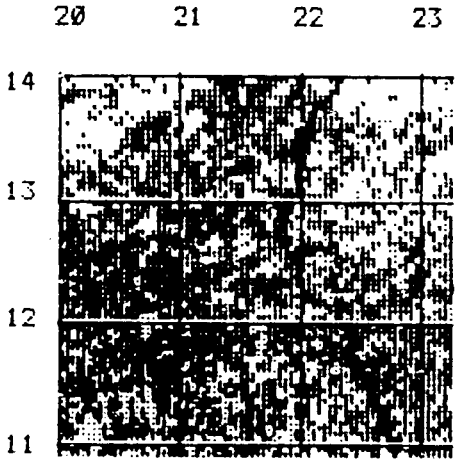
3

4

5 or more Category Improvement



Positive Vegetation Change
June 21-30/July 1-10, 1986



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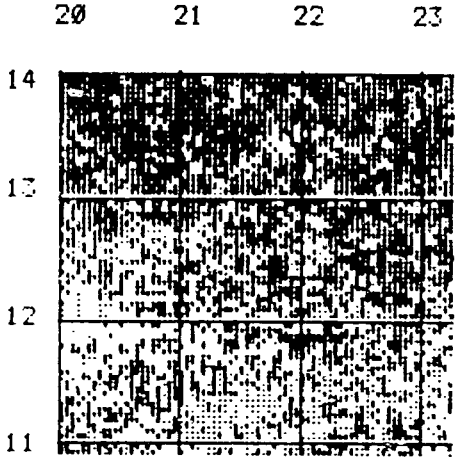
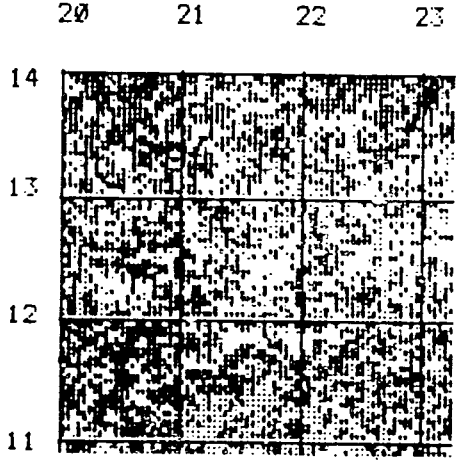
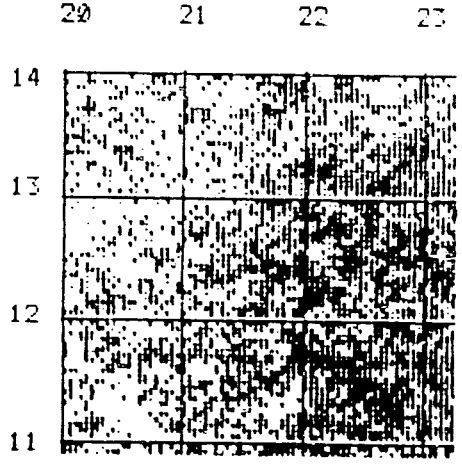
July 1-10/July 11-20, 1986



Positive Vegetation Change
July 11-20/July 21-31, 1986

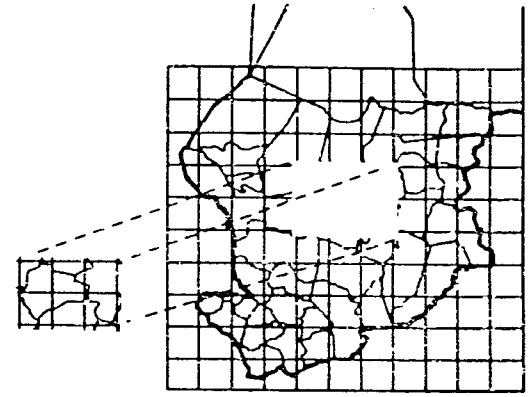


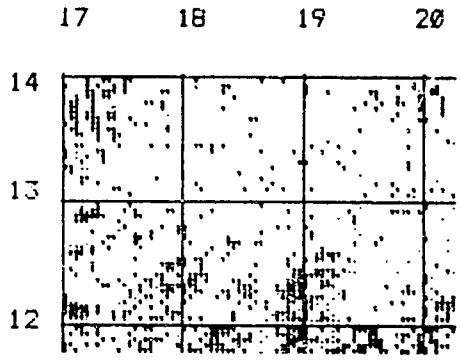
Positive Vegetation Change
July 21-31/August 1-10, 1986



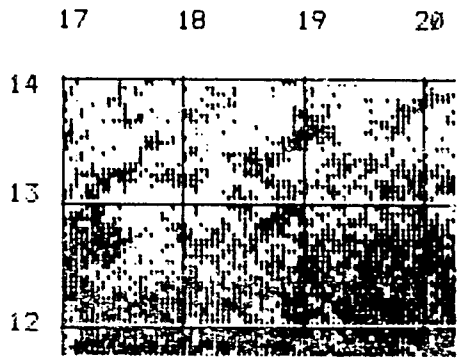
Positive Vegetation Change
Aug 1-10/Aug 11-20, 1986

FIGURE 5: Southern Batha and Northern Guera Prefectures, Positive Change in Vegetation Image by Ten Day Period, Late June to Mid-August

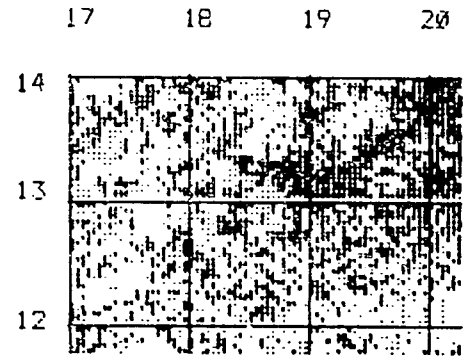




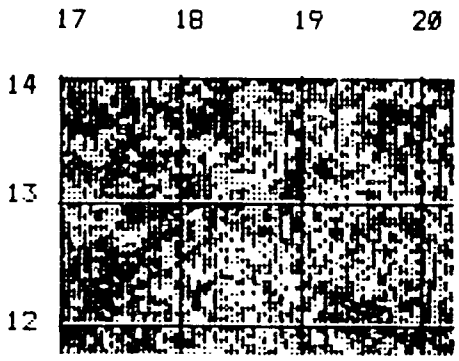
Positive Vegetation Change
June 21-30/July 1-10, 1986



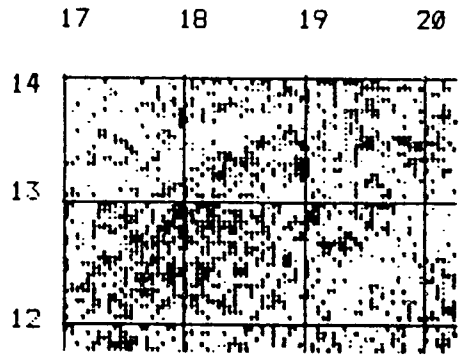
Positive Vegetation Change
July 1-10/July 11-20, 1986



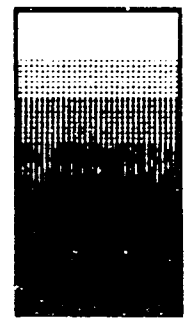
Positive Vegetation Change
July 11-20/July 21-31, 1986



Positive Vegetation Change
July 21-31/Aug 1-10, 1986



Positive Vegetation Change
Aug 1-10/Aug 11-20, 1986



No Change, or Negative Change

Clouds In Either Image

1 Category Improvement

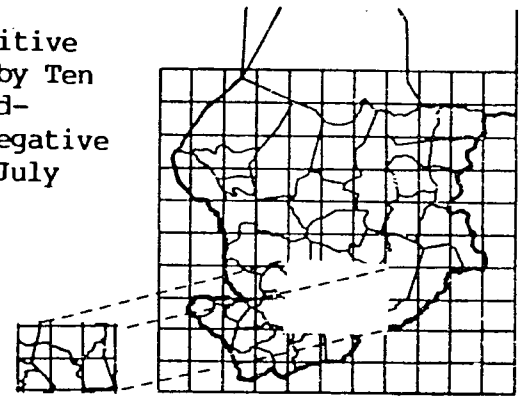
2

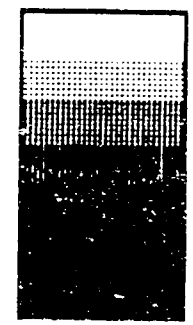
3

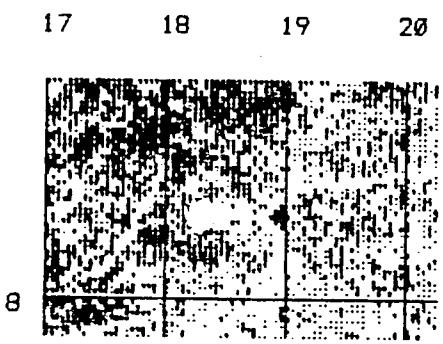
4

5 or more Category Improvement

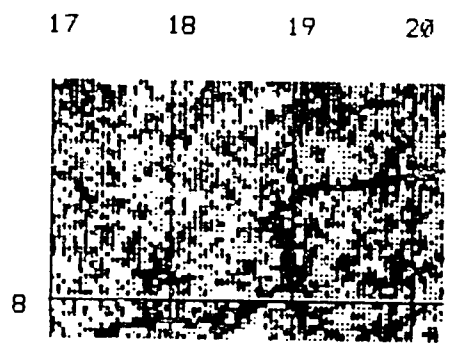
FIGURE 6: Moyen-Chari Prefecture, Positive Change in Vegetation Image by Ten Day Period, Late June to Mid-August, and Corresponding Negative Change in Vegetation, Late July to Mid-August



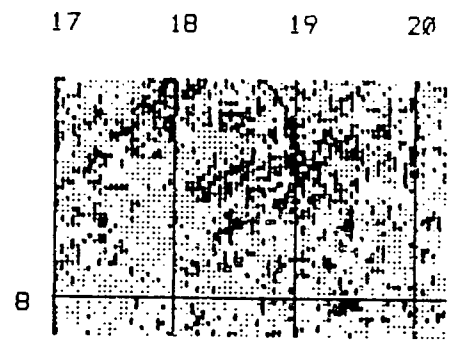




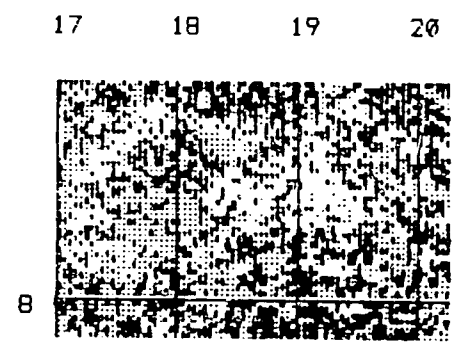
Positive Vegetation Change
June 21-30/July 1-10, 1986



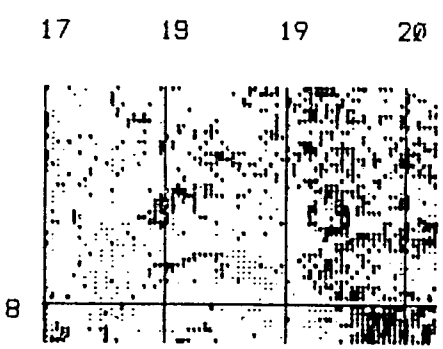
Positive Vegetation Change
July 1-10/July 11-20, 1986



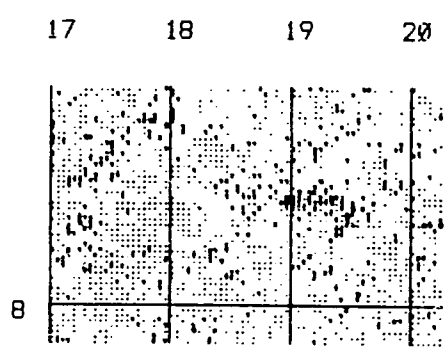
Positive Vegetative Change
July 11-20/July 21-31, 1986



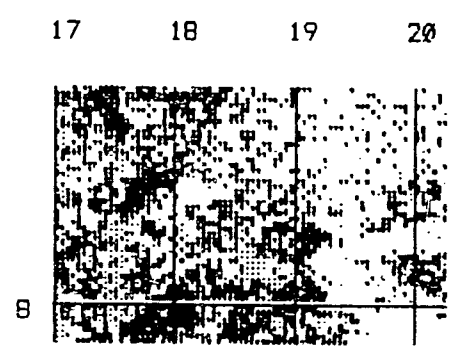
Positive Vegetative Change
July 21-31/Aug 1-10,1986



Positive Vegetation Change
Aug 1-10/Aug 11-20, 1986



Negative Vegetation Change
July 21-31/Aug 1-10, 1986



Negative Vegetation Change
Aug 1-10/Aug 11-20, 1986

APPENDIX II
African Migratory Locusts in Chad

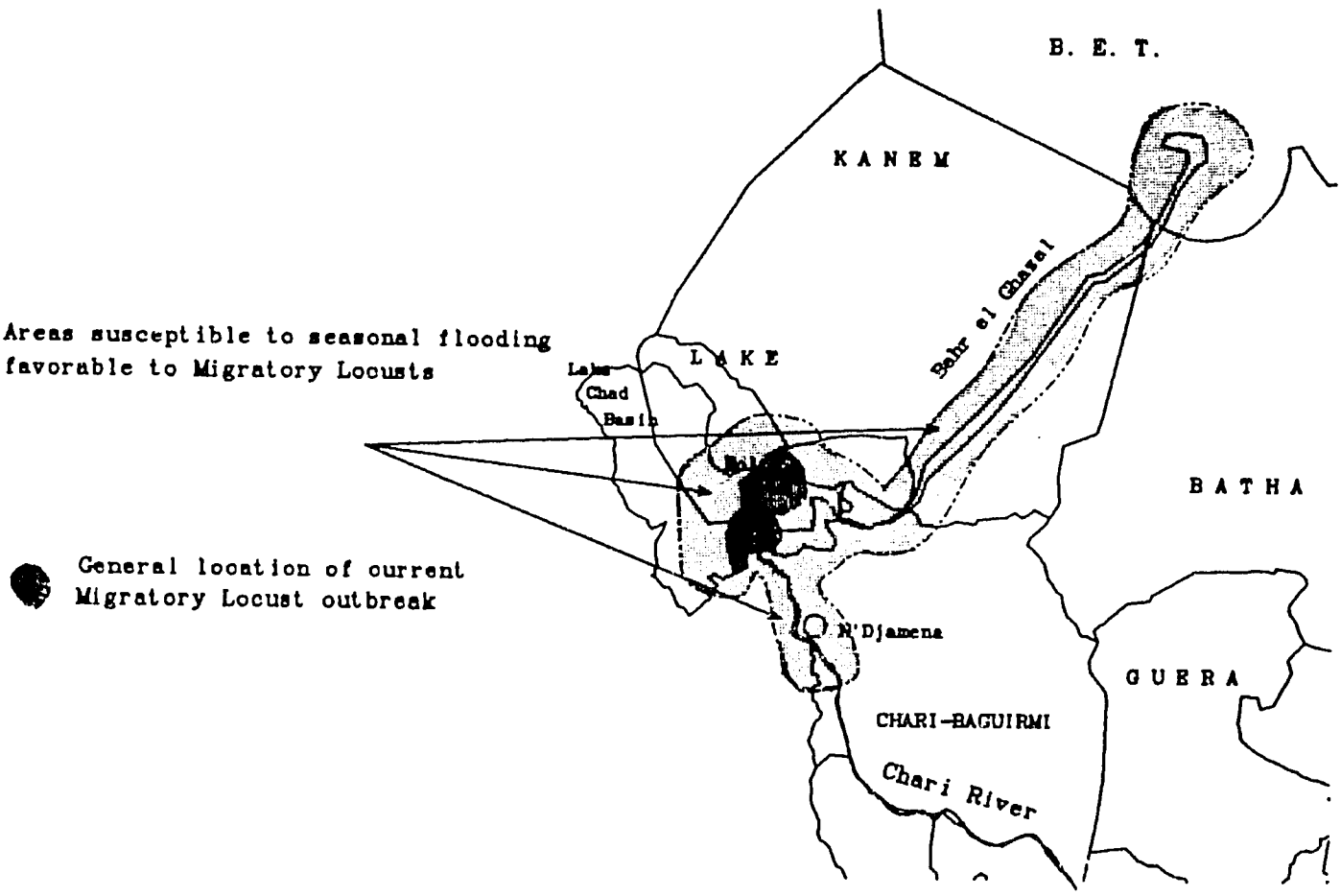
In areas containing bodies of water with annual flooding-recessional seasons, Migratory Locusts go through three or four generations in a year. In Chad, Lake Chad, the Chari River between Ndjamena and t lake, and occassionally the Bahr el Ghazal, a 300 mile l epression which drains from Lake Chad through Ka. . Prefecture, have such annual seasons (Map 3).

This year there has already been flooding along the Chari River, and flooding of Lake Chad to the northeast is imminent. It is not clear, however, whether the Bahr el Ghazal will flood this year. While July and August rains have been stronger this year than last in the south of Chad (the drainage basin for the Chari River, which itself feeds into Lake Chad), the river level at Ndjamena was still lower at the end of July than at the same time last year (224 mm versus 266 mm). This may reflect the late start of the rains and poorer rains in parts of the Central African Republic and Cameroon which also drain into the Chari River Basin. It is most likely that Lake Chad will not flood sufficiently to spill over into the Bahr el Ghazal this year.

The Migratory Locust generation cycle is considered to start at the height of the floods, well into the rainy season. In Chad, this would be from August to late October as you move north to Lake Chad, then northeast up the Bahr el Ghazal. At this point, the locusts are driven by the rising waters to surrounding Sahelian areas, where they lay eggs in soil moistened by the rains. Where the rains have been light, the eggs may take as many as 100 days to hatch. Where the soil moisture is adequate, hatching can occur in as little as 10-20 days. After the end of the rainy season, the locusts follow the receding flood waters and lay a second generation in the damp soil. This occurs from November through January as you move back south from the Bahr el Ghazal. During January through late March some locusts may breed again to produce a third generation in the flood plains immediately adjacent to Lake Chad. Production of this third generation depends on the extent of the flooding. By the time the rains begin in June or early July and a fourth generation (the First Rains Generation) is produced, the floods have disappeared and the locusts are in the period of highest concentration. Fledging occurs in late June to August and the young adults move out into the surrounding Sahel and the cycle begins again.

Map 3

CHAD: Seasonal Floods



Map: FEWS/PWA, September 1986

The type of vegetation cover in an area will also affect where Migratory Locusts tend to dwell and breed. The African Migratory Locust is seldom found in flood plain areas of very dense grasses (up to 2 meters high) or areas of floating or matted grasses (found in areas flooded for the longest time). Rather, the better locust habitats are more open areas with such grass species as Eragrostis and Panicum and scattered patches of bare soil, which provide good laying sites. In Sahelian areas, man-made clearings are the most important habitats and seem to be more favored than those which occur naturally. This has obvious implications with regard to cereal crops although the locusts will also eat wild grasses where available.

The last plague of Migratory Locusts (1928-1941) originated from swarms of the First Rains Generation leaving the flood plains of the Niger River in Mali in June, the start of the rainy season in Mali. Hopper bands produced on the retreating floods rarely give rise to swarms because they are too widely scattered and the fledglings disperse, decreasing any tendency to gregarize. Such fledgling populations are, however, sometimes larger than usual due to increased survival of gregarious individuals compared with solitarious ones. If they persist until the following rainy season, and if breeding is successful and multiplication occurs on a large scale, they may be potentially dangerous. This is associated with above--average rainfall during the early part of the rainy season and occurred in Mali in 1928, 1951 and 1968. The last two upsurges were chemically controlled.

Small outbreaks have occurred around Lake Chad, but have yet to ever start a plague. The rains in southern Chad were not strong during the early part of this season, lessening early flooding of the Chari River, but in the areas around Lake Chad, the rains were quite strong during July. Thus there is a healthy locust population right at Lake Chad at the northeast elbow (near the town of Bol), but few locusts in the plains to the south. The extent of flooding of Lake Chad to the northeast, including perhaps the Bahr el Ghazal, will define where the next generation of locusts will be produced. The timing and amount of the rains next spring will determine the extent of the locust problem next year.

There have been some, but not many, gregarious locusts produced during this First Rains Generation near Bol (in Migratory Locusts, the transformation from the solitary to the gregarious phase usually occurs at the first molt of the hopping but wingless locust nymphs). If their succeeding generations survive to next spring, the size

of the gregarious population will increase, increasing the likelihood of swarming. The size of the population that comes back for First Rains Generation breeding will depend in part on the extent of fall flooding and will itself affect the size of the First Rains Generation.

Migratory Locusts will continue to be a problem in the Bol area. As long as flooding does not occur in the Bahr el Ghazal and there is active monitoring and control efforts through the seasons, the problem should remain near Bol. The highest current densities (20-30 per meter squared) are crop damaging, but not devestating. The lowest current density in the Bol area (2 per meter square) is troublesome with regard to population increase potential, but not with regard to crop damage.

APPENDIX III
Estimates of Crop Damage by African Migratory Locusts Near Bol

The following model was developed so that crop damage could be estimated, even with the lack of information. What is known is densities of locust infestation in selected areas near Bol. Heavy infestations of 20 to 30 locusts per square meter were reported for an area of 1500 hectares (ha). (One hectare equals 10,000 square meters.) Low infestations of 2 locusts per square meter were also reported. A total of 4000 ha of maize fields, millet and sorghum fields and wild grasses are to be sprayed for locusts, so it is presumed that 2500 ha (4000 ha total minus 1500 ha of heavy infestation) are experiencing the low density infestations. The acreage planted and expected production for the prefecture are estimates based on previous years' estimates; current acreage planted in the affected area is not known.

Locusts and grasshoppers eat up to their weight in vegetation per day. (Migratory Locusts weigh 1.2 grams at maturity.) Locusts and grasshoppers usually eat the leaves and tender shoots of a plant, rather than the seeds. The more mature a crop is at infestation, the less effect locusts will have on the final yield. The maturity of each crop at the time of the current infestation is not known, although it is probable that the maize was more mature than the millet and sorghum, as Bol area maize is planted in polders before the start of the rainy season while the millet and sorghum are planted in 'dry' fields after the start of the rains.

The grains preferred by Migratory Locusts are millet and sorghum, then maize. The estimated production of millet, sorghum and berbere (a kind of sorghum) for the 1985/86 season for Lake Prefecture was 16,060 MT grown on an estimated 40,150 ha, which indicates a yield of 400 kg

per ha. For the same area, an estimated 12,483 MT of maize were grown on an estimated 6,588 ha, showing a yield of 1,895 kg per ha.

Assumptions:

1. The mix of maize, millet and sorghum, and grasses is the same for the high infestions (20 per meter square) as for the low (2 per meter square).

2. Of the cultivated areas, two-thirds is maize and one-third millet and sorghum (polder cultivation, which is favorable to maize, is predominant around Bol).

3. Infestations will have an effect on grain yield proportional to the density of infestation.

4. With high density infestations, expected final grain loss is: 20% of late season crops, 50% of mid-season crops, and 100% of immature crops.

5. With low density infestations, expected final grain loss is: 2% of late season crops, 7% of mid-season crops, and 10% of immature crops.

6. The uncultivated area is 15% of the total area.

Consider the reported 1500 hectare, high density infestation in the Bol region:

	Maize	Millet & Srghm
Hectares Affected	855	420
Production (MT)	1620	168
Consumption (MT/Day)	205	101
Late Season Losses (MT/day)	41.0	20.2
Mid Season Losses (MT/day)	102.6	50.4
Immature Crops Losses(MT/day)	205.2	100.8

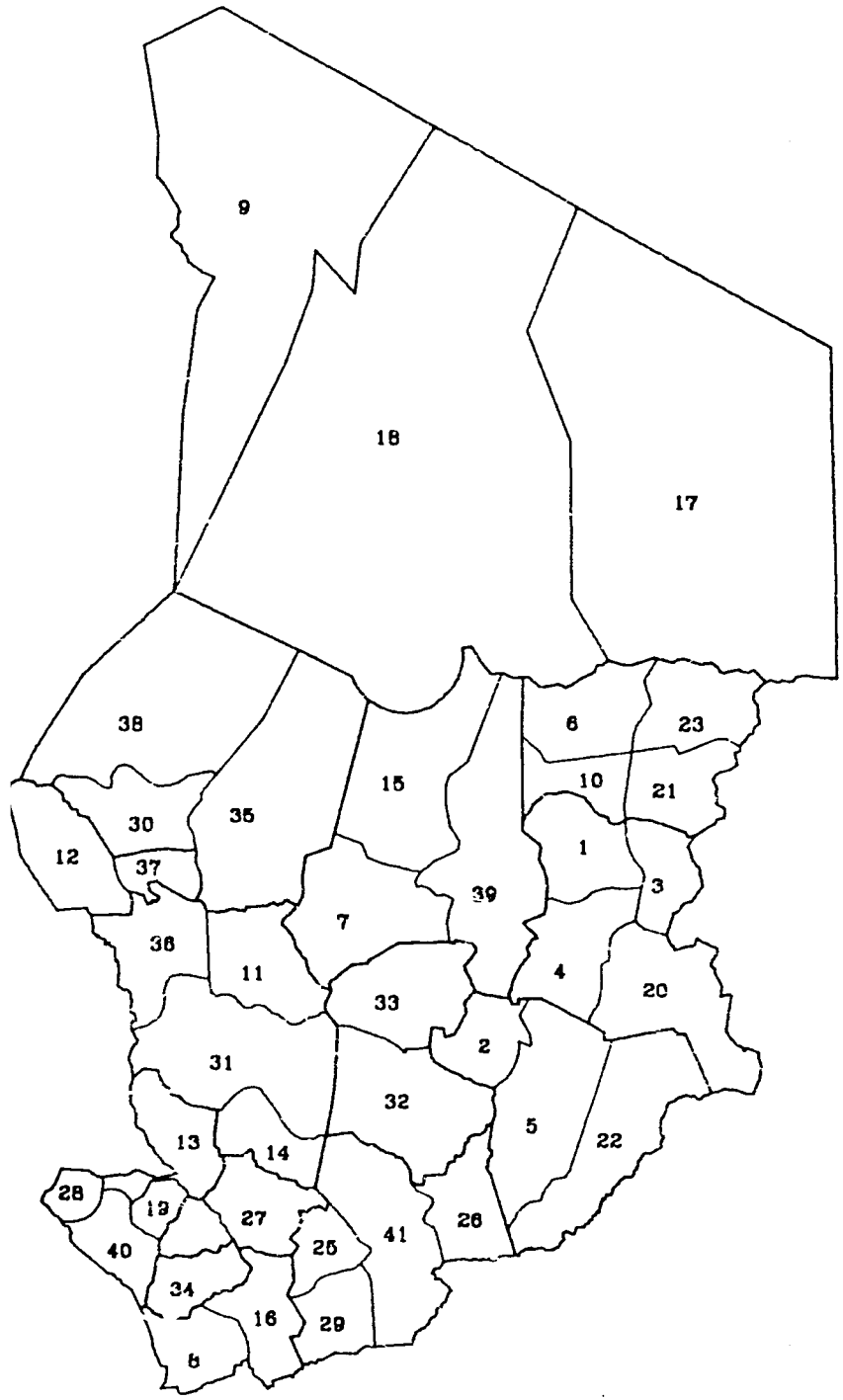
On the other hand, the presumed 2500 hectare, low density infestation in the Bol region would show:

	Maize	Millet & Srghm
Hectares Affected	1425	700
Production (MT)	2700	280
Consumption (MT/Day)	34	17
Late Season Losses (MT/day)	0.7	0.3
Mid Season Losses (MT/day)	1.7	0.8
Immature Crops Losses(MT/day)	3.4	1.7

This model can be used to determine how long it will take for a Migratory Locust infestation to destroy the crop yield in a given area, or how much the yield will be reduced given the duration of infestation. According to the model, it would take 104 days to completely destroy a late season maize crop in Bol, 41 days for a mid-season crop, or 21 days for immature crops. The corresponding numbers for millet and sorghum are 22, 9 or 4 days. If there had been 100% destruction of either crop in the Bol area by the end of August, the assessment team would have reported it, so the crops must be fairly mature.

Map 4
CHAD: Sub-prefectures

1. ABECHE
2. ABOU DEIA
3. ADRE
4. AM DAM
5. AM TIMAN
6. ARADA
7. ATI
8. BAIBOKOUM
9. BARDAI
10. BILTINE
11. BOKORO
12. BOL
13. BONGOR
14. BOUSSO
15. DJEDAA
16. DOBA
17. FADA
18. FAYA-LARGEAU
19. GOUNOU
20. GOZ BEIDA
21. GUEREDA
22. HARAZE
23. IRIBA
24. KELO
25. KOUMRA
26. KYABE
27. LAI
28. LERE
29. MAISSALA
30. MAO
31. MASSENYA
32. MELFI
33. MONGO
34. MOUNDOU
35. MOUSSORO
36. N'DJAMENA
37. N'GOURI
38. NOKOU
39. OUM HADJEI
40. PALA
41. SARH



Map: FEWS/PWA, September 1986