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Higher Calorie Intakes Related to Higher Incomes in Northern Mozambique***Donald Rose, Paul Strasberg, José Jaime Jeje and David Tschirley***The importance of understanding food consumption habits**

Food security has been an important focal point in recent policy work to improve living standards in Mozambique. The Council of Ministers has recently approved an overall food security and nutrition strategy for the nation (GRM, 1998). The strategy outlines possible interventions in the short- and long-run to address the core issues of food supply, access, and utilization. Another interministerial working group has developed a vulnerability assessment system for Mozambique which focuses attention on problem areas for food insecurity and malnutrition (GISMAV, 1998).

Understanding household food consumption habits is a key to creation of successful food security policies. Not only is information on the determinants of household consumption important for the design of macro-economic policies, but it is also essential in formulating micro-level interventions to improve shortfalls in calorie and/or other nutrient intakes. Since food is a basic need, measurement of food consumption also can be used as an alternative to income in assessing household well-being and thus provide a yardstick for evaluating development programs.

Detailed study in 3 districts of Northern Mozambique

This *flash* presents results from a detailed

* The views expressed here are those of the authors and do not necessarily reflect the official position of the Ministry of Agriculture and Fisheries.

** This *flash* is based on MAF/MSU Research Report No. 33 — *Household Food Consumption in Northern Mozambique: A Case Study in Three Northern Provinces*. It is available from the Direcção de Economia, MAP or can be downloaded along with other MSU publications at: <http://www.aec.msu.edu/agecon/fs2/mozambique>

exploration of household food consumption behavior in a rural area of northern Mozambique (Rose et al. 1999). Smallholder households were studied in Montepuez District in Cabo Delgado and in Monapo and Meconta Districts of Nampula. These areas are typical of the interior of northern Mozambique, where maize- and manioc-based cropping systems predominate and where cotton and cashew are often grown.

Repeated visits on close to 400 households in 16 villages were made from 1995-96 as part of a larger study to identify the impacts of various smallholder cotton schemes on household incomes and food security (MAF/MSU, 1996; Strasberg, 1997). Information was collected on demographic characteristics, agricultural production and sales, expenditures on food and other necessities, and daily food consumption at three different periods during the year — harvest, post-harvest, and hungry season. Household food consumption was measured using a 24-hour recall technique, in which trained enumerators conducted detailed interviews with the person in charge of food preparation. These interviews were made on 2 separate visits during each period and included the volumetric measurement of foods consumed.

Diets limited in variety of foods consumed

Households employed a diverse set of strategies to acquire maize, the principal dietary staple. While the largest share of maize was obtained through production on their own farms, households also purchased maize, received it as payments for work or from small business activities, exchanged it in mutual assistance activities with others, or acquired it through remittances from family members living outside the household.

Despite the variety of methods used to obtain maize and other foods, diets were very limited. Of over 75 individual food items in the nutrient

database, households consumed, on average, only 4 different foods per day. Furthermore, just four foods — maize, manioc, beans, and groundnuts — accounted for 86 to 88 percent of calorie intakes (Table 1). Besides these four staples, only fruits and vegetables were consumed on a majority of interview days, yet only supplied 2 percent of calorie intakes. Animal products, including fish, milk, eggs, chicken, and meat contributed only 1 to 2 percent of household calories.

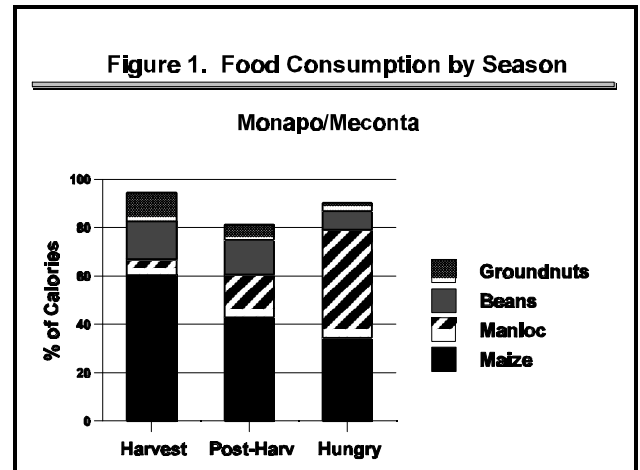
Table 1. Food consumption patterns in the study districts

Food Group	Montepuez		Monapo/Meconta	
	Days consumed (%)	Share of calories (%)	Days consumed (%)	Share of calories (%)
Maize	74	42	74	47
Manioc	42	16	45	21
Beans	51	10	59	13
Peanuts	57	18	35	8
Sorghum	15	6	9	5
Fruits & Vegetables	65	2	69	2
Animal products	14	1	50	2
Nuts & Seeds	5	2	8	1
Other foods	22	4	18	2

Seasonal nature of food and nutrient consumption

In both study areas, consumption patterns changed dramatically across the seasons. Maize was the most important food source during the harvest season, supplying about 60 percent of the calories, but dropping to 35 to 39 percent of calories in the hungry season. The important food security role of manioc was seen in the study districts, especially in Monapo/Meconta (Figure 1), where it furnished 45 percent of calories in the hungry season. In Montepuez, manioc's share was also highest in the hungry season, 27 percent, though much lower than in Monapo/Meconta. Peanuts and sorghum made up the difference in Montepuez, supplying about 20 percent of the calories during the hungry season.

Shortfalls in calorie and protein intakes occurred



in the study districts, especially during the hungry season. Average intakes reached only 1,427 calories per capita in the hungry season in Montepuez and 1,733 in Monapo/Meconta, both considerably lower than the 2,200 calories per capita recommended for Mozambique. Hungry-season shortfalls in protein were also seen — average intakes reached only 75 to 79 percent of recommendations (Table 2). The findings are consistent with data from the Mozambican national nutrition monitoring system, which show that growth-faltering rates peak in the hungry season. Note that values in Table 2 are averages and that many households consume less than these amounts. For example, while *mean* calorie intakes may appear adequate in the harvest season, 30 to 40 percent of households had intakes that were below their calorie maintenance level, a level of intake that does not even include the energy needed for occupational activities.

Besides general calorie-protein malnutrition, a number of specific micro-nutrient deficiencies occur in Mozambique. Vitamin A deficiency — which can cause growth retardation, decreased immune response, and blindness in extreme cases — has been signaled as a problem in Mozambique in districts with limited availability of fruits, vegetables and/or animal sources of vitamin A. Data from northern Mozambique indicate that intakes of this nutrient are very low. Average levels in Monapo/Meconta never reached above 40 percent of recommended levels. These low intakes could be compounded by an inadequate consumption of dietary fats, which facilitate the absorption of vitamin A. Dietary fats can be found in nuts, animal products, and pressed oils. In

Montepuez, vitamin A intakes were very low during the harvest and post-harvest seasons, but actually improved during the hungry season. This apparent anomaly was caused by the increased consumption of pumpkin squash and other vitamin-A rich fruits and vegetables during the hungry season, a time when other foods are more difficult to acquire.¹

Table 2. Adequacy of Nutrient Intakes by Season

Nutrient	Montepuez		Monapo/Meconta	
	Harvest	Hungry	Harvest	Hungry
----- % of requirements -----				
Calories	91	63	104	77
Protein	148	79	170	75
Vitamin A	23	88	38	24
Niacin	103	64	111	51
Calcium	42	42	66	49
Iron	92	64	125	78

Hungry season consumption in the study districts was also consistent with previous reports of nutritional deficiencies related to specific micro-nutrients, such as iron-deficiency anemia and niacin deficiency. Although there have been no previous reports of calcium deficiency in Mozambique, intakes in the study communities were well below internationally recommended levels. Shortfalls of calcium persist throughout the year and are not surprising given the virtual absence of dairy products from the diet.

Determinants of calorie consumption

A number of socio-economic factors were related to overall food intake at the household level as measured by per capita calorie consumption. Descriptive statistics show that calories per capita decreased with increasing household size and that households in the top third of the income distribution had the highest calorie intakes throughout the year. Households owning more than 1.5 hectares of land per capita had higher calorie intakes than those owning less than this amount. The value of staple food crops produced by the household as well as income from the sale

of cash crops were also related to calorie intakes; those with the highest incomes from each source had the highest calorie intakes in Montepuez throughout the year and in the harvest and hungry seasons in Monapo/Meconta.

The relationship of calorie consumption to household income was examined using various forms of a statistical model that controlled for household size and composition, season of the year, and village of residence. In both districts, per capita calorie consumption was positively, though modestly, related to per capita income. In Montepuez, the analysis showed that for an average household, a 1 percent increase in income would be expected to result in a 0.17 percent increase in calorie intake (**Table 3**). A similar

Table 3. Predicted Percent Increase in Calories for a One Percent Increase in Income, by Income Quintile

Income Quintile	Montepuez		Monapo/Meconta	
	Mean Per Capita Income ('000 Mt)	Predicted % Increase in Calories	Mean Per Capita Income ('000 Mt)	Predicted % Increase in Calories
1	220	0.23	205	0.29
2	412	0.17	392	0.21
3	635	0.16	540	0.19
4	1047	0.15	749	0.17
5	2374	0.13	1274	0.15
Mean	937	0.17	633	0.20

increase in income would result in a 0.2 percent increase in Monapo/Meconta. For both study areas, this effect was stronger for lower income groups. For example, in Monapo/Meconta, the fifth of the population with the lowest income (the lowest income quintile), would be expected to respond to a 1 percent increase in income with a 0.29 percent increase in calorie consumption.

Policy and program implications

The findings presented here have important implications for policies and programs directed at

improving consumption in Mozambique. Some analysts in other countries have argued that the relationship between calorie intakes and incomes is not very strong and that increases in income may result in purchases of higher-priced foods, but not necessarily more nutritious ones (Behrman and Deolalikar, 1987). The findings reported here suggest that policies that increase the incomes of rural households in Mozambique should have positive effects on their calorie intakes. These results are consistent with other research in Mozambique which demonstrated that the nutritional status of 3-6 year old children improved with increasing household income (Sahn and Alderman, 1997). Improvements in nutrition may also be effected through specific agricultural, educational and health interventions. Some programs have promoted the herding of goats as a livelihood strategy, which could enable increased consumption of calcium-rich dairy foods. Programs to increase production and consumption of cooking oils from sunflower seeds, for example, may lead to increases in calorie intakes as well as facilitate absorption of vitamin A. In Montepuez, vitamin A intakes were actually *higher* in the hungry season, due to the ready availability of pumpkin and other inexpensive plant sources of the nutrient. This suggests a role for nutrition education in combating deficiency of this micro-nutrient, since low intakes at other times of the year may be due to tastes or preferences rather than economic constraints.

Implications for vulnerability analysis

There are two important conclusions that bear on future analysis in the area of household food security. First, results from this study highlight the difficult situation that many Mozambican households face, specifically during the hungry season. Thus, monitoring of the food security and nutrition situation in Mozambique, as well as policies to improve this situation, will need to focus on the seasonal nature of food consumption. Second, a currently used method for assessing vulnerability to drought and other climatic events in Mozambique starts with an assumption that 80 percent of calories come from staple foods. In the study districts, staple foods — including cereals, legumes, nuts, roots, and tubers — accounted for upwards of 93 percent of calories. Should this pattern be common throughout Mozambique,

district-wide vulnerability may be much more widespread than previously thought and may call for revisions in current vulnerability analysis.

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Endnotes

1. Most of the rise in intake of vitamin A in Montepuez in the hungry season is due to an increase in abóbora consumption, which is not seen in the Nampula districts. We have assigned the nutritive value of pumpkin squash to this food from a database on East African foods, principally focused on Tanzania (West et al., 1988). Note also that the dietary methodology used in these recalls did not focus on collecting data on condiment use. Since piri piri, a hot sauce made from red peppers, is a common part of the Mozambican diet and a rich source of vitamin A, it is likely that estimates of vitamin A intake were underestimated.