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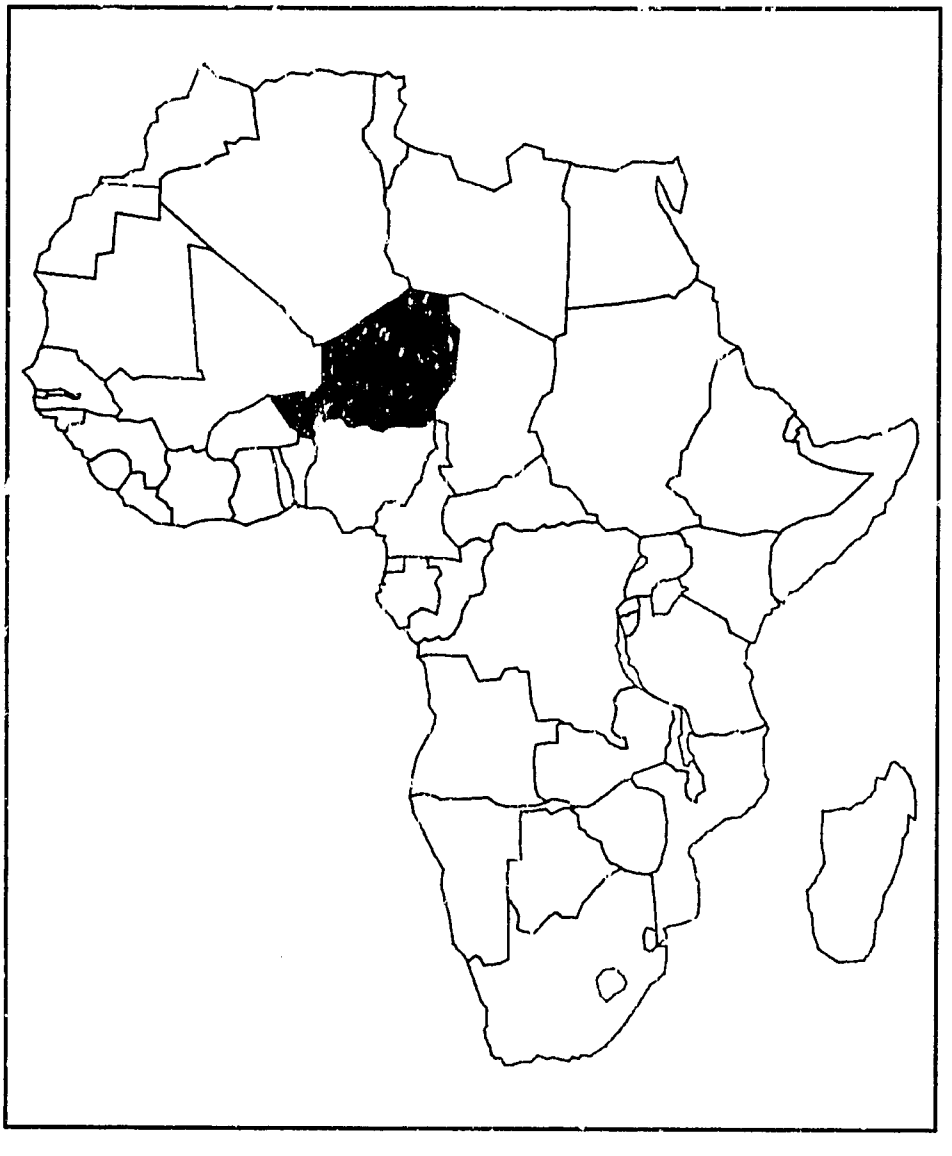
NIGER

VULNERABILITY ASSESSMENT

FAMINE EARLY WARNING SYSTEM



Produced by the Office of Technical Resources - Africa Bureau - USAID

FAMINE EARLY WARNING SYSTEM

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

- **Burkina**
- **Chad**
- **Ethiopia**
- **Mali**
- **Mauritania**
- **Niger**
- **Sudan**

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

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

This is the final report prepared under FEWS Phase I. The vulnerability assessment was completed for USAID's Africa Bureau by **Price, Williams & Associates, Inc.**

Under Phase I, the work of the FEWS Field Representatives was coordinated by **Tulane University's School of Public Health and Tropical Medicine.**

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

NIGER

Vulnerability Assessment

June 1989

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Vulnerability Assessment

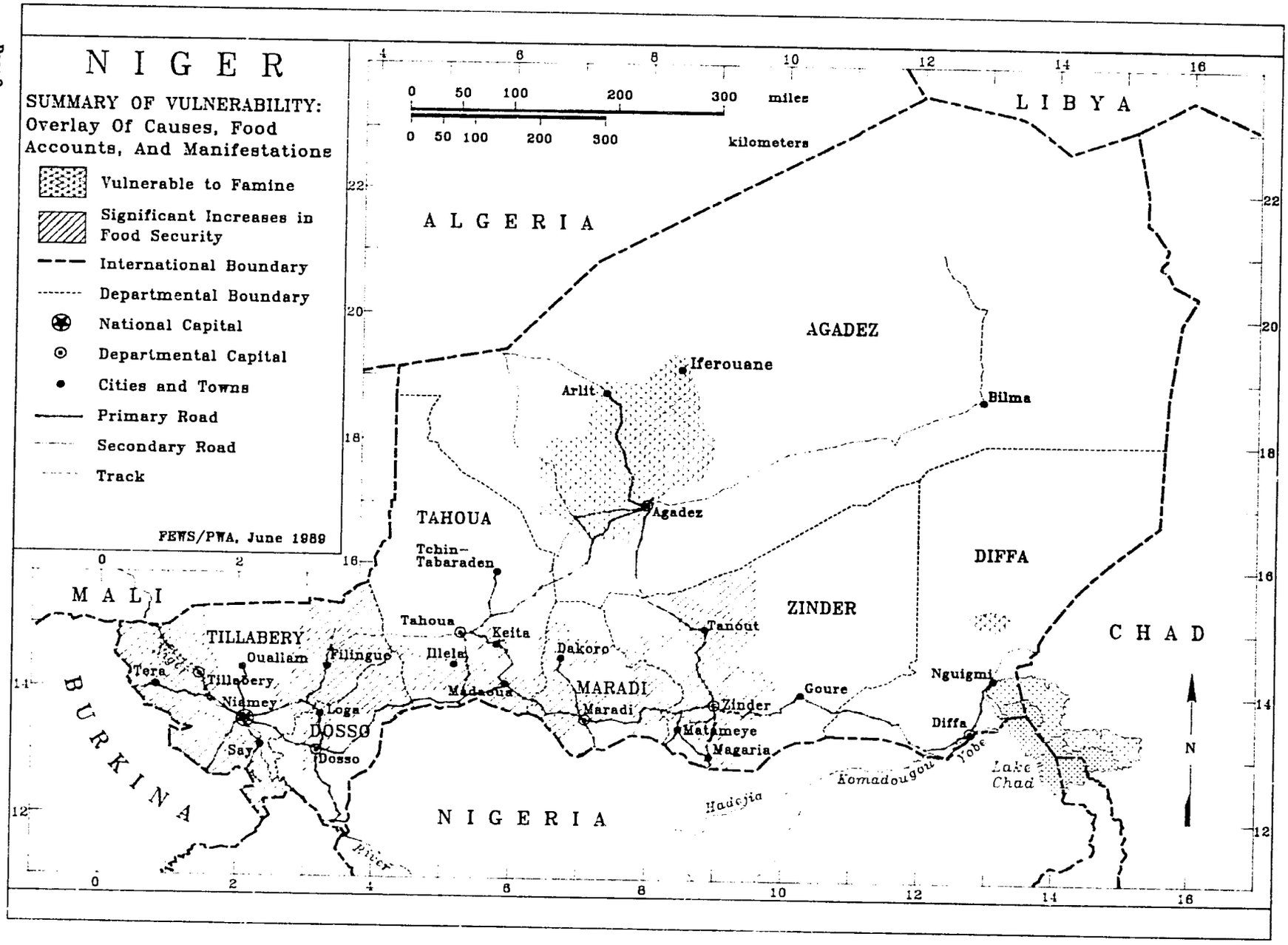
Executive Summary

No large populations or areas that will require food assistance before the next harvest period were found as a result of this assessment. The indicators that were assessed conclude that the most likely areas of potential vulnerability lie within the Air Mountains. Many other areas appear to have greatly bettered their short and even medium-term food security as a result of excellent harvests, plentiful pastures, and enormous on-farm stocks.

DRY FORECAST FOR 1989 RAINFALL IN THE SAHEL

The Synoptic Climatology Branch (SCB) of the U.K. Meteorological Office forecasts a 60% chance that the Sahel will receive less than 75% of normal rainfall. The SCB therefore expects rainfall to be less than 1988 (an average year compared to the long-term mean) but more than the "very dry years of 1986 and 1987".

As part of the SCB's research into the effects of sea surface temperatures on Sahelian rainfall, it has made experimental rainfall forecasts each year since 1986. The SCB employs four forecast methods, all based upon sea surface temperature anomaly patterns in April. Three statistical methods predict that 1989 will be dry to very dry. A dynamic general circulation model method predicts more rain in the Sahel than either of the statistical methods. At this early stage of research, the SCB has more confidence in the dry forecast. The SCB warns that the forecasts are experimental and must be used with caution. The forecasts are based on the assumption that sea surface temperature anomalies will not change in an unusual way between spring and summer. This assumption broke down for the 1988 forecast, leading the SCB to continue monitoring sea surface temperatures after April this year.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SUMMARY OF VULNERABILITY:
Overlay Of Causes, Food Accounts, And Manifestations
Vulnerable to Famine
Significant Increases in Food Security
International Boundary
Departmental Boundary
National Capital
Departmental Capital
Cities and Towns
Primary Road
Secondary Road
Track
FEWS/PWA, June 1989
0 50 100 200 300 miles
0 50 100 200 300 kilometers
LIBYA
ALGERIA
AGADEZ
Iferouane
Arlit
Bilma
Agadez
TAHOUA
Tchin-Tabaraden
DIFFA
ZINDER
MALI
TILLABERY
Tahoua
Keita
Tanout
Dakoro
Ouallam
Filingue
Illela
Tera
Tillaberry
Niamey
Madaoua
MARADI
Maradi
Goure
Nguigmi
Zinder
Loga
DOSSO
Matameye
Diffa
Magaria
Say
Dosso
BURKINA
NIGERIA
CHAD
Niger
Hadejia
Komadougou
Yobe
Lake Chad
River
N

I. Vulnerable/At-Risk Populations

Methodology: Vulnerability Assessment

The FEWS vulnerability assessment uses agro-meteorological and socio-economic indicators to define a population's probable level of vulnerability to famine. Four stages of vulnerability are identified: vulnerable, at-risk, nutritional emergency, and famine. Because available indicator data are frequently of relatively poor quality, or without extensive baselines for reference, FEWS relies upon a "convergence of evidence", a comparison of several indicators, to interpret the meaning of any single indicator. Each section that follows (Causes, Food Accounting, Manifestations) uses indicator data in different ways to locate actual and potential food stress (see Appendix 1 for details). Each surface of food stress thus created is mathematically weighted for significance to vulnerability, subjective judgements are applied, and then the surfaces of food stress are combined into a summary of vulnerability. Maps for each surface and the summary are provided within this assessment.

The general level of vulnerability across Niger appears, on the basis of indicators that were examined during this assessment (see indicator descriptions within Appendix 2), to have declined since the 1988 harvest. Contrary to recent years, no significant populations or specific areas were found that may, as a whole, require assistance before the next harvest period. Vulnerabilities seem, rather, family and sometimes village-specific. Map 1 shows this assessment's conclusion that vulnerable areas and populations will likely be found in the Air Mountains. This is based upon pest damage, cereal price activity, a pattern of chronic food access problems, and limited data about food availability. Nevertheless, local problems are probably also found in a central belt of Niger running roughly between Ouallam, northern Filingue, southern Tchin-Tabaraden and Tchirozerine, Goure, Mainé-Soroa, Diffa, and southern N'Guigmi arrondissements. A sparse dataset and the low resolution of most of the indicators covering this zone inhibit seeing the structural characteristics of a fragile food production system that lie within this chronic food stress sub-region.

This assessment also concludes that major decreases in level-of-vulnerability were seen in several parts of the country. Largely due to the excellent growing conditions leading to good harvests and pastures, Say, Tera, Filingué, Illéla, Tanout, northern Tessaoua, and Mirria arrondissements, in particular, appear to have significantly improved their food security from previous years. On-farm food stocks in some areas may be sufficient for several years of consumption needs.

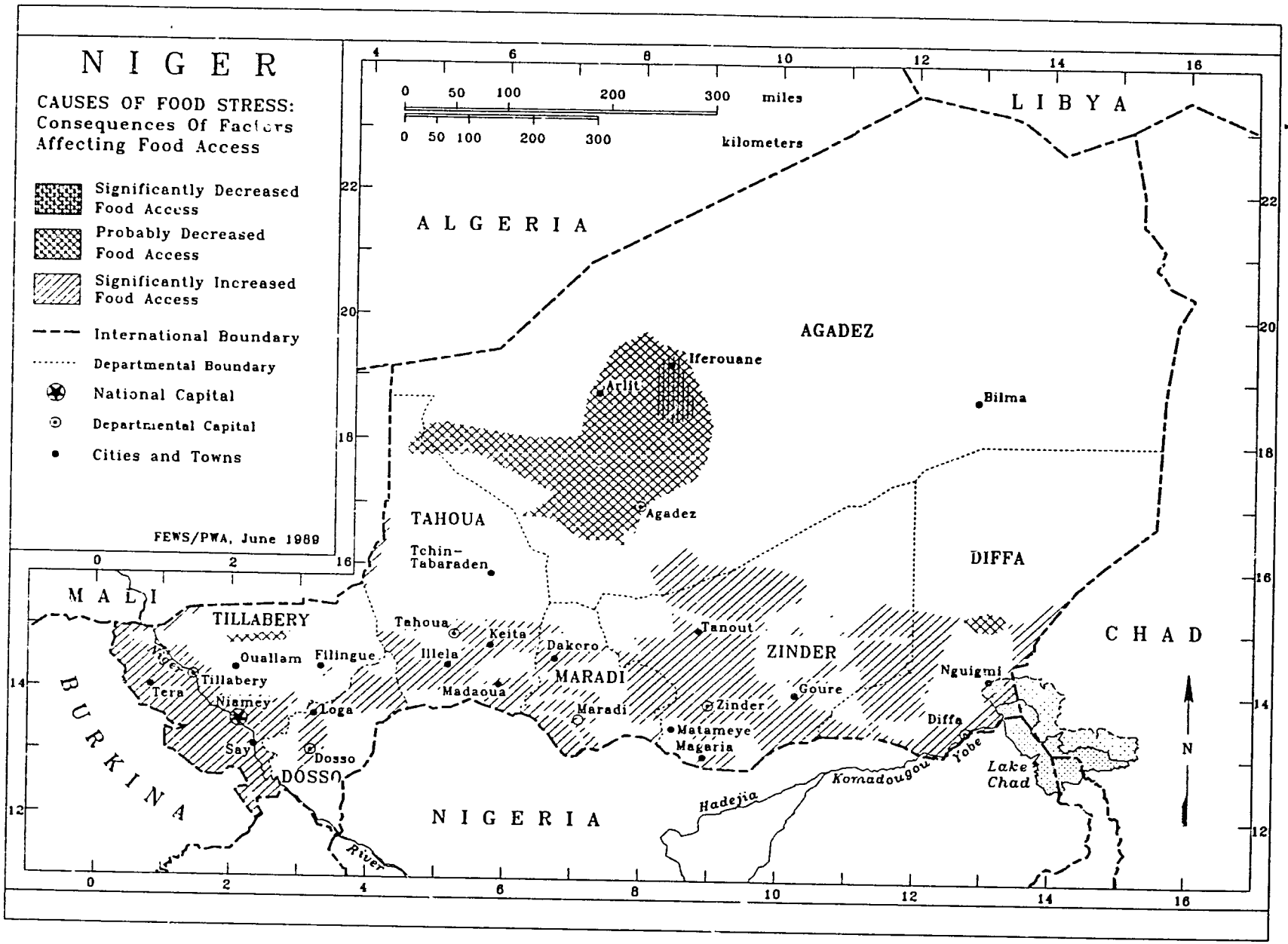
II. Causes of Reduced/Increased Access to Food

Methodology: Causes of Reduced or Increased Access to Food

Food is acquired through production, exchange, or transfer (gifts). Many factors, including rainfall, pests, floods, and warfare, can affect these acquisition mechanisms. This section provides a qualitative assessment of these factors and their likely impact on food access.

Few significant events or short-term conditions have been identified during this assessment that would indicate a decrease in food access for an identifiable segment of the population or any specific area in Niger. If such problems exist on any scale, they are likely to be found in certain garden-dependent villages of the Air Mountains where marginal growing conditions were worsened by locust problems (see Map 2). Elsewhere, anecdotal information appears to suggest that relatively small populations and areas may have suffered from decreased access to food due to problems of flooding, pests, or other local calamities, but the scale of these problems is below the resolution of this assessment.

Map 2


NIGER
CAUSES OF FOOD STRESS:
Consequences Of Factors
Affecting Food Access
Significantly Decreased Food Access
Probably Decreased Food Access
Significantly Increased Food Access
International Boundary
Departmental Boundary
National Capital
Departmental Capital
Cities and Towns
FEWS/PWA, June 1989
0 50 100 200 300 miles
0 50 100 200 300 kilometers
LIBYA
ALGERIA
AGADEZ
Iferouane
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TAHOUA
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Say
Dosso
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Yobe
Komadougou
Lake Chad
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BURKINA
NIGERIA
River
CHAD
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Most evidence presently available suggests that general food security within Niger is probably as good as it has been in any recent year (the single-hatched areas on Map 2 summarize where events and conditions have been largely positive in consequence). By most accounts, agricultural production conditions were close to optimal in Niger over almost all of the 1988 rainy season. Pastoral conditions were generally exceptional. Although there is less information available about incomes, revenues, market conditions, and transfers of money and food, what little data exists suggests that these functioned normally, if not better than average. Those populations that remain vulnerable to famine are: a) probably less vulnerable than they have recently been, b) geographically scattered, and c) socially un-differentiated from other populations less vulnerable than themselves. The following indicators have been assessed for their potential impact on food access, and form the basis for the preceding conclusion.

Rain stations in every part of the country reported a generally excellent year, most receiving at least 80 percent of the 20-year average cumulative rainfall. Many registered cumulative totals that equalled or surpassed the generally higher 30-year average amounts. In addition to the amount received, the spacing of the rains was generally quite good, with few areas experiencing any significant dry periods during critical crop stage periods.

Interpolation of rainfall totals between stations indicates that vast agricultural and pastoral areas received cumulative rainfall more than 20 percent above the 20-year average amount. These included most of Tillabery Department (except eastern Ouallam and most of Filingué arrondissements), and a pastoral area running from the southeastern half of Tchin-Tabaraden and Tahoua arrondissements through Tchirozerine Arrondissement, across Zinder Department, and covering most of southern Diffa Department. Extremely heavy flood-causing rains fell around Tera, Gotheye, and Yatakala in Tera Arrondissement, near major intermittent stream areas in Birni N'Gaouré, Gaya, Madaoua, and Guidan Roumdji arrondissements, near the city of Maradi, all across southern Zinder Department, and along the river in Diffa Arrondissement. In some cases the floods caused measurable, though relatively slight, loss to agriculture, and transport infrastructure was damaged in several areas. In general, however, the positive impact of increased soil moisture on crop yields far outweighed the negative impacts of occasional local flooding.

The picture of generally excellent rains provided by the roughly 50 rainfall station reports is reinforced by the exceptional vegetative index levels (Normalized Difference Vegetation Index, or NDVI) seen in satellite imagery. Compared with the 1982-87 norm for June through September, 1988 NDVI levels over most of the country are suggestive of significantly better growing conditions throughout this period. This is particularly the case for large parts of Tera and parts of Say arrondissements, all of Tahoua Department except for western Tahoua Arrondissement, and a large pastoral band running from Tchin-Tabaraden Arrondissement through northern Dakoro, Tanout, much of Gouré arrondissements, and the southern third of Diffa Department (except for southern Mainé-Soroa Arrondissement). Even within this area of significantly better NDVI, there are two areas where the difference from the norm is twice as great. These include an area southeast of a line running between Taza and Abalak in Tchin-Tabaraden Arrondissement that extends into northeast Keita and northwest Dakoro arrondissements in the Koren Adoua area, and a second area found in a band running through central Gouré Arrondissement (between 14.3 and 14.8 degrees north latitude).

When translating these actual 1988 NDVI values into amounts of available pasturage and relating this to the needs of the animals found within each area, it appears certain that substantially more forage is available for 1989 than is needed. According to the Integrated Livestock Project and the Ministry of Animal Resources, the arrondissements and departments found in the areas cited above probably have twice as much pasture resources compared to annual animal needs for those areas. Access to meat, milk products, and,

through sale of animals, cereals would thus appear not to be hindered either by water or pasture conditions.

The Crop Protection Service and major international agencies report that **pest damage** to food crops during 1988 was not substantially different in amount or intensity than in an average year. A wide variety of pests (birds, rats, stem borers, *chenilles*, rusts and others) are normally present and cause damage in agricultural and pastoral areas all over Niger each year. They did so this year as well. On the other hand, the presence, persistence, and southerly location of **Desert Locusts** (DL) was somewhat unusual. Early movements of DL through northern Tillabery Department were brief and caused little damage, as did later movement through northern Tahoua Department. Desert Locusts persisted later in the season in the Air Mountains and to the west in the Tamesna area. Outside of localized damage to gardens in the Air, little other damage was noted to either pastures or agriculture. Over the course of the year, approximately 950,000 hectares were treated.

Market purchases of food appear to play an increasing, yet already significant, role in making food accessible to most Nigeriens. If patterns here are similar to other Sahelian areas where such patterns have been studied, as much as 50 percent or more of all food consumed in the Sahelian zone is obtained through market exchanges. Unfortunately, there is little regularly reported data, outside of **monthly cereal prices**, with which to track the performance of this sector in Niger. Nevertheless, there is no information available to indicate that market failures or high prices made food inaccessible during 1988 and early 1989. On the other hand, the relatively low cereal prices and the apparent heavy **commercialization of the niébé crop** (more than 300,000 MT gross production) suggest that significant revenues were available and that purchases of food could have played an important role in many areas.

Although there is an issue as to whether, and to what degree, *niébé* is consumed by those that grow it, many growers sell a significant portion of their crop. In some arrondissements, if only 25 percent of the gross harvest had been sold at February 1989 prices and the revenue used to purchase millet at the same time, farmers would have added over 20 kilos per capita (10-15 percent of annual cereal needs) of millet to their supply of food available. This includes most of Zinder Department, Tera, Filingué, Illéla, Mainé-Soroa and Diffa arrondissements, some of which are chronically poor producers of millet. Another source of income, **peanut production**, suffered from disease this year and was much reduced from its normal contribution to incomes. **Off-season agricultural production** will provide at least another 80,000 MT of food, or locally significant revenues, to different parts of the country early in 1989.

Transfers of food and money also increase access to food in Niger. There is a widespread and persistent tradition of emigration to coastal areas in search of labor. While the remitted wages cannot be accurately measured, it is likely that enough of these laborers are successful that access to food in Niger is significantly increased by their transfers of food or money. Without better data, this aspect of food security can not be taken into account except in this incidental way.

III. Food Accounting

Methodology: Food Accounting

A quantitative account of all estimable food resources (production and aid) available for consumption until harvest is calculated using arrondissement-level data. Seed, feed, post-harvest losses, exports, and consumption-to-date are subtracted from this account. The months of food remaining are then calculated by dividing the food resources by the consumption rate (population times monthly consumption rate). Inadequate food access is assumed if stocks fall short of needs until harvest.

An accounting of all measurable food supplies that are likely to be available to arrondissement populations between the 1988 and 1989 harvests shows a number of arrondissements where food resources do not apparently meet food needs (see Map 3). This is despite the more than 350,000 MT surplus that exists on the national-level, if a comparison is made of net cereals produced and annual cereal needs. Most of these deficit arrondissements are found in the north and east (Ouallam, Tahoua, Tchin-Tabaraden, Tchirozerine, Arlit, Bilma, Gouré, Mainé-Soroa, Diffa, and N'Guigmi arrondissements) parts of the country. These arrondissements in particular are the same ones that are commonly assumed to be chronic food deficit areas by most observers. It would be a mistake to assume solely on this basis that these areas are unable to meet food needs. Yet, until food accounting (food balance) data and methodologies are better able to monitor meat and milk production and consumption, purchases of grain, and transfers of food and money, marginal agricultural areas such as these will continue to show poorly on a largely cereal production-related scale. The same weakness of data and methods make Kollo and Madarounfa arrondissements, with their large urban populations and market-oriented food acquisition habits, appear to have inadequate access to food.

Several significant data gaps limit the information that can be gained from this food accounting exercise. No attempt has been made to estimate the amount of on-farm stocks available going into the 1989 food year. Many donors are assuming that this was a negligeable amount following a very mediocre 1987 harvest. This assumption is probably true for many, but not all arrondissements. Another tremendous gap in our knowledge of Niger's food security is our inability to estimate food flows across the Niger/Nigeria border. Some relatively summary estimates have concluded that these flows may involve as much as 20 percent of the national Nigerien harvest at times. As described in the Causes of Food Stress section, there is an issue of how much *niébé* production to include as an addition to the stock of food available. For this assessment, no account has been taken of the sizeable contribution *niébé* makes to the diet. In a year of less food security, this variable could be key in determining likely food assistance needs.

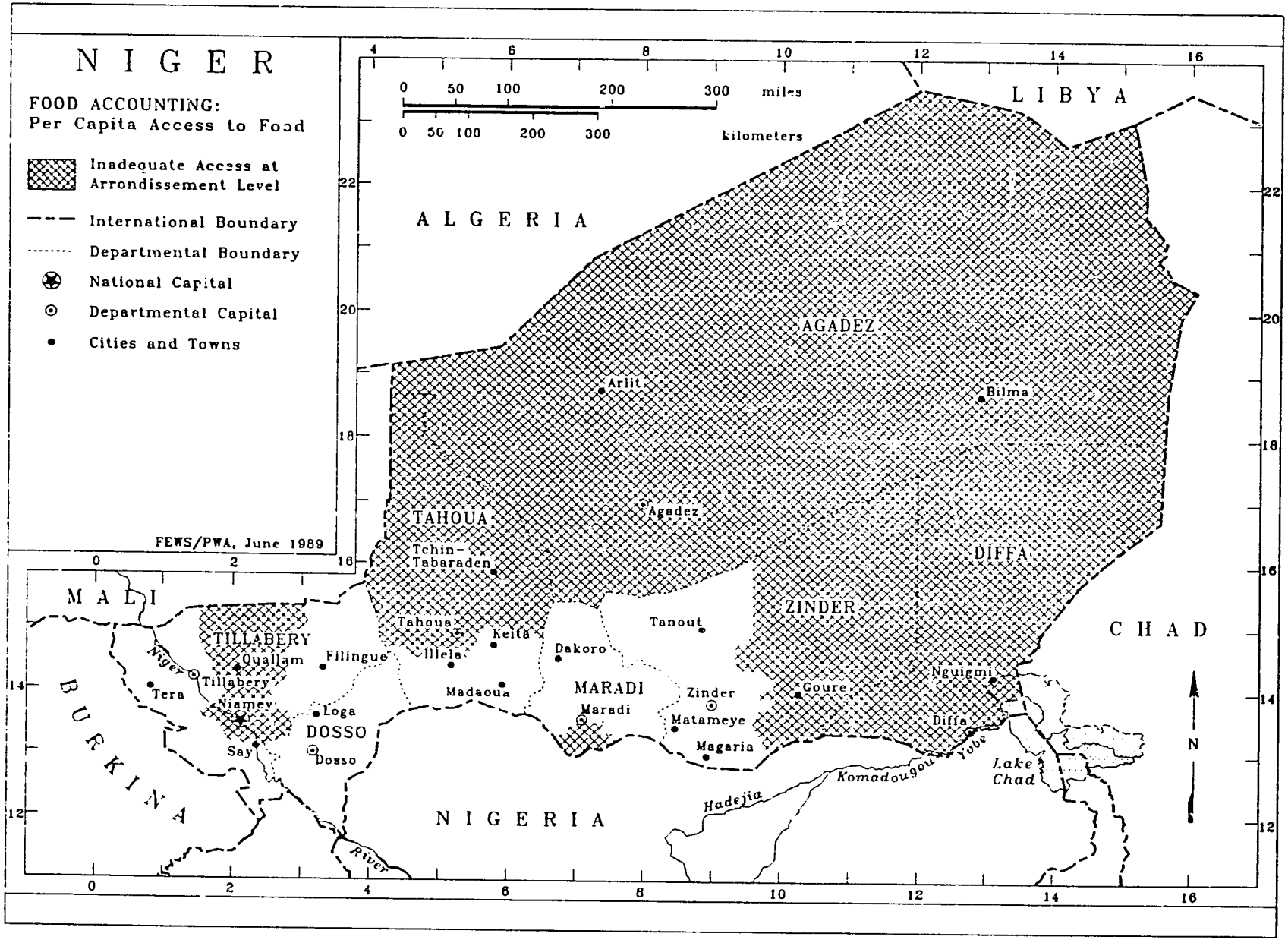
Finally, although a food accounting at the arrondissement level is more descriptive of areas potentially requiring food assistance than a national level accounting, it suffers from the same type, if not scale, of summarization of disparate conditions. For example, the food security of southern Tanout Arrondissement is likely much different than that of the northern half of the arrondissement.

IV. Manifestations of Reduced/Increased Access to Food

Methodology: Manifestations of Reduced or Increased Access to Food

Populations may manifest their current vulnerabilities to famine by their physical and socio-economic reactions to food access conditions. Based upon observed behaviors and conditions compared to a reference baseline, a subjective judgement is made of their degree of vulnerability.

Manifestations of current food stress were not found in great number, nor do those few that were found indicate that great numbers of people or large areas are involved. To the contrary, most reactions to prevailing conditions of food access indicate a lessening of stressful food access conditions. Three manifestations were assessed and mapped: 1) a Government of Niger declaration of food deficit villages based upon local administrative surveys, 2) a comparison of harvest outcomes from two recent periods, and 3) inter-annual cereal price comparisons (see Map 4). Notably absent indicators from this list include nutritional surveys and field reports of abnormal migration patterns, neither of which are present to add to the assessment this year. In the case of nutritional surveys, which are typically performed when stress is suspected, their absence is probab-


NIGER
FOOD ACCOUNTING:
Per Capita Access to Food
Inadequate Access at Arrondissement Level
International Boundary
Departmental Boundary
National Capital
Departmental Capital
Cities and Towns
FEWS/PWA, June 1989
0 50 100 200 300 miles
0 50 100 200 300 kilometers
LIBYA
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TILLABERY
Quallam
Filingue
Tahoua
Illela
Keita
Dakoro
Tera
Tillabery
Niamey
Loga
Madaoua
MARADI
Maradi
Zinder
Goure
Nguigmi
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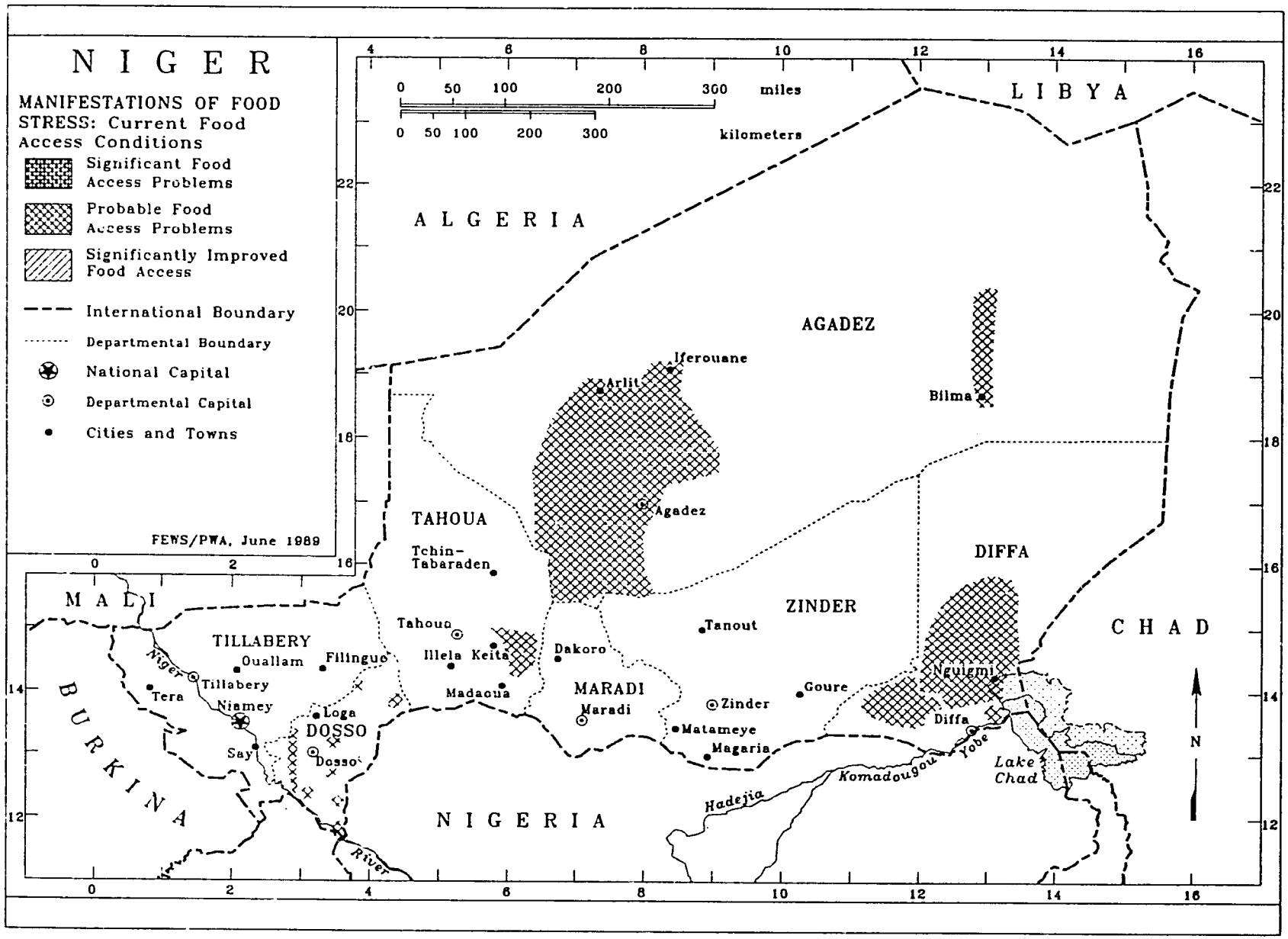
Map 3

Map 4


NIGER
MANIFESTATIONS OF FOOD STRESS: Current Food Access Conditions
Significant Food Access Problems
Probable Food Access Problems
Significantly Improved Food Access
International Boundary
Departmental Boundary
National Capital
Departmental Capital
Cities and Towns
FEWS/PWA, June 1989
0 50 100 200 300 miles
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LIBYA
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BURKINA
TILLABERY
Ouallam
Filingue
Tillabery
Niamey
Tera
Say
Loga
DOSSO
Dosso
Niger
River
N

ly another useful indicator of a lack of identifiable nutritional stress.

The Government of Niger has identified a number of **deficit villages** in several departments. The basis for this classification is a local administrative judgement about food resources in each village, and whether they meet food needs for the rest of the year. In some cases, these judgements are likely quite accurate and useful, as they precisely indicate where food needs may be greatest. There is, however, no standard procedure followed in making these estimations, so that some variation in accuracy should be expected. Most of the identified villages fall within areas already noted above in the Causes of Food Stress or Food Accounting sections as areas of possible food stress. These include villages in Tchin-Tabaraden, Tchirozerine, Arlit, Bilma, Mainé-Soroa, Diffa, and N'Guigmi arrondissements, all chronically food-short areas. Some do not fall within these areas. Many villages in Birni N'Gaouré, Dosso, Dogondoutchi, and Gaya arrondissements are listed as having food deficits ranging from 20 percent to 80 percent of annual needs. Quite probably, these deficit conditions stem from a combination of poor growing conditions and other local calamities.

Monthly **cereal prices** for over thirty sites are collected by the *Office des Produits Vivriers du Niger* (OPVN) and local police stations. The four and a half years of data thus collected form one of the most complete price datasets available in any of the FEWS-monitored countries. Although work to date in interpreting this dataset for early warning purposes has not yet identified specific causes of cereal price behavior, the absolute variations in price found through time and sometimes over space are reflective of general food access conditions known to exist through other means. For this assessment, a by-site comparison was made of millet prices during the January to March 1989 period with similar periods in 1986 and 1987, which both followed excellent harvests. Millet prices during the period in 1989 are lower in a band of arrondissements stretching from Say up to Tera, Tillabery, Ouallam, Filingué, and Tchin-Tabaraden. Refering back to production statistics for harvests immediately preceding these price periods, it is clear that the 1988 harvest was generally better than the 1985 and 1986 harvests in these areas, and the price patterns may reflect some greater food access than in the other years examined.

A price trend that tends to reinforce a pattern of food stress seen in other indicators assessed above concerns the village of Iferouane in the Air Mountains. Subject to extremely harsh conditions and having limited access to the rest of Niger, millet prices in this area tend to run significantly higher than most areas of Niger, including Agadez and Arlit, the two closest towns of any size. Normally, Iferouane's millet prices are approximately 40 percent higher than those in Agadez and 30 percent higher than in Arlit. Price differentials in March 1989 were 70 percent and 40 percent, respectively. If these differentials maintain these levels over the next months of reported prices, one might suspect relatively greater food stress in Iferouane and its environs than elsewhere in Agadez Department.

The **cumulative impact of harvest outcomes** over the last several years may move a farmer towards, or away from, vulnerability to famine. Several insufficient or declining harvests will undermine the farmer's ability to withstand future stresses and eventually may lead to the use of more costly coping mechanisms. The trend of harvest outcomes may therefore be of some use in identifying emerging stress conditions well ahead of other indicators. To this end, a comparison was made between 1986-1988 per capita agricultural production and 1983-1985 per capita production. By including the disastrous 1984 harvest on one side of the equation and comparing it to the 1986 and 1988 record harvests on the other side, one would assume the trend in most places would be up. Where it is not, there may be reason to investigate the intensity of coping mechanism use and assess the success of these coping mechanisms in resolving the cumulating stress.

Using this measurement, several arrondissements show a decrease in per capita production. These include: Ouallam and Filingué (Tillabery Department), Matameye and Magaria (Zinder),

Birni N'Konni and Bouza (Tahoua), and Birni N'Gaouré (Dosso). Arrondissements in which there was a significant increase in production over these periods (an increase of at least 3 months supply in per capita stock needs) include Illéla, Tchin-Tabaraden, Keita, Dakoro, Tanout, Tessaoua, Guidan Roumdji and Aguié. Note that many of the arrondissements showing significant increases are located on the northerly edge of the farming zone, and many showing decreases are located on the southerly border of the country. This may be related to the northerly expansion of farming populations into previously uncultivated lands and to more exhaustive use of farmlands in the south. Both conditions probably relate to a progressively greater fragility of the farming potential of the country and deserve monitoring.

APPENDIX 1

Mechanics of the Vulnerability Assessment

All available indicator data of major significance to the food security of Niger was gathered and analyzed for significance. The geographic boundaries for each were mapped as accurately as possible. Using a computer-based Geographic Information System (ArcInfo), the indicator maps were scored according to a three position scale of food stress to indicate whether they showed 1) an obvious cause of food stress, 2) no obvious food stress or significant increase in food access, or 3) a significant increase in food access (only applicable in areas without stress).

All indicators relating to "Causes" of food stress were overlaid to produce a summary surface of food stress as seen by these indicators (Map 2). A similar process was used for all indicators relating to "Manifestations" of food stress (Map 4). For the food accounting analysis, areas were mapped and scored as having adequate or inadequate access depending upon whether all food resources identified met assumed food needs (Map 3).

In a final step, the "Causes", "Manifestations", and "Food Accounting" summary maps were themselves overlaid for a grand summary of "Food Access" (Map 1). Analysts were free to use subjective criteria in applying food stress scores at each stage based upon their best judgments.

APPENDIX 2

Indicators Used in Niger Vulnerability Assessment

NDVI - Growing Conditions: The 1988 NDVI maximum was compared to the normal (1982-1987) yearly maximum. All areas significantly higher or lower (+/- 0.05 NDVI) than normal were identified. Areas of sparse vegetation (less than 0.1 NDVI) were excluded from this analysis. Sources: NOAA/NASA GAC NDVI

Rainfall: 1988 cumulative rainfall was compared to normal historic (1968-1987) cumulative rainfall. All areas receiving more than 120 percent or less than 80 percent of normal were identified. Areas where 1988 cumulative rainfall was less than 200 mm were excluded from this analysis. Sources: Joint Agriculture Weather Facility, AGRHYMET Regional Center, GON *Service Météorologique*.

Pest Damage: Areas in which pest damage was judged to have had a significant negative impact on food access were identified. Sources: Niger Crop Protection Service "*Situation phytosanitaire*" maps, May - October 1988. USAID/Niamey.

Flooding: Areas in which floods were judged to have had a significant negative impact on food access were identified. Sources: *Ministère des Ressources Animales et de l'Hydraulique, Direction des Etudes et Programmation*, November 1988.

NDVI - Animal Carrying Capacity: By arrondissement and department, pasture carrying capacity as judged by interpretation of NDVI, which was then divided by the annual animal needs using *Unité Bétail Tropical* (UBT) standard. Sources: On the arrondissement level, a Tufts Integrated Livestock Program report. UBT needs were based on a 1987 estimate of animal numbers. On the department level, the source was a report by *Ministère des Ressources Animales et Hydraulique*.

Contribution of Cash Crop: A computed *niébé* cash crop millet equivalent: the quantity of millet that could be purchased at February 1989 prices if 25 percent of gross *niébé* production were sold at 80 francs per kilo and millet were purchased in its stead. If quantity over 20 kilos, judged very significant positive impact on accessibility of food. Source: Ministry of Agriculture production figures and OPVN price reports.

Cereal Price Behavior: Comparison of average of January-March 1989 millet prices to the average of January-March 1986 and 1987 prices. Where 1989 prices were more than 20 percent higher or lower than the two year average, food access was judged bad or good, respectively. Source: OPVN.

Food Production Trend: By arrondissement, average months of per capita food stocks received from net agricultural production between 1986-88 minus average months of food stocks received from net agricultural production between 1983 and 1985. Any decrease was judged to have mildly negative impact. Sources: Population data from FEWS projection of GON 1988 census; production data from Ministry of Agriculture.

Brush Fire Damage: Brush fire damage areas noted but not mapped, as they were judged insignificant to 1988 food supply. Source: FEWS/Niger.

Food Stock Reserves: These were noted for their bearing on food security but were not mapped.

Health and Nutrition Data: Available data do not currently reflect conditions that we judge to be abnormal for Niger.

Conflict/Civil Disruption: No areas were found in which conflict was judged to have had a significant negative impact on food access.

Food Accounting notes and sources: Net harvest includes millet, sorghum, and maize and is calculated at the arrondissement level. Rice production is not included. (No other foods can be assessed with present information, and coarse cereals account for 65 to 75 percent of the typical Nigerien diet.) The food accounting assumes no carryover of stocks from 1987-88, no free distributions in 1988-89, and does not count imports or off-season production. Rate of consumption used is 190 for urban population and pastoralists and 220 for sedentary farmers. Commune populations are included in arrondissement totals. Niamey city population is included in Kollo Arrondissement. Date of harvest is assumed to be October 31. Amount of cereals consumed is based on a March 1989 population times seven months of consumption to give amount consumed from harvest until June 1. Source: GON/Ministry of Agriculture.

Key Terms

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

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

ITCZ - The Intertropical Convergence Zone (ITCZ) is where the high pressure system originating in equatorial regions of the Atlantic (the St. Helena's High) collides with the Azores High descending from the north. The ITCZ tends to move northward during the spring and summer in response to normal global weather patterns. The position of the ITCZ normally defines the northern limits of possible precipitation in the Sahel; rainfall generally occurs 100 to 300 kilometers south of the ITCZ.

NDVI - Normalized Difference Vegetation Index (NDVI) images are created at the laboratory of the National Aeronautic and Space Administration (NASA) Global Inventory Modeling and Monitoring System (GIMMS). These images are derived from Global Area Coverage (GAC) imagery (of approximately 4 km resolution) received from the Advanced Very High Resolution Radiometer (AVHRR) sensors on board the National Oceanic and Atmospheric Administration (NOAA) Polar Orbiting series of satellites. The polar orbiter satellites remotely sense the entire Earth and its atmosphere once each day and once each night, collecting data in 5 spectral bands. Bands 1 and 2 sense reflected red and infra-red wavelengths respectively, and the remaining 3 bands sense emitted radiation in 3 different spectral bands. The NDVI images are created by calculating

$$(\text{infrared} - \text{red}) / (\text{infrared} + \text{red})$$

for each pixel from the daytime satellite passes. Since chlorophyll reflects more in the infrared band than in the red band, higher NDVI values indicate the presence of more chlorophyll and, by inference, more live vegetation. A composite of daily NDVI images is created for each 10-day period, using the highest NDVI value for each pixel during that period. This technique minimizes the effects of clouds and other forms of atmospheric interference that tend to reduce NDVI values. NDVI is often referred to as a measure of "greenness" or "vegetative vigor." The NDVI images are used to monitor the response of vegetation to weather conditions.