An Overview of the Food Consumption and Nutrition Situation in Mali

Report submitted to USAID/Mali, Agricultural Development Office

by

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# Table of Contents

List of Tables and Figures ii  
List of Abbreviations Used iii  
Executive Summary v  

I. Introduction 1  

II. Overview of the Food Balance Situation 4  

A. Calculation of the Annual Per Capita Cereals Requirement 4  
B. Regional Cereals Surplus/Deficit Situation 6  

III. Food Consumption Patterns 8  

A. Regional and Ethnic Group Variation 8  
   1. Rural Sedentary Diets 9  
   2. Urban Diets 10  
   3. Diets of Nomadic Populations 11  
B. Child Feeding Practices 12  
C. Dietary Restrictions 13  

IV. Prevalence of Malnutrition 15  

A. Protein-Energy Malnutrition 15  
   1. Acute Protein-Energy Malnutrition 17  
      a. Prevalence Studies 17  
      b. Affected Population 24  
   2. Chronic Protein-Energy Malnutrition 26  
B. Vitamin and Mineral Deficiencies 28  
   1. Vitamin A 28  
   2. Vitamin C 28  
   3. Anemia 29  
   4. Goiter 29  

V. Food Consumption Strategies in Response to Changes in Production and Income 30  

A. Coping Strategies in Rural Areas in Response to Production Shortfalls 30  
B. Characteristics of Rural Households which Survive Poor Production Years with Minimal Effects on Food Consumption 33  
C. Effect of Economic Policy Changes on Food Consumption 35  

VI. Conclusion 39  

Bibliography 41  

Annex I People Contacted in Mali and Documentation Centers Consulted in Bamako 51  

Annex II Current Nutrition and Consumption Data Collection Efforts in Mali 53
List of Tables and Figures

Tables

Table 1  Estimation of Annual Per Capita Cereals Requirements 5
Table 2  Percent of Cereals Needs Met by Local Production 8
Table 3  Dietary Restrictions for Children and Pregnant Women Among Different Ethnic Groups 14
Table 4  Prevalence of Acute Protein-Energy Malnutrition Among Children in Mali: A Summary of Existing Studies 20
Table 5  Prevalence of Chronic Protein-Energy Malnutrition Among Children in Mali: A Summary of Existing Studies 28

Figures

Figure 1  Grain Surplus/Deficit by Region, 1984/85 - 1987/88 Average (MT) 7
Figure 2  Nutritional Situation of Children Under Five Years 24
List of Abbreviations Used

CDC - Center for Disease Control (Atlanta)
CESA - Commission d'Elaboration de la Strategie Alimentaire
CMDT - Compagnie Malienne pour le Developpement des Textiles
CNAUD - Comite National d'Action d'Urgence et de Rehabilitation, Ministere de l'Administration Territoriale et du Developpement à la Base
CNUCED - Conference des Nations Unies sur le Commerce et le Developpement
DNAS - Direction Nationale des Affaires Sociales, Ministere de la Sante Publique et des Affaires Sociales
DNSI - Direction Nationale de la Statistique et Informatique, Ministere du Plan
EEC - European Economic Community
ENMPM - Ecole Nationale de Medecine et de Pharmacie du Mali
FAO - Food and Agricultural Organization (of the United Nations)
FEWS - Famine Early Warning System (USAID project)
GRM - Government of the Republic of Mali
IMF - International Monetary Fund
MSF - Medecins Sans Frontieres
MSU - Michigan State University
MT - Metric tons
NCHS - National Center for Health Statistics (U.S.)
OECD - Organization for Economic Cooperation and Development
OHV - Operation Haute Vallee
OMBEVI - Office Malien du Betail et de la Viande, Ministere Charge des Ressources Naturelles et de l'Elevage
ON - Office du Niger
List of Abbreviations Used, cont.

OPAM - Office de Produits Agricoles du Mali
ORANA - Organisme de Recherches sur l'Alimentation et la Nutrition Africaines (Dakar)
PADEM - (Projet) Mise en Place de Dispositifs Permanents d'Enquetes Aupres de l'enages (UNDP)
PEM - Protein-energy malnutrition
PVO's - Private voluntary organizations
SAP - Systeme d'Alert Precoce, Ministere de l'Administration Territoriale et du Developpement a la Base
SSP - Soins de Sante Primaire, Ministere de la Sante Publique
UNDP - United Nations Development Program
UNICEF - United Nations Children's Fund
USAID - United States Agency for International Development
WFP - World Food Program (of the United Nations)
WHO - World Health Organization (of the United Nations)
Executive Summary

Malnutrition is a widespread problem in Mali, affecting every region and ethnic group. The most prevalent manifestation of undernutrition is protein-energy malnutrition although several vitamin and mineral deficiencies are also common. Although there were relatively few nutritional studies in Mali during the 1960's and 1970's, nutritional surveillance of the population, particularly in the 6th and 7th regions, has been done on a more systematic basis since the 1984-85 drought.

Food consumption data can be used as an indicator of nutritional status, but food consumption measures are not a perfect proxy for nutritional status as there are a number of factors other than food intake which have an impact on the nutritional status of the individual. Data on food consumption in Mali are, however, very sparse. Fewer than ten regional consumption studies, of varying quality, have been completed in the last thirty years. There are some upcoming studies which should make a significant contribution to the understanding of food consumption and expenditure patterns in Mali.

Annual assessments of the food balance situation in Mali generally calculate cereals consumption by multiplying regional population figures by 167 kg. This figure has been used by the GRM and many donors for the past decade, but there is currently some pressure on the GRM to increase this figure. USAID and other donors argue that a higher figure would more accurately reflect consumption levels in recent years. There also seems to be a nutritional or biological basis for raising the estimate. Calculations of annual per capita cereals requirements are made under different scenarios which make varying assumptions about the caloric importance of cereals in the diet, percentage loss, and individual energy needs. Calculations under all scenarios are well above 167 kg. per person per year.

The grain surplus/deficit situation of each region over the last four crop years is calculated. Only regions II (Koulikoro) and III (Sikasso) had a surplus in all four crop years. Region IV (Segou) was surplus in two years and deficit in two years, but its surpluses far outweighed its deficits, and on balance it was a surplus region. The remaining four regions of the country were deficit in all years. Region V (Mopti) had the largest absolute deficits.

Cereals are the main staple of the diet in most areas of the country. Among rural sedentary groups, coarse grains and rice account for 70 to 80 percent of caloric consumption. These diets are supplemented by sauces consisting of some combination of vegetables, spices, leaves, groundnuts, oil, and, more rarely, fish or meat. Overall these diets provide a sufficient level of
protein intake but are deficient in several vitamins and minerals such as vitamin A, vitamin C, riboflavin, iron, and calcium. Urban diets are based on the same staple grains as rural diets although they generally contain more rice and meat and wider variety of fruits and vegetables. Thus one would expect to find fewer vitamin and mineral deficiencies in urban areas. The lack of urban nutritional surveys prevents confirmation of this hypothesis. The staple food of nomadic groups in Mali is milk, supplemented by cereals, meat, sugar, and dates. The relative caloric importance of these foods varies widely across different groups. These diets generally contain few fruits and vegetables, and thus vitamin A and C deficiencies are common among pastoral peoples.

There are a series of common child feeding practices and dietary restrictions in Mali which undermine nutritional status. The initial breast milk, which contains valuable nutrients, is often withheld from the child, supplementary foods are often not introduced early enough, weaning foods are often watery gruels which do not provide sufficient energy for the child and lack a variety of nutrients, and weaning is usually done in a very abrupt manner. Among many ethnic groups there are taboos against the consumptions of certain foods (such as eggs and meat) by pregnant women and/or small children. Traditional treatments for illnesses such as measles and diarrhea slow children's recovery from these diseases and weaken their nutritional states. Behavioral practices within a family thus play an important role in determining the nutritional status of children.

Protein-energy malnutrition is found among all age groups in all regions of Mali. Whereas malnutrition in adults is most closely correlated with deficiencies in food consumption, PEM in young children is only partially due to problems in the level and quality of food intake. Equally important determinants of childhood malnutrition are inappropriate child feeding practices and the high level of infectious and parasitic diseases which are associated with and aggravated by secondary malnutrition. There is a synergistic interaction between nutritional status and health which flows both ways; each has a significant impact on the other.

There have been some fifty studies of the prevalence of acute PEM among children in Mali since 1984. Overall these studies show that between 7 and 20 percent of Malian children under six years old suffer from moderate or severe acute PEM. Prevalence rates were higher in 1984 and 1985 due to the effects of the drought on livelihood and food availability. Incidence of acute PEM seems to vary seasonally, dipping in the November - March period and peaking between June and September in most areas. Seasonal variations in children's nutritional status coincide with the significant seasonal swings in adult body weight described in several studies. Long-run trends in PEM
prevalence rates are harder to assess due to the small number of studies using common methodologies. Overall there does not seem to have been any long-term improvement (or deterioration) in childhood nutritional status in Mali over the last decade, although the data are too weak to permit a strong conclusion on this issue.

PEM prevalence rates vary across regions, age groups, sex, and ethnic groups. The highest rates of acute PEM have been found in pockets of the 6th and 7th regions and in the CMDT zone. The high rates in the CMDT zone may be partially explained by the timing of the survey (after one of the worst harvests of the last thirty years) and the possible inclusion of migrants from drought-stricken northern Mali in the sample population. Even accounting for these factors, rates of acute PEM in the CMDT zone are still very high, thus underscoring the importance of behavioral and environmental (sanitation and disease) factors as determinants of nutritional status. Acute protein-energy malnutrition rates are highest for children between 6 and 24 months of age (the weaning period) and many studies find statistically significant higher rates among girls than boys. Although studies vary in their findings of variation across ethnic groups, several studies find that the Tuareg and Maure are relatively better off than the Bella and Songhai in the 6th and 7th regions.

Chronic protein-energy malnutrition has been studied to a much lesser extent than acute PEM in Mali. While acute malnutrition can be traced to discreet events such as a sudden food shortage or an abrupt weaning experience, chronic malnutrition has its roots in longer-run phenomena such as low income or low levels of food production. While acute malnutrition is measured by indicators of wasting (a reduction in the amount of body tissue for a given height), the primary indicator of chronic PEM is stunted growth, which is measured by height for age. The small number of studies which measure chronic PEM in Mali give prevalence rates between 13 and 36 percent. Rates of chronic PEM generally peak later than those for acute PEM. Rates of chronic PEM are generally highest in children between 24 and 48 months of age and continue at fairly high levels until age 14.

There are numerous widespread vitamin and mineral deficiencies in Mali. Studies find that vitamin A deficiency affects between 9 and 12 percent of the surveyed population on average although there is much inter-regional variation. Deficiencies are higher in northern Mali due to the lack of fruits and vegetables in the diet. Vitamin C deficiencies are also most pronounced in the North but are found throughout the country. Anemia is estimated by the GRM Nutrition Service to affect 40 percent of the children and 47 percent of the pregnant women in Mali. The deficiency disease is highly correlated with PEM in small children and with malaria for all ages. Goiter,
attributable mainly to iodine deficiency, is endemic to Mali, estimated by the Nutrition Service to affect approximately one-third of the population. It is found in all regions of the country except for the 6th and 7th.

There has been very little empirical work to date in Mali exploring adaptive responses to production shortfalls or loss of herds in rural areas. Families generally have several layers of mechanisms that they employ to prevent a sudden loss in production or livelihood from resulting in severely reduced food consumption. One of the main adaptive mechanisms is an attempt to diversify sources of income by taking on new money-generating activities, such as wood selling, water carrying, agricultural labor, and, in the extreme, temporary or permanent migration. A second coping strategy lies in the increased gathering of wild foods, some of which are eaten in normal production years during the soudure and some of which are only eaten in exceptionally poor production years. A final coping mechanism is the reliance on neighbors and extended family members to share their resources with the more vulnerable members of the community. This mechanism is more frequently used in years of localized poor harvests rather than general droughts.

It is very difficult to describe the characteristics of rural households in Mali which survive poor production years with minimal effects on family food consumption. Trying to draw correlations between food production and consumption is a very tenuous exercise, due to the lack of a single study collecting simultaneous quantitative production and consumption data. Some studies do, however, make some limited linkages between production and consumption variables. Mainly relying on indirect evidence, it seems that the characteristics which allow families to survive bad production years without suffering large decreases in their food consumption levels are the following: relatively higher levels of staple grain production, ownership of agricultural equipment, participation in non-agricultural activities, and diversification of cultivated crops.

The evidence on how Malian families adjust their food consumption patterns to changes in prices or income is very scanty. Preliminary results from the Tufts University study suggest that changes in income levels clearly have a significant impact on food consumption as between one-half and three-quarters of the family budget is spent on food items in the seven regional capitals and Bamako. As income rises, the purchased quantity of all foods increases; there seem to be no major inferior goods in the urban food basket. The diet is overwhelmingly cereals-based in all income groups, and the proportion of calories derived from cereals does not fall as income rises. Thus it seems unlikely that income changes in the near future will result in significant changes in the composition of urban food baskets.
Qualitative evidence suggests that in the face of rising food prices, families do not seem to increase their expenditures on a cheaper substitute staple because the cheapest available staple is already the base of their diets. They are more likely to respond by cutting back on the quantity of all foods, particularly supplementary foods such as meat and vegetables.

At the macro-economic level, there are two major reforms which have direct impact on urban consumers. The removal of government monopoly on the import of certain food products should drive down prices for these commodities in the long run. Staff cuts and hiring freezes in the public enterprise sector have created a large pool of educated, unemployed people in urban areas. Increased unemployment should dampen overall consumer demand which in theory will lead to downward pressure on the general prices level.

Adjustments in the cereals marketing sector have also had an impact on rural and urban consumers. Under the changes brought about by the cereals market liberalization program, rural consumers enjoy easier access to private sector grain supplies. There is also some evidence that reduced search and transactions costs for producers and traders led to marginally lower coarse grain prices in the first three years after liberalization. Urban consumers and net buyers of grain in rural areas benefit from these reduced prices. The future of rice prices under the reform program are uncertain. They are likely to remain high (relative to past domestic prices and current international prices) in the next few years but may come down in the long run if gains in productions efficiency can be made in the Office du Niger. Lower prices would mainly benefit urban consumers, who are the main consumers of rice in Mali.

While external factors beyond the control of the household account for some of the variation in malnutrition prevalence rates in Mali, it must be emphasized that household-level factors, both economic and cultural, play a critical role in determining nutritional status. More research is needed to assess the relative importance of the various household-level economic factors in determining the consumption position of the family. Direct correlations between household economic characteristics and food consumption levels do not necessarily imply a positive relationship between these same characteristics and nutritional status. Behavioral factors intervene to promote distortions between food consumption and nutrition indicators. Thus efforts to address nutritional problems in Mali must simultaneously focus on improving the quality and quantity of food consumption and on modifying behaviors which threaten the nutritional status of all groups, but most particularly children.
I. INTRODUCTION

The problem of malnutrition in Mali is widespread, affecting every region and ethnic group. The most prevalent manifestation of undernutrition is protein-energy malnutrition although several vitamin and mineral deficiencies, having a seasonal and regional character, are also common. There have been sporadic attempts to assess the nutritional situation of a specific area of the country over the past thirty years. No national nutritional survey has ever been launched and no longitudinal nutritional data exist. In recent years, however, nutritional surveillance of the population has become more systematic as surveys of nutritional status (using anthropometric indicators) are conducted as a component of famine relief and early warning programs. Nutritional surveys of the last five years have been concentrated in the 6th and 7th regions, the areas of the country most nutritionally vulnerable in years of production shortfalls.

Food consumption data can be used as an indicator of the nutritional status of a population. It must be remembered, however, that food consumption indicators are not a perfect proxy for nutritional status as there are a number of factors other than food intake which may have an impact on the nutritional well-being of the individual. For example, poor sanitation and exposure to disease could adversely affect nutritional status by inhibiting the biological utilization of consumed nutrients. The relationship between food consumption and nutritional status is conditioned by the individual’s state of health, which is the product of a variety of biological, ecological, and behavioral factors. Thus policies and programs which bring about improvements in food consumption (through increased agricultural production, for example) may not always lead to commensurate improvements in nutritional status.

With these caveats in mind, qualitative and quantitative information on food intake can provide important indicators of the nutritional status of a population, even in the absence of specific anthropometric or clinical nutritional data. Data on food consumption in Mali are, however, very sparse. There has never been a study of food intake using a national sample, and fewer than ten regional studies, of varying quality, measuring food consumption have been completed in the last thirty years. The empirical base for calculating the demand side of the food balance equation is thus very weak.

The upcoming national DNSI/PADEM food consumption and expenditure survey (funded by UNDP) should help to fill a large gap in the existing knowledge base of food consumption in Mali. The study will collect information from approximately 3400 randomly selected households over a one-year period (March 1988 - February 1989. Data will be gathered on daily household food intake from all sources, food and non-food expenditures,
anthropometric measurements, and child feeding practices. (For a more detailed discussion of the methodology and expected results of this study, see Annex II). In addition, the recently completed Tufts University/DNSI/USAID urban food expenditure study should provide reliable information on price and income elasticities for foodstuffs in the seven regional capitals and Bamako. (The preliminary results of this study are discussed in the section V). It will be more difficult, however, to draw any strong conclusions about absolute consumption levels of specific foods and dietary adequacy from this study because 1) data were collected on expenditures, not consumption of food, 2) home-produced food and gifts were not included in data collection, and 3) certain food categories (e.g., fish, fruits, and leafy vegetables) could not be quantified and were thus excluded from the data set.

The small knowledge base of nutrition and food consumption issues in Mali can be attributed to the lack of resources devoted to this sector by either the government of Mali (GRM) or the donor community through the early 1980's. As mentioned above, nutrition monitoring and rehabilitation activities have increased dramatically since the 1984-85 drought. While the GRM appears to be very committed to nutrition issues on paper, in reality most activities in the nutrition sector are implemented by private voluntary organizations (PVO's). In 1982 the GRM drafted a food strategy paper (Ministry of Agriculture, 1982) which aimed to provide a coherent framework for intervention in the agricultural and nutrition sectors over the next few decades. The two fundamental objectives of the strategy are food self-sufficiency at the national level (with the possibility of becoming a net cereals exporter by the year 2000) and the achievement of a nutritionally adequate diet for the population. An adequate diet is defined as one providing 2450 calories per day, with 70 percent of the calories coming from cereals, for a total annual cereals requirement of 224 kg. per capita. Other than these three quantified measures of an adequate diet, the document discusses all other nutritional issues in very general terms and contains very few specific proposals.

Similarly, the GRM's Health and Social Development Plan (1981-90) outlines a primary health care strategy, containing detailed implementation proposals to combat the major childhood diseases and strengthen family planning proposals. Nutrition strategies in the document, however, are comparatively poorly developed. The Nutrition Service of the Ministry of Health is the government's primarily implementation agency in the nutrition sector. Its activities include the design of a nutrition curriculum for medical training programs, nutrition education through the mass media and seminars, coordination of school feeding programs, and cooperation with PVO's in nutritional surveillance and surveillance activities. The effectiveness of
the Service in these various activities is severely limited by its small budget and inadequate staff (currently 5 employees).

This paper will provide an overview of available data on food consumption and nutrition in Mali and attempt to examine the resiliency of these variables in response to changes in agricultural production, prices, and overall income. The next section will examine the national and regional food balance situation in recent years, focusing on the calculation of the demand side of the equation. The third section will describe food consumption patterns in Mali, noting variations across ethnic and agro-climatic zones. Dietary restrictions and child feeding practices, both having an important influence on nutritional status in Mali, will be discussed. The prevalence of malnutrition in Mali will then be assessed, drawing on several micro-level studies which have been carried out in the last two decades. The report will examine studies on both protein-energy malnutrition and vitamin and mineral deficiencies. Finally, an attempt will be made to assess how changes in agricultural production or income levels are reflected in different food consumption patterns or strategies. For example, what coping mechanisms do families employ in drought years to secure food supplies? What are the characteristics of rural farm households which survive bad production years with minimal adjustments in family food consumption? How might changes in prices and income resulting from macro-economic adjustments affect food consumption patterns?

It must be stated at the outset, however, that the evidence required to answer these questions is very weak. To date there have been no research studies in Mali which have collected both consumption and production data. Thus empirical linkages between the two variables are difficult to define. Furthermore, the only existing study which examines relationships between food consumption (actually, expenditures) on the one hand and prices and income on the other (the Tufts University/DNSI/USAID study) has only issued preliminary results. The income and price elasticities emerging from the final results of this study will allow for a much more rigorous discussion, in an urban context, of the relationships outlined above. Conclusions in this section, therefore, must be accepted as very tenuous.
II. OVERVIEW OF THE FOOD BALANCE SITUATION

A. Calculation of the Annual Per Capita Cereals Requirement

Annual assessments of the food situation in Mali generally calculate cereal consumption needs by multiplying regional population figures by 167 kg. (25 kg. of rice and 147 kg. of coarse grains). The figure of 167 kg. of cereals per capita was derived by FAO as an estimate of per capita cereals availability in Mali in the 1975-77 period and has been adopted as the standard by the GRM and several donors over the last decade (Autret, 1981). Thus the annual estimation of cereals consumption requirements in Mali is not based on any micro-level or disaggregated data, and, for most agencies involved in the planning exercise, uses a single national figure which has not been amended in several years.

It seems that USAID and other donors are trying to convince the GRM to increase the 167 kg. figure used in its food balance assessments. The GRM has tentatively agreed to adopt a higher figure for the 1988/89 crop year, pending approval by the various ministries. USAID and other donors are making the case for a higher per capita figure because they believe it would more accurately reflect consumption levels in recent years. There is also, however, a nutritional or biological basis for increasing the consumption figure used in the food balance calculation.

Table 1 calculates annual per capita cereals requirements for Mali under a variety of assumptions. The final result varies according to assumptions made about:

1. the caloric importance of cereals in the diet,
2. percentage loss due to seed, waste, and milling (between harvest or import and consumption), and
3. individual energy needs.

Two values for each variables are included in the table. Percentage of calories coming from cereals is alternately taken to be 70 and 80 percent. Mondot-Bernard and Labonne (1982) found that cereals accounted for 65 to 90 percent of caloric

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1Beginning with the assessment of food needs for the 1987/88 crop year, USAID has adopted a national grain consumption figure of 188 kg. per capita per year (156 kg. coarse grains and 32 kg. rice). Using the food needs assessment method recommended by the Food for Peace Office in Washington, USAID/Mali has taken an average of per capita grain availability in Mali over the previous five years and arrived at a figure of 188 Kg. The WFP and GRM are using the 167 kg. figure in their deficit calculations for the 1987/88 crop year.
consumption in their sample in several different regions of the country.

**TABLE 1**

**ESTIMATION OF ANNUAL PER CAPITA CEREALS REQUIREMENTS**

<table>
<thead>
<tr>
<th>PERCENT OF CALORIES FROM CEREALS</th>
<th>PERCENT ESTIMATED LOSS</th>
<th>DAILY PER CAPITA ENERGY REQUIREMENTS (calories)</th>
<th>CALCULATED PER CAPITA CEREALS REQUIREMENT (kg/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>70</td>
<td>15</td>
<td>2170</td>
<td>179</td>
</tr>
<tr>
<td>80</td>
<td>15</td>
<td>2170</td>
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</tr>
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</tr>
<tr>
<td>80</td>
<td>25</td>
<td>2300</td>
<td>236</td>
</tr>
</tbody>
</table>

*Note:* It is assumed that 1 kg of cereals yields 3530 calories.

Other studies have supported this range. The 70 percent figure also represents the goal of the GRM as stated in its food strategy document.

Percentage loss due to seed requirements, waste, and milling is estimated at 15 and 25 percent, both within the range used by the GRM, USAID, and WFP in their calculations of the food balance.

The energy requirement of 2170 calories per capita per day is taken from the Mondot-Bernard and Labonne (1982) study. They calculate this figure from their energy expenditure surveys of rural adult men and women. Mean daily expenditures for adult men agricultural workers are 2700 calories, and the parallel figure for adult women is 2600. Factoring in the requirements of the more sedentary urban population and children, they arrive at a national mean daily requirement of 2170 calories per capita.

The alternative figure of 2300 is used to reflect the upper end of the range calculated by Mondot-Bernard and Labonne.

Calculations of per capita cereals requirements under all scenarios are well above the 167 kg. figure. The estimation of the requirement seems to be most sensitive to the change in the percentage of calories coming from cereals, increasing 26 to 30 kg. when this variable alone is changed from 70 to 80 percent.
This exercise could be further refined by using regional figures for the percentage of calories coming from cereals and then weighting these estimates with population data to come up with a national figure. Disaggregated data of this type are not available now, but should be published next year in the results of the DNSI/Padem nationwide consumption survey. In addition, daily per capita energy requirements should be recalculated using the age and sex distribution pyramids deriving from the 1986 census (rather than the 1976 census upon which the above calculations are made).

Thus the donor effort to persuade the GRM to increase its official estimate of annual per capita grain consumption seems to be supported by calculations drawing on biological energy expenditure data as well as USAID's calculations of actual per capita consumption in the past five years. Clearly the 167 kg. figure is too low when compared with the available data on the caloric importance of cereals in the diet, estimated losses, and per capita energy requirements.

B. Regional Cereals Surplus/Deficit Situation

Using the 188 kg. per capita grain consumption figure calculated by USAID in their 1987/88 food needs assessment report (see footnote page 4), Figure 1 shows the average regional surplus/deficit for the 1984/85 - 1987/88 crop years. (It should be noted that 1987/88 harvest figures are still preliminary). Only regions II (Koulikoro) and III (Sikasso) had a surplus in all four crops years. Region IV (Segou) had a deficit in two years (1984/85 and 1987/88) and a surplus in the other two. Its surpluses, however, were much larger than its deficits, and on balance over the four years, it was a surplus producer of grain. The remaining four regions, I (Kayes), V (Mopti), VI (Timbuktu), and VII (Gao) were deficit producers in all four years. The Sikasso region had the largest absolute surpluses over the period, while the Mopti region had the largest absolute deficits.

Table 2 gives the percent of cereals needs met by local production in each region over the last four crop years. The Koulikoro and Sikasso regions were able to meet their needs from local production even in the worst year of the recent drought, 1984/85. In years of average and good rainfall, the Segou region is able to generate a surplus of 30 to 40 percent. The Kayes region has a grain deficit in all four years, but the size of the deficit varies tremendously (from 18 to 62 percent). The Mopti region also has a deficit in all four years, generally producing between one-half and three-quarters of its requirements. The Gao and Timbuktu regions generally produce less than one-quarter of their grain requirements. For the country as a whole, in a year of exceptionally poor rainfall like 1984/85, Mali is able to meet...
FIGURE 1

GRAIN SURPLUS/DEFICIT BY REGION

1984/85 – 1937/88 AVERAGE (MT)

Sources: Cereal Production --
       FAO FAO; National Population --
       FAO FAO 1986 census; Regional
       Population -- FAO estimates;
       cereal Requirements -- UN/FAO/FAO
       (12 1 kg/person/year).
65 percent of its consumption needs with local production. In an excellent rainfall year like 1986/87, the country reaches an equilibrium between grain production and consumption.

### TABLE 2

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>Kayes</td>
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<td>55</td>
<td>59</td>
<td>82</td>
</tr>
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<td>Koulikoro</td>
<td>104</td>
<td>133</td>
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</tr>
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<td>Sikasso</td>
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<td>35</td>
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<td>Gao</td>
<td>2</td>
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</tr>
<tr>
<td>MALI</td>
<td>65</td>
<td>89</td>
<td>99</td>
<td>81</td>
</tr>
</tbody>
</table>

Source: Cereal production from GRM DNSI. National population from GRM DNSI 1986 census. Regional population from FEWS estimate. Cereal requirements from USAID/Mali (188 kg/person/year).

Since 1969, Mali has experienced six years in which per capita cereals production has fallen below 167 kg. per capita, estimated by the government to be the minimum requirement. In only three years of the last twenty has per capita grain production exceeded 200 kg. per capita (Hoskins, 1987). Thus in approximately half of the last twenty years, per capita grain production has fallen between 167 and 200 kg.

### III. FOOD CONSUMPTION PATTERNS

#### A. Regional and Ethnic Group Variation

Cereals are the main staple of the diet in most areas of the country. Among sedentary groups, coarse grains (millet, sorghum, and maize) and rice represent 70 to 80 percent of caloric consumption. For the populations of the 6th and 7th regions and pastoral groups in other regions of the country, animal products generally account for the bulk of caloric consumption. The importance of cereals in the diets of traditionally nomadic groups, however, varies widely and has been increasing in recent years due to the expanding integration of seasonal crop
cultivation and animal herding among these populations. Normally, the urban and rural sedentary populations consume three meals a day while the nomadic populations consume only two meals a day. During the "soudure" (the pre-harvest period) or in drought years, daily meals might fall to one or two per day.

1. Rural Sedentary Diets

The three meals a day of the rural sedentary population are generally built around millet or sorghum as the staple. The staple varies occasionally according to season (higher consumption of maize in September, before the millet and sorghum harvest is in) and region (pockets of rice consumption, such as the Office of Niger). The morning meal is generally a "bouillie" (thin porridge) of millet, boiling millet flour in water and adding milk and sugar, if available. The noon meal is generally based on millet "toh" or rice. The millet flour is cooked until it reaches a dense, dough-like consistency and is served with a sauce generally containing some combination of the following ingredients: baobab or moringa leaves, gumbo, tomatoes, onions, hot peppers, "soumbala" (a traditional spice), and, more rarely, fish or meat. If rice is cooked, it is served with a sauce consisting of fish or meat, oil, and some combination of vegetables, groundnuts, and beans. The evening meal may consist of either "toh" or millet couscous, prepared by steaming the millet flour until it reaches a fluffy consistency. The sauce served with couscous can include beans, manioc, tomatoes, onions, or groundnuts.

There is very low consumption of chicken, eggs, and milk among rural sedentary populations. Although many families own chickens, they are generally only killed for visitors. Eggs are produced in abundance in rural areas but are not widely consumed due to dietary restrictions against their consumption among many Malians (this and other dietary restrictions will be discussed further on).

Overall these cereals-based diets provide a sufficient level of protein intake. Even with a low consumption of protein-rich animal products in the diet, millet and sorghum have a protein-energy ratio of 10 percent (i.e. percent of calories per gram coming from protein). In general, in a diet where the protein-energy ratio is at least 10 percent, if caloric needs are satisfied, protein requirements will also be met. (Roots and tubers have a protein-energy ratio of 6-7 percent so that adults and children eating diets based on this staple will have problems satisfying their protein requirements.) The addition of peanuts and beans to sauces enhances the protein quality of these diets. Finally, baobab leaves, consumed frequently, are a rich source of protein.
The rural sedentary diet is, however, lacking several vitamins and minerals. Consumption of fruits and vegetables varies seasonally and regionally (being less available in the northern parts of the country) and thus accounts for observed deficiencies of vitamin A and C. Vitamin deficiencies are compounded by two additional factors: the low intake of fats and oils limits absorption of Vitamin A, and most vegetables are cooked for so long that their vitamin C content is largely destroyed. Some consumption studies have found that rural diets in Mali are severely deficient in riboflavin (vitamin B-2), but no nutrition study has measured the prevalence of deficiency symptoms, partly because low intakes do not result in a classical deficiency disease (such as goiter or scurvy) as do other vitamin and mineral deficiencies. The lack of consumption of products of animal origin results in low iron intake, contributing to widespread incidence of anemia. The only significant source of calcium in the diet is green leaves. Consumption studies in Mali have noted low calcium intake, but, as with riboflavin, no nutritional study has measured the extent of the deficiency syndrome.

2. Urban diets

Diets are more diverse in cities but remain very similar to the rural diets described above. Rice and meat are consumed more widely in urban areas, and sauces for the staple grain dishes are generally more rich (more vegetables, oil, meat or fish). There are some regional variations in urban consumption, with cereals being relatively more important contributors of calories in Sikasso and Bamako, and milk and meat more important in Gao and Mopti (Rogers and Lowdermilk, 1987).

A 1975 household survey (n=1144 households) of consumption of products of animal origin in Bamako (OMBEVI, 1976) found the following consumption levels:

38.5 kg. meat/per cap./yr.
15.9 kg. eggs/per cap./yr.
10.22 kg. milk/per cap./yr.

1Riboflavin is essential for growth, reproduction, and prevention of a variety of deficiency signs, such as reddening and swelling of the mouth and throat, dermatitis of the face and ears, cracking of the lips, and anemia.

2Calcium functions chiefly to build the skeletal structure. Deficiency signs in children are stunted growth, poor quality of bones and teeth, and malformation of bones. In adults low calcium intakes can lead to muscle pains and cramps, numbness, stiffness and tingling of hands and feet, muscle spasms, and, in the long run, osteoporosis.
Beef accounts for eighty percent of meat consumption. Eggs are consumed by only 20 percent of the sample households; 67 eggs per capita per year are consumed in the egg-eating households.

There is some evidence that consumption of meat in Bamako has actually declined over the past decade. Sixty-five thousand fewer heads of cattle were slaughtered in slaughterhouses in Bamako in 1983 than in 1974 (Sidibe, 1985). The 1985 DNSI study found meat expenditures in Bamako to be only 15.12 kg. per capita per year (Rogers and Lowdermilk, 1987). This expenditure figure for Bamako probably closely approximates consumption as the 1976 OMBEVI study found that herding of animals is only done in the lowest income groups. Sidibe (1985) speculates that this lower consumption of meat in Bamako is due both to the decimation of herds in the mid-1970s drought and to a lower purchasing power among urban households.

The urban diet is richer and more varied than the rural sedentary diet due to both the wider variety of available foods on urban markets and the generally higher income levels of urban residents. Thus iron and calcium intakes are higher in urban areas, and vitamin A and C deficiencies should be less common. Nutritional studies in urban areas, however, are very rare so that it is hard to assess how these differences in dietary patterns are manifested in nutritional status.

3. Diets of Nomadic Populations

The staple of the nomadic Peul, Maure, and Tuareg diet is milk, complemented by cereals, meat, sugar, and dates. A 1983 study of the diets of Tuaregs in northeastern Mali revealed that 68 percent of caloric consumption was derived from milk, 24 percent from cereals, and 8 percent from meat (Sidibe, 1985). These figures, however, vary widely across different nomadic groups, depending on the size of their herds and their degree of interaction and exchange with sedentary populations. Cereals consumption among traditionally nomadic populations seems to be increasing as successive drought years diminish the sizes of their herds and force them to diversify their livelihoods by using part of their labor resources to cultivate grain on an annual basis. A 1981-82 study of Tuaregs in the inner Niger delta region found that the percentage of calories derived from cereals varied from 45 to 67 percent between two different camps (Hill, 1985).

Milk production and consumption is seasonal, peaking near the end of the rainy season and falling throughout the dry season as pasture becomes more scarce and water sources dry up. In the dry season the milk is generally reserved for women and children. Butter and cheese are made in the rainy season and stored. Among the Tuareg, exchange of milk for cereals or other food products
is very rare; proceeds from animal sales are generally used to purchase supplementary foods (Ag Hama, 1983).

Meat consumption among Tuaregs is also seasonal, peaking at the end of the rainy season. Animals are fattest at this time of the year and their by-products are needed to make preparations for the dry season (e.g. sacks for the storage of water). The caloric contribution of meat to the diet is very low; animals are not killed on a regular basis for consumption. The main reasons for killing animals are the visit of parents or strangers, religious holidays, sickness of the animal, and artisanal needs (Ag Hama, 1983).

The traditional diet of the nomadic populations provides ample intake of protein and calcium. Fruits and vegetables, however, are rarely found in the northern parts of the country where these populations are concentrated, and thus vitamin A and C deficiencies are common.

B. Child Feeding Practices

Malian children are generally breast-fed for their first two years of life. Among many ethnic groups in Mali, colostrum (the initial milk which flows from the breast for the first few days after birth) is discarded because it is believed to be harmful to the child. In fact, colostrum is a very rich nutritional food, containing anti-infective properties which build up the child's immune system. Introduction of supplementary foods is often late, occurring at 8 to 12 months rather than the recommended 3 to 6 months (after 6 months breast milk alone is no longer sufficient to assure the adequate growth of the child). One study in the mid-1960s in two villages in the 2nd region found that in 40 percent of the households, children were not given supplementary foods until 24 months of age (Lefevre, 1986). The most common supplementary foods given to infants are watery porridges (bouillie) which do not provide sufficient energy for the child. Weaning generally takes place between 18 and 25 months and is done in an abrupt manner, either because of a new pregnancy or because the child has reached a certain age. As a result of the combination of these practices, prevalence of protein-energy malnutrition is highest among children between 6 and 24 months of age.

Dettwyler (1986) studied child feeding practices and nutritional status among 136 children in a suburb of Bamako. She found that socio-economic status (measured by a variety of household indicators) did not account for variation in nutritional status among the sample children. Growth performance was found to be highly positively correlated with maternal attitude regarding infant feeding practices and health care.
Examples of maternal behaviors which significantly affect the child's nutritional status include: 1) whether a mother will wake a child who is sleeping at mealtime or let him sleep through the meal, 2) whether a mother prepares special foods that she knows the child likes, and 3) whether a mother will allow a child who says he is not hungry skip a meal. Thus behavioral practices within a family play an important role in determining the nutritional status of children.

Dettwyler's findings for the Bambara are supported by studies of other ethnic groups. Although the Bella are generally poorer than the Tuaregs, one study found that the Bella had lower rates of child mortality than the wealthier Tuaregs. The author concluded that this finding was attributable to different standards of child care between the two groups (Hill, 1985), underscoring again the critical impact of cultural factors on health and nutritional variables.

C. Dietary Restrictions

Dietary restrictions are found among most ethnic groups in Mali and generally apply to either a specific category of the population (e.g. children and pregnant women) or to feeding practices during illnesses. Table 3 lists some food taboos for children and pregnant women found among different ethnic groups. It should be noted that these taboos do not necessarily exist for the entire ethnic group and may only apply to a small number of villages or camps.

It is ironic that food taboos are mainly applied to children and pregnant women, the two groups with the highest nutritional needs per kilogram of body weight. Most of the restrictions pertain to foods of animal origin which are rich in protein. While the exclusion of such rarely consumed foods as snake and monkeys from the diet probably has little impact on the nutritional status among these two groups, the more general prohibitions against meat and egg consumption probably have an adverse impact on the protein intake of children and pregnant women.

Dietary restrictions for sick individuals, especially children, are common. Among some Bambara, for example, children with measles are not allowed to eat red meat. A high intake of protein is needed during a measles episode to fight the disease and recuperate lost growth. Prohibitions against meat intake thus slow children's recovery from the illness, provoke the onset of protein-energy malnutrition in conjunction with the disease, and contribute to the high rates of child mortality from measles in Mali.
Many Bambara and Tuareg groups traditionally withhold water from a child with diarrhea who is vomiting because the liquid is believed to provoke their symptoms. This practice results in the dehydration of the child which can lead to death. Thus cultural practices with respect to the treatment of diseases can have a very adverse impact on the nutritional status of the sick individual.

**TABLE 3**

**DIETARY RESTRICTIONS FOR CHILDREN AND PREGNANT WOMEN AMONG DIFFERENT ETHNIC GROUPS**

<table>
<thead>
<tr>
<th>ETHNIC GROUP</th>
<th>CHILDREN</th>
<th>PREGNANT WOMEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bambara</td>
<td>eggs</td>
<td>eggs</td>
</tr>
<tr>
<td></td>
<td>-if eaten by a child who doesn't speak, he will become deaf-mute</td>
<td>-her child will have the fragility of an egg</td>
</tr>
<tr>
<td></td>
<td>-can cause goiter</td>
<td>slaughtered meat</td>
</tr>
<tr>
<td></td>
<td>-if eaten by a young girl before she is circumcised she will bleed a lot when circumcised</td>
<td>reptiles, monkeys, rabbits, deer</td>
</tr>
<tr>
<td></td>
<td>meat</td>
<td>animals which died in labor</td>
</tr>
<tr>
<td></td>
<td>animal organs, eyes and tongues</td>
<td></td>
</tr>
<tr>
<td></td>
<td>millet (temporary)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-a child born after the harvest does not have the right to eat foods older than him; he must wait until the next harvest to consume millet</td>
<td></td>
</tr>
<tr>
<td>ETHNIC GROUP</td>
<td>CHILDREN</td>
<td>PREGNANT WOMEN</td>
</tr>
<tr>
<td>--------------</td>
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<td>----------------</td>
</tr>
<tr>
<td>Sarakolle</td>
<td></td>
<td>eggs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-her child will be deaf mute</td>
</tr>
<tr>
<td></td>
<td></td>
<td>meat</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-her child will be jealous</td>
</tr>
<tr>
<td></td>
<td></td>
<td>animals with claws</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-her child will be anti-social</td>
</tr>
<tr>
<td>Songhai</td>
<td>rice, toh</td>
<td>animals which died in labor</td>
</tr>
<tr>
<td></td>
<td>-will retard child in walking</td>
<td></td>
</tr>
<tr>
<td>Peul</td>
<td></td>
<td>python</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-the woman and child will become lazy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>goat intestines</td>
</tr>
<tr>
<td>Tuareg</td>
<td></td>
<td>bouillie, toh</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-will make woman sick unless eaten in the morning</td>
</tr>
</tbody>
</table>

IV. PREVALENCE OF MALNUTRITION

A. Protein-Energy Malnutrition

Protein-energy malnutrition (PEM) is found among all age groups in all regions of Mali. Whereas malnutrition in adults is most closely correlated with qualitative and quantitative food consumption deficiencies, PEM in young children is only partially due to problems in the level and quality of food intake. Equally important determinants of childhood malnutrition in Mali are: 1) inappropriate child feeding practices (such as the late introduction of supplementary foods and abrupt weaning, as described in the previous section) and 2) the high level of infectious and parasitic diseases, which are associated with and aggravated by secondary malnutrition (Benefice and Chevassus-Agnes, 1981; Autret, 1981; UNICEF, 1987c). The importance of these latter two factors are underscored by two findings which emerge from the PEM prevalence studies (see Table 4): PEM prevalence rates are highest for children between 6 and 24 months, the weaning period, and the incidence of PEM and childhood diseases in Mali follow similar seasonal patterns, both peaking during the rainy season.

The synergistic interaction between nutritional status and health flows both ways; that is, health is a strong determinant of nutritional status, and, at the same time, nutritional status has a significant impact on one's health.

The presence of infectious or parasitic disease affects nutritional status through several mechanisms. Illnesses such as diarrhea can weaken nutritional status through decreased absorption of almost all nutrients in the diet, decreased food intake due to loss of appetite, and increased metabolism due to fever. Malaria adversely affects nutritional status by inhibiting the efficient absorption of iron, thus contributing to iron-deficiency anemia. (Malaria and anemia have been found to follow the same seasonal patterns in Mali, peaking during the soudure; see Haidara, 1980, and Benefice and Chevassus-Agnes, 1981.) Hospital studies in Mali have found that PEM often appears immediately after other diseases, notably measles and diarrhea (Coulibaly, 1977). The GRM Ministry of Health cites a study which found that 41 percent of diagnosed cases of PEM (specifically kwashiorkor) were secondary to episodes of measles (Lefevre, 1986).

Nutritional status, on the other hand, also has a direct effect on one's state of health by weakening the body's ability to resist infection and slowing the recovery process. Protein-energy malnutrition is an aggravating factor for many diseases in Mali, particularly diarrhea and respiratory diseases (Coulibaly, 1977). In studies from other developing countries, the presence of PEM and other nutritional deficiencies (of vitamin A, for example) has been found to increase the incidence of infectious
diseases by reducing the ability of skin and internal membranes to ward off infection and suppressing the internal immune system. Moreover, once an infection is established, nutritional status consistently affects the outcome by increasing the severity, duration, and case fatality rate of the disease (Briggs and Calloway, 1984). Many seemingly healthy adults and children often have malaria parasites in the blood or a large population of worms in the intestine. Individuals are able to cope with these parasites as long as diets are adequate. But when nutritional status falls, the disease overwhelms them (Briggs and Calloway, 1984).

Although malnutrition is commonly cited as a frequent primary and secondary cause of death for children under five in developing countries, there are very little Mali-specific data linking mortality rates and malnutrition. While malnutrition is a contributing factor in many deaths resulting from diseases such as measles and diarrhea, a study in the mid-1970s showed protein-energy malnutrition alone to be the fourth biggest cause of child mortality in Malian hospitals (after measles, malaria, and diarrhea) (Coulibaly, 1977).

1. Acute Protein-Energy Malnutrition

a. Prevalence Studies

Nutritional surveys generally rely on anthropometric measures (vs. clinical or bio-chemical assessments) as indicators of PEM prevalence. Anthropometric surveys try to measure the prevalence of chronic PEM, acute PEM, or both. Chronic malnutrition is generally captured by measuring height for age, an indicator of stunting or cumulative growth retardation. Height/age is an indicator of the historical, long-run nutritional status of adults than that of children. Nutritionists believe that up until age 14, observed differences in height and weight across populations are attributable to nutritional factors rather than differential ethnic growth potentials. Thus growth norms adapted for the United States can be used as references for Malian children. After age 14, however, ethnic influences may play a role in growth so that it is unreliable to use standards developed in the U.S. as references for Malian adults. Some non-Western countries have counteracted this problem by using national samples to generate their own growth standards. Data limitations prohibit such national standards from being developed for Mali. Thus because accurate determination of protein-energy malnutrition among adults is so problematic, the discussion of PEM prevalence in Mali will focus on small children, the group believed to be most vulnerable to the syndrome.
nutritional status of an individual and is often used in population studies to make comparisons across populations or measure changes over time. Acute malnutrition is associated with wasting (a reduction in the amount of body tissue for a given height) and is generally measured by weight for height although several other measures are also used (weight for age, arm circumference, head circumference). Weight/height is an indicator of current nutritional status and is the measurement most often used to assess at-risk individuals. A key advantage of the weight/height measure is that one does not need to know the age of the child to compare his measurement against a standard. One disadvantage of the weight/height measure, however, is that a child could be mild or moderately malnourished throughout his life, resulting in reduced growth rates, but normal weight/height proportions are maintained and thus his condition is not captured by this measure.

Children with mild or moderate cases of acute malnutrition generally do not suffer long-term physical or mental damage. Children with severe acute malnutrition exhibit the obvious clinical signs of the deficiency syndromes of marasmus and kwashiorkor which have physical and mental effects which may or may not be reversible. Chronic malnutrition results in more subtle adaptations: growth stunting, lower energy levels, and inhibited intellectual and psycho-motor development. The severity of these outcomes depends on the length of the nutritional deprivation and the age at which it occurred. There is much debate (and very little evidence) over whether these childhood symptoms of deprivation can be reversed by adequate nutrition later in life.

Because studies collect different anthropometric measures and then compare these measures to different reference standards, it is often very difficult to compare results across studies. Most nutrition surveys conducted in Mali in the 1970's and early 1980's suffer from this problem of lack of common methodology, thus limiting their respective contributions to estimations of PEM prevalence in Mali. Fortunately, in the wake of the 1984-85 drought and the enormous proliferation of nutritional surveys in Mali by a variety of organizations, a commission was created by the Systeme d'Alert Precoce (SAP, a GRM agency which monitors famine early warning indicators above the 14th parallel in Mali; see Annex II for a further discussion of their activities) to fix a common methodology for all field surveys of malnutrition. This common methodology has been adopted by virtually all PVO's conducting such studies in Mali.

Table 4 lists the results of various anthropometric surveys, all but one carried out between 1984 and 1987 and concentrated in the 6th and 7th regions of the country. Most of these studies rely on a random sampling method, choosing villages and nomadic camps from census lists and once in a given village or camp,
walking in a designated pattern and measuring children in the compounds or tents encountered until the predetermined sample number has been achieved. Weight and height was chosen as the anthropometric indicator as PVO's are generally interested in assessing the at-risk individuals, those suffering from acute malnutrition. All studies use the NCHS/WHO/CDC tables as reference standards. Children falling between 70 and 80 percent of this standard are considered to be moderately malnourished and those below 70 percent of the standard, severely malnourished. Table 4 lists the percent of surveyed children falling into both of these categories.

Overall most prevalence studies from the last few years show that between 7 and 20 percent of Malian children under six years old suffer from either moderate or severe acute malnutrition rates within this range). The vast majority of these undernourished children fall into the category of moderately malnourished; eighty percent of the studies in Table 4 which give percentages of children lying below 70 percent weight/height show prevalence rates between 0 and 3 percent.

Table 4 shows the significant effect of the 1984-85 drought on nutritional status, particularly in the 6th and 7th regions. The effects of drought on nutritional status are most accurately measured by indicators of wasting or acute malnutrition (e.g. weight/height, the measure used in Table 4). The nutritional status of adults and children suffers in a drought because failed crops and dried pastures and watering holes lead to losses of livelihood and food shortages. There are no data for Mali that measure the nutritional situation of a population before and during a drought, but Table 4 offers some evidence on prevalence rates during and after a drought. Studies show that prevalence rates were already high by mid-1984 (the earliest 1980's studies in the table) and stayed high through the end of 1985. Overall rates are lower in 1986 and 1987 although some pockets of nutritional deficits persist (e.g. Temera in August-September 1986, #42, and Almoustarat in October 1986, #44). Medecins Sans Frontieres noted a big improvement in the nutritional situation of the 6th region from mid-1985 to mid-1986 (#27 and #28). A study by the U.S. Center for Disease Control during and after the 1973-74 drought showed a dramatic improvement in nutritional status in northern Mali from 1974 to 1975 (Hogan, et al., 1977). Improvements in nutritional status after a drought can be attributed to better harvests and more abundant pastures as well as food aid and nutrition recuperation activities. Over 500

1There are many nutritional studies which have been carried out in Mali in the last two decades which have excluded from the table because they used different reference standards or did not state which reference standards were used.
### TABLE 4
PREVALENCE OF ACUTE PROTEIN - ENERGY MALNUTRITION AMONG CHILDREN IN MALI: A SUMMARY OF EXISTING STUDIES

<table>
<thead>
<tr>
<th>ARRONDISSEMENT ¹</th>
<th>STUDY DATE</th>
<th>SAMPLE SIZE</th>
<th>AGE IN MONTHS ²</th>
<th>PERCENTAGE LESS THAN 80% STANDARD</th>
<th>WEIGHT FOR HEIGHT ³</th>
<th>SURVEYOR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>REGION I</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Nioro (city)</td>
<td>August 7 1984</td>
<td>1939</td>
<td>0 - 60</td>
<td>5.5</td>
<td>--</td>
<td>SSP</td>
</tr>
<tr>
<td>2 Diema (city)</td>
<td>August 7 1984</td>
<td>275</td>
<td>0 - 60</td>
<td>6.6</td>
<td>--</td>
<td>SSP</td>
</tr>
<tr>
<td><strong>REGION II</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Dilly</td>
<td>April 1984</td>
<td>445</td>
<td>0 - 72</td>
<td>23.6</td>
<td>--</td>
<td>MSF</td>
</tr>
<tr>
<td>4 Falou</td>
<td>April 1984</td>
<td>287</td>
<td>0 - 72</td>
<td>16.0</td>
<td>--</td>
<td>MSF</td>
</tr>
<tr>
<td>5 Guire</td>
<td>April 1984</td>
<td>295</td>
<td>0 - 72</td>
<td>14.9</td>
<td>--</td>
<td>MSF</td>
</tr>
<tr>
<td>6 Mouridiah</td>
<td>April 1984</td>
<td>726</td>
<td>0 - 72</td>
<td>14.4</td>
<td>--</td>
<td>MSF</td>
</tr>
<tr>
<td>7 Balle</td>
<td>April 1984</td>
<td>471</td>
<td>0 - 72</td>
<td>16.0</td>
<td>--</td>
<td>MSF</td>
</tr>
<tr>
<td>8 Balle</td>
<td>December 1986</td>
<td>324</td>
<td>6 - 60</td>
<td>4.9</td>
<td>(0.0)</td>
<td>SAP</td>
</tr>
<tr>
<td>9 Balle</td>
<td>June 1987</td>
<td>450</td>
<td>6 - 60</td>
<td>14.2</td>
<td>--</td>
<td>SAP</td>
</tr>
<tr>
<td>10 Balle</td>
<td>August 1987</td>
<td>450</td>
<td>6 - 60</td>
<td>10.7</td>
<td>(1.8)</td>
<td>SAP</td>
</tr>
<tr>
<td><strong>REGIONS II &amp; III</strong></td>
<td></td>
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<tr>
<td><strong>REGIONS II, III, &amp; IV</strong></td>
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<tr>
<td>12 CMDT Nord \</td>
<td>Nov 1984 - Feb 1985</td>
<td>3660</td>
<td>0 - 60</td>
<td>26.0</td>
<td>--</td>
<td>ENNPNM</td>
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<td>13 CMDT Sud /</td>
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<tr>
<td><strong>REGION V</strong></td>
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<td></td>
</tr>
<tr>
<td>14 Douentza (cercle)</td>
<td>Mar - May 1984</td>
<td>1282</td>
<td>6 - 60</td>
<td>7.4</td>
<td>(0.9)</td>
<td>MSF</td>
</tr>
<tr>
<td>15 Douentza (city)</td>
<td>Mar - May 1984</td>
<td>338</td>
<td>6 - 60</td>
<td>6.6</td>
<td>(0.6)</td>
<td>MSF</td>
</tr>
<tr>
<td>16 Douentza Central</td>
<td>September 1986</td>
<td>200</td>
<td>6 - 60</td>
<td>8.0</td>
<td>(0.0)</td>
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¹ Arrondissement given unless "cercle" or another designation is specified.

² If the age of the child is unknown, surveyors generally measure children between approximately 65 and 115 cm tall.

³ Weight for height figures below 80% and above 70% of NCHS/WHO/CDC standards are considered to be an indicator of moderate acute malnutrition. Ratios below 70% of the standard indicate severe acute malnutrition. The first figure in the column gives the percentage of malnourished children, including those considered to be both moderately and severely malnourished. The second figure in the column gives the percentage of children below 70 percent of the standard, those considered to be severely malnourished. A dash indicates that the latter figure was not available.
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nutrition recuperation and education centers were opened by the
GRM and various PVO's during 1984-86 and were responsible for the
rehabilitation of approximately 40,000 children (Prins, et al.,
for opening a recuperation center is when PEM prevalence (less
than 80 percent weight/height) in a given area reaches 10 percent
for children between 6 and 72 months. Children below 80 percent
weight/height are admitted and are released when they are growing
properly and when their mothers have mastered the nutrition
education material. (According to a nurse at Save the Children-
UK, stays in the nutrition centers range from two months to a
year.)

Incidence of acute PEM seems to vary seasonally. Preva­

cence rates tend to be lowest in the November - March period.
The highest rates are generally found in the June - September
period, coinciding with the soudure, or the pre-harvest hungry
period. This seasonal variation is somewhat masked in Table 4
because of the effects of the 1984-85 drought which in many cases
overwhelmed the seasonal patterns. Post-drought surveys in the
same arrondissement, however, show clearly the seasonal variation
in PEM prevalence. The prevalence rate in Balle (Region II)
reached a low of 4.9 in December 1986 and rose to 14.2 during the
soudure of the following year. In the 5th region, PEM prevalence
rose to 14.5 at the end of the 1985 soudure in N'Gouma and then
fell in half to 7.3 by March 1987. For pastoral groups, the
peaks and valleys of nutritional status may vary somewhat,
depending on the relative contribution of animal-based products
and cereals to the diet. Wagenaar-Brower (1985) found, for
example, that the difficult period for the Tuareg children falls
much earlier in the year (April - May) than for the Fulani
children (August - September) in the Niger Delta.

These seasonal variations in nutritional status among
children coincide with the significant seasonal swings in adult
body weights described in several studies (Mondot-Bernard, 1980;
Hill, 1985; Benefice and Chevassus-Agnes, 1981). Seasonal
variation in nutritional status is explained by changes in food
availability, labor demands, and disease incidence.

Inter-annual variation or long-run trends in PEM prevalence
rates in Mali are harder to assess due to the small number of
studies using common methodologies. The few studies from the
late 1970's which used the NCHS standards on weight/height and
can thus be compared with the studies in the 1980's generally
show rates within the same range as the more recent studies, 7 to
20 percent (see Mondot-Bernard, 1980; and Benefice and Chevassus-
Agnes, 1981). Thus there does not seem to have been any long-
term improvement (or deterioration) in childhood nutritional
FIGURE 2
Nutritional Situation of Children Under Five Years
(0 - 59 MOIS)

LEGENDE
% RAPPORT Poids TAILLE ≤ 80%
(NORME RCMB)

- 0 - 5%
- 6 - 10%
- 11 - 15%
- 16 - 20%
- Plus de 20%

source: Lefevre, 1986
status in Mali, although the data are too weak to permit a strong conclusion on this issue.

Caution must be exercised, however, in attempting to compare the absolute prevalence rates even across different studies using a common methodology. Table 4 indicates however that even with the standardization of research methods, surveys undertaken by two different agencies in the same arrondissement in the same month can give two very different impressions of the nutritional status of the population. In July 1986 both SAP and the Red Cross conducted surveys in the arrondissement of Almoustarat in the 7th region; one study yielded a PEM prevalence ratio of 21.4 while the other one calculated a ratio of 12.0. Similarly, in the same arrondissement in September and October 1986, UNICEF and SAP conducted studies and came up with 16.8 and 43.0 prevalence rates, respectively. Although this large variation can perhaps be partially explained by significant differences in sample size and slight differences in the timing of the surveys and age of the samples, the persistence of such large discrepancies leads one to question either the common working methodology of the PVO's or the implementation of that research design in the field. Thus the degree to which these studies accurately describe the nutritional status of the population remains uncertain.

b. Affected Population

Protein-energy malnutrition varies across regions, age groups, sex, and ethnic groups. Figure 2 shows the regional variation in prevalence of acute among children aged 0 to 5 using data from studies conducted in 1984 and 1985 which are based on the NCHS norms. High levels of PEM are found in every region of the country. Within the 7th region, the arrondissements of Almoustarat and Temera (Bourem cercie) (data from Table 4) and the Menaka cercle seem to be particularly vulnerable to high rates of PEM. In the 6th region, the cercles of Goundam and Gourma-Rharous have prevalence rates above 16 percent.

The prevalence rates in the CNDT zone (covering parts of the 2nd, 3rd, and 4th regions) are surprisingly high given that this is the major surplus grain production zone in the country. Rural residents in this zone are also believed to have relatively higher disposable incomes due to their revenues from cotton sales. The high rates are even more surprising given that the survey was conducted in the post-harvest period, November through February, when annual nutritional status is usually at its highest level. There are two possible attenuating factors which may partially explain the high rates. First, this study was done in the months immediately following one of the worst harvests Mali has recorded in the last thirty years. In addition, the sample population may have included migrants from northern Mali (fleeing drought-stricken zones) who would be expected to have a
generally poor nutritional status. Even accounting for the possible role played by these two factors, rates of childhood malnutrition in the CMDT zone are still very high, thus lending further evidence to the argument that the determinants of PEM in Malian children are not only socio-economic in nature but are also behavioral (child feeding practices) and environmental (sanitation and disease).

Very few nutritional surveys have been conducted in cities in Mali. Thus there are not sufficient data to compare the nutritional status of urban and rural populations.

In addition to regional variation in PEM incidence, rates vary across sex and age groups. Malnutrition rates in virtually all studies are highest for children between 6 and 24 months of age which coincides with the weaning period. Several studies find statistically significant higher rates of PEM among girls than boys but cannot identify a biological reason or social custom which would account for this difference (MSF, 1986; UNICEF, 1987a; UNICEF, 1987b).

Studies vary in their findings of variation in childhood nutritional status across ethnic groups. In their 1986 survey of 1800 children in the 6th region, MSF (1986) found no statistically significant differences between ethnic groups (Tuareg, Bella, Songhai, and Maure). Villeneuve (1986), on the other hand, observed significant ethnic group variation in PEM prevalence: the sedentary Songhai were much more malnourished than the nomadic Tuaregs and Maure. A 1987 study in the Bourem cercle found the Bella and Songhai people to be much worse off than the Tuaregs and Maures (UNICEF, 1987b). The authors observe that within the sample studied, the Bellas, the traditional slaves of the Tuaregs, own very few animals and no land. A 1978-79 study in southern Mali revealed that nutritional indicators among both children and adults were highest for the Minianka ethnic groups and lowest for the Malinkes and Peuls. Indicators for the Bambara lay between these two extremes (Benefice and Chevassus-Agnes, 1981). In the cercle of Segou, researchers observed less PEM among the Bozo than either the Bambara or Peul (Institut National de Recherche en Sante Publique, 1986).

2. Chronic Protein-Energy Malnutrition

The foregoing discussion of PEM prevalence focused exclusively on acute malnutrition as the bulk of nutrition surveys in Mali measure indicators of acute rather than chronic PEM. While acute malnutrition can be traced to discreet events such as a sudden food shortage or an abrupt weaning experience, chronic malnutrition has its roots in longer-run phenomena such as low income or low levels of food production. Food deficits over long periods of time result in stunted growth, the primary indicator
of chronic protein-energy malnutrition. The small number of studies which attempt to measure chronic PEM in Mali are listed in Table 5.

The six studies cited give prevalence rates between 13 and 36 percent. There are insufficient data to make any comparisons across regions or over time. Rates of chronic PEM generally peak later than those for acute PEM. Whereas the highest rates of acute PEM are found in children between 6 and 24 months of age (the weaning period), rates of chronic PEM are generally highest in children between 24 and 48 months of age and continue at fairly high levels until age 14. Mondot-Bernard (1980) explains the relatively high rates for the 6 to 14 year old category by observing that young children are very active, especially young girls, who start helping with household chores at a very young age and carry heavy loads relative to their weight.

B. Vitamin and Mineral Deficiencies

1. Vitamin A

In 1980 the GRM Nutrition Service found that severe vitamin A deficiency affected approximately 11.7 percent of the surveyed population in the 1st, 5th, and 7th regions of the country (Lefevre, 1986). A 1956-58 consumption survey in the Office du Niger and inner delta region found that the diet only satisfied 45 percent of vitamin A requirements (Cantrelle, 1961). A 1975 survey of 823 children aged 0 to 5 years in the regions of Mopti and Gao found clinical signs of vitamin A deficiency in 10.3 percent of the children (Wolcan, 1975). Most of these children were also suffering from PEM; vitamin A deficiency lowers the body's resistance to disease thus inviting the PEM-infectious disease cyclical syndrome. The same study found a 9 percent deficiency among pregnant women (n=211) in the same regions. Vitamin A deficiencies are higher in the northern parts of Mali (above the 14th parallel), where, according to the director of the Nutrition Service, wild fruits which were previously abundant have become almost extinct in the last ten to fifteen years. While moderate vitamin A deficiency is manifested in poor night vision and can be corrected, a severe deficiency results in irreversible blindness.

2. Vitamin C

Vitamin C deficiencies are common in rural Mali and are most pronounced in the northern parts of Mali due to the lack of fruits and vegetables. Mondot-Bernard and Labonne (1982) found insufficient vitamin C intakes in all eight villages of their study (in the 1st, 3rd, 5th, 6th and 7th regions) but adequate intakes in the two survey cities (Bamako and Segou). Cantrelle
### TABLE 5
PREVALENCE OF CHRONIC PROTEIN-ENERGY MALNUTRITION AMONG CHILDREN IN MALI: A SUMMARY OF EXISTING STUDIES

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<th>STUDY SITE</th>
<th>STUDY DATE</th>
<th>SAMPLE SIZE</th>
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<th>PERCENTAGE LESS THAN 90% STANDARD HEIGHT FOR AGE</th>
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</tr>
<tr>
<td>Regions II &amp; III -</td>
<td>Nov 1984 - Feb 1985</td>
<td>3660</td>
<td>0 - 5</td>
<td>15.6</td>
<td>ENMIP</td>
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<tr>
<td>CDOT Nord</td>
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<td>CDOT Sud</td>
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<tr>
<td>Region V-</td>
<td>December 1981</td>
<td>210</td>
<td>0 - 5</td>
<td>16.0</td>
<td>USAID</td>
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<tr>
<td>Koro (city)</td>
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<tr>
<td>Bamako, Segou, and eight villages in Regions I, III, V, VI, and VII</td>
<td>July - August 1977 &amp; January - April 1978</td>
<td>139 &amp; 107</td>
<td>0 - 5 &amp; 6 - 14</td>
<td>34.0 &amp; 23.5</td>
<td>Mondot-Bernard</td>
</tr>
</tbody>
</table>

Source: Lefevre (1986) for all studies except Mondot-Bernard (1980) for final study

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1 All studies except Mondot-Bernard use Harvard standards of height for age. Mondot-Bernard uses NCHS standards. Children whose height for age lies below 90 percent of the standard are said to be growth stunted, an indicator of chronic malnutrition.
(1961) found that diets in the Office du Niger and inner delta met only 35 percent of vitamin C requirements. Wolcan (197?) found 9 percent of pregnant women surveyed (n=211) in the Mopti and Gao regions to be suffering from vitamin C deficiencies.

Lack of vitamin C can result in acute or latent scurvy. Acute scurvy results in the degeneration of many body tissues: pink spots on the skin, fatigue, bleeding gums, hemorrhages in the eye, pains in the joints, etc. Symptoms of latent scurvy in young children are failure to grow properly, weakness, restlessness, irritability, and swollen joints. In older children and adults signs of deficiency are listlessness, lack of endurance, fleeting pains in the legs and joints, small hemorrhages under the skin, and bleeding gums.

3. Anemia

Anemia is widespread in Mali and, after protein-energy malnutrition, is generally held to be the second most pressing nutritional problem in the Sahel (Nutritional Status of the Rural Population of the Sahel, 1981). Anemia is estimated by the Nutrition Service to affect 40 percent of children and 47 percent of pregnant women in Mali (Service de la Nutrition, 1985). The deficiency disease is highly correlated with PEM in small children and with malaria for all ages.

A 1978 survey in northern Mali found that 62 percent of pregnant women (n=69) (and 51 percent of women overall, n=143) were suffering from either moderate or severe anemia (Benefice, et al., 1981). A 1980 study of 250 subjects in villages near Selingue found 37.9 percent of the population to be anemic (Haidara, 1980). Prevalence rates were especially high in the five to fourteen year age group and in women of child bearing age. This finding was confirmed by Mondot-Bernard and Labonne (1982). Pregnant women were four and a half times as likely to be anemic than non-pregnant women of child-bearing age. A 1978-79 study in an onchocerciasis zone of southern Mali found an overall anemia rate of 29.4 percent (Benefice and Chevassus-Agnes, 1981).

Anemia in Mali is attributable both to low intakes of iron and to the high rates of parasitic diseases, such as malaria (parasitic diseases inhibit the efficient utilization of iron in the body). Anemia reduces the oxygen-carrying capacity of the blood, resulting in lowered muscular and tissue performance. Symptoms include paleness of the skin and lips, chronic fatigue, weakness, lack of appetite, and tingling of the hands and feet. The disease is also aggravated by low intakes of riboflavin among the rural sedentary population; riboflavin deficiency interferes with the production of red blood cells.
4. Goiter

Goiter, attributable mainly to iodine deficiency, is endemic to Mali, estimated by the Nutrition Service to affect approximately a third of the population. It is found in all regions of the country except for the 6th and 7th, because salt from those regions is naturally iodized (coming from the ancient salt Sea of Senegal which once covered the area). A 1968 ORANA survey of 11,572 individuals across Mali found high prevalence rates in all age and sex groups, varying from a low of 38 percent in adult men to a high 68 percent in adult women (Dillon and Lajoie, 1981). In 1981 the World Bank found a goiter prevalence rate of 27.2 percent in 15 villages in the Kita, Bafoulabe, and Keneiba cercles of the 1st region. Inter-village variation, however, was significant; in some villages, over 40 percent of the population had goiters. A 1983 survey of one village (Neguela) and one town (Koulikoro) found goiter prevalence rates of 72 and 50 percent, respectively. Prevalence was higher in adult women and adolescents. The authors attribute the high rate of goiter in Mali to two factors in addition to iodine deficiencies: the presence of goitrogenics in the diet (substances which inhibit the absorption of iodine in the body) and genetic factors (Roux, et al., 1983).

Goiter, an enlargement of the thyroid gland, is an adaption to low iodine intakes; the gland grows to allow the body to trap more iodine. (A mild goiter is not visible but can be detected through biochemical studies.) The thyroid gland produces hormones essential for growth, reproduction, nerve formation and mental health, and bone formation. Cretinism, reduced stature and mentality, may also result in children born from iodine-deficient mothers or from mothers whose thyroid gland could not function properly.1

V. FOOD CONSUMPTION STRATEGIES IN RESPONSE TO CHANGES IN PRODUCTION AND INCOME

A. Coping Strategies in Rural Areas in Response to Production Shortfalls

There has been very little empirical work to date in Mali exploring adaptive responses to production shortfalls or loss of

1The GRM Service de Nutrition is preparing to launch a national goiter control program. They will either fortify domestically produced peanut oil with iodine or offer iodine injections in health centers throughout the country. They are currently doing pretests to determine the effectiveness of the two options.

30
herds in rural areas. The bulk of existing information on this subject has been generated in the last three years by PVO's trying to assess the reliability of various early warning indicators of famine.

Families generally have several layers of mechanisms that they employ to prevent a sudden loss in production or livelihood from resulting in severely reduced food consumption. One of the main adaptive mechanisms is an attempt to diversify sources of income by taking on new money-generating activities, such as wood selling, water carrying, agricultural labor, and, in the extreme, temporary or permanent migration. A second coping mechanism lies in the increased gathering of wild foods, some of which are eaten in normal production years (usually during the soudure) and some of which are only eaten in exceptionally poor production years (and are thus termed "famine foods"). A final coping mechanism is the reliance on neighbors and extended family members to share their resources with the more vulnerable members of the community. This mechanism is especially utilized in years of localized production shortages. Historical evidence reveals that coping mechanisms employed by Malians in past centuries included the pawning of children, slavery, raiding of other villages, and pursuit of the gold trade (Toulmin, 1986).

The first coping mechanism, diversification of income sources, varies widely across different ethnic and occupational groups. Because many families normally draw on several sources of income in an average year, it is important to have baseline information on these "normal" activities in order to identify an atypical pattern of income-earning activities. Several PVO's are currently involved in collecting such baseline data for farmers, herders, and fishermen in the 5th region (see Annex II). The identification of the main production cycles and seasonal nature of secondary income-earning strategies in non-drought years will allow observers to note deviations from these "normal" activities and thus facilitate the monitoring of food shortages in the future.

One of the most widely employed means of income diversification in Mali is migration. The tradition of seasonal migration during the dry season in Mali is more than a half-century old (Hammond, 1978). The Sarakolle in the northwestern part of the country are especially renowned for their large numbers of migrant workers (both temporary and long-term) in Senegal and France. In a 1985 assessment of populations displaced as a result of the drought, the DNAS decided it was not necessary to include the 1st region in the study even though it had suffered from an extremely poor harvest. The DNAS reasoned that the population possessed enough resources, due to remittances from family members in France, to remain in their villages and secure food (DNAS and UNICEF, 1985).
When examining migration as an indicator of economic stress in a given area, it is important to distinguish between normal and abnormal migration patterns (although this distinction is very difficult to make for nomadic peoples). Temporary and permanent migration occurs both as part of a family's normal annual income strategy and also as a coping mechanism in response to drought and food shortages. Although, for example, seasonal migration is an important and normal activity among Sarakolle males, the departure from the village of a "chef de famille" would signal a serious problem. A second example of this distinction can be found in the Mopti region, where there is normally a large migration at harvest time as agricultural laborers are hired to help others harvest their crops. In late 1987, however, there was no significant crop to harvest and consequently migrants headed for urban areas and out of the country. Thus one observed a large movement of people in the normal migration season, but the destinations were different, indicating some sort of economic stress.

In addition to distinguishing between typical and atypical migration destinations, the normal number of migrants from a given area is also an important reference point. For example, there is generally much seasonal migration during the dry season within the 5th region to the cities of Mopti and Sevare to perform miscellaneous paid labor tasks: gardening, construction, transport of harvest, leatherwork, etc. (Thiam and Davies, 1987). Therefore one would expect to see smaller numbers of adult men in villages in the region in the dry season than in the rainy season. In a January 1985 famine assessment trip to villages around Mopti and Bandiagara, de Grunne (1985), however, found practically no males between 15 and 40 resident in the villages, a significant indicator of a failed harvest.

A second coping mechanism, the gathering and consumption of wild foods, has been an important means of adjustment to food shortages in Mali for centuries. During the great famine of 1738-1756 which killed approximately half of the population in Timbuktu, some people subsisted on wild fruits and roots (Cissoko, 1968). During the most recent 1984-85 drought, gathered foods accounted for a significant part of the diet in the northern parts of the country, especially during the soudure. In a February - March 1986 reconnaissance survey of villages in the cercles of Banamba, Kolokani, and Macina, CARE researchers found that almost all deficit and some surplus villages were supplementing their diets with wild foods. These foods included fonio and "pois de terre" (typical soudure foods) as well as leaves, roots, grass, and a powder that is removed from the inside of branches of a certain tree (CARE, 1986). In a visit to the Dogon plateau during the soudure of 1985, Brett-Smith (1985b) noted that some Dogons were subsisting on the leaves of a plant called "nanchebe." A survey in the cercle of Douentza in September 1986 found that 93 percent of families (n=66) were
subsisting entirely on "exceptional foods", that is foods that they would not normally consume. These include wild watermelon, "safoto", and "palmier doum". (SAP, 1986c).

During drought years there is also an increased reliance on wild foods which are normally consumed during the soudure. In northern Mali typical soudure foods are fonio, "cram-cram", and nenuphar. While fonio is often called a "famine food", it is in reality an important and normal food source in the 5th, 6th, and 7th regions (Davies and Thiam, 1987b). Consumption of fonio in these areas should therefore not be interpreted as an indicator of food shortages. There are two aspects of the fonio crop, however, which can serve as indicators of potential problems. The failure of the wild fonio crop, due to rain shortfalls, is a significant indicator of potential stress as both nomadic and sedentary populations depend on it as a food source during the soudure. Secondly, whereas the harvesting of wild fonio is normally a family activity among nomads, among sedentary peoples the crop is generally harvested by women and young men. In emergency years, however, everybody participates in the harvest. Thus the extent of adult male participation in this activity among sedentary groups during soudure is an indicator of the level of food stocks and the expected harvest (Villeneuve, 1986).

The final coping mechanism mentioned above, reliance on neighbors and extended family members, is commonly used in years of localized poor harvests rather than general droughts. If family grain stocks are running low, the head of household may send family members to live and/or work in neighboring villages with whom the household head has a kin link, however distant (Toulmin, 1986). Localized food shortages are also dampened by exploiting marriage ties. Married women, with their small children, return to their parents' village to either secure a loan or stay for an extended period of time (Hesse and Thera, 1987). Among the Fulani and Tuareg, there are several cultural mechanisms involving the loan and transfer of animals whose aim is to support the more vulnerable members of the community (Hesse and Thera, 1987).

It is clear that coping mechanisms vary across regions, seasons, and occupational groups. It would be very difficult to quantify the effects of such mechanisms on food consumption because the "without scenario" would be nearly impossible to construct. Still research needs to be done on the sequencing of the different mechanisms among different populations and the relative contribution of the individual mechanisms to stability in food consumption.
B. Characteristics of Rural Households which Survive Poor Production Years with Minimal Effects on Food Consumption

As mentioned at the outset, trying to draw correlations between the production and consumption status of rural households in Mali is a very tenuous exercise, due to the lack of a single study collecting simultaneous quantitative production and consumption data.

There have been three consumption/nutrition studies in Mali which have attempted to relate consumption levels or nutritional status to isolated production variables. Mondot-Bernard and Labonne (1982) found that in their eight sample villages (in three different regions of the country), calorie consumption was highest in villages where plows were used. Unfortunately the authors provide no data on the quantitative magnitude of this relationship or the mechanism through which it works.

Benefice and Chevassus-Agnes (1981) examined the relationship between three indicators of nutritional status among children and adults on the one hand and harvest and income levels on the other. Their sample consisted of 1696 individuals in 16 villages in southern Mali. They found no clear relationship between harvest and income levels and the three nutritional indicators. The only exception was a positive correlation between income and harvest and weight/height among adult men. The authors concede that their data on harvest and income levels are very weak as they are based on one-shot question and answer information, and answers are not cross-checked in any way. Therefore it is difficult to draw any firm conclusions from their work on this issue.

The final consumption study which attempts to relate production and consumption variables is the 1956-58 survey carried out in the Office du Niger (ON) and inner delta region (Cantrelle, 1961). Researchers found that calorie and protein consumption was much higher among delta producers with plows than delta producers without plows or ON producers. This was largely attributable to much higher fish and rice consumption in the former group (nearly double the other two groups in grams per capita per day). Delta farmers are able to purchase a richer diet in terms of both quality and quantity because they have a variety of income sources (herding and fishing) whereas ON farmers are exclusively farmers. This study thus finds a positive correlation between level of farmer equipment, participation in non-agricultural activities, and food consumption levels.

Some indirect evidence on this issue is provided by the MSU Food Security Project. D'Agostino (1988) found that non-agricultural activities are positively correlated with both coarse grain production per household member and purchases of cereals.
Non-agricultural activities have a slight negative correlation with sales of cereals, although the relationship is not highly significant. Thus farmers participating in non-agricultural activities both produce and buy more cereals than farmers who do not participate in non-agricultural activities. This would seem to imply that these farmers have greater cereals resources and thus higher consumption levels. This conclusion is supported by the finding that these same farmers who participate in non-agricultural activities also have higher levels of non-monetary transactions (mainly gift-giving) than those who do not have secondary activities. Gifts of grain in villages usually flow from the better-off to the worse-off households, thus serving to even out consumption for the poorest members of the village. Finally, interviews in six of the MSU sample villages in the Operation Haute Vallee zone supported this conclusion. Farmers stated that those with income from non-agricultural activities were able to buy more cereals and other foods and thus enjoy a diet of greater quality and quantity.

Data from another study in the 1st region of Mali (in villages near Kita) also reveal positive correlations between levels of agricultural production and participation in non-agricultural activities (Koenig, 1986). The author states that farmers with diversified income sources are able to minimize risk and are generally the better-off members of the village. In normal production years, these secondary activities represent additional means through which rural households accumulate personal income to purchase necessities and invest in capital. In drought years, the food acquisition component of these activities increases in importance and can become the primary means through which a household feeds itself.

Diversification in cultivated crops also seems to increase the food security position of the rural household. In the flood plains of the Douentza cercle, cassava and groundnuts are planted in association with millet and sorghum and are important food sources during the soudure (Hesse and Thera, 1987). Brett-Smith (1985b) reported that the presence of gardening in some Dogon villages, representing an additional source of income and food, can make the difference between semi-starvation and adequate consumption levels in years of poor grain harvests.

Mainly relying on indirect evidence, one is able to conclude that the rural household characteristics which allow families to survive bad production years without suffering large decreases in their food consumption levels are the following: relatively higher levels of production of the staple grains, ownership of agricultural equipment, participation in non-agricultural activities, and diversification of cultivated crops. Clearly more research is needed to relate these variables directly to food consumption levels and to assess their relative importance.
in allowing farm families to maintain stable consumption levels in the face of large swings in grain harvests.

C. Effect of Economic Policy Changes on Food Consumption

The evidence on how Malian families adjust their food consumption patterns in response to changes in prices or income is very scanty, and thus the empirical evidence presented in this section will necessarily be piecemeal. The results emerging from the Tufts University/DNSI/USAID urban expenditure study will provide important information on how food consumption in urban households is affected by economic policy adjustments which lead to changes in income and prices.

Changes in income levels in urban areas clearly have a significant impact on food consumption as the Tufts study reveals that between one-half and three-quarters of the family budget is spent on food items in the seven regional capitals and Bamako (the higher percentages are for Gao and Timbuktu). Preliminary results from the Tufts study suggest that as income goes up, the purchased quantity of all foods increases (Rogers and Lowdermilk, 1987). As income rises, consumption of meat in particular increases at a faster rate than any other food in most cities. Moreover, the rate of increase in the amount of purchased calories and proteins per capita does not appear to drop off at the higher expenditure levels.

There seem to be no major inferior goods in the urban food basket; that is, no major food is consumed less in absolute terms as incomes rise. The diet is overwhelmingly cereals-based in all income groups, and the proportion of calories derived from cereals does not fall as income rises. These preliminary findings suggest that urban diets in Mali so minimally meet caloric requirements that increases in income will first be used to increase consumed quantities of all major foods. Thus it is unlikely that income changes in the near future will result in significant changes in the composition of the urban food basket.

There is no quantitative evidence on price elasticities, but descriptive studies seem to suggest that in the face of rising

1This conclusion holds to the extent that home-produced foods are relatively unimportant in urban food consumption. Home production of cereals was measured by the study in relative rather than absolute terms. An analysis of this information may show that, for the lowest quartile, as income rises, they are depending less on their fields and stepping further into the cash economy. Thus increased expenditures on food would be a substitution rather than an augmentation of calories.
prices for staple foods, families will make any number of adjustments in their food consumption patterns. They may replace a sauce based on meat, fish, and vegetables with a "soumbala" (traditional spice) or cube maggi sauce which essentially just covers the grain with a broth. Families may also substitute a thin porridge for "toh" and couscous and cut back the number of meals per day to one or two. Thus in the face of rising food prices families do not seem to increase their expenditures on a cheaper substitute staple (e.g. like potatoes in the U.S.) because the cheapest available staple is already the base of their diets. They are more likely to cut back on the quantity of all foods, particularly supplementary foods such as meat and vegetables.

A more complete data set on the income and price elasticities of the urban population will facilitate the analysis of the effects of recent economic policy changes on food consumption parameters. In the absence of such information, only a descriptive discussion outlining some of the broader impacts of such changes can be offered.

At the macro-economic level, there are two ongoing major reforms which have a direct impact on urban consumers: the removal of government monopoly on the import of certain food products and the staff cuts in the public enterprise sector. The GRM is in the process of removing government monopolies on the importation of sugar, coffee, tea, and milk. The GRM must remove these monopolies by March 1988 in order to qualify for a new IMF loan. Therefore the price of goods such as sugar, milk, and coffee can be expected to go down in the long run. This price movement will have little effect on rural consumers (except to the extent that Tuaregs benefit from lower sugar prices, sugar being one of their largest purchased food items) and will probably only benefit middle and upper income urban consumers who consume such goods on a regular basis.

Staff cuts and hiring freezes in the public enterprise sector have created a large pool of educated, unemployed people in urban areas. The effect of this policy action on their individual and family food consumption levels is uncertain, depending on what alternative income sources they have at their disposal, but the more general effect of their unemployment is a dampening of consumer demand which theoretically exerts downward pressure on the general price level. This mechanism probably has little impact on rural consumers but benefits urban consumers to the extent that they participate in the market economy.

In addition to changes in the macro-economic policy environment, adjustments in the cereals marketing sector have also had an impact on urban and rural consumers. Under the changes brought about by the cereals market liberalization program, rural consumers enjoy easier access to private sector grain supplies.
Farmers in several OHV villages affirm that it is much easier for them to buy grain in the post-liberalization period. Before liberalization, they would be forced to spend one to three days lined up at OPAM magasins if they wanted to purchase grain during the soudure, thus losing valuable labor time in their fields during the agricultural season (Dembele and D'Agostino, 1986). Wilcock, et al. (1987) find that reduced search and transactions costs for producers and traders due to reduced government regulation of the market led to marginally lower coarse grain prices (than would have otherwise been the case) in the first three years after liberalization. Urban consumers and net buyers of grain in rural areas (39 percent of farmers in the MSU CMDT/OHV sample—D'Agostino, 1988) benefit from these reduced prices.

The future of rice prices under the marketing reform program is more uncertain. The government removed its subsidy from the consumer price of domestically-produced rice in late 1987. Merchants are now legally allowed to mark-up the price by an amount which covers their storage and transport costs and permits a small profit. Consequently there has been a large increase in Bamako retail rice prices since November 1987 both because the guaranteed official producer price (which is higher than the import parity price plus transport costs) is now being directly passed on to consumers and because of scarcity due to stock mismanagement and an import moratorium. Because pan-territorial rice pricing policies have been officially abolished, there will probably be even larger increases in rice prices in the 6th and 7th regions of the country (due to higher transport costs). Although price elasticities have not yet been calculated from the Tufts study, it is likely that these significant price increases will dampen consumption of rice and may lead to increased demand for traditional coarse grains. The extent to which the Direction des Affaires Economiques, traditionally charged with ensuring that merchants respect official prices, will allow rice prices to fluctuate with changing supply, storage, and transport costs is still uncertain.

The government's future policy with respect to imported rice is currently under discussion. If the government lifts its moratorium on imports, as it is being urged to do by several donors, it is likely that a tariff will be preserved to prevent imported rice from underselling domestically-produced rice. Thus rice prices in Mali would not be allowed to follow world price trends, which have been falling in the 1980's. The optimistic scenario for domestically-produced rice is that investment in the Office du Niger will pay off in efficiency gains and lower production costs in the long-run. These gains will then be passed on to consumers in the form of lower rice prices. Lower rice prices would mainly benefit urban consumers, who are the main consumers of rice in Mali.
The groups which seem to be most disadvantaged by the cereals marketing reforms are those who enjoyed preferential access to subsidized OPAM grain in the pre-liberalization period. Counterpart fund assistance has facilitated the gradual raising of official consumer prices in the 1981-86 period, thus reducing the subsidies to select groups of mainly urban residents (the military and civil servants).

VI. CONCLUSION

The problem of malnutrition can be viewed at three different levels:

1) structural -- external factors beyond the control of the individual, such as climatic conditions and food distribution channels,

2) household economic position -- ownership of productive resources, sources of income, etc., and

3) practices within the family with regard to food consumption and health.

This paper has discussed the impact of all three levels of factors on nutrition and consumption. While structural factors account for some of the variation in malnutrition prevalence rates in Mali (nutritional status seems to be lower in the northern arid parts of the country, for example), it must be emphasized that household-level factors, both economic and cultural, play a critical role in determining the nutritional status of individuals.

The household-level economic characteristics which seem to be most correlated with higher consumption levels are high levels of grain production, participation in non-agricultural activities, ownership of agricultural equipment, and cultivation of a diverse range of crops. The relative importance of these factors in determining the consumption position of the family is unclear, and more research is needed to establish the mechanisms linking these variables to food consumption among rural families in different regions of the country.

It should be emphasized that direct correlations between household economic characteristics and food consumption levels do not necessarily imply a positive relationship between these same characteristics and individual nutritional status. Behavioral and health factors intervene to promote distortions between food consumption and nutrition indicators. Within the same socio-economic and ethnic setting, for example, subtle differences in
maternal attitudes toward child feeding practices and treatment of illnesses can result in a situation where some children in the community thrive while others suffer from varying degrees of malnutrition. The importance of behavioral and health factors in explaining malnutrition is underscored by the empirical finding that PEM prevalence rates in the CMDT zone are high and comparable with rates found in the 6th and 7th regions.

Thus efforts to address nutritional problems in Mali must simultaneously focus on improving the quality and quantity of food consumption and on modifying behaviors and reducing the incidence of diseases which threaten the nutritional status of all groups, but most particularly children. Additional research into both the impact of price and income changes on food consumption and the precise nature of the linkages between household economic characteristics and food consumption levels will greatly aid the design of projects and programs aimed at increasing food consumption levels. Health and education initiatives aimed at modifying threatening practices and reducing morbidity rates will ensure that increased levels of food intake are translated into higher nutritional status.


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ANNEX I

People Contacted in Mali

A. Ag Rhaly, Director, Institut National de Recherche en Sante Publique

Samuel Asare and David Coulibaly, project coordinators, World Vision

Oumar Coulibaly, coordinator, UNDP Projet PADEM, DNSI

Victoire d'Agostino, researcher, MSU/CESA Food Security Project

Jeneba Fadiga, project coordinator, Save the Children Fund UK

Roger Freeman, economic officer, U.S. embassy

Jean-Pierre de Lamalle, technical assistant, SAP

Lutful Kabir, country representative, Save the Children Fund UK

Walter Kessler, doctor, MSF

Melanee Lowdermilk, researcher, Tufts University/DNSI/USAID Urban Food Price Study

Michelle Poulton, country representative, Save the Children USA

Djibril Semega, Director, Service de Nutrition

Moussa Simaga, drought relief coordinator, USAID

Catherine Toth, country representative, FEWS Project

Tim Stone, project coordinator, UNICEF

Aart van der Heide, country representative, Oxfam UK

Elzadia Washington, agricultural researcher, USAID

Neil Woodruff, health officer, USAID

interviews with village elders in following six villages in OHV zone: Chola, Sirakorola, Sanankoro-Djit, Sougoula, Teneman-bougou, and Ouelessebougou-Sibleni
Documentation Centers Consulted in Bamako

Ecole Nationale de Medecine et de Pharmacie du Mali
FAO
FEWS Project
French Cultural Center
Institut d'Economie Rurale
Institut National de Recherche en Sante Publique
Medecins Sans Frontieres
Office Malien du Betail et de la Viande
UNICEF
USAID
USAID Health Office
World Bank
ANNEX II

Current Nutrition and Consumption Data Collection Efforts in Mali

1. DNSI/UNDP Projet PADEM

This will be the first national budget-consumption survey ever conducted in Mali. Data will be collected over a one year period starting in March 1988 in approximately 3400 randomly chosen households in both rural and urban areas. Data to be collected include: anthropometric measurements, quantities of food consumed, how consumed food was procured, budgetary expenditures, and feeding practices for children under two. Surveyors will collect consumption data from each household during one passage of seven consecutive days. Foods for all meals will be weighed. Large non-food expenditures over the past twelve months will be measured by a one-time recall questionnaire. Smaller non-food expenditures will be measured by monthly recall questionnaires and observed directly during the seven day consumption passage.

This study will calculate annual per capita food consumption of all major food products, annual national consumption of all major food products, annual household expenditures and budget shares of major consumer (food and non-food) items, budget shares by income class, intakes of principal nutrients, and child feeding practices both before and after weaning.

2. Save the Children Fund UK, Oxfam UK, and l'Union Internationale pour la Conservation de la Nature: Suivi Alimentaire du Delta-Seno

These three PVO's are collaborating to monitor seasonal food availability in the Inner Niger Delta region. Representatives from each PVO are stationed in five listening posts which essentially form a triangle around the zone: Douentza, Mopti, Ke-Macina, Togue-e Koumbe, and Youvarou. Researchers convene in Mopti on a quarterly basis to collate their data, discuss results, and issue joint papers.

There are four passages each year with a questionnaire. The questionnaire asks for information about sources of consumed food, work activities, problems of production (crop, livestock, and fish), stock levels, purchases/sales, illnesses, investment, and migration. Price data is also collected once a month at approximately 15 markets in the region.

The goals of the project are to monitor changes in food availability in the zone, design a calendar of seasonal fluctuations in food availability, identify the production cycles of the different production systems in the zone (agriculture, herding,
fishing, and combinations of these activities), identify means by which producers secure food during food shortages, identify adaptation strategies of producers from each production system, identify indicators of food stress, and provide necessary information to local planners to aid in the design of a contingent plan for future droughts.

3. Médecins Sans Frontières, Projet Rehabilitation Medico-Nutritionnelle en VIe et VIIe Region

MSF operates nutrition rehabilitation and education centers throughout the 6th and 7th regions. They periodically conduct nutrition surveillance surveys in arrondissements and cercles where the nutritional situation seems to be deteriorating. They also conduct occasional surveys on disease (e.g. measles) prevalence in the event of an outbreak or anticipated outbreak. MSF publishes quarterly reports which contain the results of their nutrition surveys and report on the numbers of women and children in the nutrition rehabilitation and education centers each month.

4. Système d'Alerte Précoce (SAP)

This multi-donor project monitors famine early warning indicators in the regions of Mali north of the 14th parallel. SAP issues a monthly bulletin which collates information gathered at the arrondissement level (156 arrondissements are covered) on harvests, food stocks, consumption of soudure and famine foods, rainfall, migration, pests, and prices. These data comprise Phase I and II of the project. When Phase I and II regular monitoring data identify a problem zone, Phase III survey teams and questionnaires are sent to the area. These surveys collect both socio-economic and medical-nutritional information at the household and individual level. The survey teams, composed of a doctor, nurse, and social worker, gather information on precise migration flows, foods consumed in a given day, sources of income, heights and weights of children, and illnesses. Based on this data, SAP makes recommendations on the immediate needs of the zone and required responses at the government or donor level.

In addition to its monthly reports, SAP also issues frequent "Rapports de Mission" to problem zones and the detailed results of their Phase III surveys.
5. MSU/CESA Food Security Project

The Food Security Project has collected two years of data on coarse grain production and transactions (sales, purchases, gifts, and barter) for 190 households in the OHV and CMDT regions. During the third and final year of farm-level data collection (1987-88), consumption data will be collected in the OHV zone. Household food consumption quantities will be collected through a series of 24-hour recall surveys in each of three different seasons: hot, dry season (April - May), rainy season/soudure (June - August), and harvest period (September - November). During each recall interview, the following information will also be collected: the source of each consumed food, the number of meals consumed by the household in the past 24-hour period, and the number of adults and children present at each meal.

In addition to the above seasonal data, biweekly information will be collected on household food and non-food expenditures. The following one-time questions will also be asked of each household: child feeding practices (e.g. age at weaning, foods given when child is sick), how food is distributed at mealtimes, preparation times of various foods, food preferences, existence of a household or individual garden, and adjustment mechanisms which households take when household grain stocks run low or market prices for grains begin to rise.

The goals of this study are:

1) An examination of the adequacy of the diet in terms of calories and other major nutrients. The adequacy and composition of the diet will be compared across different strata, using both the MSU household strata (based on level of agricultural equipment and grain surplus/deficit situation) and an expenditure-based strata (derived from the data to be collected).

2) A description of the rural households which are relatively better-off in terms of food consumption, taking into account indicators of both quality and quantity. Available MSU data will allow correlations of consumption with the following socio-economic indicators: household grain production, household size, volume of grain purchases and sales, diversity of crop production, and participation in non-agricultural activities.

3) A description of the adjustment mechanisms that rural households use in response to food shortages, due to either production shortfalls or seasonal variation in food availability. A description of the extent to which consumption levels are protected in the face of a decline in food availability either at the household stock or market level.

4) A description of how rural and urban household food consumption adjusts in response to price and income changes. An examination of the potential dietary impact of an increase in the level and diversity of rural incomes. A discussion of the consumption effects of various agricultural, fiscal, and trade policies. A description of the extent to which rural and urban
food baskets differ (urban data would come from the Tufts University/DNSI/USAID study) and, based on this description, an assessment of long-run demand patterns for different commodities under different scenarios of income growth and rural-urban migration.