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Research Paper Series

Toward Improved Maize Marketing and Trade Policies to Promote Household Food Security in Central and Southern Mozambique

David Tschirley, Danilo Abdula, and Michael T. Weber

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Toward Improved Maize Marketing and Trade Policies to Promote Household Food Security in Central and Southern Mozambique

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This paper draws on insights generated from previous and ongoing research on agricultural marketing and policy issues conducted by the Department of Agricultural Economics at Michigan State University in collaboration with colleagues in the Ministry of Agriculture of Mozambique. Support for this analysis was provided by the Rockefeller Foundation, USAID/EGAT and Africa Bureau, and the World Bank. Support from the USAID mission, and from the Ministry of Agriculture and Ministry of Plan and Development in Mozambique, is also acknowledged for their role in financing the collection and analysis of household survey data reported in this study.

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Executive Summary

Mozambique's food production and marketing system faces a huge set of challenges now and over the next decade, driven by structural constraints, population and income growth, and a rapidly rising urban share of population. We examine this challenge through the lens of the country's primary staple, maize, focusing primarily on the Center and Southern regions of the country.

After presenting summary information on data sources, we examine trends in population growth, urbanization, and consumption patterns, highlighting the production and marketing challenge that the country faces. Section 4 examines the structure of maize production and farm level marketing. In Section 5 we review urban and rural consumption shares of maize relative to other staples, and estimate the proportion of net maize buyers in rural areas. Section 6 links production and consumption by focusing on milling, with special emphasis on the Central and Southern regions. In Section 7, we examine maize trade between South Africa and southern Mozambique, highlighting the potential impact of the value added tax on maize grain imports. Section 8 concludes with suggestions for policy steps which might address some of the constraints identified, and for further research.

Mozambique's urban population share is estimated to be above 35%. Rural population growth rates were slightly negative between 2000 and 2005, compared to over 5% annual urban growth rates. These growth rates will lead to an urban population share of 48% by 2015. Even if economic growth slows from recent rates, total urban demand for maize is likely to double over the next decade while the number of farmers may actually decrease. The country will also need to continue feeding a large number of rural net buyers. The rise in urban demand represents a huge growth opportunity for Mozambican farmers. Yet the growth in demand could easily be satisfied by imports from South Africa if productivity in production and marketing in Mozambique does not improve.

Less than 5% of maize producers account for over 50% of production and over 70% of sales. Unit marketing costs are high, quality is generally poor, and it is difficult to provide reliable supplies to large buyers, especially in the South. As a result, the largest millers in the country, located in Maputo, rely almost exclusively on maize grain imported from South Africa. Medium-scale millers in the Center and South rely primarily on local production, but hold very small market shares. Penetrating the growing industrial maize milling market will require major public and private investment in supply chain development (see the final section of this summary for details).

About 70% of rural households in the Center and South are net buyers of maize; total rural market demand for maize rivals that in urban areas. Especially in the deficit rural South, this means that maize grain availability and prices during the hungry season can have major impacts on household real incomes.

Maize meal prices are extremely high in Mozambique. The leading brand cost about US$800/mt in early 2005, while the cheapest was about US$440. Maize grain at retail was about US$280/mt during the same period in Maputo. These prices compare to a range of US$270-US$330 for comparable meals in Zambia, and grain prices of US$190. This very wide differential between grain and meal prices in Mozambique may be related to the structure of the industry: the two largest millers hold nearly a 100% market share in Maputo and also sell into major cities and rural areas throughout the country. A 25% duty on imported maize meal effectively eliminates the possibility of competition from that source.

At least three new millers have come into the market over the past four years, but they have much lower milling capacity. At least in the South, they have a very small market share and do not appear to have had any effect on prices charged by the leading millers.

Breakfast meal:rice price ratios range from 1.6 to 2.9 in Maputo compared to 0.61 to 0.75 in Lusaka. The relative affordability of rice means that its budget shares are relatively high. Maize shares in total food expenditure in urban Maputo province are 2.4%, compared to 7.4% for rice and 15.5% for wheat. The maize share rises outside of Maputo, to 14.5% in other southern provinces and 40% in the Center.

Despite very high maize meal prices, only about one-third of maize consumers in Maputo rely primarily on maize grain for their maize supplies; about two-thirds primarily purchase refined maize meal. In cities outside of Maputo, about 70% of consumers rely primarily on maize grain. We attribute the surprisingly low share of consumers in Maputo relying on maize grain to the low price and widespread availability of rice, the resulting very low budget share of maize, especially for higher income consumers, and the buying habits of low income consumers, who tend to buy very small quantities at a time, making hammer milling infeasible and hand pounding less desirable.

Urban hammer milling boomed in the early 1990s, fed by market reform and large amounts of yellow maize food aid in the market. With the sharp reduction in food aid after 1993 and the rise of the maize mill CIM starting in 1997, the hammer milling sector declined in the urban South. By 2003, it was difficult to find hammer mills in the city, and most of those operating indicated that their main clients were small manufacturers of alcohol, not consumers or retailers of whole meal. Though about a third of consumers in Maputo, and 70% in other southern cities, rely primarily on grain for their maize supplies, nearly all of them process the grain at home, reflecting long-standing practice in this area of the country. Beira, and the Center in general, has maintained a much more active hammer milling sector. Of 18 such mills interviewed in Beira in 2003, all indicated that their main clients were either retailers of *mugaiwa* (whole meal) or consumers; 70% of interviewed consumers in that city relied primarily on grain for their maize supplies, and 90% reported using hammer mills to process the grain.

Mozambique's 17% VAT is applied to imported maize but not rice or wheat. Maize meal is exempt but maize grain is not, meaning that grain imported for sale as grain must pay the VAT, while grain imported for meal receives a reimbursement. Thus, in principle, the application of the VAT favors rice and wheat relative to maize, favors the availability of maize meal over maize grain at retail, and favors large industrial millers over smaller traders and hammer millers. In practice, however, imports of grain for sale as grain have not occurred despite several prolonged periods where such imports would have been profitable. We attribute the absence of imports by small traders to complexities in import procedures and to the high degree of formality and large scale of the South African maize marketing system. We hypothesize that the lack of imports by larger scale formal traders is due to a combination of factors: consumers in Maputo have access to a low cost option in rice, they spend very little on maize, and most of them are therefore willing to pay the high premium for refined meals on the small quantities that they buy.

Government could take several steps to improve competition in the maize milling sector. The most immediate impact on competition would be achieved through a reduction in the import duty on maize meal. Previously 25%, it fell to 20% on 1 January 2006, with eventual elimination by 2015 for imports from South Africa, and 2012 for all other imports. More

rapid reduction, perhaps to 10%, could provide meaningful competition to domestic millers. Other steps involve reducing the cost of supplying maize grain to Maputo and the rural South – whether through domestic production or imports – so that more consumers can choose to purchase grain rather than meal, and either hand pound it or take it to hammer mills. To reduce the cost of maize supplies from domestic production, government should collaborate with private sector in a maize supply chain development program. Key elements in this program would include:

- More active market information focused on farmers in the Center (and promising areas of the South) and the traders that supply the South from the Center;
- Training of farmers in post-harvest handling procedures to improve quality, and programs to facilitate adoption of improved on-farm storage technology;
- Training for these traders in basic accounting and post harvest handling;
- Promoting more efficient rural assembly of grain through recognized market days, improved physical infrastructure in assembly points, and improved transport services linked to these assembly points;
- Focusing investments in road infrastructure on feeder roads into and trunk roads out of these assembly points;
- Improved marketing infrastructure in public terminal markets of Maputo, Beira, and perhaps other key cities of the South and Center. Improved storage and sales point infrastructure would be especially useful.

Financing of the program would need to involve public, private, and donor funds.

Maize grain imports for the South will be a crucial complement to domestic production for the foreseeable future. At least two measures could be taken by government to facilitate efficient trade in maize. First, government might consider converting the value limit in the simplified regulatory procedures for small-scale maize imports to a volume limit, and increasing this limit to perhaps 20 metric tons per month. This change would substantially expand the number of informal traders who could take advantage of these provisions, and would reduce their unit costs. Second, government could consider phasing out the VAT on maize grain. Because all imports currently are for processing into meal, resulting in eventual reimbursement of VAT, the tax generates no permanent income for the state. Furthermore, although the VAT alone has not acted as a binding constraint on maize imports for sale as grain, it could become a constraint if the reforms in import procedures suggested above are instituted. Finally, if the above two measures are taken, government and donors could consider special programs to facilitate rehabilitation of the hammer milling sector in the South, which has steeply declined over the past decade.

Toward Improved Maize Marketing and Trade Policies to Promote Household Food Security in Central and Southern Mozambique

By

David Tschirley, Danilo Abdula, and Michael T. Weber

1. Introduction

Mozambique's food production and marketing system faces a huge set of challenges now and over the next decade, driven by structural constraints, population and income growth, and a rapidly rising urban share of population. Decisions the country makes now, and actions it takes over the next decade to meet these challenges, will have major impacts on its macro-economy, on the level and distribution of income growth in rural and urban areas, on rural-urban migration, and through these on the economic, social, and political dynamics of the country for many years to come.

In this paper we examine this challenge through the lens of the country's primary staple, maize. We choose maize among the country's several staple foods (including cassava, rice, and wheat products) for a combination of reasons. First, it is the most widely produced staple in the country. In no province do fewer than two-thirds of rural households produce maize; rice's participation, in contrast, falls below 10% in four provinces, and wheat is not produced locally at all. Second, maize is the most widely sold staple in the country: cassava rivals maize in breadth and level of production, but three times more households sell maize than sell cassava. Third, maize is the only staple food in Mozambique which is regularly exported, generating substantial income for smallholder farmers in the Center and North of the country. Finally, maize is the most widely consumed staple across the country, occupying as much of the average budget share in 2002 as high as rice, cassava, wheat, sorghum, and millet combined.

We focus this paper primarily on the Center and Southern areas of the country, because these regions, with South Africa, form a natural market area due to production patterns and costs of transport. Maize from Mozambique north of the Zambezi river flows almost entirely to northern cities or to Malawi, or feeds net buyers in rural areas of the North.

The paper is organized as follows. First we present summary information on the various data sources used in the paper. Next we briefly examine trends in population growth, urbanization, and consumption patterns, highlighting the dimension of the production and marketing challenge that the country faces. Section 4 examines the structure of maize production and farm level marketing in the country. In Section 5 we review urban and rural consumption shares of maize relative to other staples, including the extent to which farming households rely on purchases of maize and other staples to meet their needs. Section 6 links production and consumption by focusing on the milling of maize, with special emphasis on the Central and Southern regions of the country. In Section 7, we examine the maize trade between South Africa and southern Mozambique, highlighting the potential impact of the value added tax on maize grain imports. Section 8 concludes with suggestions for policy steps which might address some of the constraints identified, and for further research.

2. Data

This paper relies on a broad range of data sources. Overall population and rural/urban growth rates in Section 3 come from the United Nations *World Population Prospects: The 2003 Revision.* More detailed information by province and city are from http://www.citypopulation.de. The Ministry of Agriculture's 2002 National Agricultural Household Survey (TIA 2002) provides nationally and provincially representative data on smallholder rural households' income strategies, including the production and marketing of food crops. It forms the basis for the analysis in Section 4. The Ministry of Plan and Finance (now Ministry of Plan and Development) carried out its *Inquérito às Familias* in 1996 and 2002 (IAF 1996 and IAF 2002). These expenditure surveys provide nationally and provincially representative data for urban and rural areas on total household expenditure and budget shares for specific items or groups. These data are utilized in Section 5 when we examine urban and rural consumption patterns. Data from TIA 2002 indicating whether or not households purchased selected staple foods are also used in this section. Because available IAF data do not distinguish between purchases of maize grain and maize meal, nor between various types of meal, the Ministry of Agriculture's Policy Analysis Department (DAP) and Agricultural Market Information System (SIMA) have collaborated on several smaller-scale surveys over the years, including:

- The 1994 Maputo Maize Consumer Survey, which randomly selected 388 households in poor neighborhoods of Maputo and interviewed them about their maize grain and meal purchasing and processing practices;
- The 2003 Consumer and Small-Scale Miller Survey, a follow-up to the 1994 survey, which randomly selected 305 households in poor neighborhoods of Maputo, Xai-Xai, and Beira; and
- The 2005 Maize Trader and Miller surveys. This set of surveys included interviews with the top five millers in the country, 100 rural traders across the country, and small special purpose surveys of food staple retailers in Maputo.

Time series price data come from SIMA's data base of weekly prices in 25 markets across the country, spanning 1991 to the present. Key parts of the survey data analysis were done originally by Abdula (2005), and are either reproduced or used in other ways in this paper.

3. Key Trends and Challenges

Urbanization in Mozambique has proceeded at a very rapid pace over the past two decades.[1] From official figures of less than 10% in the 1970s, and a commonly cited figure of 15-20% in the early 1990s, the country's urban population share is now estimated to be above 35%. After a brief surge following the end of the civil war in late 1992, rural population growth rates are estimated to have been slightly negative between 2000 and 2005, compared to over 5% annual urban growth rates. At expected growth rates over the next decade, the urban population share will reach 48% by 2015 – nearly half the country's population. These patterns mean that a key challenge for Mozambique over the next decade – as for most other SSA countries – will be how to feed a rapidly rising urban population. In the Center and

[1] A change in the definition of "urban" in the 1999 census may have biased upwards somewhat the official figures on urbanization, but long-term trends from 1950 to present are consistent with the picture painted here. http://www.NationMaster.com is a helpful website for various types of national data, with good documentation of and links to sources. Tiffen (2003) is an important reference on the implications of urbanization for agricultural development policy.

South of the country, this population is expected to rise by two to three million people over the next decade, while the rural population is expected to fall slightly. Fifteen years ago there were four to five rural residents (nearly all of them farmers) for every urban resident. Today that ratio is about 2:1, and in a decade's time will fall nearly to 1:1.

Economic growth will increase the size of this challenge. Even if growth slows from the strong and sustained levels it has registered over the past decade, total urban demand for maize grain for human and animal consumption is likely to double over the next decade[2] while, as explained above, the number of farmers available to meet that demand may actually decrease.

The country will also need to continue feeding a large number of rural net buyers. In 2002 and 2003, nearly three-quarters of the households in the South and two-thirds in the Center purchased maize and either did not sell any, or sold less than they purchased: they were net buyers of maize. This fact, along with current urbanization levels, means that in 2005 rural *market* demand for maize was comparable to urban market demand; although the share of rural market demand in total demand will fall over the next decade due to the growth patterns explained above, it will remain an important part of the national market for years to come.

In meeting the challenge of rapidly increasing urban maize demand and continuing high levels of purchases in rural areas, Mozambique will need to provide remunerative prices to farmers to stimulate production, but accessible prices to consumers (both rural and urban), the vast majority of whom remain very poor. In general, this needs to be done through an efficient combination of domestic production and marketing, and imports. Yet the share of domestic and imported maize that constitutes an "efficient combination" depends critically on productivity and the level of competition throughout the domestic production and marketing system. If Mozambican production and marketing are very inefficient, then it is economically "efficient" to import relatively larger quantities; yet the country would be much better off if it could increase the efficiency of its domestic system and reduce imports in that way.

The challenge and opportunity can be seen by examining current and future patterns of urban demand and imports. Currently, urban demand for maize in the south and center of the country is about 200,000 metric tons per year, of which perhaps 70,000 mt are imported.[3] This means that about 130,000 mt of domestic production flow to urban areas every year. By 2015, total urban demand is likely to be nearly 400,000 mt.[4] This represents a huge growth opportunity for Mozambican farmers; domestic marketing would have to triple to displace imports and meet all this demand. Yet the growth in demand could very easily be satisfied by imports from South Africa – the country produces roughly 10 million mt per year – if productivity at the production and marketing levels in Mozambique does not improve. What needs to be done for domestic production and marketing to keep pace with this very rapid growth in demand, especially as the number of rural producing households falls? What will be the consequences if the country fails to meet this challenge? We begin to explore this question in the next section by examining the structure of production and marketing of maize at the farm level.

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[2] Increased demand for livestock products, especially poultry, will be a key driver of this derived demand for maize.

[3] Urban demand figures are based on urban population data combined with maize calorie and budget shares from various sources; imports are based on reports from the major millers in the center and south.

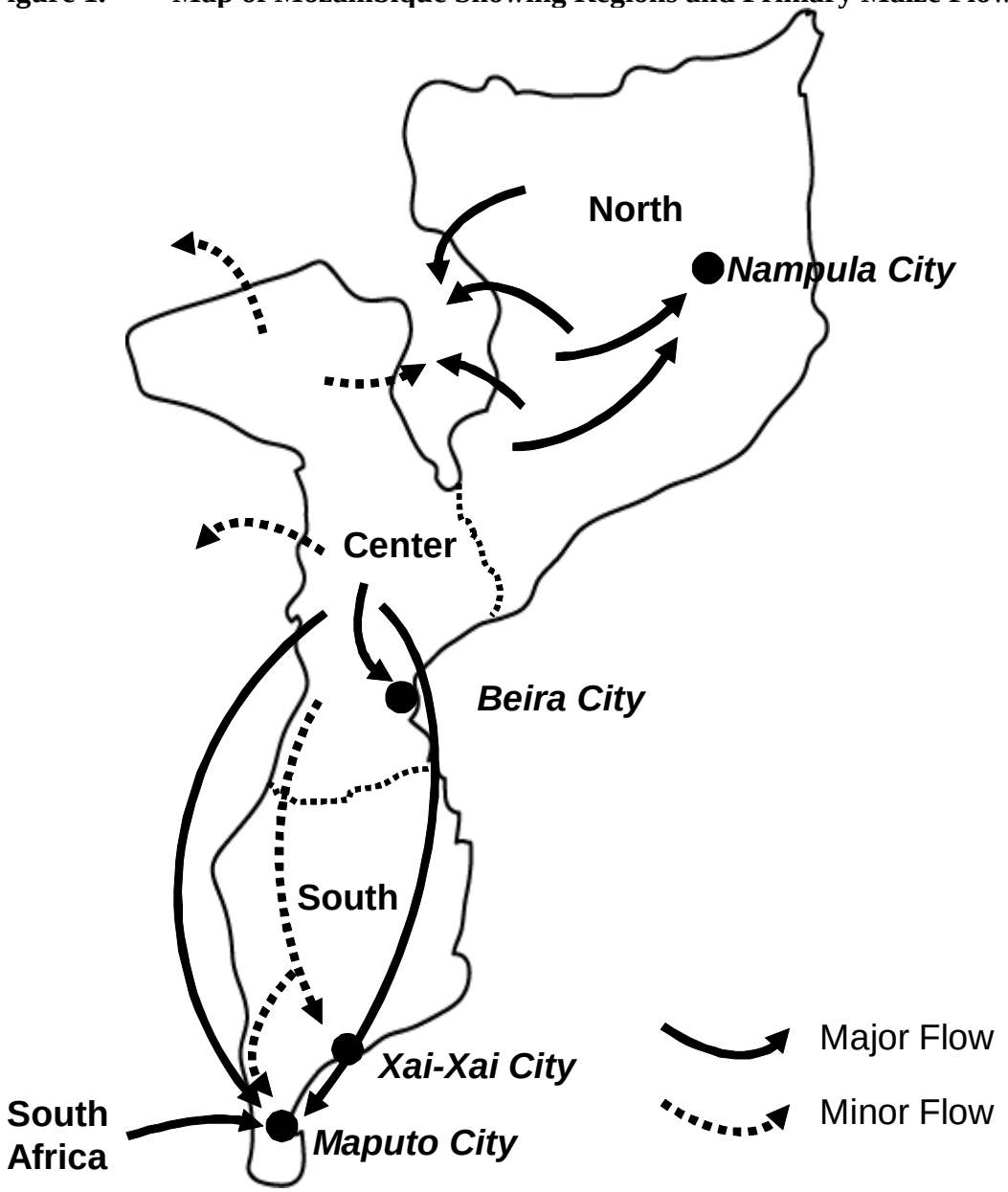
[4] Based on project population growth rates, annual per capita income growth of 3%, and an income elasticity of demand for maize of 0.50.

4. The Structure of Production and Marketing at the Farm Level

Discussions of agricultural production, marketing, and trade in Mozambique have a strong geographical focus due to distinctive features of the country's geography and related agro-climatic factors. In this paper, we define the South as the provinces of Maputo, Gaza, and Inhambane; the Center as Sofala, Manica, and Tete, and the North as Zambêzia, Nampula, Cabo Delgado, and Niassa (Figure 1). Rainfall in the northern four provinces is generally more reliable than in provinces to the south, and is less correlated with rainfall in the Southern Africa region. For example, during the devastating regional drought of 1992, and the less severe but still widespread drought of 1995, rainfall and production in these four northern provinces was relatively unaffected. Rainfall in the Center is strongly correlated with that in the Southern Africa region and is more variable than in the North, but is more abundant and more reliable than in the South. Geographically, the country is long and narrow along a north-south axis, with the major metropolitan area (Maputo/Matola)[5] located in the far South. As a result, distances from northern production zones to consumption centers to the south are much longer – and transport costs higher – than they are to or from neighboring countries to the west. East-west rail links, built during the colonial era to facilitate trade with the colonial powers, reinforce the natural advantage of east-west, as opposed to north-south, trade. Finally, the Zambêzi River, which separates Zambêzia province from Sofala province to the south (and part of our Northern region from our Center), has no bridge except in Tete province to the west. As a result, the river acts as a natural barrier to trade for a low value product like maize. As we show in Figure 1, maize leaving rural areas north of the river almost all flows into northern cities or Malawi, while south of the river it flows primarily to central and southern cities.

[5] Together, Maputo and Matola have more than three times the population of Beira, the second largest city in the country, located in the Center.

Figure 1. Map of Mozambique Showing Regions and Primary Maize Flows



During any given year, the north of the country accounts for about half of Mozambique's maize production and 60% of its sales, despite the fact that it has the lowest proportion of households growing maize of any region (Table 1). These patterns are driven by the concentration of rural population in the provinces of Zambêzia and Nampula of the North, which between them have nearly 40% of the country's population. Production and sales in the South are very low, meaning that this region depends on production in the Center, complemented by imports from South Africa, to feed itself. Mean household maize production and sales are highest in the Center.

Table 1. Maize Production and Sales Indicators by Region of Country (2001/02 Production Year)

	Region			
	North	**Center**	**South**	**Total**
% of National Population	51	23	26	100
% of National Production	51	40	10	100
% of National Sales	59	39	2	100
Household Level by Region				
% Planting Maize	74	94	90	-
% Producing Maize	73	90	78	-
Mean Quantity Produced Among Those Producing (Mean Kg)	406	749	250	-
% Selling Maize	24	23.4	3.8	-
Mean Quantity Sold Among Those Selling (Mean Kg)	154	299	137	-

Data Source: TIA 2002

To examine the structure of production and marketing, we break smallholder households in each region into six mutually exclusive groups: those who did not produce maize, those who produced but did not sell, and quartiles of sales among those producing and selling (Tables 2-4). Several patterns stand out. First, production and especially sales are highly concentrated. In the Center and North, only about 25% of households sell maize, and the top quarter (about 6%) account for over 70% of all sales. In the South, less than 1% of households account for over three-quarters of sales. These top sellers cultivate more total area and devote more area to maize than other groups, and achieve substantially higher maize yields. Second, the largest producers and sellers are located in the Center. The largest quartiles of sellers in that region achieve mean maize production more than double their cohort in the North, and comparable to the much smaller group in the South; the sales of this group in the Center are more than double those of their cohort in both of the other regions. Finally, well over half of the households in each region purchased maize grain or maize meal during the 2002 agricultural season: 59% in the North, 76% in the Center, and 80% in the South. Large shares even in the top sales quartile purchase maize, though these are likely purchasing maize meal rather than maize grain.[6]

[6] The questionnaire asked simply if the household had purchased "maize grain or maize meal."

Table 2. Production and Marketing Characteristics by Category of Maize Production and Sales Behavior: Northern Region (2002 Harvest Season)

Indicator	Households With No Production	Households With Production But No Sales	HHs with Production and Sales (Sales Quartile)			
			1 (Lowest Sales)	2	3	4 (Highest Sales)
% of HH in Region	27.5	47.7	6.3	6.0	6.2	6.3
Median years of education of household head	1	2	2	2	2	3
% of Maize Produced in Region	0	54.2	5.0	6.8	10.6	23.5
% Maize Sold in Region	0	0	3.3	8.3	17.2	71.2
Mean Quantity Produced per HH in Kg (Median)	0 (0.0)	334 (193)	233 (116)	329 (227)	503 (350)	1,102 (706)
Mean Quantity Sold per HH, among those Selling (Kg)	0	0	23	59	118	483
Average Percent of Production Sold	0	0	20.8	30.5	36.5	54.1
% of HH Buying Maize or Maize Meal	72.6	58.5	49.0	42.3	50.0	33.7
Total Area Cultivated per HH (Ha)	1.01	1.16	1.02	1.18	1.35	2.00
HH Area per Capita	0.37	0.34	0.32	0.35	0.37	0.71
Area in Maize per HH (Ha)	0.02	0.36	0.30	0.37	0.50	0.69
Mean Maize Yield (Kg/Ha)	0	1,148	1,051	1,284	1,305	1,848

Data Source: TIA 2002

Table 3. Production and Marketing Characteristics by Category of Maize Production and Sales Behavior: Central Region (2002 Harvest Season)

Indicator	Households With No Production	Households With Production But No Sales	HHs with Production and Sales (Sales Quartile)			
			1 (Lowest Sales)	2	3	4 (Highest Sales)
% of HH in Region	10	65.7	6.1	5.8	6.1	6.3
Median years of education of household head	2	2	2	2	2	3
% of Maize Produced in Region	0	53.2	6	7.1	11.4	22.4
% Maize Sold in Region	0	0	2.8	8	17.5	71.6
Mean Quantity Produced per HH in Kg (Median)	0 (0.0)	545 (346)	662 (500)	827 (639)	1,251 (850)	2,397 (1,751)
Mean Quantity Sold per HH, among those Selling (Kg)	0	0	44	131	269	1071
Average Percent of Production Sold	0	0	10.7	25.9	36.3	52.2
% of HH Buying Maize or Maize Meal	92.4	77.6	80.2	68.3	68.9	43.4
Total Area Cultivated per HH (Ha)	1.54	1.73	1.73	1.79	2.02	2.95
HH Area per Capita	0.39	0.45	0.46	0.42	0.51	0.69
Area in Maize per HH (Ha)	0.25	0.89	1.06	1.01	1.20	1.64
Mean Maize Yield (Kg/Ha)	0	830	928	1,094	1,168	1,995

Data Source: TIA 2002

Table 4. Production and Marketing Characteristics by Category of Maize Production and Sales Behavior: Southern Region (2002 Harvest Season)

Indicator	Households With No Production	Households With Production But No Sales	HHs with Production and Sales (Sales Quartile)			
			1 (Lowest Sales)	2	3	4 (Highest Sales)
% of HH in Region	22.5	73.1	1.1	0.8	1.4	1.1
Median years of education of household head	1	2	2	2	2	4
% of Maize Produced in Region	0	76.7	2.5	2.1	4.9	13.7
% Maize Sold in Region	0	0	2.5	5.2	15.3	77
Mean Quantity Produced per HH in Kg (Median)	0 (0.0)	203 (87)	438 (104)	512 (289)	670 (482)	2,459 (1,386)
Mean Quantity Sold per HH, among those Selling (Kg)	0	0	15	44	74	488
Average Percent of Production Sold	0	0	12.2	17.2	16.5	33.5
% of HH Buying Maize or Maize Meal	82.2	79	94.1	63.2	84.1	57.2
Total Area Cultivated per HH (Ha)	1.02	1.38	1.29	1.25	2.02	2.64
HH Area per Capita	0.49	0.45	0.60	0.58	0.67	1.00
Area in Maize per HH (Ha)	0.17	0.64	0.80	0.68	0.72	1.86
Mean Maize Yield (Kg/Ha)	0	486	1,074	984	1,462	1,562

Data Source: TIA 2002

Two results from TIA 2002 data show that production in each region is geographically dispersed. First, in the South, no district had more than 12% of total regional sales, while in the Center no district exceeded a 15% share. Second, in the Center and South, 86% of the variation in household maize sales quantities lies within villages, not across them.[7] This result suggests that smallholder households with high sales are spread across many villages rather than concentrated in a few. These results make it clear that the large producers and sellers are spread over a large geographic area, implying high costs for assembling maize grain.

What do these patterns imply about the challenges we laid out at the beginning of this paper? First, production is spread over hundreds of thousands of farmers, nearly all of them very small and distributed across large geographical areas. Most of these farmers do not even produce enough maize to meet their own needs. External input use is rare, and educational levels are extremely low. Seed is typically saved from production or purchased in local markets, resulting in uneven color (yellow mixed with white, especially in the South) and milling characteristics (mixture of flint and dent). Post harvest handling, including on-farm storage, is typically poor, exacerbating the quality problems just mentioned.[8] For Mozambique's maize production system to supply a growing modern milling industry at all, and to supply traditional markets more reliably and at lower cost, productivity and quality must be substantially raised. To do this under the current production and marketing structure requires major investments in improved seed systems, broader input systems, and extension. Currently, Mozambique ranks near the bottom of Sub-Saharan African countries in crop productivity.

Second, a small minority of farmers sells maize, and most of these sell only 100 or 200 kg – hardly enough to achieve economies of scale. Unit costs are therefore very high both for the farmer and the trader. Tripling the volume of maize marketed in the Center and South over the next decade, which is our estimate of what is needed if the country is to fully meet demand in these regions from domestic production, will not happen without major investments at the farm level, complemented by improved roads, storage infrastructure, and market information.

5. Rural and Urban Staple Consumption Patterns

In this section we first present more detailed information on the staple purchasing habits of rural farm households, the share of rural net buyers of key staples, and the likely size of market demand for maize in rural areas compared to urban. We then present the evolution of retail staple prices in the South and Center since 1997, highlighting the substantial changes in relative prices among these staples over the past eight years. Next we focus on budget shares for staples in rural and urban areas, using data from the 1996 and 2002 IAF Surveys. Finally, we use several surveys conducted jointly by the Ministry of Agriculture's Policy Analysis Department and SIMA to look in more detail at the ways in which households obtain their maize, as this has important impacts on the real cost of this staple food for poor consumers.

[7] Based on one-way Analysis of Variance with village as the treatment variable.

[8] On a more positive note, SIMA's annual windshield survey recently picked-up increase attention to moisture content of grain by farmers and small traders, driven by the trade with Malawi: Malawian buyers refuse to purchase grain judged to have too high a moisture content.

A. Rural Staple Purchases and Net Buying Status

By combining information on purchases and sales of staples, we can calculate the approximate share of rural households that were net buyers of each staple.[9] For maize, we define these as households who purchased more maize grain (or its equivalent in meal) than they sold. Table 5 shows that purchases of staples in addition to maize by rural households are quite common. In every region a majority of rural households were net buyers of maize during the 2001/02 agricultural season; in the Center and South this share was about 70%. A majority in the Center and South were also net buyers of rice, while in the North, where cassava predominates in the populous provinces of Zambêzia and Nampula, half the population was a net buyer of this commodity.

Table 5. Share of Rural Smallholder Households Purchasing Selected Staples, and Share of Net Maize Buying Households in Rural Areas, by Region (2001/02 Production Season)

	% Buying			% Net Buyers		
Region	Maize	Rice	Cassava	Maize	Rice	Cassava
North	59%	48%	51%	53%	47%	50%
Center	76%	59%	34%	68%	59%	33%
South	80%	87%	18%	71%	87%	18%
National	67%	57%	42%	61%	57%	41%

Data Source: TIA2002

Production levels combined with information on calorie shares from maize suggest that, for many households, the quantities of maize or maize meal being purchased are substantial. FEWSNET estimates an average maize calorie share in Mozambique of 25% to 39%. The lower bound of this range implies per capita maize consumption per year of about 57 kg, or about 315 kg per household. In the South, 87% of households produce less than this amount, while in the Center 45% produce below this level. Among these households, production levels plus the FEWSNET calorie share data suggest that purchases average about 190 kg in the Center and 240 kg in the South. Overall, these calculations suggest that rural households in the Center and South are likely to be purchasing over 170,000 mt of maize per year, similar to our estimate of urban demand in the two regions. Because we chose the lowest figure in the FEWSNET range, this would seem to be a conservative estimate for rural market demand.

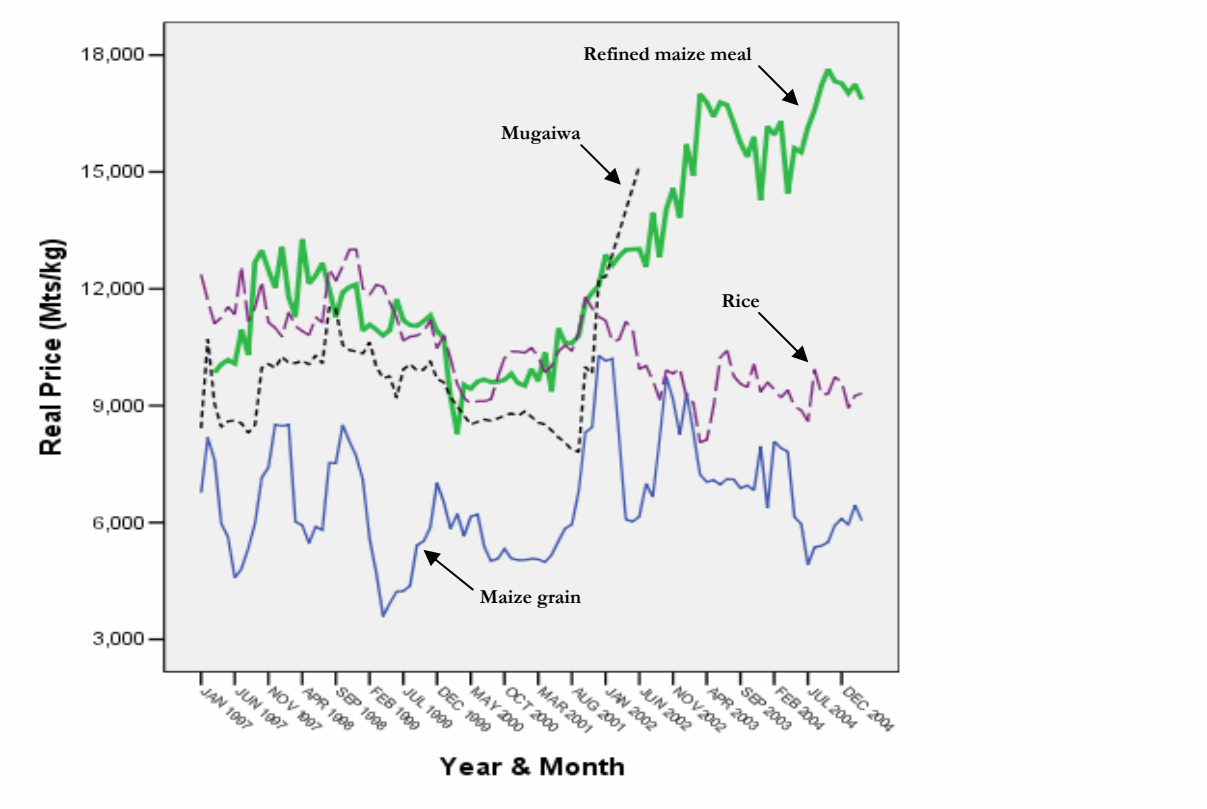
The high proportion of net buyers of staples in rural areas of the country, and the substantial volumes that are being purchased, have major implications for the demands being placed on the production and marketing system, and thus for policy in the country. We will return to this issue in later chapters.

[9] Our share calculation is only approximate because we do not have data on quantities purchased. However, we can unambiguously determine whether a household a) was out of the market, b) only sold, c) only bought, or d) both bought and sold. Only the final group cannot be unambiguously classified as a net buyer or not. We computed percent net buyers by assuming that half of this group was a net buyer. Because this final group is under 10% for every staple in every region, actual percentages should lie close to this figure.

B. Evolution of Retail Staple Prices in Maputo

In this section we examine the real prices at retail of maize grain, refined maize meal, *mugaiwa*[10], and rice in Maputo since 1997 (Figure 2). We chose this starting point because it is when refined maize meal produced domestically began to be regularly available in the Maputo market. The period can be roughly divided in two based on relative prices: through 2001, and from January 2002 to the present.

Figure 2. Real Prices of Key Staples at Retail in Maputo, January 1997 - March 2005 (base = March 2005)



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During the first period, maize grain was always by far the most affordable staple. Rice and refined maize meal had very similar prices at the top end, about 60% above the price of maize grain. *Mugaiwa* was regularly available and undercut rice and refined meal slightly in price while exceeding the price of grain by about 40%. Since late 2001 or early 2002, *mugaiwa* has been absent from the retail market, the price of refined maize meal has trended sharply upwards, and rice has continued its steady decline. As a result, the price of refined maize meal, which differed from that of rice by less than 10% during the first period, exceeded the rice price during the second period by an average of about 60%. Maize grain's average price relative to rice also rose during the second period, from 57% to 73%, with seasonal price rises frequently bringing maize nearly to parity with rice. Maize grain's price relative to refined meal, however, fell from 48% to 39%, driven by meal's sharp price rise.

These same basic patterns – steady maize prices, falling rice prices, rising prices of refined maize meal, and the disappearance of *mugaiwa* – are also seen in other southern cities such as

[10] *Mugaiwa* is the common name throughout southern Africa for whole meal, i.e., meal produced with none of the germ or pericarp removed. This can be done at a hammer mill, where the grain is simply cleaned and milled, with a nearly 100% extraction rate, or at home where it is hand pounded.

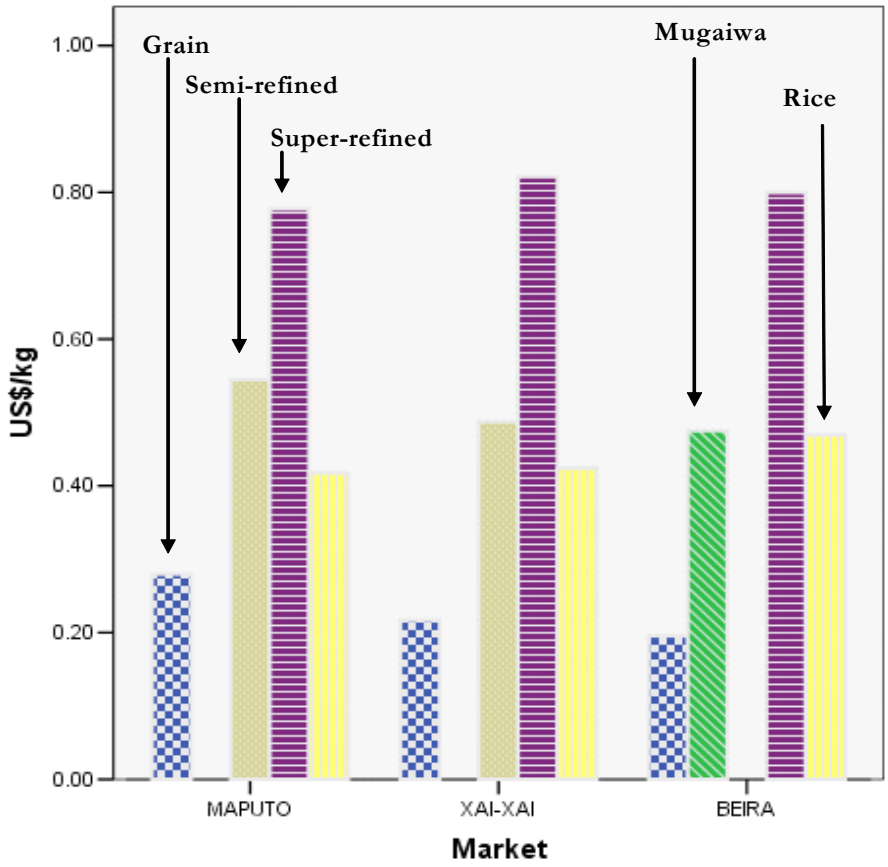
Xai-Xai. In Beira in the Center, *mugaiwa* has continued to be available in the market, but the falling price of rice has brought the price of these two staples to approximate parity over the past year. Figure 3 shows the US$ prices of maize grain, *mugaiwa*, semi-refined maize meal, the most refined maize meal, and rice in Maputo, Xai-Xai, and Beira during 2005. The price of the most refined meal, produced by the same company,[11] is very similar – and very high at about US$800/ton – in all three cities. In Maputo the price of this meal is about three times that of grain, while in Xai-Xai and Beira it is higher by a factor of about four. In all cities outside of Maputo, the price of maize grain relative to rice is substantially lower than in Maputo: about 75% in Maputo, 50% in Xai-Xai, and 39% in Beira. This pattern is consistent with Beira being the closest to production areas and Maputo the furthest away, and with Maputo being the cheapest import destination for rice.

Taken together, these changes in relative prices would be expected to increase the consumption of rice relative to maize among poor consumers throughout the South and Center, though to a lesser degree outside of Maputo than within it. For the maize that households do consume, the sharp increase in the price of refined maize meal relative to grain should increase households' purchase and processing of maize grain relative to purchases of refined meal. Yet prediction of the actual impacts of these relative price changes on household behavior is complicated by several factors. First, incomes have increased substantially throughout the two regions over the past seven years. This could be expected to increase the demand for convenience and thus favor purchases of maize meal (and rice) over maize grain. Second, until 1997 in Maputo, and somewhat later outside of Maputo, the industrial maize milling industry was nearly defunct, and industrially refined maize meal was seldom available in markets except as an expensive imported product. Since that time, Companhia Industrial de Matola (CIM) has aggressively expanded its production and marketing, especially of its most refined brand,[12] with MEREC Industries as its main competitor. Smaller competitors have emerged recently at prices slightly below CIM. All have been protected by a 25% duty on imported maize meal. Widespread availability of and advertising for maize meal, even if it is more expensive than other options, would be expected to increase its sales, especially as household incomes rise. We turn in the next two sections to an examination of actual expenditure behavior of consumers.

The 1996 and 2002 IAF surveys are the key data sources for poverty monitoring and analysis in Mozambique, and also provide nationally representative information on expenditure patterns of rural and urban households. We first examine changes in budget shares of key staples in the South and Center of the country between the two surveys, then examine how these budget shares in 2002 varied with the income (proxied by total expenditure) of the household. In the previous section we suggested that *apriori* prediction of changes in expenditure patterns was complicated by changes in incomes and in the availability of and advertising for refined maize meal.

[11] See Section 5.C and Table 8.
[12] See Section 6 for more information on the milling industry.

Figure 3. Retail Prices of Key Food Staples in Maputo, Xai-Xai, and Beira, January-March 2005 (US$/kg)



C. Rural and Urban Staple Budget Shares

Table 6 shows actual changes in budget shares between 1996 and 2002. Maputo, Gaza, and Inhambane provinces are in the South, while Manica and Tete are in the Center.[13] We see that in urban areas of all these provinces, the maize budget share (comprising maize meal and maize grain) actually increased while that of rice fell, despite the changes in relative prices outlined above. In urban areas of the South, this pattern is partially explained by strong diversification in the diets: budget shares of meat, poultry, fish, fruits, and vegetables all increased significantly. In rural areas, the opposite pattern was observed, except in Manica and Tete provinces: maize budget shares declined while rice increased. This divergent pattern between rural and urban areas in part reflects reduced maize production in 2002 compared to 1996 due to drought, but may also reflect greater success by CIM and other maize millers in penetrating urban as compared to rural markets. Perhaps the most telling result in this table is that maize is not the primary staple in either rural or urban areas of Maputo province; it is the primary staple in Gaza and Inhambane provinces, though by a slight margin, and is far and away the key staple in Manica and Tete provinces of the Center.

[13] The results are grouped in this way based on published results from IAF 1996, and because we have access only to the 2002 data set. Sofala province was grouped with Zambêzia in the 1996 results, and so is not included here (we have put Zambêzia in the North in our classfication).

Table 6. Percentage of Total Food Expenditure Allocated to Food Items in Rural and Urban Areas of Southern and Central Mozambique, 1996 and 2002

Food Items		Maputo Province		Gaza and Inhambane Provinces		Manica and Tete Provinces	
		1996	**2002**	**1996**	**2002**	**1996**	**2002**
Urban	Maize	1.1	**2.4**	10.1	**14.5**	24.6	**39.9**
	Rice	15.0	7.8	16.2	9.8	6.1	4.4
	Wheat	21.7	15.5	16.3	6.0	5.9	2.9
	Cassava	5.0	1.3	2.9	**5.2**	0.5	0.5
Rural	Maize	16.4	9.1	22.4	12.2	23.2	**48.0**
	Rice	6.2	**11.4**	5.7	**9.5**	1.1	**2.5**
	Wheat	6.1	**7.4**	3.4	3.2	0.9	**1.4**
	Cassava	7.2	4.7	14.5	8.4	0.8	0.5

Data Source: IAF 1996 and 2002, according to their definition of rural and urban
Notes: 2002 results computed by the authors

To provide insights to how expenditure patterns vary with income, we break households into three groups (terciles) of total expenditure, and report these shares for the lowest and highest terciles (Table 7). Several patterns emerge from the table. First, though maize remains the primary national food staple, consumption patterns in Mozambique are more diversified than they are in many other countries of Southern Africa. For example, the budget share of maize grain and meals is much lower in the South than it is in the rest of the country. While it remains the top staple in rural areas of the South, its urban budget share in the region lies below both rice and wheat (and even cassava among the lowest income households). In rural areas of all three regions, the maize budget share about doubles from the bottom to the top expenditure tercile; in urban areas, it holds steady in the North and Center and falls by more than half in the South.

Wheat is much more consumed in the South than in the other two regions, and is much more consumed in the urban South than the rural South, with a budget share about three times larger in the urban areas. Rice budget shares rise with income in rural areas (though much less than maize), but in the urban Center and South, they fall (by about half in the South). Consistent with expectations, cassava budget shares fall sharply with income throughout the country in both rural and urban areas

Table 7. Percent of Total Food Expenditure Allocated to Food Item Categories, by Tercile of Total Expenditure and Rural and Urban Region (2002)

Food Items Categories	Rural						Urban					
	North		Center		South		North		Center		South	
	Total Expenditure Terciles						Total Expenditure Terciles					
	1 (Lowest)	3 (Highest)	1 (Lowest)	3 (Highest)	1 (Lowest)	3 (Highest)	1 (Lowest)	3 (Highest)	1 (Lowest)	3 (Highest)	1 (Lowest)	3 (Highest)
	% of total expenditure											
Maize and Derivatives	16.5	33.1	30.1	52.3	8.4	16.1	13.8	14.3	17.8	20.1	4.2	1.9
Rice	4.4	5.6	1.2	4.3	8.5	10.8	4.9	9.0	9.6	7.0	11.2	5.8
Wheat and Derivatives	0.3	1.2	0.3	1.6	0.9	6.4	1.6	9.2	3.7	10.3	8.6	18.0
Cassava	28.8	15.8	1.5	0.7	12.1	4.1	34.5	2.5	1.0	0.8	6.6	0.7
Leaves	6.7	2.8	11.9	3.0	29.2	11.6	3.5	1.9	8.8	3.1	17.8	8.4
Other	43.3	41.5	55	38.1	40.9	51	41.7	63.1	59.1	58.7	51.6	65.2

Data Source: IAF 2002

D. Urban Purchases of Maize Grain and Maize Meals

Households throughout Southern Africa consume their maize as a stiff porridge, called *shima* in Mozambique. This porridge can be made in a variety of ways, but each in the end requires the mixing (frequently the boiling) of maize meal in water. In this section we focus on the type of maize meal that consumers obtain and how they obtain it, because these factors can have major implications for the cost of this basic staple.

Table 8 presents the various types of maize meals available to consumers in Mozambique in early 2005, information on how they are obtained and produced, and their prices in Maputo. Extraction rate refers to the amount of meal obtained per unit of grain; a lower extraction rate indicates a more refined meal with more of the germ and pericarp removed. The cheapest source of maize meal for all consumers is to produce *mugaiwa* at home by purchasing maize grain and processing it in one of several ways. The cash cost of *mugaiwa* obtained in this way is simply the price of maize grain, which was one-half to one-third the cost of the most expensive refined maize meal (Top Score). Top Score is the leading brand of the top maize miller in the country (CIM), and has been the subject of an aggressive marketing campaign (advertising and distribution) throughout the South and Center of the country. Between these two extremes lies a range of options, from purchasing grain and taking it to a local hammer mill, to purchasing *mugaiwa* directly, to purchasing one of several industrially manufactured meals that are cheaper than Top Score.[14]

Mugaiwa was regularly available in southern retail markets through 2001, then with declining frequency before disappearing from markets in early 2003. Quantities were typically small, however, and prices were not far below those of refined meals. For example, in a 1994 survey of 388 consumers in poor neighborhoods of Maputo (the Maputo Maize Consumer Survey), only 3% cited purchases of maize meal as their primary source of supply for maize, even though *mugaiwa* was regularly available (in fact was the primary meal available in the market at the time) and was recognized by nearly all consumers (MOA/MSU Research Team 1994). Prices of *mugaiwa* from 1997 through 2001, when it and refined meal were both regularly available, were about 60% above grain prices, and only about 15% below prices of refined meal. This suggests that the market for ready-made *mugaiwa* was primarily low income households or individuals who wanted a low cost staple but placed a high premium on the convenience of not having to pound their own grain or take it to a hammer mill.

[14] See Section 6 for more information on the maize milling sector in Mozambique and the relatively recent emergence of industrial meal competitors to Top Score.

Table 8. Attributes of Maize Meals Consumed in Maputo in Early 2005

Mill Name	Product and Extraction Rate	Characteristics (Who Made; Where Consumer Acquire; Maputo Market Share)	Price (Mt/Kg)
CIM	1 Top Score (65%)	Industrial millers. Buy at retail. 50% market share in Maputo	11,800 - 15,000
CIM	2 Matabicho (75%)	Industrial millers. Buy at retail. 14% market share in Maputo	8,000 - 8,300
MEREC	3 Mpupu (65-75%)	Industrial millers. Buy at retail. 37% market share in Maputo	8,000 - 8,300
SMC	4 Mananga (80%)	Industrial millers. Buy at retail. Sold primarily outside Maputo	7,000 - 8,000
VONK	5 Power (80%)	Industrial millers. Buy at retail. Sold primarily outside Maputo	8,300 - 11,000
Hammer Mill	6 Mugaiwa (100%)	Retail traders taking grain to small hammer millers. Buy at retail. Well known as Mugaiwa	Not available in Maputo
Hammer Mill	7 Mugaiwa (80-100%)	Consumers taking grain to small hammer millers. Maize grain is produced or bought at retail, then milling service is sought. The extraction rate depends on degree of hand pounding done before taking for milling. Also well known as Mugaiwa	5,500-6,500 (Grain price plus milling charge)
Home Made	8 Hand Pound Maize Meal (65-85%)	Home made. Consumers produce maize grain or purchase it at retail, then make own meal through hand pounding in the "*pilão*"; or may partially pound at home to remove germ and pericarp, then take to hammer mill for final milling	5,000 – 6,000 (grain price)
Home Made	9 "Alguidar" Maize Meal (65%)	Home made. Consumers produce maize grain or purchase it at retail, hand pound to remove germ, and then soak it overnight. Meal is then made at home using an "*alguidar*" method	5,000 – 6,000 (grain price)

Source: SIMA and author calculations

Thus, the key determinant of the final cost of maize meal to poor consumers (both rural and urban) is the price and availability of maize grain in markets throughout the year. In 1994, the Maputo Maize Consumer Survey showed that 89% of low income households cited purchases of maize grain as their primary source of maize, and an additional 6% cited grain from family production. By 2003, these proportions had fallen but remained important, especially outside of Maputo. During the harvest period of 2003, 36% of households in poor areas of Maputo, and 70% in comparable areas of Xai-Xai and Beira, relied on purchases of maize grain (in some cases complemented by grain from family production) as their principal source of maize (Arlindo et al. 2004). In Maputo, the balance, nearly two-thirds of households, relied primarily on purchases of refined maize meal; none cited *mugaiwa* as their main source of maize. *Mugaiwa* became more important as one moved out of Maputo, but remained well below other sources, with 4% of households in Xai-Xai citing it, and 12% of households in Beira.

The decrease from 95% to 36% in the share of households in Maputo relying primarily on maize grain for their maize (implying that they processed the grain themselves or in hammer mills) is striking in light of the sharp increase in the price of maize meal relative to grain, documented in Section 4.B. This change suggests that CIM's marketing efforts, helped by increased incomes in Maputo and protection from imports, have been quite successful. We will return to this issue in the next section.

The predominance of maize meal over grain in consumer purchasing patterns in Maputo, and of rice over maize meal, is confirmed in surveys of food retailers. In a survey of small retailers in one of the main open air food markets in Maputo (*Xipamanine)*, conducted in June 2005, enumerators found 134 sellers of rice, 66 of refined maize meal, none of *mugaiwa*, and only 18 of maize grain. Of the total quantity of the three staples sold in the market during a representative day, 64% was rice, 23% refined maize meal, and 13% maize grain. This means that the share of grain in total maize sales (13/36=36%) exactly coincides with the results from 2003 on the share of households relying primarily on maize grain instead of meal for their maize supplies. Overall, about twice as much rice as maize (meal and grain) was sold, which also is broadly consistent with the budget shares reported earlier. Among the sellers not selling maize grain, all indicated that the reason was insufficient consumer demand to provide acceptable returns to the business. This idea – that maize is a low margin commodity and thus not worthwhile unless you can transact large quantities – is persistently mentioned by larger traders who are questioned about their lack of involvement in the maize trade (various personal communications). In a separate survey of a new retail segment in Maputo, the so-called *Contentores,*[15] only one of the 17 surveyed sellers had ever sold maize grain, and this person had quit selling it. All the sellers carried rice and refined maize meals. Of the 16 who had never sold maize grain, five said there was insufficient demand, and three indicated that one had to enter that business in large scale for it to be profitable.

There was some evidence of reduced availability of maize grain during the hungry season in each city, requiring households to rely more on expensive refined meal for their maize, or on staples other than maize. In Maputo, the share of households relying on maize grain as their main source of maize fell from 36% during the harvest to 24% during the hungry season,

[15] The word *contentores* refers to the shipping container cars that are retrofitted and used as retail shops. This retail segment has emerged in Maputo over the past two to three years, driven by the arrival of refugees from the Great Lakes region and their investment in this business. The *contentores* appear to serve a lower-middle income demographic, between the low income consumers frequenting open air markets and the higher income consumers which frequent the traditional shops (*lojas* or *mercearias*).

while in Xai-Xai and Beira the share fell more modestly, from 70% to 61%. The most telling statistic, however, is that in Xai-Xai the proportion of households relying on rice as their main staple rose from 43% during the harvest season to 84% during the hungry season, reflecting a decided shift away from maize. The poor harvest and high maize prices that year certainly contributed to this pattern.[16] On the other hand, Mozambique in general, and Maputo in particular, typically has the lowest seasonal price rise of any country in the region with the exception of South Africa (Tschirley et al. 2004), suggesting that seasonal scarcity is less severe in Mozambique than in those countries.

Consumer use of hammer mills to mill grain is much higher in the Center than it is in the South. In Maputo, only about half those obtaining grain (meaning about 10%-20% of the population) reported using a hammer mill, and only 10% reported this in Xai-Xai. In Beira, where a much larger share of the population relies on maize as their main staple, 90% reported using a hammer mill to process the grain. We now turn to an examination of the milling industry in the country.

6. The Milling Industry

We first discuss the industrial milling sector, then turn to the urban and rural hammer milling sector.

A. Industrial Milling

The industrial maize milling sector in Mozambique declined throughout the 1980s due to a combination of ineffective state management and the difficulty of obtaining supplies due to the civil war. By the early 1990s, the sector was essentially defunct. CIM was privatized in the mid-1990s and by 1997 was operating on a regular basis as the only industrial maize miller in the country. As shown earlier in Figure 2 (Section 5.B), the retail price of CIM's top brand (Top Score) tracked rice prices very closely during the company's first three years of operation, then began a rapid and sustained upward trend, while rice continued its steady downward trend and maize grain trended down from the high levels reached in early 2002. As a result, by March 2005, the price of Top Score exceeded US$800/ton throughout the country, three times the maize grain price in Maputo, four times the grain price in other cities of the South and Center, and more than double prices of comparable meals in Zambia and Malawi.

This very high price of CIM's top brand has created room for competitors to enter the market (Table 9). Mobeira began operations the same year as CIM, but has concentrated on wheat milling and has never seriously competed with CIM. MEREC in 1999, and more recently Vonk, SMC, and Inácio de Sousa have entered the market with products priced well below CIM's Top Score. To date, CIM has had the most aggressive national coverage, but MEREC competes directly with it in Southern and Central markets. Vonk competes with CIM in its home market in the Center, and has recently entered the Maputo market to compete with CIM. SMC and Inácio de Sousa serve southern markets outside of Maputo, and to date have not ventured seriously outside of these areas.

[16] The 2002/03 marketing season -- thus the 2003 hungry season – was a crisis year in Southern Africa, with low availability and high prices of maize grain.

Table 9. National Market Share of Industrial Maize Millers

Name of Miller	Starting Year of Operation	Name of Meal Produced	Price of Leading Brand, Early 2005 (mts/kg)	Current Milling Throughput, all Brands (MT/Month)	Location	National Market Share (%)
CIM	1997	Top Score, Matabicho	11,800-15,000	2350	South (Matola)	38
MEREC	1999	Mpupu	8,000-8,300	2100	South (Chibuto)	34
MOBEIRA	1997	?	--	900	Center (Beira)	14
Vonk	2003/04	Power	8,300-11,000	400	Center (Chimoio)	6
SMC	2000/2001	Mananga	7,000-8,000	240	South	4
Inácio de Sousa	2002	Palmeira	7,000-8,000	240	South	4
Total	-	-		6,230	-	100

Data Source: 2005 Miller Survey

Despite this competition, prices remain very high, and CIM with its Top Score brand maintains a strong hold on the market in Maputo. Among 17 *Contentores* surveyed around Maputo in early 2005, all 17 carried Top Score, 9 carried Matabicho (CIM's less refined brand, which is also much less aggressively marketed), and 13 carried Mpupu. Only one trader carried any other brand. Among the 17, Top Score held a 49% market share on total volume, Matabicho a 13% share (62% total share for CIM), and Mpupu a 37% market share.

CIM and MEREC rely almost entirely on imports for their supply of maize grain, primarily from South Africa but also from the United States when prices there are favorable. Each has experimented with local purchases, including bringing maize from the North by ship, but find that quality and reliability of supply are major problems. Vonk is a major grain trader who entered the milling sector after nearly 10 years of trading activity. He supplies his mill in the Center entirely with domestic purchases. SMC and Inácio de Sousa in the South rely primarily on domestic production, but have had difficulty obtaining sufficient supplies during the hungry season, and have therefore begun importing grain during that season from South Africa. Future growth prospects for these two companies likely depend on regular grain imports.

B. Urban and Rural Hammer Milling

The urban small-scale hammer milling sector grew rapidly in the South during the late 1980s and early 1990s. This growth was made possible by the widespread availability of cheap yellow maize grain from food aid, much of which was sold into commercial markets, and by the liberalization of agricultural markets that was taking place at that time. Because food aid maize was a dent variety, which does not perform well in hand pounding, hammer mills were

the best processing option.[17] Until a privatized CIM began operating again in 1997, the hammer milling sector was responsible for most of the milling in Maputo. For example, the 1994 Maputo Maize Consumer Survey showed that, among households purchasing maize meal, purchasers of whole meal (*mugaiwa*) outnumbered purchasers of refined meal by a factor of three. Yet even this small-scale milling sector touched only a small part of the maize market at this time, as shown by several patterns from the 1994 survey. First, 95% of households cited maize grain as their primary source of maize, with only 3% relying primarily on maize meal purchases. Second, 99% of households reported buying maize grain over the past year, while fewer than 40% purchased any maize meal. Finally, among those purchasing grain, only 14% reported processing it partially or wholly in a hammer mill; the rest relied entirely on hand pounding.

With the sharp reduction in food aid after 1993 and the rise of CIM starting in 1997, the hammer milling sector began to decline in Maputo and generally in the urban South. By 2003, it was difficult to find significant numbers of hammer mills in the city. Of the four interviewed at that time, all indicated that their main clients were small manufacturers of traditional alcohol, not consumers or retailers of whole meal. Beira, and the Center in general, has maintained a much more active hammer milling sector. Of 18 such mills interviewed in Beira in 2003, all indicated that their main clients were either retailers of *mugaiwa* or consumers. The consumer survey of the same year complements these findings, showing that 70% of interviewed consumers in that city relied primarily on grain for their maize supplies, and that 90% of these reported using hammer mills either wholly or partially to process the grain. Beira also shows a higher share of consumers relying primarily on purchases of *mugaiwa* for their maize supplies, about 20%, compared to nearly zero in Maputo and less than 5% in Xai-Xai.

Regional patterns in rural areas mirror findings in cities. About two-thirds of villages in the Center had a hammer mill in 2002, compared to about 20% in the South (Table 10).

7. Import Duties on Maize Meal and the Value Added Tax on Maize Grain Imports

Two key results stand out from previous sections of this paper. First, prices for refined meal are exceptionally high throughout Mozambique, with the top two brands ranging in price during early 2005 from about US$440/mt at retail (8,000 mts/kg, the lowest price for MEREC's Mpupu brand; see Table 8) to over US$800/mt (15,000 mts/kg, the highest – and most common – price for CIM's Top Score brand). This compares to a typical price range of US$270-US$330 for comparable meals in Zambia. Recent entrance of more medium-scale industrial millers has provided more choice to consumers, but has not appreciably reduced overall price levels nor reduced the market share of the two large millers. Meanwhile, the retail price of maize grain during the same period has ranged from US$280/mt in Maputo down to US$196/mt in Beira (Figure 2), creating a huge differential between grain and meal prices. Second, despite this wide differential, only about one-third of low income households in Maputo obtain their maize primarily through purchases of grain for processing in-house or at a hammer mill; two-thirds primarily purchase refined meals. The share of low income households relying primarily on maize grain in Xai-Xai and Beira is much higher, at around 70%.

[17] Dent varieties have a large amount of soft starchy material in the endosperm, which is lost when the grain is pounded and cleaned. Local varieties used in hand pounding are all flint varieties, which have a much harder endosperm.

Table 10. Share of Rural Villages with a Hammer Mill, by Region and Province (2002)

Region	Province	% of Villages with Maize Mill
North	Niassa	45.7
	Cabo Delgado	27.0
	Nampula	18.0
	Zambezia	33.0
Center	Tete	56.4
	Manica	67.3
	Sofala	69.4
South	Inhambane	18.7
	Gaza	16.3
	Maputo	28.6

Data Source: TIA 2002

The low share of households in Maputo that rely primarily for their maize supply on purchases of grain rather than meal is puzzling, given the low incomes of most of these households. To investigate whether this behavior within Maputo is related to problems of maize grain availability, we turn now to a key policy issue in the sector: the value added tax on maize.

Mozambique stands out in Southern Africa for its commitment in policy and practice to open borders. This policy has paid high dividends in the maize market, where surplus production in the North is regularly exported at low cost to Malawi, while the South depends on relatively low cost production from the Center and imports from South Africa. Closed borders in Mozambique would dramatically reduce maize prices to farmers in the North and increase them to consumers in the South. Additional benefits of this open borders policy include much less seasonal variation in maize prices in Maputo and southern Mozambique than in Malawi and Zambia (Tschirley et al. 2004), and regular access by consumers throughout the country to cheap rice imported from world markets.

Two policies which may impinge on open trade in food staples in Mozambique are the 17% value added tax (VAT) on maize grain imports, and the 25% duty on imported maize meal. Because maize grain pays only the basic 2.5% duty (VAT is reimbursed; see below), the 25% duty on maize meal provides much higher effective protection to the milling activity. This duty fell to 20% on 1 January 2006 as part of the SADC Trade Protocol, and will be progressively eliminated by 2015 for imports from South Africa and 2012 for all other imports (see Section 8, Conclusions and Policy Implications, for more on this issue).

Two peculiarities of the VAT suggest *apriori* that it may negatively affect maize grain imports and the availability of maize grain for retail purchase. First, the tax is charged on maize grain transactions, but not on rice and wheat. Thus, imported rice reaches consumers paying only normal import costs plus a modest 2.5% import duty; wheat reaches millers in

the same way. If maize grain were to be imported, it would pay the 17% VAT in addition to normal duties and other costs, creating an immediate cost disadvantage for this product. Second, sales of maize meal are exempt from VAT, but sales of maize grain are not. This means in practice that anyone importing grain and processing that grain into meal is entitled to a full reimbursement of the VAT paid on the imported grain,[18] a trader importing grain to sell as grain would not be entitled to this reimbursement. Maize grain is thus specifically disadvantaged by this policy relative to maize meals, rice, and wheat. By favoring maize meal over maize grain, the VAT also favors large industrial millers over small hammer mills, since the latter provide only custom milling services, and the grain entering their mills, if imported, would have paid the 17% VAT. Given that maize grain prices are always substantially lower than other staples available to low income consumers, what impact might this policy be having?[19]

Figure 4 presents the prevailing wholesale market price (in real terms) of maize grain in Maputo from May 1999 to January 2005, along with the import parity price (IPP) from South Africa with and without VAT. IPP is calculated from the lowest cost market of origin in South Africa, plus costs of rail transport, loading/unloading, insurance, and regular duties of 3%. VAT of 17% is charged on this total cost, as per the VAT regulation. Figure 4 highlights periods when either of the IPPs was below the prevailing wholesale market price, while Table 11 indicates the duration of each period, and the mean price difference between the IPP and the prevailing market price during the period. This simple analysis shows that, even with VAT charged, there were four periods of at least five months' duration during which IPP was below the prevailing wholesale market price in Maputo, suggesting that traders importing at those times would have been able to make a profit. Without the VAT, the duration of these periods would have been longer and the price difference would, of course, have been greater. Yet we know that the only imports of maize grain of any significant volume in recent years have been by the industrial millers, especially CIM and MEREC. Maize grain for sale at retail is entirely of domestic origin.

What could explain this absence of imports of maize grain for sale as grain, given the profit opportunities that appear to exist? For small-scale importers of the type that supply southern markets with production from the Center, the absence of imports is likely related to the complexity of import procedures, and to aspects of the South African maize marketing system that may make it difficult for a small trader to operate effectively. First, an importer needs to be officially registered as such with Mozambican authorities, a requirement which will be an impediment for many small traders, who tend to operate informally. Second, the trader must present at the border a formal price quote (as part of the so-called "pre declaration") for the commodity they are importing; for traders accustomed to operating on a cash basis in a traditional open-air marketplace, this too can be an impediment. Finally, the importer must have a phytosanitary certificate obtained in South Africa, which may be the biggest regulatory impediment of all for these types of traders. When interviewed in April 2005, three such traders formerly involved in small-scale trade with South Africa had abandoned it, citing "rigid procedures" at the border.[20]

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[18] Maize millers complain that the VAT reimbursement process is complicated and slow, but it appears that they do receive the reimbursements.

[19] Maize grain always carries the lowest price per kg, typically by a substantial amount in Mozambique. It does, however, require further processing, which rice and maize meal do not, and maize meal requires a somewhat longer cooking time than the type of rice sold in Maputo. Also, many consumers feel that rice "fills the belly" more than maize.

[20] Though it is important to note that none of these traders had ever imported maize, focusing instead on higher value items like groundnuts and beans.

Figure 4. Prevailing Prices of Maize Grain at Wholesale in Maputo, Compared to Import Parity Prices from South Africa With and Without VAT (May 1999–January 2005)

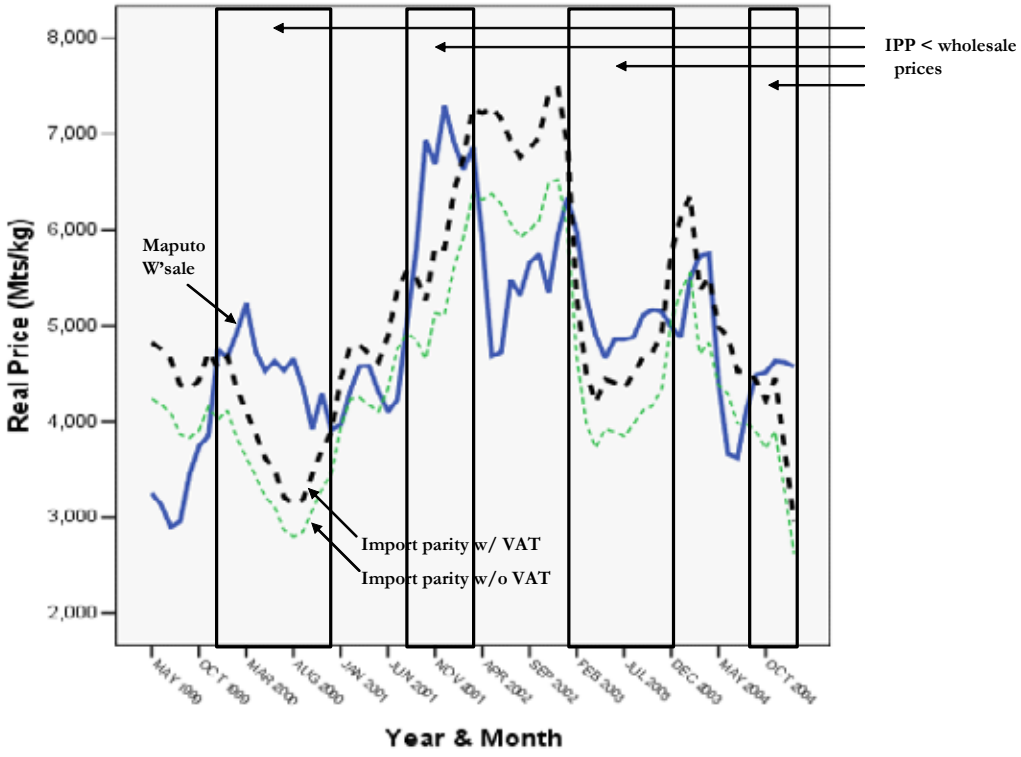

Table 11. Duration and Mean Price Difference of Periods When IPP Was Below Maputo Wholesale Price, With and Without VAT

Period when IPP below Maputo Wholesale Price		Duration (months)		Mean % by which Maputo Wholesale Price exceeded IPP	
Begin	End	w/ VAT	w/o VAT	w/ VAT	w/o VAT
Dec-99	May-01	12	18	-10%	-20%
Aug-01	Feb-02	5	7	-7%	-18%
Jan-03	Nov-03	10	11	-8%	-18%
Mar-04	Jan-05	7	9	-6%	-18%

Note: Period based on IPP without VAT. Price difference is % of wholesale price.

The main Act regulating maize imports in the country (Acta 206/98) provides for a simplified system for any importer with an FOB value not exceeding US$500, and who has not imported during the previous 30 days. In this case, a formal quotation and other requirements in the pre declaration are dropped. This simplified system can be exploited only by the smallest traders since, with US$500, it is possible to import from South Africa only about three tons of maize grain. One trader working alone would have to pay relatively high unit transport costs on this volume, and would also require high unit mark-ups to earn an acceptable return on her time and capital. Thus, current regulations on imports would seem to create significant barriers for traders wishing to engage in maize trade between the two countries in anything other than very large or very small scale. Doubling or tripling the value

limit for application of the simplified regulations, or basing it on a volume limit of, say, 20 metric tons,[21] would make this provision a potentially more useful tool in promoting more active trade.

Within South Africa, the maize marketing system is highly formalized and large scale. Maize grain is not easily found in markets; open air markets are not nearly as common in South Africa as in Mozambique, and few if any traditional "Cash & Carry" wholesalers carry maize grain.[22] Unless a trader has direct contact with a farmer wishing to sell, maize grain would have to be purchased in a large, modern grain silo operated by private trading firms. Though managers of these facilities in Mpumalanga province (eastern South Africa) indicate that they would be willing to sell quantities as small as 3-4 tons, it is the rare small trader from Mozambique who would have the cultural, linguistic, and commercial ability to purchase regularly from such a source.

This explanation for the absence of imports from South Africa by small traders leaves open the question of why larger formal traders, such as those already importing large quantities of rice from the world market, do not also import maize grain and sell it into the same distribution channels they use for rice. A partial answer to this question lies with a combination of factors: the low price and widespread availability of rice, the resulting very low budget share of maize, especially for higher income consumers, and the buying habits of low income consumers. We will briefly discuss each of these factors.

The retail prices of maize grain and rice in Maputo during the first three months of 2005 were about US$280/mt and US$410/mt, respectively, giving a maize:rice price ratio of 0.68. During the same period in Lusaka, maize and rice prices were US$180 and US$440, respectively,[23] for a maize:rice price ratio of 0.41. Maize is much more affordable relative to rice in Lusaka (and Zambia as a whole) than it is in Mozambique. When one further considers that rice needs no processing prior to cooking, while maize does, and the common perception among consumers in Maputo that rice "fills the belly" more than *shima*, the overall advantage of maize grain relative to rice is further diminished in southern Mozambique. In central areas of the country, where the maize price is lower and rice slightly higher (Figure 3), maize grain is a better option, and in fact the overall maize budget share and reliance on maize grain over maize meal are both substantially higher in those areas.

Table 6 showed that the 2002 budget share for maize grain and meal in urban Maputo province was 2.4%. Rice's budget share is three times higher, and wheat is seven times higher.

At prevailing income levels and prices, maize's budget share implies purchases of about 10 kg per capita per year, or less than one kilogram per capita per month. An average family of five is thus purchasing only about 4 kg of maize, either as grain or meal, per month. These are not large quantities, certainly too small in many consumers' minds to justify a monthly trip to the hammer mill. This leaves hand pounding as the most reasonable alternative. The lowest income consumers are those most likely to be attracted to the cost savings attainable by purchasing maize grain, but previous research (MOA/MSU Research Team 1994) has shown that these consumers are also the most likely to face cash flow constraints and

[21] This limit would allow traders to fill a 20 ton truck and thus achieve much lower unit transport costs.
[22] Personal observations in numerous C&C wholesale operations in Mpumalanga province, July 2004.
[23] Rice prices in other major cities of Zambia were higher, ranging from US$490/mt to US$590/mt; in Mozambique, rice prices in other major cities did not exceed US$440/mt. Thus, on a national level, rice is much cheaper in Mozambique than it is in Zambia.

therefore to make frequent purchases of small quantities. Our researchable hypothesis is that such consumers are, *ceterus paribus*, more likely to choose maize meal over maize grain in their purchases due to the inconvenience of having to frequently process small quantities of maize grain.

To recap, we have shown that, in principle, the application of the VAT on maize imports favors rice and wheat over maize, favors the availability of maize meal over maize grain at retail, and favors large industrial millers over smaller traders and hammer millers. In practice, however, we have shown that imports of grain for sale as grain have not occurred despite several prolonged periods where such imports would have been profitable. We attribute the absence of imports by small traders to complexities in import procedures and to the high degree of formality and large scale of the South African maize marketing system. We hypothesize that the lack of imports by larger scale formal traders is due to a combination of factors: consumers in Maputo have access to a low cost option in rice, they spend very little on maize, and most of them are therefore willing to pay the high premium for refined meals on the small quantities that they buy.

8. Conclusions and Policy Implications

This paper began by focusing on trends in rural and urban population growth, consumption patterns, and maize demand over the next ten years, quantifying the dimension of the production and marketing challenge faced by the country, and asking what needed to be done for domestic production and marketing to keep pace with an anticipated very rapid growth in maize demand, especially in urban areas. Overcoming the cost disadvantages of the dispersed, small-scale structure of production and marketing that we documented in the smallholder sector requires major, long-term investment in basic education and health, in seed, broader input systems, and agricultural information systems including extension and marketing information, in improved post-harvest handling, including better on-farm storage, and in rural roads. Mozambique's productivity challenge at the farm level is made more difficult than its neighbors' because it has a substantially smaller share of its land area in high potential medium altitude zones, and because its use of external inputs (including animal traction) is much lower. On the other hand, the country has more abundant land than Malawi, and rainfall in the Center and North is more reliable than in large areas of South Africa, Zimbabwe, and southern Zambia.

A major concern cited by Walker et al. (2004) is that returns to education are very low in agriculture, and much higher in non-agricultural self-employment and non-agriculture wage labor.[24] Related concerns included the extremely small size of the commercial smallholder sector, driven by low returns to greater land cultivation, the miniscule contribution of livestock earnings to rural household incomes, the poor performance of the cashew and cotton subsectors, and the particularly poor position of widow-headed households, driven primarily by low crop and livestock income. They note that "Mozambique has now reached a stage of economic development where growth in agriculture is constrained by the paucity of locally adapted research findings. Relying on off-farm income sources to grow the small-farm commercial sector may be a viable option in southern Mozambique where crop potential is limited and demand for labor from South Africa is a reality, but it is not a sustainable

[24] Tschirley and Benfica (2000), using a separate data set, also found this pattern. Boughton et al. (2006) also document concerns about limited progress in agricultural productivity.

proposition in northern and central Mozambique where off-farm income hinges on growth in agriculture." (p. 50)

Mozambique's agricultural research institutions have for many years been woefully underfunded and as a result have lost qualified personnel. The recent consolidation of at least three separate institutes into one (*IIAM – Instituto de Investigação Agrária de Moçambique)*, a more aggressive post-graduate training program, and improved operational funding prospects suggest that the country may be entering a period when it can begin more seriously to address its agricultural productivity constraints. Continued major investments from government and donors will be needed for several decades to realize this potential.

Mozambique can be clearly distinguished from its neighbors on the basis of its consumption patterns, the structure and behavior of its milling industry, and its policy and practice in maize trade. Each of these areas has policy implications. Staple consumption patterns in Mozambique are much more diversified than in other countries of the region, with the exception of South Africa. This means that maize does not have the same impact on consumer and producer welfare that it does in other countries with higher maize shares in production and consumption. Nationally, maize remains the most important staple in various dimensions, and therefore requires good policy and productive public and private investment. However, more than any other country of the region, Mozambique needs to avoid (and has so far successfully avoided) a "maize centric" development policy that prioritizes this crop over broader agricultural and rural development.

Maize milling is highly concentrated in Mozambique, with CIM having perhaps 60% of the market in Maputo, and MEREC nearly 40%. Prices for maize meal are by far the highest in the region, with the leading brand (CIM's Top Score, with about a 50% market share in Maputo) more than double the price of comparable meal in Zambia. Competition is emerging, with three new mills opening since 2000. As of early 2005, however, these new millers together produce only about one-fifth the volume of CIM and MEREC, have tiny market shares in Maputo, and have not appreciably affected the price surface for maize meal in the country: prices even at the bottom end in Mozambique are higher than the broadly prevailing prices in Zambia and Malawi.

Most competitors to CIM and MEREC lie outside of Maputo, suggesting that market concentration may be less in outlying areas of the South and Center, but we currently have no data to confirm this. At least one of the competitors, Vonk with its Power brand, has entered the Maputo market, but it is too early to determine what effect it might have on price levels.

It would not be appropriate for the government of Mozambique to directly mediate competition between these companies, and there are no signs that it intends to do so. There are, however, several steps that the government could take to improve competition in the sector. The most immediate impact on competition would be achieved through a reduction in the import duty on maize meal, which is scheduled for full elimination only in 2015 (2012 for all imports except from South Africa, yet RSA is and is likely to remain the main source of imported grain). Reducing the duty more quickly, perhaps to 10% by next January, might provide meaningful competition for Maputo millers, as Cash & Carry prices in Mpumalanga province of eastern RSA are about US$420/mt. Retail prices in the same area are around US$500/mt.

Other steps involve reducing the cost of supplying maize grain to Maputo and other urban and rural areas of the South and Center, whether from domestic production or imports, so that

more consumers can choose to purchase grain rather than meal, and either hand pound it or mill it in hammer mills. To reduce the cost of maize supplies from domestic production, government should collaborate with private sector in a maize supply chain development program. Key elements in this program would include:

- More active marketing information focused on farmers in the Center (and promising areas of the South) and the traders that supply the South from the Center. Making marketing information available through cell phones, possibly on a subscription basis, should especially be investigated;
- Training of farmers in post-harvest handling procedures to improve quality, and programs to facilitate adoption of improved on-farm storage technology;
- Training for these traders in basic accounting and post harvest handling techniques; such training has been provided to some formal sector store owners, but informal traders have benefited from little if any of these efforts, despite their predominant role in maize marketing;
- Promoting more efficient rural assembly of grain through recognized market days, improved physical infrastructure in assembly points, and improved transport services linked to these assembly points;
- Focusing investments in road infrastructure on feeder roads into and trunk roads out of these assembly points;
- Improved marketing infrastructure in public terminal markets of Maputo, Beira, and perhaps other key cities of the South and Center. Improved storage and sales point infrastructure would be especially useful, and would have payoffs for many crops other than maize.

Financing of the program would involve public, private, and donor funds. Government must play the role of facilitating profitable private sector activity rather than unduly regulating or directly participating in private sector activities.

Activities such as these focused on the domestic supply chain will have important payoffs for farmers and consumers. Yet the payoff will take time to develop; maize imports for the South will be crucial complements to domestic production for the foreseeable future. Two, and perhaps three, actions could be taken by government to facilitate efficient trade in maize. First, government should consider converting the value limit in the simplified regulatory procedures for small-scale maize imports to a volume limit, and increasing this limit to perhaps 20 metric tons per month. This change would substantially expand the number of informal traders who could take advantage of these provisions, and would reduce their unit costs if they were to become involved in maize imports. Second, government could consider phasing out the VAT on maize grain. Because all imports currently are for processing into meal, resulting in eventual reimbursement of VAT, the tax generates no permanent income for the state. Furthermore, although the VAT alone has not acted as a binding constraint on maize imports for sale as grain, it could become a constraint if the reforms in import procedures suggested above are instituted. Finally, if the above two measures are taken, and as the cost of trade between Center and South also falls and grain becomes more available at lower prices, government and donors could consider special programs to facilitate rehabilitation of the hammer milling sector throughout the South, which has steeply declined in urban areas over the past decade.

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