Background paper for the
COMPETITIVE COMMERCIAL AGRICULTURE IN AFRICA STUDY (CCAA)

MOZAMBIQUE COUNTRY CASE STUDY

DISCUSSION DRAFT – NOT FOR CITATION

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`EXECUTIVE SUMMARY

Introduction

1. This paper presents the Country Competitiveness Analysis for Mozambique, developed as part of a Competitive Commercial Agriculture in Africa (CCAA) study. The main objective of the CCAA study is to investigate the extent to which competitiveness and growth of selected commodities in a number of African countries can be reinstated by undertaking value chain analysis and identifying weaknesses and strengths for each of the commodities[1]. While the analysis in all the other CCAA countries covers seven key commodities and three farming sectors – individual family farmers (FAM), emergent commercial farmers (ECF) and large commercial farmers (LCF) – the Mozambique analysis is limited to five key commodities (cassava, cotton, maize, rice and soybean), and two farming sectors, the FAM and ECF sectors. Data limitations impeded the inclusion of cattle and sugar, and the virtually nonexistent large commercial farmers in all five commodities originated the exclusion of the LCF sector from this study.

2. The CCAA analysis is based on the assumption that commodity competitiveness must be assessed considering the driving factors behind the strengths and weaknesses of its value chain. Therefore, an analysis of the cost share from each stage of the supply chain – production, assembly, processing, and trade/distribution – is important, and should consists of disaggregating the different cost items incurred at each stage of the value chain. This will allow analyzing competitiveness of the commodity in the domestic, regional or international market with knowledge of the stages where bottlenecks affect the supply chain. This approach is assumed to help decision makers to put in place the right policy reforms, institutional changes and climate change for private investment, by dealing with the specific factors that can bring improvements to the competitiveness of the commodity towards a successful commercial agriculture in the country.

3. To assess where Africa's agriculture competitiveness problems need to be better targeted to better compete in international markets, the results of the CCAA study are compared with similar studies in Brazil and Thailand.

Approach and Limitations

4. In all three countries, the CCAA analysis comprises qualitative and quantitative data. While the qualitative analysis provides general background on the current prospects, institutions and policies in place, as well as the resulting trends and problems for each commodity, the quantitative analysis calculates a set of standard indicators and benchmark prices.[2] As Keyser points out, "the methodology is built around a set of seven interlinked Excel templates that calculate standard indicators of total costs and private profitability at each major stage in the production and marketing cycle". These templates allow filling in the data obtained from the different activities throughout the supply chain, and the costs incurred at each stage. The results can then be compared with international benchmarks, for appropriate assessment of the commodity's competitiveness in international markets.

5. For each commodity, the CCAA analysis splits the costs along the value chain into **Domestic Value Added (DVA)** and **Shipment Value (SV)**, the two main value chain indicators. "For cross-country comparisons, the final calculation of SV for each traded commodity is the most comprehensive measure of actual and potential competitiveness"[3]. The SV of a given commodity at

[1] In addition to Mozambique, the Africa CCAA competitiveness analysis includes Nigeria and Zambia. In all three countries, qualitative background on the production foundations for each commodity is presented, and the same methodology is used for quantitative analysis.

[2] Keyser, 2006.

[3] Keyser, 2007.

the selected world (international, regional or domestic) sale market is compared with the export (FOB price) or import (CIF price) parity prices.

Summary Findings

6. **General considerations.** There are a number of key findings from this study. First, there are natural positive basic conditions for Mozambique's agriculture, encompassed by the country's different agro ecological zones from north to south, which results in an enormous potential for the production of different food and cash crops. Second, there are some important basic infrastructure investments that can support agricultural production in the country. For instance, the country has three important ports – Nacala in the North, Beira in the Center and Maputo in the South – all with good potential for structural linkages with highly endowed agricultural production areas as well as with landlocked neighboring countries. Third, the country has a fairly long experience in producing and processing several agricultural commodities. And forth, increased competitiveness of Mozambique's agriculture can be key in contributing to the country's efforts in fighting poverty and improving food security and economic growth. Other important findings of the study include:

7. **Most of Mozambique's CCAA commodities seem to have potential**. Among Mozambique's CCAA commodities, cotton, maize, soybeans and rice seem to have potential. While Mozambique's cotton has a long history as an export crop and maize is an important import substitute in addition to exports to neighboring countries, soybeans and rice are primarily produced as import substitutes. The quantitative CCAA analysis indicates that increased investment in these four crops can improve their potential for competitiveness, first in regional markets, but also in international markets. For instance:

- As an export product, Mozambique's cotton lint has a long history in accessing important international markets, traditionally in Europe and in Asia more recently. Regardless of low yields, considerable dynamics have taken place in Mozambique's cotton sector, characterized by the entry of new concession companies and investments in geographic areas outside Mozambique's traditional cotton belt of Nampula and Cabo Delgado Provinces.

- Maize is the most important food crop in Mozambique, and has a great potential for farm production and trade. Maize yields in Mozambique are among the lowest in the Southern Africa region, but potential for increased production and productivity is very high especially in northern Zambezi. Investments in production technology are expected to result in considerable increase in Mozambique's competitiveness in the maize sector in regional and international markets.

- Potential for rice production in Mozambique is also high, especially in Zambezia province, and to some extent in Sofala and Gaza provinces. Increased investments on rice production in those provinces can result in high opportunities for import substitution. Like most of the staple food crops in Mozambique, rice is mainly rain fed. If irrigation investments are in place, rice production and productivity can have significant increases in Mozambique.

- Soybean is a fairly new crop in Mozambique, but agricultural and market scenarios suggest a high potential in the northern Zambezia/southern Niassa area of northern Mozambique, and in Manica and Tete provinces in central Mozambique. In both production areas, improved soybean production can strongly benefit from a local good demand of soybean sub-products and investments in new industrial units, and from already existing roads and railways linking to the important consumer markets of Beira in the center and Nampula and Nacala in the north.

8. **Cassava seems to be more problematic especially as a potential export crop**. While cash crops with high commercial value and good export markets like cotton or cashew nuts, or food crops with traditional domestic such as maize, groundnuts and beans have higher proportion in contributing to Mozambique's agricultural production and trade, lower value commodities like cassava are usually produced either for own consumption or for unreliable local markets, and are hardly exported even to regional markets. As a crop mostly produced for consumption, cassava is an important substitute for rice or maize especially for poor consumers in northern Mozambique and some parts of southern Mozambique. However, additional investments in research, extension and production can create opportunities for increased access to markets, primarily regional markets but also international markets as industrial uses of cassava products are increasing worldwide.

9. **Mozambique's agricultural sector benefits from little policy distortions**. Overall, there are not too many policy distortions affecting the agricultural sector. Indeed, Mozambique has shown to be a good example of little public sector intervention in distorting markets, with lower intervention over time. While since the country's Independence through the mid-1960s the government was the key player in agricultural production and trade, through parastatals and public sector farms, the government has made strong commitment to withdraw from production and trade, and has made important efforts in restricting itself from intervening with policies that could distort the sector. Therefore, there are no "quick fixes" on the policy side to improve competitiveness. Import duties are low for agriculture inputs, varying from 0% (recycled seed) to 2.5% (fertilizers, herbicide and insecticides). Local taxes such VAT are not applied for recycled seed, fertilizer, insecticide or herbicide. The combination of a low or nil import duty with nil additional taxes results in a fairly small share of the final SV for these inputs. On the other hand, import duties for equipments including transport and office equipments imported for use in the agricultural sector are higher than import duties on agricultural inputs, reaching 25% in some cases.

10. **Low adoption of yield enhancing technologies leads to generally low farm-level productivity**. In spite of its natural potential and long history of agricultural production and trade for many cash and food crops, the exploitation of that potential is still by and large very weak, and largely characterized by very low farm productivity levels for nearly every crop. Currently, agricultural productivity is perhaps one of the poorest in Southern Africa. Over the past years, agricultural yields have stayed steady at low levels for most of the crops, and reported increases in agricultural production are highly correlated with population growth rates. The root causes for Mozambique's low agricultural yields include weak markets especially for food crops, limited applied research and extension, improvement of basic infrastructure especially in rural areas and low adoption of yield enhancing technologies such as irrigation, animal traction, chemicals and improved seed varieties by the majority of farmers, as follows:

- *Excluding for selected cash crops, farmers do not have consistent access to inputs and output markets for most commodities*. Contract farming systems in crops like cotton and tobacco ensure access to input and output market to farmers, but this does not apply for most of the other crops. While a limited access to input market does not allow improved yields, problems with accessing output markets lead to risky increases in cultivated areas and better yields. In fact, although most farmers do not cultivate more than 2 hectares and their agricultural productivity is very low, there are complaints about output markets for their produce. For those accessing some market, received prices are very low in most instances. This disincentives increases in cultivated area or improves in productivity.

- *Only 11% of the households use irrigation systems in their agricultural production in the country* and percentage of smallholders applying any type of irrigation is even smaller in the provinces with the highest potential for agricultural production. For instance, in Nampula and Zambezia only 7% and 3% of the households, respectively, irrigate their fields. The overall picture suggests that southern Mozambique has the highest percentage of smallholders applying any type of irrigation (TIA 2006).

- *Fertilizer and pesticide utilization is very low in all the provinces*. Countrywide, around 95% of the households do not use fertilizer. And the scenario is even more serious in the provinces with the highest potential for agricultural production: Nampula with3% of households using it, and Zambezia with only 2%, are among the most modest fertilizer users in the country. On the use of pesticides, the picture is not any different: 95% of the households in Mozambique did not use it, and the use in the two provinces was also low.

- *Use of animal traction is very weak, and limited to central and southern Mozambique*. While in Inhambane and Gaza provinces, in the south, around 50% of the households use animal traction as part of their farming systems, there are no smallholders using animal traction in their agricultural production in the whole northern part of Mozambique. Among central provinces, only Tete reports acceptable levels of animal traction use (39% of the households), while in Manica only 14% use it.

11. **Competitiveness for some crops is helped by relatively inexpensive family labor**. In rural Mozambique, there are in general very little employment opportunities, and alternative uses of family labor are nearly inexistent. As a result, there are no alternative market-worthy uses of family labor. The extremely low opportunity cost for labor in the rural areas result in highly inefficient family labor in the agricultural sector. This relatively inexpensive family labor contributes to the reduction of the total costs of agricultural production in some and hence to higher competitiveness of some crops.

12. **There are virtually no large-scale commercial farms in Mozambique**. Excluding a long standing horticultural sector in the Chokwe area in southern Mozambique, a recently promising tea sub-sector in Zambezia province, and the sugar sector where large-scale companies perform agricultural production under vertical integration schemes, there are little other examples of cases of long lasting investments by large-scale companies in Mozambique. Recent news has indicated that some farmers from Zimbabwe have made large-scale investments in Manica province starting in the 1990s, following Zimbabwean economic and political crisis. But there is no evidence that most of them have kept their investments in Mozambique. Different factors including climate differences between Zimbabwe and Manica province as well as capital and market problems are often indicated as the driving forces behind the some times called failure of the "Manica Miracle". The Ministry of Agriculture, through its national surveys (TIA) has been colleting data on both small-to-medium scale, and large-scale commercial farms, but data on large-scale farms has not been released; hence it is difficult to know the extent of commercial farmer investment in the country and the crops where that investment is made.

13. **Initially the most attractive markets will be domestic markets and then regional markets**. Mozambique's ability to compete in the international markets needs to be scaled up in accordance to the current status of the country in terms of production competitiveness and access to markets. High transport costs, low productivity, low concern about grades and standards by stallholder producers and small-scale traders, and high transaction costs lead to increased difficulties in accessing regional and international markets for most of the commodities in a competitive manner. Given relatively lower transport costs to neighboring countries and limited concern in most of Mozambique's neighboring countries, accessing regional market particularly through cross border trade seems to be more attractive in the short run. Mozambique also needs to consider the impact of regional integration in the SADC area (primarily through the Free Trade Area that starts in January 2008) to improve its access to the regional market. Further, the country needs to invest in quality and standard issues to better compete in international markets.

14. **Transaction costs are very high**. Agricultural production is generally dispersed in Mozambique. Along with the low sizes of planted land for most crops and the resulting small quantities of produced and traded product, dispersed production leads to very high transaction costs and affects competitiveness. Frequently, traders spend many days traveling long distances within a single district to procure agricultural commodities, which increases trading cost (increased number of

days to procure product) and risk (they travel and procure commodities in areas where there are no commercial banks).

15. **Mozambique needs to invest on quality and standard issues to better access regional and international markets**. Export opportunities to regional and international can be better achieved if international standards are met by Mozambican producers. Currently, given limited investments in applied research, extension and new variety seeds, traded commodities do not meet international standards and their current access to regional markets is possible, for most commodities, through informal cross-border trade, benefiting especially small-scale traders and poor consumers in destination countries. Improving standards of Mozambican commodities, the country can take better advantage of initiatives such as AGOA and Everything But Army (EBA). Furthermore, standard and quality issues, along with the ability of domestic production to deliver products in a regular and timely basis have determined that local agro-processing units prefer imported commodities.[4]

[4] Mozambique's maize processing leading unit (CIM – *Companhia Industrial da Matola*), located in Maputo, has publicly claimed that relying on domestic maize grain would lead to important losses in the unit, mainly because Mozambican producers and traders of maize grain do not observe standards (humidity, size of grain) and are not able to deliver product in timely and regular manner.

LIST OF ABBREVIATIONS

ACP	African, Caribbean, and Pacific Countries
AGRICOM	Mozambican Cereal Marketing Institute (later ICM)
CCAA	Competitive Commercial Agriculture in Africa
CF	Conversion factor
CIF	Cargo, insurance and freight
CLUSA	Cooperative League of the United States of America
COMESA	Common Market of East and Southern Africa
CRF	Capital recovery factor
DAP	Early Warning Unit (Ministry of Agriculture)
DVA	Domestic value added
ECF	Emergent commercial farmer
EU	European Union
FAM	Family farmer
FAO	Food and Agriculture Organization
fob	Free on board
Forex	Foreign exchange
GOT	Ginning outturn (% lint)
GoM	Government of Mozambique
IAM	Mozambican Cotton Institute
ICM	Mozambican Cereal Institute (parastatal)
IIAM	Mozambican Agricultural Research Institute
INIA	National Institute for Agricultural Research (later IIAM)
IITA	International Institute for Tropical Agriculture
INE	National Statistics Office
ISO	International Standards Organization
JICA	Japan International Cooperation Agency
LCF	Large commercial farmer
LCU	Local currency unit
MADER	Ministry of Agriculture and Rural Development (now MINAG)
MINAG	Ministry of Agriculture
MSU	Michigan State University (MSU/FSRP)
MT	Metric Tones
MZN	Metical (Mozambican currency)
NGOs	Non-Governmental Organizations
O&M	Operation and maintenance
PAM	Policy analysis matrix
PROAGRI	Program for Integrated Agricultural Development
R&M	Repairs and maintenance
RSA	Republic of South Africa
SACU	Southern Africa Customs Union
SADC	Southern Africa Development Community
SIMA	Agricultural Market Information System
SSA	Sub-Saharan Africa
SV	Shipment value
TIA	National Agricultural Survey
UEM	Eduardo Mondlane University
USAID	United States Agency for International Development
USD	United States Dollar
VAT	Value added tax
VDP	Value for duty purposes

MAJOR DEFINITIONS

Domestic Value Added (DVA)	=	Domestic costs and mark-ups + Official duties and tax + Unofficial charges & extra costs
Shipment Value (SV)	=	Domestic value added + Foreign components

PRODUCT STAGES

1. Farm production	=	Farm gate product
2. Assembly	=	Assembled raw material
3. Processing	=	Processed raw material
4. International logistics	=	Traded commodity (Product 1, 2, 3)

EXCHANGE RATE

Local Currency	=	New Mozambican Metical (MZN)
USD 1.00	=	MZN 25.00
MZN 100	=	USD 4.00

WEIGHTS AND MEASURES

1 hectare (ha)	=	2.417 acres (ac)
1 kilogram (kg)	=	2.204 pounds (lbs)
1,000 kilograms (kgs)	=	1 metric ton (MT)
1 kilometer (km)	=	0.62 miles

LIST OF COMMODITIES BY SECTOR AND FARM LOCATION

Commodity	Production (FAM & ECF)	Final Product (Stage)	Place of Final Comparison
Cassava	West Nampula	Dry tuber (Assembly)	Nacala –Import Parity
Cotton	Central Nampula	Lint (Distribution)	Nacala – Export Parity
Maize	Manica	Dry grain (Assembly)	Beira – Import parity Blantyre – Export Parity
Rice	Zambezia	Polished rice (Distribution)	Beira – Import parity
Soybeans	Southern Niassa/Northern Zambezia	Bagged seed (Assembly)	Namialo – Import parity

SUMMARY OF FINAL PARITY PRICE COMPARISONS

Product	Final Stage for SV Comparison	Final Shipment Value per MT	Ideal Parity Comparison	Available Reference Price
Cassava	Assembled tubers	$231	Regional export parity to RSA	$56/MT CIF Rotterdam
Cotton lint	Processing (fob factory gate)	$1,045	International "Cotlook" Reference Price	$1,100 CIF INDEX "A" from Cotlook (April 06)
White Maize	Assembly (un-milled grain)	$314	Regional export to RSA	$180/MT market price in Randfontein (April 06)
White Maize	Assembly (un-milled grain)	$137	Regional export to Malawi	$156 market price in Blantyre
Rice	Logistics (polished Thai rice delivered in Beira)	$433	International import parity	$500/MT CIF Beira (ex Thailand)
Soybeans	Assembly (bagged seed)	$425	RSA import/export parity	$254/MT fob in Rotterdam

Competitive Commercial Agriculture in Africa (CCAA)

MOZAMBIQUE COMPETITIVENESS REPORT

I. INTRODUCTION

1. This paper presents the Country Competitiveness Analysis for Mozambique undertaken as part of the Competitive Commercial Agriculture in Africa (CCAA) study. The primary objective of the CCAA study is to investigate the extent to which competitiveness and growth of selected commodities in a number of African countries can be reinstated by undertaking value chain analysis and identifying weaknesses and strengths for each of the commodities. With this, the study explores the feasibility of restoring competitiveness and growth in selected African countries by identifying key commodities, production systems, and marketing arrangements that are capable of underpinning rapid development of commercial agriculture. The analysis in Mozambique covers five important commodities and two farm sectors including traditional family farms and more advanced emergent farm systems.

2. In Africa, the CCAA competitiveness analysis is being undertaken in Zambia, Nigeria, and Mozambique. In these countries, as elsewhere, the restoration of agricultural competitiveness depends on a number of factors, including the technical performance of agricultural commodity chains (comprising production, assembly, processing, and exchange activities); supply and demand conditions in domestic, regional, and global markets; and the appropriateness of the institutional and policy environment. By identifying commodity chains and production systems that have potential to compete effectively in an increasingly globalized world economy, the CCAA study is intended to inform the design of integrated programs of policy reforms, institutional changes, and supporting investments needed to promote the emergence of a successful commercial agriculture in the three African case study countries.

3. To establish international benchmarks of successful development, a parallel analysis of value chain performance is also being carried out in Brazil and Thailand. These assessments are meant to allow production costs and other aspects of value chain performance in Africa to be compared on a global scale to help determine where the best opportunities for rapid growth in each target country can most likely be found. These cross-country comparisons will be written-up later by CCAA team leaders as part of an overall synthesis. This report looks exclusively at the factors that shape current competitiveness and development options in Mozambique.

A. Objectives

4. In this context, the specific objectives of the Mozambique Competitiveness Analysis are to:

- Identify commodities or products that are currently competitive or stand good prospects of becoming competitive in domestic, regional, or global markets.
- Identify weak links in the value chain that are the main obstacles to achieving competitiveness.
- Summarize the qualitative *and* quantitative factors that shape the actual and potential competitiveness of each commodity for the three farm systems being covered.

5. To achieve these objectives, the paper is organized in five sections including the current introduction. Following a few additional remarks about the overall approach and limitations, the competitiveness analysis begins in Section II with an overview of the Mozambique country context. For this part of the report, special attention is given to describing Mozambique's natural resource base

and other basic factors that shape the country's trade patterns and opportunities for competitive market development.

6. Section III then introduces the quantitative methodology developed for the CCAA study. The full methodology is described in a separate paper and the emphasis here is merely on setting out some key definitions and explaining how to interpret the value chain indicators and other financial results. Next, Section IV presents the main value chain analysis for each of the five commodities selected for CCAA coverage in Mozambique. For each commodity, the discussion begins with qualitative information on recent production trends and marketing constraints that help to interpret the quantitative results. Key data from the quantitative analysis are then set out together with some brief comments and interpretation. Finally, each commodity's total shipment value at the most realistic place of international competition is compared with an appropriate import or export parity price to assess the prospects for competitive trade and development.

7. The discussion concludes in Section V with a summary of important findings and areas for further analysis. The full set of spreadsheet templates completed for the Mozambique analysis is presented separately in a quantitative annex.

B. Approach and Limitations

8. As described, the analysis for Mozambique is based on qualitative and quantitative data. From the qualitative perspective, the approach is to try and identify major policies, institutional, and organizational factors that affect costs and shape trading relations. The quantitative analysis, on the other hand, was prepared using a very specific methodology provided to all CCAA country teams designed for this study to calculate a set of standard indicators and benchmark prices that can be compared across countries for each commodity and farm sector.

9. The qualitative work is based on an extensive literature review that was carried out as a distinct first phase of the Mozambique analysis. The complete literature review includes far more information than could be summarized here and is presented separately.[5] This background document should, however, be read as an integral part of the CCAA work in Mozambique and includes a wealth of information relevant to the planning of effective development strategies and opportunities for renewed agriculture competitiveness. Highlights of this background analysis for the five CCAA commodities selected for detailed quantitative analysis in Mozambique are summarized here.

10. Very often, the secondary data in which the CCAA analysis is based on is of varying quality and level of aggregation. Moreover, especially for food crops where smallholder production predominates (i.e., maize, rice), the validity of the analysis is greatly affected by the huge variation in technology and efficiency among small farmers. With a few exceptions, however, the available studies present only one or two input-mixes and productivity levels. Being based on a literature review, the present study suffers the same deficiency though we try to compensate partly for this by examining the sensitivity of the results for each crop to variations in the main parameters.

11. From the quantitative side, the analysis is based on a methodology developed specifically for the CCAA study. The methodology is built around a set of seven interlinked Excel templates that were provided to all CCAA study teams to calculate standard indicators of total costs and private profitability at each major stage in the production and marketing cycle.[6] By filling in the elements of the templates for individual commodities and farm systems, the spreadsheet methodology provides a practical way of establishing benchmark prices that can be compared with world standards as

[5] Coughlin, Peter E. (2007). Competitive Commercial Agriculture in Sub-Saharan Africa: Mozambique, CCAA Background Working Paper, Econ Policy Research Group, Maputo.

[6] Keyser, John C. (2006). Definition of Methodology and Presentation of Templates for Value Chain Analysis, Competitive Commercial Agriculture in Africa (CCAA), The World Bank, Environmental, Rural and Social Development Unit, Washington DC.

measures of international competitiveness. The methodology also helps to identify specific areas where domestic costs could most effectively be reduced in order to improve overall competitiveness.

12. The CCAA study is the first time the spreadsheet templates have been used in a fully operational sense, and lessons also need to be drawn from this experience so that the methodology can be further refined and developed. One first important observation, for example, is that the methodology is very data intensive. Therefore, because the original design of the CCAA project called for the use of secondary data only, the type of primary information required to utilize fully the templates was not always available. Additional efforts were made to collect as much current, primary information as possible, but this was not always possible given time and resource constraints. Because this information was not always available, best guesses have sometimes had to be used instead of actual data and this must be kept in mind when interpreting the discussion that follows. Every effort is made to document the places where these assumptions have a particularly important bearing on the final conclusions, but it is essential to stress that the results are indicative only, and require further analysis before recommending any type of investment program or policy reform package.

13. Farmers, assemblers, processors, and traders may all incur very different costs and returns from the figures estimated here. Especially at the processing level, relatively little reliable information was available and these costs should be investigated further as part of any follow-on activity. It is believed that the data here still provide a reasonably accurate picture of underlying competitiveness, but the analysis is no substitute for more careful investment planning. Variations in annual yield, actual distances to market, composition of investment costs, seasonal differences in commodity prices, and localized transport costs can all have an important bearing on each product's final competitiveness. Because of the macro scale of the CCAA study, it was not possible to look at these issues for individual commodities in specific locations as would be required for a more detailed investment planning.

14. Indeed, many other factors that could possibly be covered here also shape Mozambique's competitiveness. The analysis touches on a great many aspects including exchange rate policy, customs policy, customs administration, value added tax policy, and infrastructure development, but each of these topics could be the basis for a complete study in its own right. Other factors like consumer preferences, price competition in rural and urban markets, quality control measures, investments in achieving international standards, seasonality, regional customs procedures and transit regulations, and capacity to implement trade agreements including detailed processes to verify rules of origin are just some of the issues that need to be considered to truly inform the design of integrated programs of policy reforms, institutional changes, and supporting investments like the CCAA study sets out to do. As a new methodology, there is also a question of how to interpret the data and whether the spreadsheets produce the right quantitative indicators. It is hoped that this exercise for Mozambique and other CCAA countries will lead to the type of discussion that is needed to refine the spreadsheet templates and further develop the methodology.

15. It should also be stressed from the outset that the results for one country must only be compared in a limited sense with those from another. While the template methodology is designed to produce a standard set of indicators, any number of seemingly minor differences in how one country team values specific production factors can have an important bearing on the final results. Rather than strive for exacting levels of detail and consistency between countries, the approach adopted for the CCAA study is to aim for a general picture of international competitiveness and relative price levels only. In practice, this makes the analyst's task much easier, since there are times when a "best guess" of some budget coefficient is entirely acceptable for providing a general indicative picture.

16. The parameters used were chosen to be slightly better than average in order to ascertain the actual and medium-term competitiveness of Mozambican farmers. This choice arose because the present study attempts to examine the prospects for improved competitiveness in a context where, except for cash crops, the vast majority of Mozambican farmers eat most they produce. For example, 78% of maize farmers and 84% of rice farmers produce *exclusively* for own consumption (TIA 2006).

Though desperately poor and, justly, the main targets for poverty reduction, such subsistence farmers have very little or nil impact on competitiveness in the short- and medium terms. By contract, those who sell crops tend, on average, to farm slightly more land and use better techniques. This observation justified our methodological decision to assume, for crops like cassava, yields based on district-specific studies, therefore perhaps slightly above the norm because to judge potential competitiveness requires us to focus upon farmers who, in fact, sell their crops. Moreover, the best of them are models of what is and can be achieved on a larger scale and by many more people—hence, the interest of focusing on them.

17. One major limitation in examining the competitiveness of smallholder production in Mozambique's smallholder agriculture is the difficulty in measuring the opportunity cost of family labor. Due to the usually absent market labor in rural Mozambique, it is very difficult to have a commonly acceptable opportunity cost for labor in rural areas. The CCAA analysis, however, assumes that on average the economic opportunity cost of family labor equals 60% the cost of hired labor in rural Mozambique which in turn is assumed to be, in the reality of most of the rural areas, about half of the official minimum wage for the agricultural sector. These assumptions recognize that the ability for rural Mozambicans to obtain temporary paid jobs is close to zero, and no precise average is possible especially when talking of millions of small farmers in diverse parts and seasons, therefore are not taken into account for financial calculation, but only for economic calculations. At least, by assuming an average opportunity cost we avert the gross error of assuming it is nil.

18. The fact that the CCAA analysis assumes that the value chain for all the commodities includes production, assembly, processing and distribution is not always coherent with the actual supply chain structure in some sub-sectors. For some commodities such as cassava, maize and soybean, the actual supply chain in Mozambique currently evolves through assembly, whereas the cotton and cotton sub-sectors include processing, but the assembly function in cotton is performed by the concessionaires, who also do the processing.

II. COUNTRY CONTEXT

19. Competitive of Mozambique's agricultural sector is influenced by different factors, including the country's long distance from north to south, the generally unimproved roads linking to rural areas associated with limited access to transport and high transport costs, the asymmetry in global competition with imports across the country, generally limited market-oriented agriculture, small spots of land cultivated by most of the farmers, and the commonly very low level of technology utilization conjoined with small sizes of cultivated land by small farmers.

20. **Mozambique's massive size and long-distances from north to south**. Mozambique is a long country from north to south, with a clear variation of temperature, altitude, patterns of rainfall and other natural conditions. In the north and center, where the potential for agricultural is in general higher than in the south, climatic pattern is highly characterized by well defined rainfall conditions whereas erratic rainfalls characterize the southern part of the country. From north to south, Mozambique is naturally endowed with high potential for agricultural production, but as a result of agro-climatic conditions, cropping patterns follow regional differences. For instance, maize is mostly produced in the central provinces of Manica and Tete, and in northern Zambezia and southern Niassa, in the north. Cassava is mostly produced in Nampula province, along with northern Zambezia, whereas rice is mostly produced in southern Zambezia and in Gaza Province. In result of its good potential for agricultural production, Mozambique has once been a reference among the best coconut and cashew nuts in the world, and has a long history of cotton, maize, cassava, groundnuts production in southern Africa.

21. **Generally unimproved roads linking to rural areas**. Excluding the main road that links Mozambique from south to north, and other major roads linking provincial capital cities or to neighboring countries, there are no other significantly improved roads especially linking to rural areas. Given the poor condition of most roads, transport costs are high and domestic trade for most

commodities often takes place only on a regional basis within and between northern, central, and southern provinces respectively except for high value crops such as groundnuts and common beans, for which significant is trade reported every year from north to south. Moreover, Mozambique has 3 main Ports (Maputo, Beira and Nacala), all served with important railways and roads, but those railways and roads are primarily designed to serve neighboring countries. Although Beira and Nacala are both shallow water ports, both are mainly used for coastal routes rather than as direct outlets to major international destinations. Reduced volume of goods is often indicated as the main reason for the reduced traffic in both ports.

22. **Global competition is greatest in the south**. Due to the close proximity to South Africa and the port of Maputo, farmers in southern Mozambique face stiffer competition from regional global imports than more isolated producers in northern and central regions, where farm gate prices are lower than in the south. Though very far away from the important consumer markets of the south, farmers in northern and central provinces can benefit from the regional context. For instance, through the Nacala Corridor, and farmers in Nampula and Niassa provinces have benefited from formal trade with Malawi. Farmers from Zambezia province have also benefited from cross border trade with Malawi; accounting for most of the southern Africa region's informal cross border trade in maize for several seasons since 2004/05. Regardless of lack of information, there is a common conviction among agricultural economists in Mozambique that maize and other agricultural commodities are traded from Manica province to Malawi.

23. **Limited market-oriented agriculture**. There are very few large-scale farm systems in Mozambique. Apart from a few producers of export quality tropical fruits in southern and central Mozambique and an enclave of former Zimbabwean farmers in Manica, there are almost no independent large-scale commercial farmers in Mozambique. The most notable exception to this is a total number of 66 autonomous cotton producers in parts of Nampula Province cultivating a total area of 1,756 hectares, and 1 in Cabo Delgado Province, who cultivates 10 hectares. Out of the autonomous cotton producers, only those with long experience have their own equipment. All the others use extremely low input technology, relying on rented improved equipment. There are also 4 large-scale, corporate-run sugar plantations in the country.

24. **Farmers usually cultivate small spots of land**. Surprisingly, most farmers still do not cultivate more land after more than 10 years of peace. Over the past years, less than 3% of households have farmed more than 10 hectares. This scenario seems to be resulting from Mozambique's agricultural sector development that started before independence, when efforts were made to develop large Portuguese-owned farms that were meant to coexist with a neglected small-scale, subsistence sector. Policy changes that took place after independence aimed at the creation of large companies that were supposed to take over the extensive land areas previously Portuguese-owned companies, but overall smallholders are dominant in agricultural production except in the sugar sub-sector where agricultural production is exclusively performed by large-scale companies. (Walker et al, 2004)

25. **Access to and use of technology**. Smallholder agriculture in Mozambique is predominantly based on rudimentary hand tools. In general, small-scale farmers do not have access to improved technology and farming tools. Only in localized areas of the country, and for selected crops, farmers use fertilizer, chemicals or animal traction. Total fertilizer consumption in Mozambique was less than 10,000 MT in the mid-1990s and might have decreased to around 8,000 MT in early 2000. Fertilizer and chemicals are mainly used by farmers who grow cotton and tobacco on contractual schemes. They are usually made available in advance by the concession companies as part of the concession contract arrangements. Outside these armaments, supply of fertilizer and chemicals might be neglected. Because the country was more or less left fallow during the long civil war, farmers have been able to achieve some yields without using fertilizer, but this is starting to change as farmers have now returned to the land and are cultivating the same plots each year for more than 10 years. Furthermore, agricultural yields are thought to be the lowest in the whole southern African region, and this is might worsen. As Mozambique looks into the future, a major challenge is to develop new input

supply systems needed to sustain more intensive forms of agriculture. At present, very few farmers use fertilizer, no agri-chemicals, and produce only using low-yielding recycled seed. With better input use, yields could improve significantly.

26. **Agriculture is the main activity for rural households**. Most of the households rely on agriculture, which is in accordance with the fact that agriculture is the most important economic activity in rural Mozambique. Data from a national household survey conducted by the Ministry of Agriculture in 2006 (TIA 2006) indicate that, residents in rural areas in Mozambique develop different economic activities, but agriculture is the most important, and in the percentage of households who mainly rely on agriculture increases from south north. On the other hand, the percentage of people working against wages is higher in southern and central Mozambique than in the north.

27. **Access to Extension Services is still very Limited**. The percentage of small scale farmers who had access to extension services was lower in the provinces of Zambezia and Nampula, although this two of the most important provinces in agricultural production and the two most populous provinces in the country. This might suggest at least two things. First, the fact that the percentage is lower in those two provinces might not mean that they had less extension agents than other provinces; the low percentages of smallholders who had access to extension services might simply indicate that these provinces have much more smalls scale farmers than others. Second, in any case, the importance of these two provinces both in terms of agricultural production as well as in population size suggest the need for improved extension services to increase productivity and agricultural competitiveness.

28. **Access to price information and farmer organizations needs important improvements**. It is widely acknowledged in current literature about agricultural development in developing countries that small scale farmers usually face very high transaction costs, and increased access to farmer organizations along with better and timely access to price information and market opportunities can play an important role in reducing transaction costs and increasing competitiveness. In Mozambique, regardless of existing efforts for increased establishment and strengthening of farmer organizations as well as access to information, current figures are not very encouraging. TIA 2006, for instance, found that the percentage of small scale farmers who belong to farmer organizations is in general very low, not reaching 15% in a single province. Even in provinces where efforts have been more concentrated, such as Nampula and Zambezia, that percentage is as low as 6% and 4.9% respectively. Regarding access to price information, there are important initiatives countrywide for collecting and disseminating price information in particular and access to market opportunities in general. However, the percentage of smallholders who have access to that price is still generally modest, except in provinces where local constant efforts have been implemented for several years, such as Nampula (42%) and Cabo Delgado (35%).

29. **Use of yield-enhancing practices is limited**. In Mozambique, very few smallholders use yield0enhancing practices such as irrigation, animal traction. Regarding irrigation, Inhambane and Maputo provinces, in the south, have the highest percentage of smallholders applying any type of irrigation, 26% and 24% respectively, whereas even the provinces with the highest potential for the production of most crops record extremely low levels of utilization of irrigation schemes. In Nampula and Zambezia provinces, for instance, only 7% and 3% of the households irrigate their fields. Countrywide, only 11% of the households use irrigation systems in their agricultural production. In terms of fertilizer utilization, 95% of the households did not use fertilizer in Mozambique in the 2004/05 season. Again, the provinces with the highest potential for agricultural production had very modest uses of fertilizer: Nampula had 3% of households who used, and Zambezia province had less than 2%. Regarding the use of pesticides, the picture is not any different: 95% of the households in Mozambique did not use it, and the use in the two provinces was also low. As far as use of animal traction concerns, only provinces in central and southern Mozambique used it.

III. METHODOLOGY

30. This section introduces the basic methodological concepts and assumptions readers should be familiar with to interpret the quantitative results for Mozambique. The quantitative analysis was carried out according to a specific methodology developed for the CCAA study. Full details of the methodology are provided in a separate CCAA report.[7] Additional procedures are discussed in Section V with the results for each commodity.

31. The quantitative methodology is primarily concerned with the measurement of production costs and returns at each major stage of the value chain. To help make these calculations, the methodology is based around a set of interlinked spreadsheet templates. Among other things, these templates produce a set of benchmark indicators that can be compared across countries. Because agriculture practices vary greatly between individual value chain participants, however, the quantitative results can only be thought of as indicative measurements. Specific levels of input use, actual yields, production outturns, and overhead costs can all vary significantly from one participant to another and have important implications for international competitiveness.

32. While great care has gone to ensure that the most reliable data possible were used for the analysis, even the best constructed models are unlikely to provide a definitive picture of all costs and returns. This is particularly true because the original CCAA design did not anticipate a need to collect primary data, which later became required by the spreadsheet methodology. Even without this limitation, the results are best thought of as a spectrum of possibilities covering different farm systems and typical assembly and processing arrangements only. Most producers are believed to fall somewhere around the competitiveness benchmarks established here, but the analysis does not attempt to predict actual costs and returns (let alone cash flow requirements) for specific individuals.

A. Concepts and Definitions

33. To interpret the quantitative results it is first necessary to introduce some essential concepts and definitions applied for the value chain analysis. These points not only help to understand the quantitative data, but are also useful to bear in mind when looking at value chain performance from a qualitative perspective.

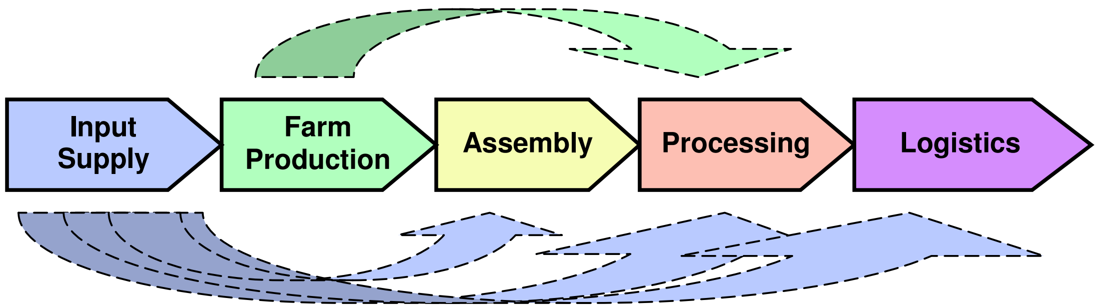
34. **Stages of the value chain.** Value chain analysis has gained considerable popularity in recent years. Although many approaches are taken, value chains essentially represent enterprises in which different producers and marketing companies work within their respective businesses to pursue one or more end-markets. Value chain participants sometimes cooperate to improve the overall competitiveness of the final product, but may also be completely unaware of the linkages between their operation and other upstream or downstream participants. Value chains therefore encompass all of the factors of production including land, labor, capital, technology, and inputs as well as all economic activities including input supply, production, transformation, handling, transport, marketing, and distribution necessary to create, sell, and deliver a product to a certain destination.

35. The main stages of an agricultural value chain as defined for the quantitative methodology are illustrated in the figure below. In this diagram, dashed arrows flow from input supply to all other stages to show that this is a crosscutting function that affects all participants, not just at the farm level. A dashed arrow is also drawn from farm production to processing to show that some farmers may deliver their crop directly to a factory, thereby fulfilling the assembly function as well. This can either

[7] Keyser, 2006.

happen as part of a vertically integrated supply chain managed by a large company or because the scale or proximity of an individual's production to the factory justifies direct delivery.

Figure 1: Stages of the Value Chain



36. Some of the main activities that occur at each stage of the value chain are as follows.

- **Input supply.** This stage is concerned with the sourcing of raw materials required for agriculture production, processing, and trade. Inputs may either be procured locally or imported. The final value of an input at its place of use includes all manufacturing costs, transportation costs, customs duty and tax, and unofficial payments incurred up to that point. The efficiency of a country's input supply system therefore has a major bearing on the performance of the entire value chain.

- **Farm production.** This stage is concerned with primary agriculture production and ends with the sale of a raw commodity at the farm gate. These transactions may occur literally at the farm gate or at some other sale point where the farmer hands over ownership of the product to the next value chain participant. Depending on the crop, some type of primary processing (such as the shelling or bagging of dry grain) may take place at the farm level. Farmers may also store their commodity for several months before selling to an assembler or processor.

- **Assembly.** This stage involves the collection of agricultural produce from many farmers and delivery of the raw material to a factory for industrial processing or packaging. Bagging and simple grading of crops can also occur at this stage depending on arrangements made at the first point of sale.

- **Processing.** The processing stage involves the transformation of agriculture raw materials into one or more finished internationally traded goods. Raw commodities, of course, are also traded and this stage may not apply to every crop. The spreadsheet templates have been designed to accommodate the production of up to three goods from a single raw material.

- **Domestic and international logistics.** The logistics stage is concerned with the delivery of traded commodities to their final market destination. This may either be a foreign market in the case of exports, or a local market for import substitutes. For import substitutes, the logistics stage ends at the domestic level, but the analysis is still concerned with the cost of importing a like product from the nearest or most competitive country.

37. **Price build-up from stage to stage.** In value chain analysis, all inputs and outputs carry forward their inherited value from the previous stage. This point may seem obvious enough, but is

important to stress in value chain analysis where the focus is on cost levels at different stages as a key determinant of international competitiveness. The competitiveness of any domestic commodity as an import substitute, for example, depends on the efficiency of the input supply system, farm production, assembly, processing, and logistics up to the final point of international competition. For a commodity like white maize in Mozambique that is almost always processed locally for domestic consumption or exported as whole grain, the final competitiveness can be compared as assembled raw material with an equivalent parity price.

38. By looking at the cost composition at each stage of the value chain and comparing these costs with world standards, value chain analysis not only shows if the country is internationally competitive, but also helps to identify key stages where costs can most effectively be reduced. These benchmarks can be compared with world standards at similar stages of the commodity value chain.

39. **Product transformation.** Throughout the value chain agriculture products take on many different forms. In the most basic sense, this may simply be the difference between a recently harvested farm product with high moisture content and one that has been assembled in a warehouse and dried for several months. As described, most agriculture raw materials also undergo some type of industrial processing to produce one or more final traded commodities. This may involve any number of processes such as the milling of dried maize (to produce maize flour and maize bran) or ginning of seed cotton (to produce lint and fuzzy cotton seed). Again, this point on product transformation may seem obvious enough, but the fact that a single agriculture commodity can take on different forms at each stage of the value chain means that great care is needed to track the accumulated value across products in a consistent manner.

40. For this study, the approach taken is to use ***conversion ratios*** as a simple tool for quantifying a product's transformation. These ratios are applied at the assembly stage to allow for crop drying and product losses and at the processing stage to allow for the transformation of a single raw material into a maximum of three finished goods. By applying the correct ratios to any agriculture commodity, it is possible to work forward or backward within that commodity's value chain to determine its equivalent value in a different form.

B. Value Chain Indicators

41. Beyond the analysis of cost build up, quantitative value chain analysis is also interested in the type of costs incurred as a product accumulates its value. This helps to identify areas where new policies or process innovations could have the greatest impact on international competitiveness.

42. Because a country is only able to influence prices within its own borders, the analysis is particularly interested in the composition of domestic costs. These costs include legitimate local business expenses and mark-ups, official customs duties and taxes, and any number of unofficial payments that are sometimes made to facilitate a particular operation. A product's total value at any given stage in the value chain, therefore, is equal to the sum of all domestic prices and imported cost components. For the CCAA study, these costs are measured in terms of **Domestic Value Added (DVA)** and **Shipment Value (SV)**, which constitute the main value chain indicators as follows.

Domestic Value Added (DVA)	=	Domestic costs and mark-ups + Official duties and tax + Unofficial charges and extra costs	[1]
Shipment Value (SV)	=	Domestic Value Added + Foreign components	[2]

43. DVA and SV are measured according to equations [1] and [2] respectively on a per ton basis at each stage of the value chain for the following products.

Farm production	Farm gate product
Assembly	Assembled raw material
Processing	Processed raw material
International logistics	Traded commodity (Product 1, 2, 3)

44. For cross-country CCAA comparisons, the final calculation of SV for each traded commodity is the most comprehensive measure of actual and potential competitiveness. For a given product or commodity produced in a specific country, international competitiveness is determined by comparing SV at the final destination (sale point) with a benchmark. The benchmark will usually be the cost–insurance–freight (CIF) reference price for the product or commodity at the specified destination.

45. By looking at the composition of SV, including the elements of DVA that contribute to this total figure, the country analyst can gain further insight where costs can most effectively be reduced. If some cost accounts for a very large share of total value, or is significantly higher than the international benchmark, then new policies or other investments focused on reducing this cost would likely be an effective strategy for improving trade competitiveness. Similarly, by looking at the build-up of SV (and DVA) from stage to stage, the analyst can gain insight to the competitiveness of individual participants. If farm production, for example, accounts for a disproportionately large share of final shipment value (either in absolute terms or compared with an international benchmark) then policy interventions or other investments focused on this stage of the supply chain may be required.

46. An example of how the spreadsheet templates measure DVA and SV together with the required conversion factors is given below.[8] As shown, the spreadsheet template calculates each value chain indicator in local currency and US dollar terms on a per unit basis and by the percent contribution of each cost component to total DVA and SV. All prices in the DVA and SV calculations are expressed in observed financial terms.

Table 1: Example of Detailed DVA and SV Calculations

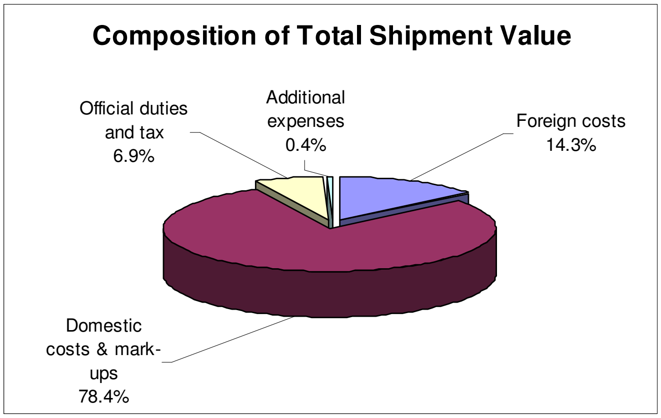
	MZN per MT	USD per MT	% of DVA	% of SV
Domestic costs	20,410	816.42	91%	78%
Duties and tax	1,789	71.55	8%	7%
Additional expenses	112	4.47	0.5%	0.4%
Total DVA	**22,311**	**892.44**	**100%**	**86%**
Foreign costs	3,715	148.58	17%	14%
Total SV	**26,026**	**1,041.02**	**117%**	**100%**

foreign conv factors (cf)		**domestic conv factors (cf)**	
% foreign	14.27%	tax as % DVA	0.080
foreign cf	1.000	extras	0.005

47. To assist with interpretation, the spreadsheets also produce a graphic illustration of the main value chain indicators as shown in the figure below.

8 See Section IV for more information on price decomposition and estimation of conversion factors.

Figure 2: Graphic Representation of the Composition of SV



48. **Interpretation of value chain indicators.** Bearing in mind many other factors must be taken into account in deciding which enterprises to promote and how best to allocate scarce investment resources, several conclusions could be drawn from these data. In the example above, the numbers show that domestic costs account for an estimated 86% of the product's final shipment value which is likely to provide extensive opportunities for policy makers and private investors to improve the product's competitiveness by focusing on domestic factors alone. As shown, however, official taxes only account for an estimated 6.9% of the final shipment value suggesting that policy changes in this area may not have a sufficient bearing on final SV and international competitiveness without other domestic improvements.

49. DVA and SV calculations may also be compared across stages of the value chain as shown in the next example. The first three sets of numbers shown below are per MT of raw material. At the final stage, the measurements are per MT of traded product (which is lint in the case of cotton). All values are cumulative of the inherited value from the each previous stage.

Table 2: Example of DVA and SV Value Chain Indicators (including value from previous stages)

Cotton (FAM)	FARM GATE PRODUCT		ASSEMBLED RAW MATERIAL		PROCESSED RAW MATERIAL		FINAL TRADED PRODUCT	
	MZN	USD	MZN	USD	MZN	USD	MZN	USD
Domestic Value Added								
Costs & mark-ups	2,447.5	97.90	4,783.8	191.35	6,110.0	244.40	20,410	816.42
Official duties & tax	38.7	1.55	111.7	4.47	542.9	21.72	1,789	71.55
Additional costs	5.3	0.21	7.2	0.29	36.3	1.45	112	4.47
Total DVA	**2,492**	**99.66**	**4,903**	**196.11**	**6,689**	**267.57**	**22,311**	**892.44**
Foreign costs	519.5	20.78	590.4	23.62	1,194.8	47.79	3,715	148.58
Total Shipment Value	**3,011**	**120.44**	**5,493**	**219.72**	**7,884**	**315.36**	**26,026**	**1,041.02**

50. In this example, one ton of lint has the final shipment value at the port of Nacala in northern Mozambique of USD 1,041 per MT. At 35% ginning outturn for Mozambique, this value by definition includes of all the farm level, assembly, and processing costs for 2.86 MT of un-ginned seed cotton. The other product of from cotton processing, fuzzy seed is a byproduct of the value chain for lint and is specifically considered here, but could be analyzed using the same approach if there was an interest in processing that seed to produce cake for stock feed and cottonseed oil for human consumption.

51. Finally, the measurements of DVA and SV may be compared in absolute and relative sense, with international benchmarks established by successful competitors. This is one of the main features of the CCAA value chain analysis and the methodology has been designed to allow comparison of the financial values and percent build-up of DVA and SV with the most relevant import or export parity

price against which the country must compete. If increased production substitutes for imports, then an import parity price should be used. Import parity prices are determined by first finding the price the country is most likely to pay in order to import the commodity and then by adding transportation costs to obtain the landed price in domestic CIF terms. If increased production will be exported, then an export parity price is to be used, determined by subtracting international transport costs from the international price to give the domestic fob equivalent. Depending on the stage of the value chain being analyzed, additional calculations to convert the parity price to a farm gate, assembly point, or into factory processing-level equivalent may be needed.

52. Again with reference to the data for cotton, if the export parity value of lint at the port of Nacala gate is greater than the estimated costs of domestic production (USD 1,041 per MT) then Mozambique can be said to be internationally competitive. If the final shipment value is greater than the comparable parity price, however, then Mozambique may need to invest in value chain improvements to increase its international competitiveness. Like all aspects of the quantitative analysis, however, the results should not be read a literal expression of absolute competitiveness. If final SV is "close" to the international benchmark then the country may still be competitive, as mirrored by actual trade performance.

C. Price Decomposition

53. The CCAA quantitative methodology begins at the financial level with enterprise budgets for each stage of the production and marketing chain. These budgets provide all the information to show if the production and marketing of an agriculture commodity is profitable for individual value chain participants. To calculate DVA and SV, however, budget prices must be broken down into their constituent parts.

54. Similar to the use of conversion ratios to track a product's transformation from stage to stage, the CCAA spreadsheet templates employ a variety of ***conversion factors*** (CFs) to calculate each component of DVA and foreign share of total SV. In all cases, the process of price decomposition begins with a known financial price actually encountered by value chain participants. At the farm production stage, these prices include the cost of seed, fertilizer, chemicals, and other farm inputs; at the assembly stage, the main prices include transport and storage and so on throughout the process.

55. The spreadsheet templates use four different CFs as follows. All budgets at the farm level are calculated in per hectare terms; thereafter, for assembly, processing, and distribution, all budgets are expressed in per ton terms.

- **% Forex.** This conversion factor is an expression of foreign costs as a share of total SV. With reference to Table 2, the % forex is 14.27% or 0.1427. This coefficient allows the analyst to calculate both the foreign and domestic share of total costs beginning with an input's known financial (shipment) value.

- **Domestic tax.** This conversion factor is an expression of domestic customs duties and other taxes as a share of total DVA. Again with reference to Table 2, the cf for domestic tax works out to 0.08, which is the total amount of tax divided by DVA. If the total tax rate as a share of DVA is known, this coefficient may be applied directly.

- **Domestic extras.** Like the cf for domestic tax, the cf for extras is an expression of unofficial costs as a share of total DVA. For Mozambique, some rough estimates of unofficial extras were included to account for various inefficiencies and other excess charges. In Table 2, these costs equal 0.5% of total DVA.

- **Foreign CF.** The foreign cf is used for economic analysis of value chain performance and is derived by dividing the economic exchange rate by the financial exchange rate. The resulting coefficient is multiplied by the foreign share of total SV to determine the value of imported inputs in economic terms.[9] In the case of Mozambique, government does not impose any restrictions on the conversion of foreign exchange and it is therefore assumed that the financial and economic exchange rates are equivalent (hence the foreign CF always equals 1).

D. Summary of Cost Categories

56. A second dimension of the analysis is to look at the composition of total costs. This is straightforward to do with detailed budget information and the CCAA spreadsheet templates were designed to prepare a summary of total costs by major category as shown in Table 3. By looking at the relative contribution of different categories of inputs to total price build-up, it is possible to identify areas where specific policies or other investments could have the greatest impact on international competitiveness. This example is taken from the farm production stage for cotton; all costs are expressed per ton of farm gate product (not per hectare).

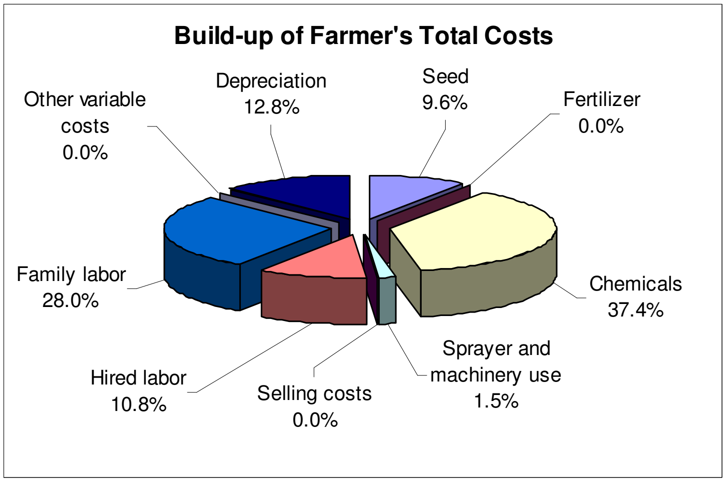
Table 3: Example of Cost Summary by Input Category at Farm Production (MZN per MT farm product)

	Total per ton SV farm gate	**% of total SV**	**Domestic Value Added (DVA)**				**Total DVA as % SV**	**Foreign Value**	**Foreign as % SV**
			costs	taxes	extras	total DVA			
Variable Costs									
Seed	200	9.6%	200	-	-	200	100%	-	0%
Fertilizer	-	0.0%	-	-	-	-	#DIV/0!	-	#DIV/0!
Chemicals	782	37.4%	258	19	4	281	36%	500	64%
Spraying costs	31	1.5%	6	6	0	13	40%	19	60%
Irrigation costs	-	0.0%	-	-	-	-	#DIV/0!	-	#DIV/0!
Machinery O&M	-	0.0%	-	-	-	-	#DIV/0!	-	#DIV/0!
Packing materials	-	0.0%	-	-	-	-	#DIV/0!	-	#DIV/0!
Selling expenses	-	0.0%	-	-	-	-	#DIV/0!	-	#DIV/0!
Hired labor	225	10.8%	225	-	-	225	100%	-	0%
Family labor	585	28.0%	585	-	-	585	100%	-	0%
Overheads & management	-	0.0%	-	-	-	-	#DIV/0!	-	#DIV/0!
Seasonal credit	-	0.0%	-	-	-	-	#DIV/0!	-	#DIV/0!
Land rent/tax	-	0.0%	-	-	-	-	#DIV/0!	-	#DIV/0!
Total Variable Costs	**1,823**	87.2%	**1,274**	**25**	**4**	**1,304**	**72%**	**519**	28%
Fixed Investments	**267**	12.8%	**208**	**12**	**1**	**221**	**83%**	**46**	17%
TOTAL	**2,090**	100.0%	**1,482**	**37**	**5**	**1,525**	**73%**	**565**	27%
Totals in USD	83.60	100.0%	59.28	1.49	0.22	60.99	73%	22.60	27%

57. Like the value chain indicators, the CCAA templates also produce a graphic summary of cost structure as shown in the next example again from the farm production stage. This makes the data easier to interpret and shows right away that fertilizer accounts for the bulk of farm level costs. In this example, marketing costs and hired labor are also important cost components and so could be good areas to look at as part of a strategy for reducing costs and improving competitiveness.

[9] Because the analysis of SV and DVA is carried out in financial prices, economic calculations are supplemental to the value chain analysis. Through the decomposition of DVA into its three constituent parts, however, the economic value of domestic inputs is already known. Having come this close to determining the total economic price, a provision is also made for the conversion of foreign prices to their economic equivalent using the foreign cf as described.

Figure 3: Graphic Representation of Cost Build-up



58. Further insight to how well the production and marketing process is organized can also be gained by comparing the summary data for each stage with international benchmarks. Value chain analysis alone cannot be used to predict optimal cost structures, but if one cost component is significantly higher than the international benchmark, further examination of the reasons behind this outcome may be in order.

59. Because the type of costs incurred at different stages vary, the templates for farm production, assembly, processing, and logistics are designed to accommodate different cost categories as shown in Table 4. The CCAA methodology calls on country analysts to collect detailed cost information for each of the following types of costs. Not all costs will pertain to every crop or production system in which case the space for that component should be left blank as indicated by the example above.

Table 4: Categories of Variable Costs by Value Chain Stage

Farm Production	Assembly	Processing	International Logistics
Seed Fertilizer Chemicals Spraying costs Irrigation costs Machinery O&M Packing materials Selling expenses Hired labor Family labor Overheads / management Seasonal credit Land rent / tax	*Components brought forward plus…* Purchase from grower Packaging Storage & depot costs Vehicle O&M License fees Crop levies Hired labor Overheads / management Interest	*Components brought forward plus…* Purchase from assembler Energy & machine operation Packing & consumables Storage Repairs & maintenance Vehicle O&M Hired labor Overheads & licenses Interest	*Components brought forward plus…* Purchase from processor Loading & re-loading Storage Transport to delivery point Duties & tax Clearing fees Licenses & permits Other overheads Interest

E. Financial Costs and Profitability

60. **Basic indicators.** Beyond the analysis of cost structures and price components, the value chain analysis is also interested in the private costs and returns that accrue to individual participants. Agriculture production and marketing begins with the decisions private investors make and it is important to have a sense of the underlying costs and profitability of competing enterprises and marketing systems to know if they are viable. Because the value chain analysis is constructed around enterprise budgets, these measurements are easy to make. The main templates are designed to calculate total variable costs, investment costs, gross profit, and net profit as shown below in the example for farm-level ECF maize.

Table 5: Sample Calculation of Basic Financial Indicators

FARM PRODUCTION **Maize (ECF)**	**Per Hectare**		**Per Ton**	
	MZN	**USD**	**MZN**	**USD**
Gross revenue (yield * price)	**5,628**	**225.10**	**2,251**	**90.04**
Production costs				
Variable costs	2,806	112.24	1,122	44.90
Investment costs	213	8.54	85	3.41
Total costs	**3,019**	**120.78**	**1,208**	**48.31**
Farmer income				
Gross margin (revenue - var costs)	**2,822**	**112.86**	**1,129**	**45.14**
Net profit (gross margin - invest costs)	**2,608**	**104.32**	**1,043**	**41.73**

61. Similar cost and profitability tables are included as part of the spreadsheet templates for assembly, processing, and distribution level according to the standard value chain conventions and units of measure listed below.

Farm Production	Farm gate product	Per Ha; per MT
Assembly	Assembled raw material	Per Ha; per MT
Processing	Processed raw material	Per MT; share from Product 1, 2, 3
Logistics	Traded commodity 1, 2, 3	Per MT processed raw material; per MT traded commodity

62. **Supplemental indicators.** A great many more financial indicators can be calculated from the detailed enterprise budgets that cover each stage and further attention to these possibilities would be a useful area for additional analysis. For the purpose of this "first cut" CCAA analysis, two especially useful crosscutting indicators are gross and net rate of return. These measures show the rate of return to an investor's outlay of cash and the ability of the enterprise to cover its long-run depreciation costs respectively. Enterprises with a high ratio provide a better return than those with a low ratio.

- **Gross rate of return** = gross profit / total variable costs.
- **Net rate of return** = net profit / total production costs.

63. **Summary of costs and profitability.** Similar to the summary tables for value chain indicators discussed above, the spreadsheet templates produce a set of tables for financial costs and profitability. An example of how these indicators are presented for ECF maize is given below. All indicators are measured per ton of raw material consistent with the standards set out for the CCAA study (farm gate product, assembled raw material, and so on). Results for final commodities are also expressed in per ton of raw material terms and therefore show the share based on each product's outturn ratio only.

Table 6: Example of Financial Cost and Profitability Calculations for ECF Maize (per MT raw material at all stages)

Maize (ECF)	FARM GATE PRODUCT		ASSEMBLED RAW MATERIAL	
	MZN	USD	MZN	USD
Gross revenue	**2,251**	**90.04**	**4,378**	**175.12**
Production costs				
Crop purchase		-	2,251	90.04
Other variable costs	1,122	44.90	593	23.70
Investment costs	85	3.41	-	-
Total costs	**1,208**	**48.31**	**2,844**	**113.74**
Final income				
Gross margin	1,129	45.14	1,535	61.38
Net profit	**1,043**	**41.73**	**1,535**	**61.38**
Rates of return				
Gross margin/total VC		1.01		0.54
Net profit/total costs		0.86		0.54

F. Main Assumptions

64. To apply the CCAA methodology to Mozambique, a great many assumptions have had to be made covering everything from the location of analysis, expected yields, specific input and output prices at different stages of the value chain, and so on for each commodity and enterprise variation covered. Every effort has been made to ensure these assumptions reflect actual conditions to the best extent possible or, at the very least, to document each assumption to make the work as transparent as possible. The analyst is, however, presented with a great many opportunities to make mistakes or use inaccurate data and these limitations must be kept in mind when interpreting the results that follow.

65. Some of the most important assumptions about yield, price, and specific locations for individual transactions are presented in Section V together with the results for each commodity. Even more detailed information on the specific procedures and values are also include on the actual spreadsheet templates which are presented in a quantitative annex at the end of this report. Several very detailed assumptions are also included as embedded comments in the Excel workbooks themselves. General, cross-cutting assumptions are described below.

66. **Farm sectors.** According to the CCAA study design, the value chain analysis should focus on three farm systems distinguished by unique management and labor characteristics. These systems are not defined in terms of total size or legal status, but by their management system and labor supply as follows. In all cases, the emphasis is on commercial potential rather than subsistence production.

- **Family Sector Farmers (FAM)** are characterized by agriculture operations where family members double as managers. These operations have no permanent full-time hired workers and may rely only on seasonal labor hired at peak production times.

- **Emergent Commercial Farmers (ECF)** are also characterized by the presence of family members who double as managers, but may include 1-3 full-time hired workers. Additional hired labor may also be used at peak production times.

- **Large Commercial Farmers (LCF)** are managed by fully specialized managers who may either be a family member or hired professional. These farms operate using three or more full-time hired workers and additional seasonal labor at peak production times.

67. In Mozambique, however, LCF farmers are mostly not present and a decision was made only to focus on FAM and ECF-type producers. As described in the background section, most agriculture in Mozambique is practiced on a very low level and, on this basis, the FAM-level value chain models are indicative of the overwhelming majority of producers. At this traditional level, farm households

are assumed to cultivate using a hand hoe over a limited area using use recycled seed, no fertilizer, and no agri-chemicals. Although these producers rely mostly on family labor, they sometimes used hired workers (who are often paid in-kind rather than with cash) to help with tasks that need to be carried out quickly according to the demands of the season.

68. ECF-type producers, on the other hand, are meant to represent an improved model of family-based production. At this level, the household is assumed to cultivate using ox drawn equipment over a larger area. These systems therefore require a greater input of hired labor although family members still play an important role, both as managers and actual farm laborers. As an improved model, it is also assumed that ECF farmers use hybrid seed (or improved planting materials in the case of cassava), a small amount of fertilizer, and herbicide or insecticide as required. In reality, there are very few growers in Mozambique who have actually adopted these improvements, and the ECF models are mainly indicative of *potential* farm practices rather than any kind of widespread practice already in existence.

69. **Farm location.** Consistent with the CCAA focus on international competitiveness, the locations selected for analysis in Mozambique correspond with the most important growing areas for each commodity. These locations are set out by province and farm sector in Table 7. As shown, an important feature of Mozambican agriculture is that farmers are often a long way from the terminal market for their produce, which adds significantly to the final shipment value due to high overland transport costs.

Table 7: List of Commodities by Farm Sector and Location

Farm Enterprise	Farm Area	Distance to Final Market
Cassava	West Nampula	350km to Nacala for sale as dry tuber
Cotton	Central Nampula	50km from ginnery for seed cotton; then lint 220 km to Nacala Port
Maize	Manica	250km to Beira if import substitute; 570km to Blantyre if for export
Rice	Zambezia	50km from rural mill for paddy; then 500km to Beira urban market
Soybeans	Southern Niassa/Northern Zambezia	500km to Namialo (site of new plant, 90km from Nacala)

70. The selection of these locations for each crop's farm production emerges from their importance.

- **Cassava and Cotton in Nampula Province**. Nampula Province was selected for cassava and cotton for the following reasons: For cassava production, Nampula contributed for about 37% of Mozambique's cassava production, on average, in the period of 2000/01 – 2004/05; and for cotton it contributed with 51.2% of Mozambique's total production over the period of 1990/01 – 1999-2000, and with 38.8% in the 2002/03 and 2004/04.

- **Rice in Zambezia Province**. Zambezia Province accounted for 56% of Mozambique's rice production, for 49% of total marketed rice, and 56% of cultivated land for rice production in 2006.

- **Soybean in southern Niassa Province/northern Zambezia**. Although Mozambique does not have a long history of soybean production, southern Niassa stands as the commercial centre for soybean produced in the promising area of southern Niassa/northern Zambezia. The area is currently benefiting from increased investments not only in agricultural production but also through a great opportunity for vertical coordination with a processing unit under installation in central Nampula. For the expected commodity flow, existing railway and road in the southern Niassa district of Cuamba will be key,

- **Maize in Manica Province**. Manica is not the province with the highest share of Mozambique's maize production; is the third after Tete and Zambezia provinces. However, Manica was selected for farm calculation because of several factors. First, it has one of the highest maize production potentials in the country; second, Manica is one of the most important suppliers of Mozambique most important consumptions center of Maputo and Beira, and third, it has been benefiting from major investments both in farm production and processing for animal feed and human consumption. All these factors have inspired important studies on maize production in Manica, which results in the existence of important data on production costs and overall competitiveness.

71. Because the value chain analysis is concerned with more than farm production, each commodity is analyzed at other stages of the value chain until the point where that commodity can be compared directly with an export or import parity price. An overview of the final basis for these competitiveness comparisons is set out below. For maize, import and export parity scenarios were analyzed as indicated. For most commodities produced in northern areas, the final comparison is made at the port of Nacala where domestic production will face the greatest competition from imports. Similarly, rice from Zambezia is often sold only into Quelimane, but will face stiffer competition in Beira so that location is analyzed instead.

Table 8: List of Commodities by Stage and Place of Final Comparison

Farm Enterprise	Final Stage	Final Product	Place of Final Comparison and Parity Basis
Cassava	Assembly	Dry tuber	Nacala (M)
Cotton	Distribution	Lint	Nacala (X)
Maize	Assembly (M & X)	Dry grain	Beira (M); Blantyre (X)
Rice	Distribution	Polished rice	Beira (M)
Soybeans	Assembly	Bagged seed	Namialo (M)

72. **Yield.** Crop yields are intended to reflect a realistic expectation in a year with "normal" growing conditions using the inputs charged at each management level. Due to an almost limitless number of possible variations related to seasonal growing conditions, local soil type, farmer skill, seed quality, and many other factors, actual yields on individual farms can be quite different than shown here. A summary of all farm-level yield assumptions is set out below; more detailed information on the inputs used by FAM and ECF farmers to achieve these results is given in Section IV with the discussion of results for each commodity.

Table 9: Summary of Farm Gate Yield Assumptions (MT/Ha of product shown)

Farm Enterprise	Product Form	FAM	ECF
Cassava	Dry tuber	1.33	2.50
Cotton	Raw seed cotton	0.57	0.80
Maize	Shelled grain	0.75	2.50
Rice	Unprocessed paddy	1.00	3.00
Soybeans	Dry seed	0.50	1.60

73. **Crop marketing.** Farm-level marketing in Mozambique is mostly informal and usually consists of little more than farmer selling their produce by the roadside to a local trader operating with hired transport. Only in the case of cotton do more "formal" arrangements apply in which farmers are meant to sell to an established concessionaire for a fixed price determined by the Cotton Institute of Mozambique (IAM). For all crops, including cotton, it is assumed that the trader provides packing materials (grain bags, cotton bales, etc), which are valued as an assembly cost rather than part of farm production.

74. **Financial prices.** Current prices for inputs and outputs prevailing in mid-2007 are applied to the analysis of each enterprise. An exchange rate of MNZ 25.00 = USD 1.00 was used to convert all foreign and domestic values as required. Mozambique imposes no controls on the exchange of foreign currency and the financial and economic exchange rates are assumed to be equivalent.

75. **Tax rates.** Mozambique generally imposes very modest taxes on farm inputs and other materials used for agriculture production, processing, and marketing. While the CCAA value chain methodology provides a set of detailed templates to estimate the foreign exchange component and other required conversion factors for the quantitative analysis, this approach was not needed in Mozambique and an alternative method of calculating "simple CFs" was sufficient to complete the analysis.

76. This approach only requires information on applicable taxes and reliable assumptions about the foreign exchange content of each input and unofficial extras as a percent of DVA. These estimates were made with by referencing secondary information collected during the initial literature search for Mozambique and by comparing local conditions with data from other countries where more detailed analysis was undertaken. The estimates for unofficial extras applied to some inputs are meant to account for various inefficiencies and other excess charges. The figures for customs duty and other local taxes were taken from the official Customs Handbook for Mozambique. As described above, domestic CFs are expressed as a percent of total DVA (rather than SV). A summary of all CF calculations and percent forex assumptions used for Mozambique is set out below.

Table 10: Summary of Simple Conversion Factors and Foreign Exchange Assumptions Used for Mozambique Analysis

Input	% Forex (share of total SV)	% Total SV			Domestic CFs		Notes
		% customs duty	% other local tax	% local extras	Tax	Extras	
Hybrid seed	30.0%	2.5%	0.0%	0.5%	0.0348	0.007	Covers imports and local multiplication
Recycled seed	0.0%	0.0%	0.0%	0.0%	-	-	
Other seed					-	-	Place holder for other variety
Fertilizer - north	78.0%	2.5%	0.0%	1.0%	0.1109	0.045	% forex from GDS 2005 (quoted by Couglin)
Fertilizer - center	78.0%	2.5%	0.0%	1.0%	0.1109	0.045	% forex from GDS 2005 (quoted by Couglin)
Fertilizer - south	78.0%	2.5%	0.0%	1.0%	0.1109	0.045	% forex from GDS 2005 (quoted by Couglin)
Herbicide	64.0%	2.5%	0.0%	0.5%	0.0678	0.014	% forex from GDS 2005 (quoted by Couglin)
Insecticide	64.0%	2.5%	0.0%	0.5%	0.0678	0.014	% forex from GDS 2005 (quoted by Couglin)
Grain bags	20.0%	25.0%	17.0%	0.5%	0.3953	0.006	Imported, recycled 5ys
Hand tools	10.0%	5.0%	0.0%	0.5%	0.0529	0.006	Hoes, fork, shovel, ax, machete and similar
Ox equipment	20.0%	5.0%	0.0%	0.5%	0.0595	0.006	Hoes, fork, shovel, ax, machete and similar
Hand sprayer	71.0%	5.0%	17.0%	0.5%	0.6414	0.017	
Tractors	75.0%	5.0%	0.0%	0.5%	0.1905	0.020	
Mechanical attachments	75.0%	5.0%	17.0%	0.5%	0.7440	0.020	
Mechanical sprayer	75.0%	5.0%	17.0%	0.5%	0.7440	0.020	
Irrigation equipment	75.0%	5.0%	0.0%	0.5%	0.1905	0.020	Irrigation equipment for sugar?
Bicycle	60.0%	5.0%	0.0%	0.5%	0.1190	0.013	
Car	50.0%	25.0%	47.0%	0.5%	0.9116	0.010	25% duty + 17% VAT & 30% excise on DPP
Motorbike	65.0%	25.0%	17.0%	0.5%	0.9035	0.014	
Light truck (vanette)	50.0%	25.0%	47.0%	0.5%	0.9116	0.010	25% duty + 17% VAT & 30% excise on DPP
Heavy truck	65.0%	5.0%	17.0%	0.5%	0.5314	0.014	
Office equipment (computers)	62.0%	7.5%	17.0%	0.5%	0.5393	0.013	
Office equipment (other)	62.0%	7.5%	17.0%	0.5%	0.5393	0.013	
Building materials - basic	20.0%	5.0%	17.0%	1.0%	0.2325	0.013	
Building materials - finishing	70.0%	5.0%	17.0%	0.5%	0.6200	0.017	
Electricity	10.0%	5.0%	10.0%	0.5%	0.1491	0.006	Domestic from hydro using imported parts
Fuel (transport)	45.1%		75.0%	1.0%	0.7806	0.018	Adapted from Coughlin
Crop storage	5.0%	5.0%	17.0%	2.0%	0.1958	0.021	Forex for building cost
Sacks for processed rice	60.0%	7.5%	17.0%		0.5123	-	
R&M (processing)	70.0%	5.0%	17.0%	1.0%	0.6200	0.033	Assume imported at duty and tax rates shown
Salaries (formal sector)	0.0%	0.0%	0.0%	0.0%	-	-	
Administration (processing)	25.0%	5.0%	17.0%	2.0%	0.2480	0.027	
Depreciation (process, dist)	60.0%	5.0%	17.0%	2.0%	0.4650	0.050	
Crop handling (assembly, dist)	0.0%	0.0%	0.0%	2.0%	-	0.020	
Batteries	60.0%	7.5%	17.0%	1.0%	0.5123	0.025	
Insurance	35.0%	0.0%	17.0%	2.0%	0.2235	0.031	Foreign costs for global underwriting

77. **Investment costs.** The annual per hectare cost of farm implements used by FAM and ECF farmers were estimated using the *capital recovery cost* method. As set out in the CCAA methodology document, this cost is the annual payment that will repay the cost of a fixed input over its useful life and provide an economic rate of return on the investment. This approach has the advantage over the simple division of an input's value by its useful life as it accounts for the fact that if the investor did not purchase the input, the money could have been invested in some other enterprise.[10] Because cassava has useful life of more than one season, crop establishment costs were similarly estimated using the capital recovery method. At the assembly, processing, and distribution stages, information on fixed investment costs was not available

78. **Family labor.** No charge is included for family labor in the calculation of a private costs and returns. This approach is necessary for the financial calculations because family labor is not paid for with an actual expenditure of cash. The use of family labor does, of course, have an opportunity cost, but by excluding this from the financial estimates, crop profits can easily be reinterpreted as returns to family labor and all other non-cash inputs used to produce and market that commodity. The benefit of this method is that it allows direct comparisons between enterprises without the risk of applying incorrect proxy values. This approach is also consistent with the standard definition of an opportunity cost which states that the value of family labor is the income foregone by not engaging in the next most profitable activity.

79. For the calculation of DVA and SV, however, a different approach is needed. At this level, the value chain analysis is interested in the total cost to Mozambique of all factors used in the production and marketing of each agricultural commodity. Because family labor often accounts for a large share of production inputs with traditional FAM and improved ECF-type systems, some proxy value needed to be applied.

80. As discussed in Section II, the approach taken was to apply a rule of thumb estimate to the value chain calculations by charging family labor at 60% of the rate for casual labor. FAM and ECF farmers rarely have the opportunity to sell their labor at the full wage rate every day of the year, and this approach is at least a clear and simple way to recognize the value of this input. Further analysis could always look at the effects of different family wage rate assumptions, but the basic outcome is easy to predict since labor costs and final estimated shipment values are directly related. In all cases, the quantity of family labor on FAM and ECF farms was estimated on the basis of a five member household with proportionate adjustments for tasks that must be carried out over a limited number of days, in which case hired labor must be used

81. **Transport costs.** The costs of moving agriculture produce from the farm to an assembly market or processing plant and then on to the final distribution point has been estimated on the basis of MZN 1.75 (USD 0.07) per MT per Km with appropriate adjustments made to account for the extra bulk of seed cotton, lint, and dry cassava tubers as described in more detail with the discussion of results for these commodities. A summary of key road distances and basic freight costs over these routes is given below.

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[10] Annual cot per hectare (or per MT) = purchase price of implement * per hectare (or per MT) share of total use * capital recovery factor. CRF = ((1+i)^n)*i/(1+i)^n-1 where i = real interest on savings and n = number of years in the implement's useful life. See Monke and Pearson, 1989 for a detailed discussion of this methodology.

Table 11: Summary of Basic Road Freight Calculations based on Standard Delivery Distances

Road Distances and Financial Costs

			MZN per MT	USD per MT
Manica farm to Beira	250	km	438	17.50
Manica farm to Malawi border	450	km	788	31.50
Manica farm to Blantyre	570	km	998	39.90
Zambezia rice mill to Beira	500	km	875	35.00
Inhambane farm to Maputo	500	km	875	35.00
Nacala to Namialo	100	km	175	7.00
Nacala to Nampula	190	km	333	13.30
Nacala to Nampula ginnery	220	km	385	15.40
Nacala to soybean area	600	km	1,050	42.00
Soybean area to Namialo mill	500	km	875	35.00

IV. COMMODITY ANALYSIS

82. Having set out the basic context of the country case study and main features of the quantitative methodology, this section now presents the country-level results for each of the five CCAA commodities studied in Mozambique. For most of the commodity, the discussion begins with qualitative background information on recent production trends, marketing constraints, and other factors that shape Mozambique's competitiveness in that product.[11] The quantitative results are then presented together with a few words of interpretation. Many other conclusions, of course, can be drawn from the detailed information produced by the analysis and readers with a detailed interest in Mozambique's competitiveness options should also look carefully at the template pages that are reproduced in the quantitative annexes.

A. Cassava

83. **Qualitative background**. In Mozambique, cassava is the second most important staple food next to maize. In Mozambique, the main cassava producers are Nampula with 37% of national production, Zambezia with 31% and Cabo Delgado with 19%. Cassava is exclusively produced by smallholders as a low-labor-intensive crop, and most households typically grow cassava in small farms, in consociation with other food crops. Given its resistance to drought and tolerance to poor soils, cassava is grown throughout the year and is the most important food crop in substantial areas of the country, guaranteeing food security both in rural and suburban areas in Northern Mozambique and to some extent in southern Mozambique. Due to its tolerance to drought, cassava is especially important in drought years when shortage of maize production is severe.

84. **Farm production.** Table 12 shows the evolution of cultivated area for cassava in Mozambique for the past 14 years. As shown in table, Nampula and Cabo Delgado provinces, both in northern Mozambique, have always been among the three most important contributors to land allocation to cassava in the country. Zambezia Province, right in the south of Nampula and very much linked to it in agricultural production and trade, has the second most important area allocated to cassava production in Mozambique. Overall, the area allocated to cassava production in Mozambique has increased over time in the past 14 years.[12]

[11] In the case of soybean, the background discussion does not include trends of recent production and marketing given that production and marketing of soybean in Mozambique was only introduced very recently, hence there are no statistics on the crop production.

[12] Data on planted area and yields for cassava, maize and rice is collected every year since the early 1990s by the early Warning Unit (*Departamento de Aviso Previo - DAP*) of the Ministry of Agriculture, is the most regular data set on agricultural production (volumes, area and yields), and is used for official agricultural statistics.

Table 12: Area Cultivated for Cassava in Mozambique, 1993/94 – 2006/07

Province	Annual Cultivated Land ('000 Hectare)													
	93/94	94/95	95/96	96/97	97/98	98/99	99/00	00/01	01/02	02/03	03/04	04/05	05/06	06/07
Cabo Delgado	125.0	131.7	133.1	134.9	134.3	133.0	154.1	166.5	169.5	173.0	176.7	180.2	183.6	187.4
Niassa	22.0	23.9	24.1	25.6	24.3	20.8	21.5	24.5	25.0	25.6	26.3	27.4	27.9	28.6
Nampula	461.4	461.5	463.5	465.7	465.6	455.9	415.5	441.3	433.4	439.0	449.2	465.0	474.1	483.8
Zambezia	207.4	247.9	250.0	250.7	264.3	248.8	247.5	270.4	273.3	280.8	287.2	297.1	300.4	306.3
Tete	1.7	0.8	0.9	1.3	1.4	1.5	1.2	1.4	1.4	1.4	1.5	1.5	1.5	1.6
Manica	0.6	0.7	0.7	0.7	1.1	1.1	1.1	1.3	1.3	1.4	1.4	1.4	2.6	2.6
Sofala	12.9	15.0	14.7	14.8	12.3	11.8	10.8	13.3	13.2	13.7	14.1	14.8	15.1	16.2
Inhambane	66.6	72.8	73.3	73.7	72.9	61.1	62.0	62.3	64.0	67.6	69.8	72.3	73.1	74.2
Gaza	23.4	26.2	27.1	27.4	34.0	25.6	33.0	36.6	37.1	37.1	39.0	39.0	39.9	41.1
Maputo	4.4	5.1	5.1	5.1	5.2	4.9	5.6	6.4	6.2	6.1	6.1	6.8	7.3	7.7
National	925.4	985.6	992.6	999.8	1,015.4	964.6	952.4	1,024.0	1,024.3	1,045.6	1,071.3	1,105.4	1,125.5	1,149.5

Source: Ministry of Agriculture, Early Warning Unit

85. **Farm Yields**. Cassava farm yields have increased just slightly over the past 14 years in Mozambique (Table 13). In addition to having higher areas planted for cassava, northern Mozambique (and zambezia province) also has higher cassava yield in the country.[13]

Table 13: Cassava Yields in Mozambique, 1993/94 – 2006/07

Province	Annual Yields (Tons per Hectare)													
	93/94	94/95	95/96	96/97	97/98	98/99	99/00	00/01	01/02	02/03	03/04	04/05	05/06	06/07
Cabo Delgado	4.20	4.50	5.00	5.46	5.67	5.90	5.27	6.07	6.46	6.96	7.00	7.00	8.00	8.15
Niassa	3.80	4.50	5.00	5.50	5.70	5.90	5.90	6.10	6.50	7.00	7.00	7.00	7.89	7.86
Nampula	3.37	4.30	5.00	5.49	5.70	5.90	5.90	6.10	5.24	5.06	5.01	4.98	6.01	6.64
Zambezia	4.00	4.30	4.59	5.39	5.64	5.87	5.90	5.89	6.50	7.00	7.00	4.15	7.15	7.55
Tete	2.50	3.80	4.30	4.80	4.98	5.20	5.20	5.36	5.50	5.50	6.00	5.00	6.00	7.04
Manica	3.00	3.80	4.30	4.80	5.00	5.20	4.49	5.07	5.83	5.61	6.00	0.00	4.97	5.34
Sofala	3.20	3.80	4.30	4.41	4.90	5.06	4.08	4.95	5.93	5.93	6.50	0.05	6.56	6.16
Inhambane	3.00	3.50	4.00	4.50	4.68	4.85	4.77	10.18	4.94	5.14	5.77	0.00	6.61	6.52
Gaza	2.00	3.50	3.75	4.50	4.63	4.16	4.34	5.10	4.84	3.32	5.02	5.02	5.78	5.85
Maputo	1.52	3.50	3.58	4.50	4.62	3.83	3.03	5.10	4.75	2.08	4.24	3.96	4.24	4.32
National	3.56	4.24	4.77	5.34	5.55	5.76	5.63	5.92	5.78	5.88	5.99	4.73	6.71	7.10

Source: Ministry of Agriculture, Early Warning Unit

86. **Market prospects**. In Mozambique, most cassava is produced for own consumption, although there is a significant market for dried cassava in northern Mozambique, where traders usually buy it in western Nampula, northern Zambezia or southern Cabo Delgado and sell around the coastal area of Nampula province. Statistics from the Ministry of Agriculture National Surveys indicate that only about 5% of Mozambique's cassava is traded. Like in other crops, traders of cassava are responsible for packing materials and can stay for a week or more concentrating the necessary quantity before they take the product to the final markets. Unfortunately, not often traders take into account all direct and indirect costs involved in trading agricultural commodities. For

However, there have been strong discussions among users and analysts in Mozambique regarding the accuracy of this data. Those hesitant about the quality of the data rise several reasons, including the unreliable methodology used.

[13] This data needs to be read with special care given the methodology used for its collection. In general, a limited number of districts is visited before harvest, and the data is then expanded to the whole provinces and then the country. There is no specific argument on the correctness of the sampling techniques used to select the districts (and villages) where the information is collected.

instance, because there are no conditions for a paid accommodation most of them spend their time sleeping in improvised places and therefore do not include accommodation costs in their operational costs. Likewise, some bring food from home or use any other mechanisms for having food while they market, hence do not value the cost of food as part of their operational costs. Due to its weak market, it is usually difficult to keep track of cassava prices, and farmers sell at the best spot price they can get from local small-scale traders.

87. As for import substitution possibilities, cassava is but rarely used to mix with wheat flour for making bread, which currently depends entirely on imported wheat.[14] It is viable and virtually undetectable. For example, "a taste panel study conducted by PAM [2005] revealed that blending cassava with wheat flour at 10% and 15% produced composite flour bread acceptable to Zambian consumers. Out of 145 participants, only one could detect a 'cassava flavor' in the bread" (Chitundu, Droppelmann and Haggblade 2006:15). This suggests a big opportunity for import substitution in myriad small bakeries in towns and cities all over Mozambique. For example, Djoussou and Bokanga (1997) showed that, if Nigeria used 15% cassava flour to make bread, it would save $14.8 million in foreign exchange, of which $4.2 million would go to farmers and the rest to processors. The Zambian study of various downstream applications of cassava products also confirmed that "widely recognized commercial potential existed, easily sustaining a 50% increase in national cassava production" (Chitundu, Droppelmann and Haggblade 2006:19). Though little done in Mozambique, cassava can also be used as a partial substitute for maize in feed mixtures[15] (AGROGES & Austral, 2007)

88. **Processing or Export**. Regardless of its importance as a food staple in many parts of the country, processing or export of fresh or dried cassava is negligible in Mozambique. Nevertheless, a significant market for cassava and derivatives exists in South Africa, which imports significant quantities of cassava starch from Thailand and Brazil (External Market Task Force 2004:6-7, quoted by AGROGES & Austral, 2007). Mozambique is not taking advantage of the demand for cassava starch in South Africa due to a number of factor including insufficient organization and timing at the pick-up points to ensure timely deliveries at the processing plant; the last-minute insistence by sellers to renegotiate prices when deliveries were being effectuated in order to get "food grade prices for industrial grade cassava" though the prices had been "previously negotiated and confirmed by CSM"; and a delay , in 2001, of one week at "the border post when CSM attempted to import cassava from Mozambique" (External Market Task Force 2004:7, quoted by AGROGES & Austral, 2007).

89. **Cassava Disieses**. Cassava plants are severely affected by the Mosaic Virus and the Cassava Brown Streak Virus Disease especially in northern Mozambique. In a 4-year study conducted by Save the Children in Nampula Province, the brown streak virus was found to have affected 57% of examined roots.[16] The study also concluded that this disease reduced expected output by 20% (i.e., about $70/h) on average (McSween, Walker, Salegua and Pitoro 2006: vi and 16).[17] In a recent study to identify research priorities for IIAM, Walker et al. (2006:49) argued that "effective agricultural research should be able to solve these problems. Cassava is a versatile crop and offers more opportunities for post-harvest research than other root and tuber crops. Mozambique needs to participate more fully in the 'silent revolution' of expanding post-harvest uses for cassava that is occurring in other countries of SSA."

[14] Reportedly "the bakery industry has started the use of composite flour (wheat and cassava) for bread and biscuit production, no significant further information on the evolution of that use was found, suggesting that further investigation must be carried out on the subject" (AgroGes and Austral 2006:14 citing Zacarias, Cuambe and Dambe 2005).

[15] In a Zambian study in 2006, "the cassava-based rations produced weight gains [chickens and dairy cattle] equivalent to maize-based feeds and would prove commercially viable so long as cassava chips could be procured at the mill gate at 60% of the price of maize" (Chitundu, Droppelmann and Haggblade 2006:14-15).

[16] In Mozambique, cassava is attacked mostly by the cassava mealy bug and the cassava mosaic virus (INIA and IITA/SARRNET 2003:4).

[17] Save the Children's program to distribute Nikwaha was reportedly very successful, achieving a 75% return on investment (McSween, Walker, Salegua and Pitoro 2006:35).

90. **Policy matters**. Due to its importance for food security and income-earning for poor population in rural Mozambique, cassava is highlighted in Mozambique's government policies for the agricultural sector, especially in the national program for integrated agricultural development (PROAGRI).

91. **Quantitative assumptions.** The main assumptions used for the value chain analysis of cassava are set out below, and are based on current practices and conditions in northern Mozambique, where production and marketing activities are far more developed, representative and integrated than in the south. Because there are no industrial processing facilities for cassava in northern Mozambique, and cassava is mostly marketed as dry tubers or chips the analysis ends at the assembly stage for dry tubers. The assumed conversion ratio from fresh to dry tubers is 6:1 – all farm yields and assembly costs are measured in dry tuber terms.

92. As shown, both smallholders and emergent commercial farmers use almost no inputs on cassava at all. Even assuming that most cassava is intercropped with other food staples, there is no use of inputs for any of the other crops, hence cassava does not indirectly benefit from inputs used in other crops. The most significant difference between FAM and ECF management, therefore, is that ECF farmers are assumed to use an improved (hybrid) cultivar which results in the higher yield.[18] ECF farmers are also assumed to devote more labor to weed control and other improved crop husbandry practices.

Table 14: Cassava, Summary of Main Value Chain Assumptions

Sector	**Annual Yield (MT dry tuber/ha)**	**Farm Inputs**	**Assembly Inputs**
FAM	1.33	Establishment: Local planting material; 26 days labor clearing and planting (w/ hand hoe). Production: 73 days labor for all tasks (estimate 70 days family + 3 days hired)	Buy loose tubers at farm gate and pack using recycled bags. Delivery 350km from western Nampula to Nacala town market (+20% premium above standard road rate for extra bulk of cassava) Small allowance for crop storage and unofficial payments at police roadblocks and/or market center.
ECF	2.50	Establishment: Improved planting material; 15 days labor clearing and planting (w/ ox plow). Production: 100 days labor for all tasks (estimate 80 days family + 20 days hired)	

93. Farmers in northern Mozambique usually sell their cassava at the roadside or in local marketplaces. In the case of cassava in northern Mozambique, traders mainly from Nampula and Nacala cities travel to rural districts where they buy the product and pursue with its transportation to Nampula, Nacala or other towns either on hired or returning trucks. The farm gate and assembly level price assumptions for dry cassava are summarized below. FAM and ECF farmers are assumed to produce an identical product and product from either of the sectors is assumed to be sold in the same marketplaces. Therefore, there is no difference between prices paid to each category of farmer.

[18] Improved planting materials are generally not available in Mozambique and this model is mainly a hypothetical possibility to show the likely benefit of investing in the multiplication of improved cultivars for sale to farmers.

Table 15: Cassava, Summary of Commodity Price Assumptions

	MZN per MT	USD per MT	Product Form	Location
Farm gate price	1,500	60.00	loose tubers (dry)	Western Nampula
Assembled raw material	2,500	100.00	bagged tubers (dry)	Nacala

94. **Farm production.** Per hectare and per ton financial indicators for cassava are summarized below. As set out in the methodology section, the financial data do not include a value for family labor, which is only counted in a broader economic sense by the value chain indicators. In these terms, the numbers show that it costs about 30% more for an ECF farmer to produce a ton of cassava than an unimproved FAM sector grower, but as will be seen below, a different picture emerges in value chain terms when the cost of family labor is taken into account.

Table 16: Cassava, per Hectare and per MT Farm-Level Financial Indicators

FARM PRODUCTION Cassava (FAM)	Per Hectare		Per Ton	
	MZN	USD	MZN	USD
Gross revenue (yield * price)	**1,995**	**79.80**	**1,500**	**60.00**
Production costs				
Variable costs	36	1.44	27	1.08
Investment costs	311	12.45	234	9.36
Total costs	**347**	**13.89**	**261**	**10.44**
Farmer income				
Gross margin (revenue - var costs)	**1,959**	**78.36**	**1,473**	**58.92**
Net profit (gross margin - invest costs)	**1,648**	**65.91**	**1,239**	**49.56**

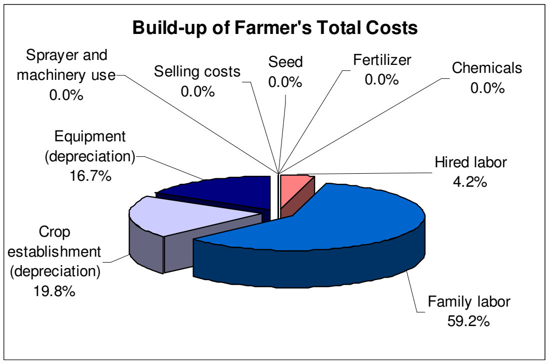
FARM PRODUCTION Cassava (ECF)	Per Hectare		Per Ton	
	MZN	USD	MZN	USD
Gross revenue (yield * price)	**3,750**	**150.00**	**1,500**	**60.00**
Production costs				
Variable costs	240	9.60	96	3.84
Investment costs	580	23.21	232	9.28
Total costs	**820**	**32.81**	**328**	**13.12**
Farmer income				
Gross margin (revenue - var costs)	**3,510**	**140.40**	**1,404**	**56.16**
Net profit (gross margin - invest costs)	**2,930**	**117.19**	**1,172**	**46.88**

95. Deciding about actual cassava yields in Mozambique is not easy, as different sources of information indicate different yields. For instance, a recent study conducted by Andrade et al in selected districts suggests that in areas with higher potential for cassava production yields can as high as 15 MT of fresh tuber per hectare. However, other sources indicate that 8 MT per ton seems to be the highest yields in most districts. Hence, the assumption here is that ECF type of farmers will decide to produce cassava in areas with high potential for farm production and better access to markets, only in those cases farm yield will reach 15 MT of fresh cassava (or 2.5 MT of dry tubers) per hectare. Moreover, estimating the right yields for cassava is not easy as many farmers collect it year-around, becoming difficult to for them to estimate annual quantities collected per hectare.

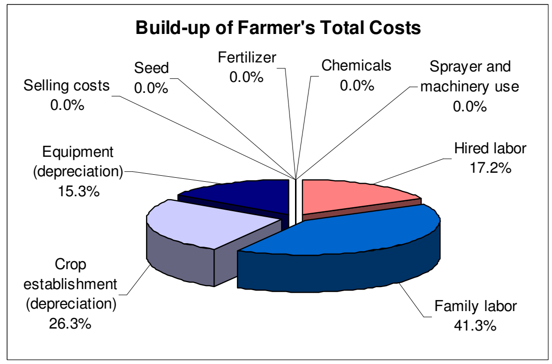
96. The pie charts illustrate the composition of farm-level costs in more detail. Labor accounts for the majority of total costs in both cases, and a distinction is also made between fixed investments in farm equipment and cassava establishment. In reality, if the difference of hired vs. family labor is not taken into account, labor accounts for 60% in both cases. The larger size of land cultivated by ECF farmers combined with the cultivation of improved planting materials determine the use of a higher proportion of hired labor.

Figure 4: Cassava, Composition of Farm-level Costs

FAM



ECF



97. Table 17 looks at the annualized investment cost of cassava establishment using the capital recovery method. Because cassava has a productive life spread over more than one season, these costs were treated as an investment item similar to tools and other fixed farm equipment. At the FAM level, the only type of value chain costs are domestic; at the ECF level where farmers use improved planting material, other cost components figure into the value chain calculations. As shown, it costs a little more than twice as much to establish a hectare of improved cassava, but the difference is not great as a share of overall farm costs.

Table 17: Cassava, Annualized per Hectare Crop Establishment Costs

FAM

	MZN	USD	% of DVA	% of SV
Total Investment Module (annual cost)				
Domestic costs	169	6.76	100%	100%
Duties and tax	-	-	0%	0%
Additional expenses	-	-	0%	0%
Total DVA	**169**	**6.76**	**100%**	**100%**
Foreign costs	-	-	0%	0%
Total SV	**169**	**6.76**	**100%**	**100%**

foreign conv factors (cf)		**domestic conv factors (cf)**	
% foreign	0.00%	tax as % DVA	-
foreign cf	1.000	extras	-

ECF

	MZN	USD	% of DVA	% of SV
Total Investment Module (annual cost)				
Domestic costs	257	10.27	90%	70%
Duties and tax	26	1.02	9%	7%
Additional expenses	1	0.06	1%	0%
Total DVA	**284**	**11.35**	**100%**	**77%**
Foreign costs	83	3.32	29%	23%
Total SV	**367**	**14.67**	**129%**	**100%**

foreign conv factors (cf)		**domestic conv factors (cf)**	
% foreign	22.65%	tax as % DVA	0.090
foreign cf	1.000	extras	0.005

98. **Assembly of cassava.** Table 18 summarizes the estimated financial costs and returns at assembly on a per ton and per hectare basis. As stated in the methodology section, he value at the assembly level includes all costs brought forward from the farm level including the cost of purchasing the commodity from farmer, plus all the other costs such as packing and transportation to the assembly point. Therefore, the value chain indicators at the assembly level are cumulative.

99. Because assemblers are mainly concerned with how many tons of produce they trade, the per MT indicators are the most meaningful. The per hectare data, however, are still interesting from a value chain perspective because of the differences between FAM and ECF farm systems. Simply because ECF farmers produce more cassava over the same area, total costs of moving that product are greater than at the traditional FAM-farm level as shown. Viewed in a more dynamic sense, however, the fact that ECF farmers produce more cassava could provide the assembler important advantages in terms of the quality of purchased product, associated wit important savings on time and other costs not measured here, hence reducing transaction costs. More detailed analytical tools are needed to reflect these advantages from the trader's perspective.

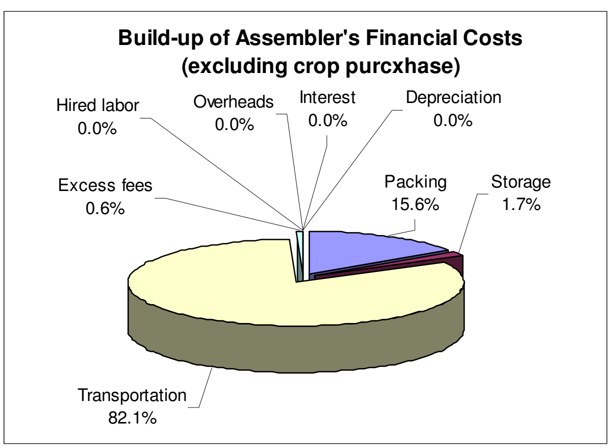
Table 18: Cassava, per Ha and MT Financial Indicators for Assembly

ASSEMBLY Cassava (FAM)	Per Hectare		Per Ton	
	MZN	USD	MZN	USD
Gross revenue (qty sold * price)	3,325	133.00	2,500	100.00
Production costs				
Crop purchases (payment to farmer)	1,995	79.80	1,500	60.00
Other variable costs	1,190	47.61	895	35.80
Investment costs	-	-	-	-
Total costs	3,185	127.41	2,395	95.80
Assembler's income				
Gross margin (revenue - total var costs)	140	5.59	105	4.20
Net profit (gross margin - invest costs)	140	5.59	105	4.20

ASSEMBLY Cassava (ECF)	Per Hectare		Per Ton	
	MZN	USD	MZN	USD
Gross revenue (qty sold * price)	6,250	250.00	2,500	100.00
Production costs				
Crop purchases (payment to farmer)	3,750	150.00	1,500	60.00
Other variable costs	2,238	89.50	895	35.80
Investment costs	-	-	-	-
Total costs	5,988	239.50	2,395	95.80
Assembler's income				
Gross margin (revenue - total var costs)	263	10.50	105	4.20
Net profit (gross margin - invest costs)	263	10.50	105	4.20

100. The chart below illustrates the composition of assembly level costs. Transport cost is by far the most significant cost component faced by cassava assemblers in Mozambique. This is in line with the long distances that traders must travel from production areas to market locations and the highly variable transport costs, in conjunction with the absence of specialized transporters for agricultural commodities. Investing in the reduction of transport costs can be key to reduce prices that consumers have to pay for dry cassava and can therefore improve competitiveness of the sector.

Figure 5: Cassava, Composition of Assembly Costs (350km Delivery Distance)



101. **Cassava value chain indicators.** Some conclusions can be drawn from the value chain indicators for the cassava sub-sector in Mozambique. The first conclusion is that ECF farmers produce at a lower cost than FAM farmers due to higher costs and mar-ups at faced by FAM farmers. Secondly, assembly contributes to more than 70% of the total shipment value under the two categories of cassava farm producers.

Table 19: Cassava, per MT Value Chain Indicators

Cassava (FAM)	FARM GATE PRODUCT		ASSEMBLED RAW MATERIAL	
	MZN	USD	MZN	USD
Domestic Value Added				
Costs & mark-ups	682.14	27.29	1,643.02	65.72
Official duties & tax	5.09	0.20	367.16	14.69
Additional costs	0.53	0.02	13.88	0.56
Total DVA	**687.77**	**27.51**	**2,024.07**	**80.96**
Foreign costs	10.70	0.43	370.93	14.84
Total Shipment Value	**698.46**	**27.94**	**2,395.00**	**95.80**

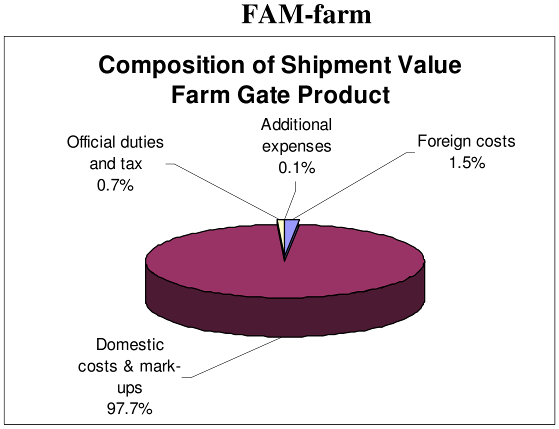
Cassava (ECF)	FARM GATE PRODUCT		ASSEMBLED RAW MATERIAL	
	MZN	USD	MZN	USD
Domestic Value Added				
Costs & mark-ups	623.67	24.95	1,596.42	63.86
Official duties & tax	5.09	0.20	376.06	15.04
Additional costs	0.53	0.02	14.34	0.57
Total DVA	**629.30**	**25.17**	**1,986.83**	**79.47**
Foreign costs	10.70	0.43	408.17	16.33
Total Shipment Value	**639.99**	**25.60**	**2,395.00**	**95.80**

102. The pie graphics below provide the composition of costs both at farm production and assembly level. These graphics show in a very clear way that domestic costs and mark-ups are by far the most important costs for cassava farm production in Mozambique, and official duties and foreign costs altogether increase for about 30% the total shipment value at the assembly level. This suggests that, while reducing domestic costs at the farm level can reduce total costs incurred by farmers, there is also need for intervention in reducing official duties and foreign costs, which can then contribute for a reduced price paid by final consumers.

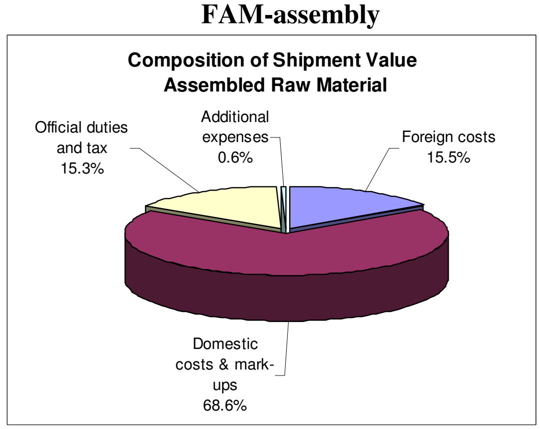
103. The composition of the shipment values shown in the pie charts below suggest that interventions aiming the reduction of domestic costs both at the farm gate and the assembly levels can have a significant impact in improving the competitiveness of cassava produced in Mozambique primarily as an import substitution but as an export product as well. As an export product, cassava or its derivatives can bring important gains to participants in the supply chain of this commodity as there are important opportunities especially in South Africa but also in other countries in the southern Africa region.

Figure 6: Cassava, Composition of Farm and Assembly Level Value Chain Indicators

FAM-farm

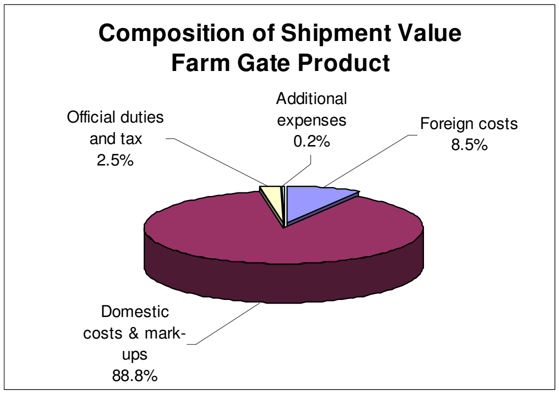


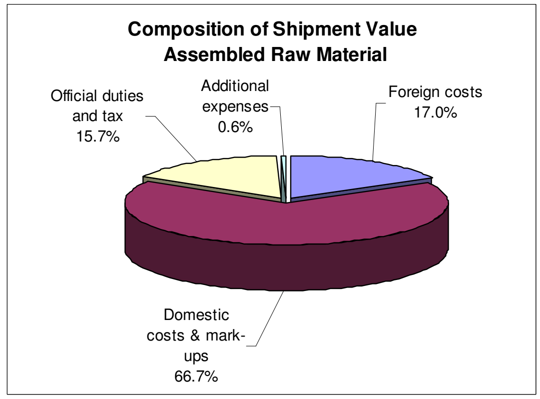
FAM-assembly



ECF-farm

ECF-assembly





104. **Parity price Comparisons**

105. Based on data supplied for CCAA by FAO, an approximate import per MT parity price for dry cassava delivered to final assembly point in Nacala, northern Mozambique, can be worked out as follows.

Dry cassava, FOB Rotterdam	MZN 1,400	USD 56.00
Plus shipping to Maputo	MZN 2,125	USD 85.00
Plus shipping to Nacala	MZN 2,250	USD 90.00
Equal Nacala Import Parity	MZN 5,775	USD 231.00

106. It is assumed that if cassava is to be imported from Rotterdam to northern Mozambique, the entry point will be Maputo, the most important commercial port in the country. This is suggested by institutions contacted as part of this study, who indicated that commercial imports usually enter Mozambique through Maputo, and then are shipped to other Mozambican ports like Beira and Nacala. Under this assumption, and based on the cost of USD 90.00 for shipping from Maputo to Nacala, the import parity price for cassava in Nacala is higher than the cost of locally produced cassava in the same market point. Because the total SV for cassava as an assembled raw material in Nacala is lower than the import parity price of similar product imported from Europe, it is very unlikely that northern Mozambique imports any cassava from northern Europe.

107. The challenge for Mozambique's cassava is not, in fact, perhaps looking at the import parity prices from northern Europe, but rather from other countries in Southern Africa or other important competitors in Latin America (Brazil) as it is becoming an important crop for industrial uses.

108. As an export commodity, on the other side, Mozambique would not be competitive in cassava since the per ton SV of dry tubers delivered only to Nacala is greater than the fob Rotterdam price. However, regional markets can be better explored as export destinations for Mozambique's cassava. South Africa's increased use and market for cassava and cassava products can be used as a potential for Mozambique's future investment and export opportunities.

B. Cotton

109. **Qualitative Overview**. Cotton has been one of the most important export cash crops in Mozambique's agriculture since the early 20th century. Mozambique's cotton history has always been characterized by direct state intervention since the colonial period due to the importance that has always been devoted to the crop. In the colonial period, cotton was farmed by small scale farmers

under geographical "concession" monopolies. Available information indicates that official records of cotton production in Mozambique started in 1931, and the highest volume was produced in the 1972/73 season, with nearly 145,000 MT produced.

110. Until the early 1960s, farming cotton in Mozambique was of the exclusive responsibility of smallholders, who were required sell solely to the geographic monopolist concession companies. This scenario, however, changed with the beginning of the liberation war in the mid-1960s, when the regime increasingly encouraged commercial farmers to compensate for the fall in the availability of seed cotton from small farmers (Tschirley, Ofiço and Boughton 2005:2). With the independence of the country in 1975, severe structural changes took place in the cotton sector, and both the market and production systems collapsed. The government responded by trying to reorganize production through communal villages and huge state-owned conglomerates and began to manage the facilities of the previous cotton companies while selling the output to new international customers. Due to administrative and technical problems compounded by the effects of the civil war support first by Rhodesia and later by the South African apartheid regime, the strategy failed and, by 1985, production fell to merely 5,200 tons (Lemaitre, Fok and Jeje 2002:47).

111. When Mozambique became independent in 1975, the government officially launched a centrally planned economy, nationalizing all the cotton companies in the country. At the same time, a civil war started, with strong impact in rural Mozambique and agricultural production. As a result of the combination of the centrally planned economy (with extremely low national capacity to run nationalized companies, combined with the civil war that destroyed the country's infrastructure and provoked disconnections between rural and urban areas with clear instability in rural areas and strong disincentives to agricultural production, cotton production collapsed and annual volumes decreased to around 10,000 MT by 1985.

112. In 1986, the government introduced joint venture companies, and cotton production was re-launched. With the end of the civil war in 1992, cotton production raises in the country, reaching 50,000 MT in 1995. This increase in production resulted primarily from expansion in planted area, due to the return of farmers to theirs traditional production areas. With the new political environment, the need for increased production brought "new" problems such as the need for credit. New investments in the sector (and in the agricultural sector as a whole) resulted in increased production. In 1999 the country produced 100,000 MT. However, yields remained stagnant. In 2000, the government announces "open concession system" for the cotton sector, and new companies enter. Expansion of planted area continues in several provinces, resulting in increased cotton production in the country. Comparably, new entering companies in general have better yields.

113. In 2000, new private companies either initiated activities in provinces other than the traditional cotton producers or took over the areas previously explored by others. For instance, Dunavant and Cottco started operating in Tete and Manica Provinces and Plexus took over the Lomaco concession area in Cabo Delgado. The new entrants also became monopolists in their areas and, hence, experienced little or no side selling and achieve nearly 100% loan repayments. Moreover, several have considerable regional experience and are strongly dedicated to improving output per hectare. "These firms in Sofala, Manica, Tete, and Zambezia provinces south of Nampula, and Cabo Delgado province directly north of Nampula, have steadily increased their productivity and production levels. [As a result,] by 2004, Nampula's share in national production had fallen under 40% and was set to fall still further during the 2004/05 season (Tschirley, Ofiço and Boughton 2005:41).

114. Currently, Mozambique's cotton sector still faces important challenges regardless of all structural changes. First, yields are among the lowest in Africa. To improve cotton production, Mozambique needs to increase yields and the quality of seed cotton; hence incentives to farmers need to be put in place for better taking advantage of their investments. Second, the country's ginning sector is either obsolete or not fully used. Along with low yields and low quality of seed cotton, Mozambique's ginning sector needs important improvements, which can result in better quality of the

country's lint. This requires additional efforts in agricultural and genetic research, and better mechanisms for input supply. Third, Mozambique's cotton sector needs to improve integrated investments in the supply chain. Currently, the country experiences insufficient research and extension services, poor input-distribution systems, improper planting and weeding, deficient and dangerous spraying, little or no fertilizer usage, expensive credit, comparatively low farm-gate prices, poor infrastructure, and obsolete, low-yield cotton gins with huge excess capacity.

115. The situation in Mozambique is, however, neither static nor uniform. Whereas, given the confusion and disorganization caused by side- selling, smallholders in Nampula Province average merely 300 kg/ha to 400 kg/ha, "CNA has achieved mean yields above 800 kg/ha each of the past three years, while other companies are situated around 500 kg/ha but with a rising trend … [due mainly to] imported seed and more effective extension assistance" (Tschirley, Ofiço and Boughton 2005:42). The Cotton Institute of Mozambique (IAM) has also been developing new varieties that can double smallholder yields to 600 kg/ha to 800 kg/ha. Hence, over the last seven or eight years, these diverse, largely uncoordinated efforts have introduced new, high-yield germ plasm and more is in the pipeline though a "lack of coordination of work with other companies or dissemination of results by public agencies" may well hamper their dissemination and adoption (Tschirley, Ofiço and Boughton 2005:32). By the 2004/5 season, 36% of all cotton came from CA324 while the previously popular Remu 40 had fallen to 36% and A637, to nil. In 2006/7, CA324 had risen further to around 40%, which is symptomatic of the new dynamic in the cotton sector.

116. Another problem is that, being risk and debt adverse, smallholders also tend to skimp on applying the recommended number of pesticide applications. To overcome this problem, "at least three companies—AGRIMO, CNA, and Dunavant—make insecticides available once for all treatments, making it 'compulsory' for the farmer to undertake the number of applications determined by the company". On the other hand, farmers complain frequently that the inputs or sprayers arrive late or in inadequate quantities. This is critical because adequate spraying increases output by 100% or more (GDC 2005:27). Compounding the problems of inadequate input delivery, the implicit interest rate charged by the concessionaires on loans for inputs "are clearly higher than is typical for operations of this type. Thus, despite operating with lower risks and, formally at least, no competition within their concessions, these companies do not seem to pass the benefits of their favorable market position to the smallholders" (IFAD 2003:29). A recent study by Global Development Solutions (GDS 2005:38) also found preliminary evidence suggesting that the cotton companies it studied may well be charging farmers more than double the actual cost of the insecticides supplied. The report suggested that this issue be thoroughly investigated.

117. The supply and extension systems are also failing in other ways. Free seed and inadequate extension systems encourage wastage. "Interviews revealed that … [some] farmers were found to be planting as many as 100 seeds in a single planting hole where only four to five seeds would have been adequate. Such wasteful practices continue to erode the cost structure of cotton companies in Mozambique" (GDS 2005:29). Moreover, the "mishandling of … pesticides is pervasive. A striking evidence is that not one of the more than 100 focus group farmers used protective measure during the handling and application of pesticides despite being aware of the potential hazard" (Tschirley, Ofiço and Boughton 2005:7 and 35). Farmers also tend to plant food crops early in the season and cotton later. This quite logical preference has, however, adverse implications for their cotton crop. Due to "this cropping pattern, the moisture content of cotton when … delivered to the ginnery is between 3% and 5% … [whereas it] should ... be between 7% and 9%. With a higher moisture content, there is less fiber damage and more volume to the cotton, which can translate to a GOT ratio of 36.0% to 36.5%." (GDS 2005:40). A further problem is that cotton from Mozambique is one of the most contaminated in the world, "preceded only by cotton from India, Pakistan, Turkey, Uganda, Tanzania and Uzbekistan", partly due to the harvesting methods and poor quality control and partly due to the ginneries (Lemaitre, Fok and Jeje 2002:12). Consequently, at the ginnery, additional cleaning is required, which increases losses by 2% (GDS 2005:41) Another problem—with repercussions for the ginneries—is that farmers do not use the same seed variety. Due to "poor post-harvest-handling practices, particularly during collection, [this] results in batch mixing, where cotton from different

seed varieties are mixed into a single batch." This lowers the ginner's outturn ratio (GDC 2005:30 and 41).

118. By law, the grading system for raw cotton has only two grades (1 and 2) but six for cotton lint and, in times of intense side-selling and pirate buying, even those grades are largely ignored (Tschirley, Fok and Jeje 2005:38). "As a result of the batch mixing and poor grading system, 99% of cotton purchased by cotton companies are graded between grades 1 and 2; however, when cotton is ginned, the resulting lint is a grade 4 or even a grade 6. At the same time, the cotton companies are required to pay the cotton farmer the fixed price for grade 1 cotton" (GDS 2005:30). Ironically, the lack of a nuanced grading system with good enforcement discourages both farmers and cotton companies from taking measures to improve quality. Moreover, due to the poor quality of lint, it traded at a 3.1% discount to Index A between 1999 and 2003 though "this discount [was] higher for some companies, while others traded near par" (Tschirley, Fok and Jeje 2005:38). Between 1995 and 1999, the quality of Mozambican lint fell steadily and the top grades (Extra and I) disappeared entirely (Fok, Bachelier and Gadaga 2004:19). In recent years, however, Mozambican lint has been improving in quality. For example, in 2003, nearly half qualified as Middling Plus as against 23% in 2002, 30% in 2001 and merely 9% in 2000 while, over the same period, the worst grades—V, VI and inferior—have fallen from 12% of total production to nil. A further advantage is that "according to interviews, between 63% to 77% of production achieve fiber length of 2.8575 cm, while 21% to 35 % of production results in fiber length of 2.7781 cm. Taking into account that many African cotton producers are only able to achieve fiber length of less than 2.6 cm, the quality of cotton fiber produced in Mozambique is considered competitive" (GDS 2005:18).

119. This said, the current grading system remains outmoded. The cotton world, propelled by the technological exigencies for stricter consistency required by high-speed, high-quality spinning and weaving, is moving toward Standardized Instrument Testing of Cotton (SITC) to measure additional quality dimensions and improve consistency in grading. To achieve this, IAM seems to favor centralized grading since "reliable grading of cotton creates confidence among international buyers and thus creates benefits for all exporters" though some of the cotton companies disagree (Tschirley, Fok and Jeje 2005:39). IAM's position accords with a recent analysis by Poulton et al. (2004:522) who argued that "quality-control regulations and procedures are critical to the long-run success of a cash crop system. … However, where liberalization has led to more dispersed purchases by private agents, public quality control mechanisms have largely collapsed." Till now, that seems to be Mozambique's situation. The present grading lacks the rigor and consistency required to create a solid reputation—and, hence, preference and premium—for Mozambican cotton (Fok, Bachelier and Gadaga 2004).

120. **Farm production**. Mozambique has a long history of cotton farm production. Historically, northern Mozambique, especially Nampula and Cabo Delgado province, has always been the most important farm production area, contributing with the highest cultivated area, total volume produced and investment in ginning factories. In recent years, however, these two provinces have recorded some of the lowest yields in the country, and a number of ginning units are facing problems of underutilized capacity or obsolete machinery.

121. As shown in Table 20, northern Mozambique, especially Nampula and Cabo Delgado, has always contributed with the highest levels of cotton production in the country at the farm level. In fact, Nampula and Cabo Delgado provinces have always been the most important cotton producers in Mozambique for decades.

Table 20: Cotton Production in Mozambique, 1999/00 – 2006/07

Region	Annual Production (Tons)							
	99/00	00/01	01/02	02/03	03/04	04/05	05/06	06/07
Northern Mozambique	26,182	59,307	65,809	36,255	67,704	52,052	90,779	59,779
Central Mozambique	9,082	11,633	18,860	17,754	25,391	26,631	31,422	40,000
Southern Mozambique	131	108	6	135	110	-	20	170
National	35,395	71,048	84,675	54,144	93,205	78,683	122,287	99,949

Source: Mozambique Cotton Institute, Ministry of Agriculture

122. Table 21 shows that, given dynamics in cotton production in Mozambique, provinces other than Nampula and Cabo Delgado are emerging with better yields and thus with some potential for further contributing for a better performance of the cotton sector in the country. In fact, while Nampula and Cabo Delgado together contribute for more than 50% of Mozambique's cotton production and more than 60% of small scale farmers producing cotton, they have record lower yields than Manica, Sofala and Tete provinces. This reduction in Nampula and Cabo Delgado's geographical share of cotton performance reflects a long-term structural shift in the industry. Whereas, in 1991/92, the southern part of the country produced 25% of all seed cotton, by 1999/2000 it produced none. Its large-scale projects had collapsed. During the same period, production in central Mozambique rose from 6% to 26%. Similarly and partly related to those shifts, the share of production organized through farmers' associations rose from nil in 1991/92 to 25.7% in 1999/2000 (surging in 1998 and 1999 and, then, almost exclusively in Nampula and Cabo Delgado Provinces where population densities are higher) and has probably risen yet more in subsequent years while direct large-scale cotton farming fell from 37.6% to 2.6% and that of private commercial farmers from 18.2% to 5.1% (Lemaitre, Fok and Jeje 2002:49 and 50). International price pressures have apparently eliminated large-scale direct farming by the cotton concessionaire firms, which now prefer to rely on small farmers (when possible in associations) since they endure, albeit grudgingly, the price pressures.

Table 21: Summary of cotton production in Mozambique, 2006/07

Province	Area Planted (Ha)		Number of Farmers		Yields (Ton/Ha)	Production (Ton)	
Niassa	14,775	7.79%	20,487	7.79%	0.48	7,064	7.07%
Cabo Delgado	57,667	30.42%	78,094	29.68%	0.39	22,728	22.74%
Nampula	54,310	28.65%	84,971	32.29%	0.55	29,987	30.00%
Zambezia	21,213	11.19%	34,593	13.15%	0.48	10,177	10.18%
Tete	20,213	10.66%	19,787	7.52%	0.57	11,622	11.63%
Sofala	15,690	8.28%	20,885	7.94%	0.86	13,511	13.52%
Manica	5,001	2.64%	3,473	1.32%	0.94	4,690	4.69%
Inhambane	628	0.33%	741	0.28%	0.24	150	0.15%
Gaza	82	0.04%	78	0.03%	0.24	20	0.02%
Maputo	0	0.00%	0	0.00%	0	0	0.00%
National	189,579	100.00%	263,109	100.00%	0.53	99,949	100.00%

Source: Mozambique Cotton Institute, Ministry of Agriculture

123. **The Concession System**. Table 22 shows concession companies and new operators in currently Mozambique.

124. During the colonial period, the introduction of cotton production in Mozambique was characterized by strong interest, by the colonial authorities, to ensure its cultivation under a highly performing system. Hence private concessions were created to ensure geographical monopolies for controlling production, trading and ginning in all selected cotton belts and further export lint mainly to Portugal. (Tschirley et al, 2006: 6). A key feature of Mozambique's concession systems, an in fact the center of Mozambique's concession system, was the financing mechanisms to farmer's access to inputs. But while ensuring production, the concession system also highly determined the real effort

that farmers devoted to produce cotton. Introduction of other, more liberalized cash crops, suggest that some farmers can easily examine alternative crops for their cash earnings. This reality is even stronger in the traditional cotton belts of Nampula and Cabo Delgado Provinces.

125. In the first years of Mozambique's Independence, the concession system was discontinued and the companies were nationalized under the newly adopted system of centrally planned economy. But the problems that resulted from the new structural changes implied a review of the centrally planned economy model, allowing the re-introduction of the concession system. Currently, the concession system is inspired in the system that existed in the colonial period, and at least 10 concession companies operate in Mozambique's cotton sector. All the concession companies are required to inform, ahead of time, their plans for cotton production in each season (Horus, 2004:13). The rules for promoting cotton production in each "concession" include the limitation of each concession company to buy cotton exclusively from the farmers they worked with in the season. Most of the concessions work with 15,000 to 25,000 smallholder farmers, but at least one has nearly 60,000 farmers, while other have less than 3,000. In general, the geographical "concession" can last for 5-year tacit-renewable contracts. In general, all the concession companies are lined with similar rights, requirements and obligations. For instance, they all must have their own extension services and agents, must distribute inputs (seed, pesticides) and services in a timely manner, must purchase from all farmers in their geographical areas, and must receive, store and process cotton from autonomous producers. The concessions companies have the right to be the exclusive buyers in their concession areas, and can export lint to international markets.

Table 22: Concession Companies in Mozambique, 2006/07

Company	Province	Planted Area		Nr. Of Farmers		Production	
		Ha	(%)	Nr.	(%)	Tons	(%)
SAN	Niassa	14,775	7.80	20,487	7.79	7,064	7.07
	Nampula	6,641	3.51	8,585	3.26	4,023	4.03
PLEXUS	Cabo Delgado	57,645	30.43	78,093	29.68	22,693	22.70
SANAM	Nampula	22,368	11.81	45,111	17.15	11,987	11.99
CANAM	Nampula	22,451	11.85	28,572	10.86	12,427	12.43
DUNAVANT	Zambezia	14,188	7.49	20,043	7.62	7,736	7.74
	Tete	16,016	8.45	16,317	6.20	8,264	8.27
MOCOTEX	Zambezia	2,575	1.36	5,650	2.15	1,106	1.11
E.A.V.Z	Tete	4,197	2.22	3,470	1.32	3,358	3.36
	Manica	3,851	2.03	1,783	0.68	3,765	3.77
C.N.A	Sofala	15,690	8.28	20,885	7.94	13,511	13.52
	Manica	1,150	0.61	1,690	0.64	925	0.93
Empresa Algodoeira de mocambique	Inhambane	628	0.33	741	0.28	150	0.15
	Gaza	82	0.04	78	0.03	20	0.02
New Operators	Nampula	2,700	1.43	2,700	1.03	1,550	1.55
	Zambezia	4,450	2.35	8,900	3.38	1,335	1.34
Autonomous	Cabo Delgado	22	0.01	1	0.00	35	0.04
T O T A L		189,429	100.00	263,106	100.00	99,949	100.00

Source: Mozambique Cotton Institute, Ministry of Agriculture

126. **Autonomous Producers**. Starting in 2002, new buyers started entering the cotton industry in Mozambique, with no specific concessions. This resulted in perceived problems by the concession companies on the one hand, but also the need for increased thinking on the need for new arrangements for the increase of prices to farmers, the whole advantages and constraints of the concession system, and the need for increased prices to farmers for better competitiveness at the farm gate. The entrance of international companies (Dunavant, Plexus, etc) either in areas previously under traditional Portuguese concessions (e.g. southern Cabo Delgado province) or in areas less traditional in cotton

production (e.g. Tete and Zambezia provinces) resulted in new, better concession practices and consequently higher yields. There are important dynamics that should be followed in Mozambique concession system and firms that need to be tracked over the near future. For instance, in Nampula province, some of the traditionally important concession companies such as CANAM are losing their concession areas in favor of new companies. A second example is that areas where small farmers are contractually linked to new entering companies (either multinationals or local new operators) tend to have higher yields than those contractually linked to the traditional concession firms.

127. **Processing**. Mozambique has a long domestic ginning history. Historically, each concession company has always had at least one ginning unit to allow domestic processing of seed cotton. In addition to strengthening vertical coordination/integration from seed cotton production to export of lint, this adds value and enhances international competitiveness of the sector as a whole. Given that historically all seed cotton has always been processed in the country, evolution of lint production has been correlated with that of seed cotton production.

128. Currently, there is no evidence that the ginnery stage is the key point affecting Mozambique's ability to compete in the international market in spite of obsolete machinery in most of the ginneries. The ginning industry's ability to compete internationally—despite all its problems—suggests that improvements along various points in the value chain would greatly enhance its international competitive advantage. Indeed, in recent years, the industry has been attracting new investors with improved technologies and managerial systems. Mozambique's ginneries also benefited from the joint-venture companies. "By 1995, there were four joint-ventures and six private companies, with the former concentrated in the 'cotton belt' region of Nampula and southern Cabo Delgado Provinces and the latter distributed over western Nampula, and the provinces of Zambezia, Sofala, and Manica to the south of Nampula" (Tschirley, Ofiço and Boughton 2005:4).

129. Regardless of its long experience in cotton production and processing, Mozambique's current processing and the existence of limited problems specifically attached to the ginning stage in Mozambique's cotton industry, ginneries current operation is characterized by a low ginning outturn, as a result of a combination of technical and policy factors. An example of technical problem is the low quality of seed cotton and the obsolete machinery used in most of the ginning factories. On the political side, the appearance of independent buyers in recent years resulted in side selling of seed cotton by farmers who had received financial assistance from concessionaire companies, reducing the ability of the companies for ginning as expected. In intensively contested zones, new buyers typically paid 7% or 8% more than the concessionaires (Pitoro 2001:21).

130. In spite of identified problems, Mozambique's ginning industry survives mainly because (i) since Mozambique is a coastal country, the distances from farm to port are shorter than in many other African countries, (ii) the farmers' direct costs (including hired labor) per hectare and per kilo are extremely low by international standards, and (iii) Mozambican farmers seem to stick with cotton growing, despite its low profitability per hectare, because the system guarantees inputs, announces before planting the minimum price farmers will receive for their seed cotton, and secures the post-harvest market outlets, thereby drastically reducing the farmers' risks and ensuring that they will receive at least some annual cash income. Such guarantees are not available for other crops except tobacco (de Sousa 2005:20).

131. **The Role of Farmer Associations**. When cohesive and well managed, the farmers' associations reduce costs for input distribution, quality control, and output marketing while also reducing side-selling and improving debt recovery. Together, the farmers also have more power in their negotiations for better services and premium prices. And that they need! In Mozambique, the farm-gate prices that the concessionaires pay for seed cotton are "the lowest in the region". For example, between 1998 and 2002, the average farm-gate price was \$0.16/kg in Mozambique but \$0.22/kg in Uganda, Tanzania and Zambia and \$0.25/kg in Zimbabwe though all but Tanzania are inland countries (de Sousa 2005:23). As a consequence, the return to family labor day was merely \$0.51 in Mozambique (less than half the agricultural minimum wage) but \$0.81 in Zambia, \$0.82 in

Tanzania, and $1.39 in Zimbabwe. Nevertheless, "when compared to the average world market price, after deducting freight and average quality discount for Mozambique origin, cotton is still slightly profitable despite poor productivity at the farm level. The domestic resource cost [ratio] is 0.76 f.o.b., showing a slight comparative advantage", which, of course, is vulnerable to the international price fluctuations for cotton lint (World Bank 2006c:118).

132. **Main Challenges**. There are important challenges in Mozambique's cotton industry. First, price pressures are one of the constraints faced by small cotton farmers. The concessionaires provide no support for fertilizers, preferring instead to rely on crop rotation, fallow periods, and the clearing of virgin lands to maintain minimal fertility levels. The farmers are also plagued by the lack of inadequate extension services and low yields in large part due to "stagnant varietal development (the varieties predominantly in use through the 2003/04 season were released approximately 30 years ago)", namely, Remu 40 and A637 (Tschirley, Ofiço and Boughton 2005:31 and 41). During the 1990s, the average yield among family farmers was 350 kg/ha to 400 kg/ha compared to about 1,000 kg/ha in French-speaking West Africa, 700 kg/ha in Zimbabwe, and 600 kg/ha in Zambia (Lemaitre, Fok and Jeje 2002:54; Tschirley, Ofiço and Boughton 2005:41).

133. Secondly, ginning presents considerable inefficiencies. Of 24 installed gins, only 11 are operational and, except for two new gins operated by SANAM and AGRIMO, all have obsolete "saw gins originally installed in the 1940s and 1950s and rehabilitated beginning in the late 1980s" (Tschirley, Fok and Jeje 2005:39). For more than 35 years, Mozambique's ginning outturn has been stagnant from 32% to 35% whereas the average outturn in French Africa is 42%, in Zimbabwe, 40%, and Zambia, 38% (Lemaitre, Fok and Jeje 2002:55). The ginners have an operational capacity to gin between 230,000 tons on the basis of 24 hrs/day, 100 days per year, a capacity that far exceeds seed cotton production, which, in the last ten years, has never exceeded 116,000 t. With capacity more than double present requirements, fixed unit costs are high. With a scarcity of ginning technicians, maintenance is also poor. Costs are further aggravated since most gins supply their own electricity for lack of a reliable alternative (Tschirley, Fok and Jeje 2005:39). Since few have modern systems and machines to control moisture, permit gentle drying, and condition the lint, which improve the lint's quality and value, they cannot establish a reputation for good, consistent quality that decreases the problems experienced by spinners and weavers thereby increasing efficiency and decreasing per unit costs. Indeed, value goes beyond the classing data, reputation counts and is **paid for** too. That is a target worth aiming for.[19]

134. Third, the cotton value chain has been further handicapped by the collapse of the spinning, weaving, and garment industries in the 1990s and early 2000s largely due to inadequate capital and technical and managerial skills. Even when the African Growth and Opportunity Act was enacted, the government delayed too long to get its visa under the act and, when it finally did so, no spinner and only one garment producer benefited substantially and latter still shut its doors after a few years (Coughlin 2000 and 2001). As yet, no new investors have appeared to revive these industries.

135. As an export product, Mozambique's cotton lint has a long history in accessing important international markets in Europe and Asia. Regardless of low yields, there have been considerable dynamics in Mozambique's cotton sector, characterized by the entry of new concession companies and investments in geographic areas outside Mozambique's traditional cotton belt of Nampula and Cabo Delgado Provinces.

136. In summary, the cotton sector may well be entering a new epoch technologically and organizationally. The proliferation of new cotton concessionaire companies, several with systems proven to enhance productivity elsewhere in the region, plus the ongoing improvement and diversification of the germ plasm and cotton varieties available may well increase the relative profitability of cotton growing, ginning and merchandizing, i.e., the entire value chain. The existence of these new, more efficient entrants plus the institution of a system for stricter evaluation of the

[19] www.certifiedcotton.com

concessionaires' performance coupled with a requirement to periodically re-open their areas for public bidding should improve performance as well as farm-gate prices and other developmental benefits realized by farmers. Underperformers will be pushed to improve under threat of loss of their concessions. Indeed, the recent grants of concession rights to Cottco (Zimbabwe) and Dunavant (Zambia) in Tete Province may represent a turning point in terms of investors' profile and quality. Unlike other operators, these two companies have a strong track record in promoting smallholder cotton growing in their respective countries using innovative input and extension delivery models and rigorous credit screening practices, and their move into Mozambique may constitute a source of innovation and good practice from which other companies can learn (de Sousa 2005:22).

137. Evidence of this new competitive dynamics already exists. After the sharp downturn of 1998, production has been growing significantly. Furthermore, "Dunavant has … purchased the AGRIMO concession and expects to more than triple production in it during 2004/05. Cottco has grown production rapidly over two years in its concession areas in Manica and Tete provinces, and expresses an interest in expanding outside this area. If these companies, along with CNA and Plexus, have the financial resources to expand geographically, then IAM's job instituting the strengthened regulatory approach may, at least over the next two to three years, be substantially facilitated" (Tschirley, Ofiço and Boughton 2005:42 and 43).

138. **Quantitative Assumptions.** The quantitative analysis for cotton production in Mozambique is based on FAM and ECF production in northern Mozambique. The main assumptions used for the analysis of cotton are summarized in Table 22. Farm production is based in central, northern and western Nampula and cotton lint is delivered to the port of Nacala for international shipping as a global export. Information on the value of cotton seed was not available and this byproduct is not specifically included in calculations presented here. Despite the greater yield and better overall management, fewer days of total labor are required at the ECF level because farmers at this level use oxen for cultivation instead of hand hoe. Farm yield assumptions are based on different studies carried out in northern Mozambique, and represent a realistic farm management scenario in Nampula province. FAM yields are assumed to be 0.57 tons per hectare, while ECF farmers have higher yields (2.50 MT per hectare) as result of better farm management practices.

Table 22: Cotton, Main Value Chain Assumptions

Sector	Yield (MT seed cotton/ha)	Farm Inputs	Concessionaire		Final Delivery
			Assembly	Processing	
FAM	0.57	From concession: seed, basic insecticide, spraying service (maybe) Farmer inputs: Batteries for sprayer, 115 days total labor (est. 85 days family + 30 days hired)	Buy and bale loose seed cotton at rural depot. Deliver 50km to own ginnery (+40% premium for loosely packed seed cotton)	35% GOT (seed output and price for seed not known)	Lint 220km from ginnery to port at Nacala (+30% premium for baled lint)
ECF	0.80	From concession: seed, basic insecticide, spraying service (maybe) Farmer inputs: Batteries for sprayer, extra chemicals, 80 days total labor (est. 65 days family + 15 days hired)			

139. As indicated above, an important feature of the cotton system is that farmers are meant to receive a minimum set of inputs from the concession company operating in their area. This system does not always work effectively (especially with regard to the provision of insecticide and loan of hand sprayers), but when it does, provides cotton farmers an important advantage since the cost of these inputs does not have to be paid for up-front.

140. Another important feature of Mozambique's cotton sector is that the assembly and processing operations are treated as a vertically integrated system managed by the concession. Because the firm is responsible for collecting cotton from smallholder growers, the price for unprocessed seed cotton delivered to the gin gate is purely an internal matter for the concession holder. The approach, therefore, was to set the price at assembly equal to total costs thereby rolling the calculation of financial profits for the concessionaire forward to the processing stage where an observed ex-factory gate price was available. Distribution is normally also managed by the concessionaire and at this stage, it is assumed that the agent receives export parity. A summary of all price assumptions used for the analysis of cotton is given below. The blue shading for the price at assembly is indicates this is an internal price for the concession.

Table 23: Cotton, Summary of Commodity Price Assumptions

	MZN per MT	USD per MT	Product Form	Location
Farm gate price	5,300	212.00	loose seed cotton	Nampula rural
Assembled raw material*	5,493	219.72	baled seed cotton	Ginnery (Nampula)
Ex-factory price				
Lint	25,375	1,015.00	Lint (35%)	Ginnery (Nampula)
Seed	2,400	96.00	Seed (58%)	Ginnery (Nampula)
Trash	-	-	Trash (7%)	Ginnery (Nampula)
Final traded price				
Lint	26,125	1,045.00	Lint at port	Nacala
Seed	??	??	Seed at feed mill	Nampula
Trash	-	-	Trash	Disposed at gin

*/ Denotes internal price equal to total accumulated costs

141. **Farm production.** Financial indicators for per hectare and per ton cotton farm production are summarized below. Similar to cassava and all the other crops included in this study, the financial data on cotton farm production do not include a value for family labor, which is only counted in a broader economic sense by the value chain indicators. As indicated in Table 24, it costs about 30% more for a FAM farmer to produce a ton of cassava than an ECF sector grower, due especially to higher variable costs faced by FAM type of farmer. However, farm incomes per MT and per hectare are higher among ECF farmers as a result of higher yields.

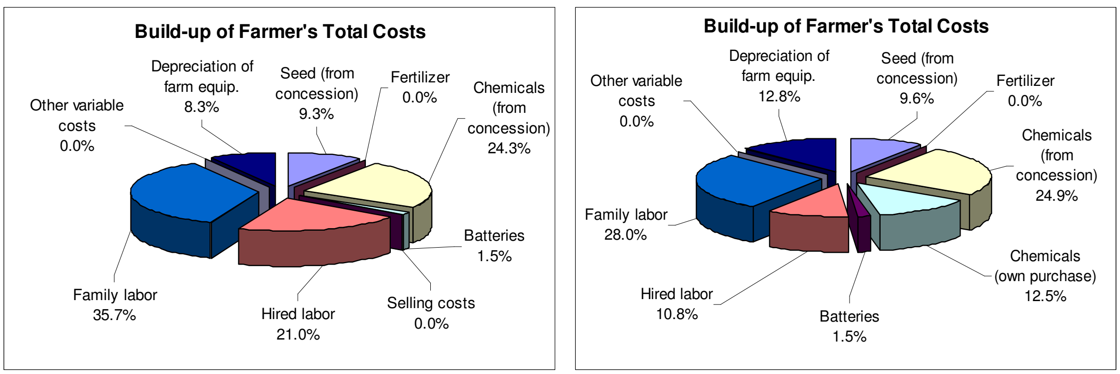
Table 24: Cotton, per Hectare and per MT Farm-Level Financial Indicators

FARM PRODUCTION Cotton (FAM)	Per Hectare		Per Ton	
	MZN	USD	MZN	USD
Gross revenue (yield * price)	**3,021**	**120.84**	**5,300**	**212.00**
Production costs				
Variable costs	962	38.48	1,688	67.51
Investment costs	142	5.69	250	9.98
Total costs	**1,104**	**44.17**	**1,937**	**77.49**
Farmer income				
Gross margin (revenue - var costs)	**2,059**	**82.36**	**3,612**	**144.49**
Net profit (gross margin - invest costs)	**1,917**	**76.67**	**3,363**	**134.51**

FARM PRODUCTION Cotton (ECF)	Per Hectare		Per Ton	
	MZN	USD	MZN	USD
Gross revenue (yield * price)	4,240	169.60	5,300	212.00
Production costs				
Variable costs	991	39.62	1,238	49.53
Investment costs	213	8.54	267	10.67
Total costs	**1,204**	**48.16**	**1,505**	**60.20**
Farmer income				
Gross margin (revenue - var costs)	**3,250**	**129.98**	**4,062**	**162.48**
Net profit (gross margin - invest costs)	**3,036**	**121.44**	**3,795**	**151.80**

Figure 7: Cotton, Composition of Farm-level Costs

FAM **ECF**



142. **Assembly, processing and distribution.** Financial indicators for all value chain stages (including farm production) are summarized below. As described, assembly and processing are treated as vertically integrated operations managed by the concession holders. In practice, the concessionaire is also normally responsible for distribution of cotton up to the final place of export (in this case the port of Nacala), but because a distinct ex gin gate price for lint was available, separate calculations of cost and profitability were made for these two stages. At the final delivery point cotton lint is sold for export parity.

Table 25: Cotton, per MT Financial Costs and Profits (all stages)

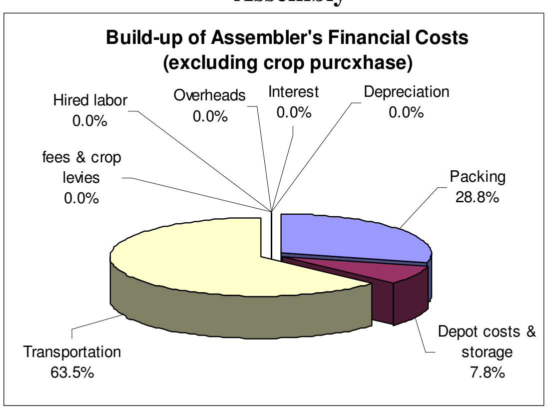
Cotton (FAM)	FARM GATE PRODUCT		ASSEMBLED RAW MATERIAL		PROCESSED RAW MATERIAL		TRADED FINAL PRODUCT (Lint)	
	MZN	USD	MZN	USD	MZN	USD	MZN	USD
Gross revenue	**5,300**	**212.00**	**5,493**	**219.72**	**10,273**	**410.93**	**26,125**	**1,045.00**
Production costs								
Crop purchase		-	5,300	212.00	5,493	219.72	25,375	1,015.00
Other variable costs	1,688	67.51	193	7.72	2,187	87.48	526	21.02
Investment costs	250	9.98	-	-	200	8.00	75	3.00
Total costs	**1,937**	**77.49**	**5,493**	**219.72**	**7,880**	**315.20**	**25,976**	**1,039.02**
Final income								
Gross margin	3,612	144.49	-	-	2,593	103.73	225	8.98
Net profit	**3,363**	**134.51**	**-**	**-**	**2,393**	**95.73**	**150**	**5.98**
Rates of return								
Gross margin/total VC		2.14		0.00		0.34		0.01
Net profit/total costs		1.74		0.00		0.30		0.01

Cotton (ECF)	FARM GATE PRODUCT		ASSEMBLED RAW MATERIAL		PROCESSED RAW MATERIAL		TRADED FINAL PRODUCT (Lint)	
	MZN	USD	MZN	USD	MZN	USD	MZN	USD
Gross revenue	**5,300**	**212.00**	**5,493**	**219.72**	**10,273**	**410.93**	**26,125**	**1,045.00**
Production costs								
Crop purchase		-	5,300	212.00	5,493	219.72	25,375	1,015.00
Other variable costs	1,238	49.53	193	7.72	2,187	87.48	526	21.02
Investment costs	267	10.67	-	-	200	8.00	75	3.00
Total costs	**1,505**	**60.20**	**5,493**	**219.72**	**7,880**	**315.20**	**25,976**	**1,039.02**
Final income								
Gross margin	4,062	162.48	-	-	2,593	103.73	225	8.98
Net profit	**3,795**	**151.80**	**-**	**-**	**2,393**	**95.73**	**150**	**5.98**
Rates of return								
Gross margin/total VC		3.28		0.00		0.34		0.01
Net profit/total costs		2.52		0.00		0.30		0.01

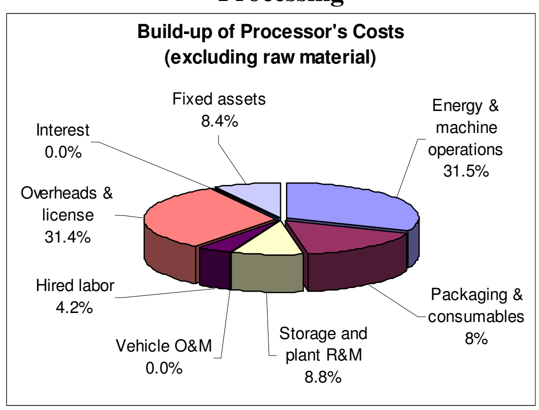
- **Extremely attractive returns to farm production.** These are excellent in all cases and appear to improve significantly at the ECF level, suggesting that investments in improved production would be very appealing to small producers. Even without investing in ox drawn cultivation, the data suggest that hand hoe farmers could also benefit from adopting improved practices.
- **Gross and net profits for assembly equal zero.** This is because the operation is internal to the concession holder and the price paid to the assembler has been set equal to total costs. Profits at the ginning stage, therefore, are inclusive of both the assembly and processing-level operations.
-

Figure 8: Cotton, Composition of Assembly, Processing and Final Distribution Costs

Assembly



Processing



Distribution

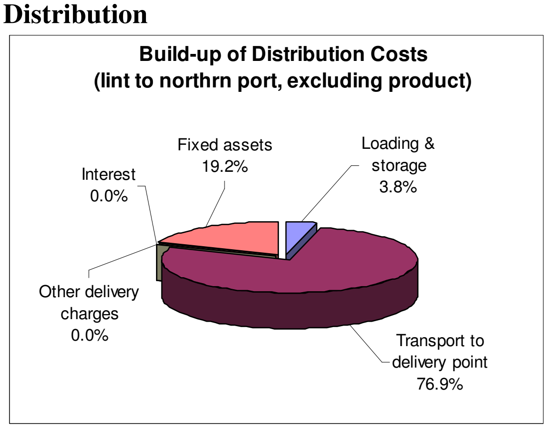


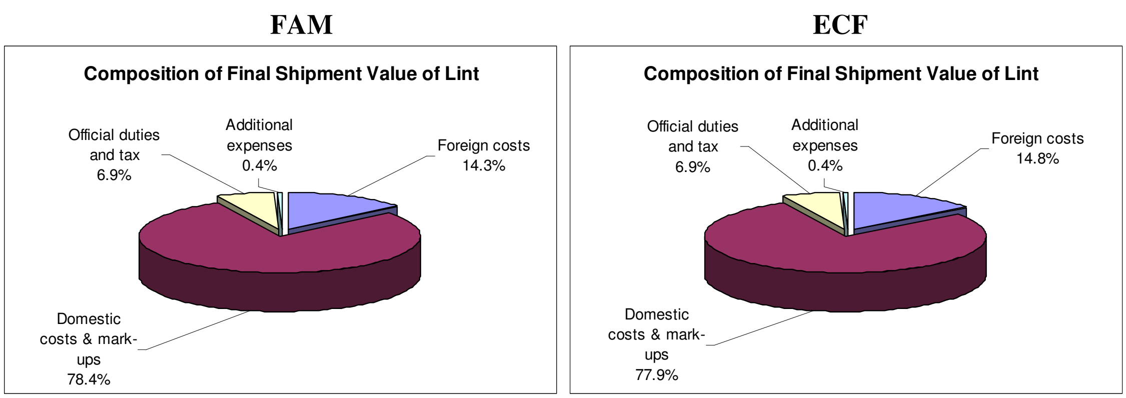
Table 26: Cotton, per MT Value Chain Indicators

Cotton (FAM)	FARM GATE PRODUCT		ASSEMBLED RAW MATERIAL		PROCESSED RAW MATERIAL		TRADED FINAL PRODUCT (Lint)	
	MZN	USD	MZN	USD	MZN	USD	MZN	USD
Domestic Value Added								
Costs & mark-ups	2,447	97.90	4,784	191.35	6,110	244.40	20,410	816.42
Official duties & tax	39	1.55	112	4.47	543	21.72	1,789	71.55
Additional costs	5	0.21	7	0.29	36	1.45	112	4.47
Total DVA	**2,492**	**99.66**	**4,903**	**196.11**	**6,689**	**267.57**	**22,311**	**892.44**
Foreign costs	519	20.78	590	23.62	1,195	47.79	3,715	148.58
Total Shipment Value	**3,011**	**120.44**	**5,493**	**219.72**	**7,884**	**315.36**	**26,026**	**1,041.02**

Cotton (ECF)	FARM GATE PRODUCT		ASSEMBLED RAW MATERIAL		PROCESSED RAW MATERIAL		TRADED FINAL PRODUCT (Lint)	
	MZN	USD	MZN	USD	MZN	USD	MZN	USD
Domestic Value Added								
Costs & mark-ups	2,447	97.90	4,740	189.58	6,066	242.63	20,284	811.36
Official duties & tax	39	1.55	110	4.41	541	21.66	1,785	71.39
Additional costs	5	0.21	7	0.29	36	1.46	112	4.48
Total DVA	**2,492**	**99.66**	**4,857**	**194.28**	**6,644**	**265.74**	**22,181**	**887.23**
Foreign costs	519	20.78	636	25.44	1,240	49.62	3,845	153.79
Total Shipment Value	**3,011**	**120.44**	**5,493**	**219.72**	**7,884**	**315.36**	**26,026**	**1,041.02**

143. The composition of final SV for lint delivered to the port of Nacala for export is summarized below for the FAM and ECF value chains. As shown, the final composition works out to be very similar for both farm sectors, only that there is a slightly higher foreign component in the ECF product because of the additional use of insecticides and other inputs with a higher foreign exchange component at the farm level. Otherwise, all other costs from assembly through to processing and distribution are identical leading to very similar results for the two farm sectors as shown.

Figure 9: Cotton, Composition of Final SV for Lint at International Port



144. **Parity price comparisons.**

- Based on Cotlook Index A, the estimated export parity price for lint at the port of Nacala is MZN 26,125 (USD 1,045) per MT.
- The estimated SV comes in slightly below this figure at MZN 26,026 (USD 1,041) per MT, showing that Mozambique is competitive at current price levels, but only just.
- If global lint prices continue to fall, the domestic industry may struggle without process improvements that help to reduce farm costs and improve the ginning outturn ratio. At only 35%, the GOT in Mozambique is very low, even by African standards. Efforts to increase this to something closer to 40-41% (as is now being achieved in Zambia) are surely an important challenge for future competitiveness.

C. Maize

Production and Overall Importance. Maize is Mozambique's most important food crop but yields are low and, of the land dedicated to maize, only 5% is planted with improved seeds though these could greatly enhance production. Nevertheless, various studies have shown that improved technologies are risky and render low or negative net results **unless** combined with a strategy of delaying sales by five or six months to achieve, on average, significantly higher prices.[20] This, of course, requires capital and investment in storage.

Table 27: Area Cultivated for Maize in Mozambique, 1993/94 – 2006/07

Province	Annual Cultivated land ('000 Hectare)													
	93/94	94/95	95/96	96/97	97/98	98/99	99/00	00/01	01/02	02/03	03/04	04/05	05/06	06/07
Cabo Delgado	59.78	64.01	66.74	67.75	67.40	67.48	79.31	85.84	87.23	88.80	90.58	92.42	94.70	96.45
Niassa	112.89	120.89	123.98	134.87	132.23	113.17	115.86	132.38	135.86	139.36	143.24	147.88	151.53	164.80
Nampula	93.61	106.74	110.09	122.25	124.89	122.36	111.50	125.35	116.83	118.42	121.17	125.31	127.91	133.08
Zambezia	147.32	174.07	184.94	194.55	203.56	194.80	189.96	207.35	210.18	215.54	220.89	225.18	231.10	235.69
Tete	92.80	102.68	116.12	146.21	158.55	166.95	143.91	163.33	167.11	171.04	177.37	183.61	188.98	194.30
Manica	114.62	126.85	127.88	130.75	169.25	176.86	161.33	196.12	200.46	207.55	213.01	222.91	229.88	236.77
Sofala	74.97	83.56	84.60	91.91	81.73	80.19	78.43	91.87	89.16	93.37	95.91	101.82	104.16	108.17
Inhambane	110.94	122.49	124.58	126.08	121.84	103.30	106.52	108.78	111.09	113.15	115.69	120.03	120.76	122.74
Gaza	92.24	111.35	106.64	114.76	121.79	93.78	123.56	140.82	143.46	144.22	151.43	150.28	151.28	165.36
Maputo	57.81	67.80	67.69	69.77	66.08	61.98	65.61	76.17	65.13	64.72	64.63	70.12	70.73	74.54
National	956.98	1080.44	1113.26	1198.89	1247.31	1180.87	1175.98	1328.02	1326.51	1356.18	1393.93	1439.56	1471.03	1531.90

Source: Ministry of Agriculture, Early Warning Unit

Table 28: Maize Yields in Mozambique, 1993/94 – 2006/07

Province	Annual Yields (Tons per Hectare)													
	93/94	94/95	95/96	96/97	97/98	98/99	99/00	00/01	01/02	02/03	03/04	04/05	05/06	06/07
Cabo Delgado	0.75	1.21	1.22	0.92	1.45	0.85	0.63	0.82	1.21	1.50	1.50	1.51	1.62	1.67
Niassa	0.70	1.10	1.31	1.30	1.31	1.28	1.05	1.01	1.31	1.43	1.43	1.49	1.72	1.60
Nampula	0.44	0.80	0.92	0.96	0.96	1.06	0.96	0.98	0.96	1.14	1.12	1.24	1.25	1.24
Zambezia	0.62	1.00	0.99	0.98	1.04	0.99	0.88	0.94	1.24	1.23	1.26	1.11	1.24	1.29
Tete	0.49	0.35	0.80	0.86	0.79	1.06	0.97	0.92	1.06	1.06	1.06	0.98	1.09	1.22
Manica	0.89	0.60	1.21	1.22	0.94	1.47	1.19	1.05	1.04	0.85	1.14	0.80	1.05	1.14
Sofala	0.70	0.70	0.76	0.70	0.88	1.31	0.95	0.87	0.79	0.86	0.90	0.84	0.71	0.74
Inhambane	0.34	0.40	0.53	0.38	0.49	1.01	0.78	0.70	0.36	0.25	0.37	0.31	0.44	0.28
Gaza	0.26	0.21	0.25	0.53	0.61	0.41	0.43	0.47	0.36	0.21	0.62	0.37	0.39	0.32
Maputo	0.14	0.30	0.23	0.53	0.46	0.58	0.46	0.75	0.50	0.24	0.44	0.46	0.57	0.17
National	0.55	0.68	0.85	0.87	0.90	1.06	0.87	0.87	0.93	0.92	1.03	0.93	1.04	1.03

Source: Ministry of Agriculture, Early Warning Unit

145. **The alternative** is to have efficient storage in the hands of merchants whose arbitrage would reduce the seasonal price swings and commodity flow reversals common in central and northern Mozambique whereby maize exporting zones turn to importing maize during the 'hungry season' a few months before each harvest, a pattern "typically associated with inefficient storage" (de Sousa 2006:14). Indeed, de much of South Africa's comparative advantage as a regional maize exporter arises because, in South Africa, capital is cheaper and grain storage is more efficient than elsewhere in

[20] "Even under the assumption of high transport costs, conditions are relatively favorable for DNER/SG participants in Manica Province (Regions 4, 10-Manica), where intensified maize production is profitable for two-thirds of farmers. For farmers in Nampula (Regions 7, 8, 10- Nampula) who are far from the Maputo market, intensified maize is barely profitable for the top tercile in Region 10 and unprofitable for all the rest. With lower transport costs, profits increase for Manica Province farmers, but the package is still unprofitable for the lower tercile of farmers" (Jeje et al. 1998:xi).

the region. Since, month to month, maize prices typically rise much faster than the interest rate, efficient storage is a profitable, trade-winning strategy for merchants who buy during the harvest and sell into the region months later after stocks there diminish and prices rise sharply (de Sousa 2006:14).

146. **Storage and** the cost of capital are thus important aspects of the value chain that can, if efficient and cheap, reduce or eliminate such seasonal commodity flow reversals and the associated transportation costs. The latter account for roughly 50% of the cost of maize to the final consumer. Moreover, efficient storage would bring higher gains from trade. For example, in the north, many maize farmers and merchants are selling into Malawi, which, till 2007, has been a maize-deficit country. Since Malawi is further inland, such exports are more profitable than to coastal or other overseas countries and would be yet more profitable if, due to efficient storage, some sales could be delayed till supplies get tighter and prices better (Jeje et al. 1998:xi).

147. **Of the maize millers, the** top two supply 72% of Mozambique's market and have significant monopoly power in the maize meal market (Abdula 2005:87). Currently, the large formal-sector flour producers use about 100,000 tons of maize per annum. Of this, the largest miller reports that roughly 5% is local, 80% comes from South Africa and 15% comes from the USA, Argentina and, now, sometimes Mexico. Since Mozambique has no maize drying facilities anywhere, local maize must be bought soon after the harvest and definitely before the end of September. If purchased after September, the kernels are of unacceptable quality: yellowed, drilled by insects, and attacked by fungus. Moreover, when bought, the maize is quite humid (about 17%) and, to avoid rotting, must be milled almost immediately. However, if dried to only 11% to 12.5% humidity, it could be stored and milled much later. This option, however, does not exist in Mozambique. Only the large millers have silos for storing grain with pest controls and regulated humidity. Elsewhere, the storage comprises grain bags placed in covered shelters, where the maize remains humid and subject to rapid deterioration. Thus, in the opinion of the directors of one of the two large flour mills, the Companhia Industrial de Matola—with factories in Nampula and Matola—the country urgently needs to invest in silos and drying capacity, especially in Chimoio.[21] Without this, it will be very difficult to compete against the cost and quality of maize purchased from well-organized commercial farmers in South Africa, the major exporter of white maize in the region.

148. **If more local maize of good quality were available for milling, especially in the south, it could also be** used to substitute—up to 5%—some of the wheat that is presently imported to make wheat flour for bread.[22] At that level, consumers would not be able to detect the presence of maize in the flour. "Some countries in sub-Saharan Africa have little wheat production and the increased demand for wheat creates a potential market for composite flour. Notwithstanding, composite flour[s] are only used commercially in Zambia (6% maize flour substitution) and in Zimbabwe (10% maize flour substitution). In Latin-American only Brazil use[s] composite flour made with cassava and maize. … [Evidence exists that] quality protein maize variety may be more suitable … for production of composite flour" (Mejia and Patrucci *circa* 2003). Given that, on net, sub-Saharan Africa imports wheat, strategies—including the use of composite flours—to decrease this dependence are on the rise (Morris and Byerlee 1993:744 and note 18). Furthermore, many studies have shown that consumers accept or even prefer breads, muffins, cookies and chapattis made from composite flour,[23] a strategy still not used in Mozambique.[24]

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[21] interview with Luís Aveleira, director, and Alfredo Lopes, finance director, Companhia Industrial de Matola, 18/6/2007

[22] interview with Luís Aveleira, director, and Alfredo Lopes, finance director, Companhia Industrial de Matola, 18/6/2007

[23] "The possibility of using wheat flour substituted with 15%, 30%, and 50% maize flour compared with 100% wheat flour in making bread (moka) was also investigated in Mali. The results revealed that *moka* prepared from 50% maize mixed with wheat flour was preferred to *moka* prepared from 100% wheat flour. In terms of storage, no significant differences were observed between *moka* prepared with wheat flour substituted with 15%, 30% and 50% maize flour and that prepared with 100% wheat flour.… Maize utilization studies in Tchad showed

149. Maize is the principal domestically produced food staple in Mozambique. Maize I thus important as it helps to achieve food security and it is important in the livelihood of the people in rural areas. The growth in maize production through enhanced agricultural productivity in Mozambique will stimulate growth in other economic sectors, with which agriculture has deep linkages.

150. Currently, Mozambique lags behind all other East and Southern African countries in maize, productivity. In 2004 its maize yield averaged 960 kg/ha compared to 1500 kg/ha for Kenya, 1100 kg/ha for Malawi, and 2600 kg/ha for South Africa (FAOSTAT 2005). These low yields are a reflection of Mozambique's limited use of irrigation and of yield-enhancing inputs such as fertilizer and improved seeds.

151. Regardless of substantial work on agricultural research and extension carried out by the both public sector and Non-governmental Organizations (NGOs), introduction of new, improved maize varieties in farming processes has been negligible throughout the country. Increases in maize yields will heavily depend on the utilization of new technologies including fertilizer, chemicals and new varieties. This is in line with important results from applied research and extension, which suggest that it is key that and improved technologies are disseminated to farmers (Uaniene, 2006)

152. Maize is the most important food crop in Mozambique, and has a great potential for farm production and trade. Maize yields in Mozambique are among the lowest in the Southern Africa region, but potential for increased production and productivity is very high especially in northern Zambezi. Investments in production technology are expected to result in considerable increase in Mozambique's competitiveness in the maize sector in regional and international markets.

that wheat flour could be composited with 30% maize flour for the preparation of consumer acceptable biscuits" (Fakorede et al. *circa* 2002).

[24] In most developed countries, the international trend favors multi-grain breads thus creating new products and markets going beyond concerns about whether the bread has been adulterated (ICRISAT 2001:115-116)

Box 1.

Mosagrius: Lessons from Failure

In 1997, the Government of Mozambique and the South African Chamber for Agricultural Development (SACADA) started the Mosagrius Program to settle hundreds of large-scale South African farmers in the Niassa Province, a province with vast tracts of scantly populated fertile land—a rare and transitory opportunity.

Within a few years, the Mosagrius Company became insolvent and SACADA withdrew. The program "failed primarily due to poor advance preparation and planning, insufficient capital and financing, … and weak monitoring of … [the] program's implementation". The South African and Mozambican farmers and their business plans were not properly screened, access to improved seeds, good fertilizers, and appropriate guidance and information was not facilitated, the promised infrastructure (roads, railroads, electricity, communications) and credit lines were not set up, credit default rates were high, and the program had an "expensive corporate governance structure and office administration" (Alberts 2001:2,18 and 19).

Of the 22 Mozambican farmers, 18 were civil servants, many of whom kept their jobs while attempting to manage their farms from a distance. Of the 17 South African farmers that came, only one stayed on. He, however, got exceptional yields (11 t/ha to 15 t/ha on fertile, virgin land) and was making significant profits since the break-even point is 7 t/ha. His perseverance and success manifests the possibilities (Alberts 2001:21).

The program's failure, however, reinforces the observation that to develop value chains (from producer to processor, transporter and distributor) and implement multisectoral rural development programs requires an integrated, pro-active approach to plan synchronized and complementary investments, provide inputs and training, simplify administrative requirements, make other interventions, and mobilize private investment. Only this—a well-planned, adequately financed, and supportive framework—can inspire confidence that *individual* private investments will be viable and profitable (Ernst & Young and EconPolicy 2005a:80 and 2005b:25). And *confidence* is the actuator!

153. **Quantitative assumptions.** The main assumptions applied to the value chain analysis of maize are summarized below. The analysis begins with farm production based in Manica Province, which is one of the most important maize growing areas in Mozambique and extends only as far as the assembly level since maize is nearly always traded as an unprocessed commodity. Because maize is used both for domestic consumption and for export, however, both possible trade scenarios are analyzed. As with other commodities, the models assume that farmers sell unpacked (loose) grain by the roadside to a small trader who bags the maize and uses hired or returning transport over the distances shown to the final domestic or international assembly market.

154. Producing maize in Manica Province and selling it either in central Mozambique especially Beira, or in Malawi is not just a theoretical assumption**.** Evidence suggests that maize produced in Manica Province reaches other important consumer domestic markets in central and southern Mozambique including Maputo, the largest consumer market in the country. In many marketplaces of central and southern Mozambique, most of the maize sold in the open assembly and retail markets is brought by informal traders from Manica and Sofala provinces throughout the year. Moreover, Malawi becomes an important destination for maize produced in Manica especially in drought years in the southern Africa region, when large-scale commercial traders play an important role.

Table 29: Maize, Main Value Chain Assumptions

FARM LEVEL			**ASSEMBLY LEVEL**	
Sector	**Yield (MT/ha)**	**Main Inputs (per ha)**	**Domestic Market**	**Export Market**
FAM	0.75	Recycled seed, 95 days labor (est. 80 days family and 15 days hired)	250km to Beira	570km to Blantyre

ECF	2.75	Hybrid seed, 100kg NPK + 100kg urea, 95 days labor (est. 50 days family and 45 days hired)		

155. Table 30 summarizes the farm gate and assembly level price assumptions based on observed market prices in the specified market. It is perhaps somewhat surprising that the foreign price in Blantyre should be lower than the price in Beira (since Blantyre is a landlocked in area of Malawi that is generally food deficit), but these terminal market assumptions only affect the financial calculations for the assembler and do not have a bearing on final measurement of SV which is the figure used for measuring trade competitiveness. Put differently (and perhaps more simply), if the final SV is lower than the current or actual market price in Blantyre, Mozambique farmers can be said to be competitive.

Table 30: Maize, Summary of Commodity Price Assumptions

	MZN per MT	USD per MT	Product Form	Location
Farm gate price	2,251	90.04	loose grain	Manica roadside
Assembled raw material				
Domestic market	4,378	175.12	bagged grain	Beira
Foreign market	3,900	156.00	bagged grain	Blantyre

156. **Farm production.** At the traditional FAM level, most farmers only use recycled seed and labor. This practice has been possible in Mozambique due to the very good soil quality after than land was rested for nearly 16 years during the civil war. Now that farmers have moved back on to the land and are farming the same plots year after year, the situation is beginning to change and the use of improved inputs is becoming increasingly important. The ECF model, therefore, is meant to reflect the type of input package an improved farmer might realistically use including hybrid seed and a fairly modes amount of fertilizer, but no herbicide or other agrichemicals. The total labor estimate for both sectors is the same except for the division between family and hired labor is different. Because ECF farmers are assumed to cultivate using ox-drawn equipment, this means that more time is available in the total labor allocation for tasks like weeding and harvesting of the additional yield. Hence, hired labor is usually needed for the additional work.

157. The per hectare and per ton financial indicators for both farm-level maize models are summarized below. As indicated in Table 31, FAM farmers have much lower variable costs when compared to ECF farmers because of the use of fertilizer, chemicals and hired labor by the latter. As a result, ECF farmers have higher yields, gross margin and net profit per hectare. However, because the 2.5 MT per hectare reached by ECF is not sufficient enough when compared to the investment costs, FAM have higher profits per ton than ECF farmers.

Table 31: Maize, per Hectare and per MT Farm-Level Financial Indicators

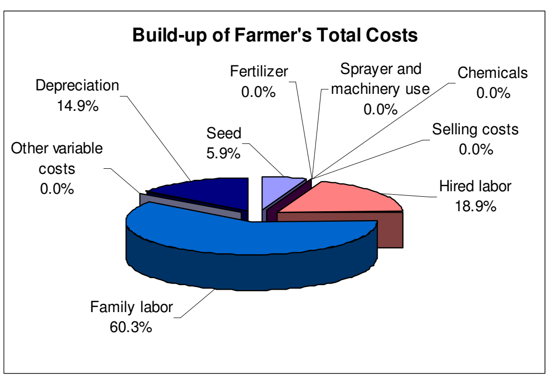
FARM PRODUCTION Maize (FAM)	Per Hectare		Per Ton	
	MZN	USD	MZN	USD
Gross revenue (yield * price)	**1,688**	**67.53**	**2,251**	**90.04**
Production costs				
Variable costs	236	9.45	315	12.60
Investment costs	142	5.69	190	7.59
Total costs	**379**	**15.14**	**505**	**20.19**
Farmer income				
Gross margin (revenue - var costs)	**1,452**	**58.08**	**1,936**	**77.44**
Net profit (gross margin - invest costs)	**1,310**	**52.39**	**1,746**	**69.85**

FARM PRODUCTION Maize (ECF)	Per Hectare		Per Ton	
	MZN	USD	MZN	USD
Gross revenue (yield * price)	**5,628**	**225.10**	**2,251**	**90.04**
Production costs				
Variable costs	2,806	112.24	1,122	44.90
Investment costs	213	8.54	85	3.41
Total costs	**3,019**	**120.78**	**1,208**	**48.31**
Farmer income				
Gross margin (revenue - var costs)	**2,822**	**112.86**	**1,129**	**45.14**
Net profit (gross margin - invest costs)	**2,608**	**104.32**	**1,043**	**41.73**

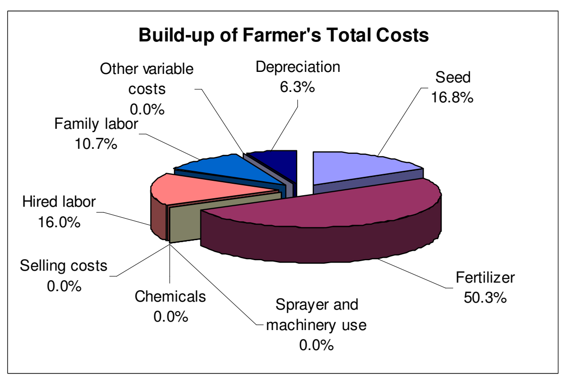
158. The composition of farm level costs is illustrated below. Family labor is by far the highest individual variable cost faced by FAM farmers, while fertilizer is the most important variable cost for ECF farmers per ton of produced maize. Furthermore, although farmers use recycled seed at the FAM level, it still has a financial opportunity cost since that grain could otherwise have been sold for cash or purchased in local marketplaces. The market price for grain is therefore the opportunity cost for retained seed.

Figure 10: Maize, Composition of Farm-level Costs

FAM



ECF



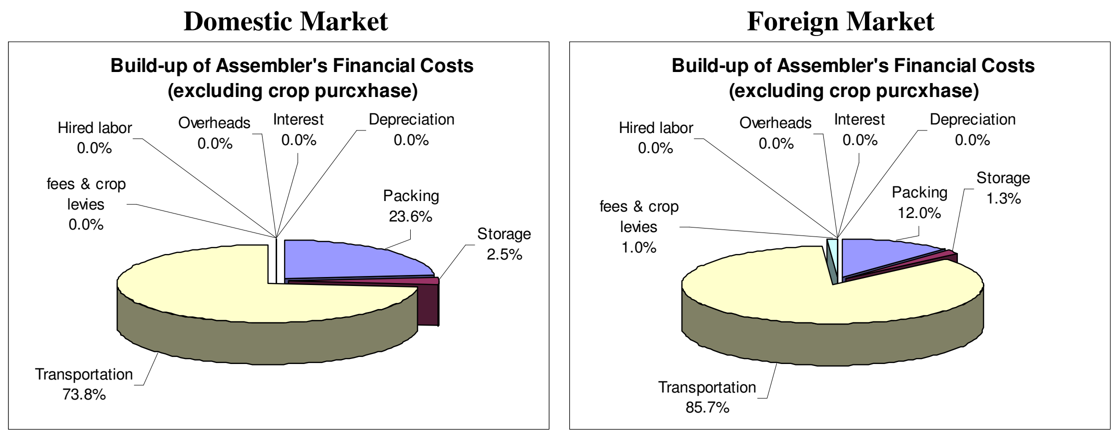
159. **Assembly.** As a commodity traded in its unprocessed form, assembly is the last stage in the value chain for maize. It is assumed that both FAM and ECF farmers sell most of their maize to itinerant small-scale traders right after harvest. Because there are no market distinction between maize from one or the other source, both FAM and ECF receive similar price for their product. The difference in received price will only emerge from selling maize later on in the season.

Table 32: Maize, per MT Financial Indicators at Assembly for Domestic and Export Transactions (over assumed delivery distances)

Maize (FAM & ECF)	DOMESTIC MARKET (Beira)		FOREIGN MARKET (Blantyre)	
	MZN	USD	MZN	USD
Gross revenue	**4,378**	**175.12**	**3,900**	**156.00**
Production costs				
Crop purchase	2,251	90.04	2,251	90.04
Other variable costs	593	23.70	1,164	46.57
Investment costs	-	-	-	-
Total costs	**2,844**	**113.74**	**3,415**	**136.61**
Final income				
Gross margin	1,535	61.38	485	19.39
Net profit	**1,535**	**61.38**	**485**	**19.39**
Rates of return				
Gross margin/total VC		0.54		0.14
Net profit/total costs		0.54		0.14

160. As shown in Table 32, assemblers who buy maize in rural Manica province will have slightly higher gross revenue selling in Beira than in Blantyre, Malawi due to the longer distance to Blantyre and associated higher transport costs. Received net profit from selling maize in Beira is actually 3 times higher than selling it in Malawi. This is in accordance with the fact that maize from Blantyre Province can only be sold in Malawi and still highly competitive to locally produced maize or that purchased in other places if transport cost is greatly reduced. Otherwise, this trade will only happen in years of evident maize shortage in the southern Africa region. Otherwise, selling in other areas of central Mozambique could become more profitable than selling in Blantyre.

Figure 11: Maize, Composition of Assembly Costs for Domestic and Export Transactions (over assumed delivery distances)



161. The main value chain indicators based on the stated assumptions and other detailed coefficients set out in the enterprise budgets for maize are summarized below. As discussed above, even with the increased yields earned by ECF farmers, their total shipment value is higher than that of FAM farmers. The share of assembly shipment in the total shipment value is hence higher if maize is to be sold in Blantyre than if it is sold in Beira both under the FAM or the ECF farmer scenario.

Table 33: Maize, per MT Value Chain Indicators

Maize (FAM)	FARM GATE PRODUCT		ASSEMBLED RAW MATERIAL			
			Domestic (Beira)		Export (Blantyre)	
	MZN	USD	MZN	USD	MZN	USD
Domestic Value Added						
Costs & mark-ups	1,244	49.75	2,349	93.94	2,410	96.42
Official duties & tax	9	0.36	244	9.74	485	19.41
Additional costs	1	0.04	6	0.25	22	0.88
Total DVA	**1,254**	**50.15**	**2,598**	**103.94**	**2,918**	**116.70**
Foreign costs	19	0.76	245	9.80	498	19.90
Total Shipment Value	**1,273**	**50.91**	**2,844**	**113.74**	**3,415**	**136.61**

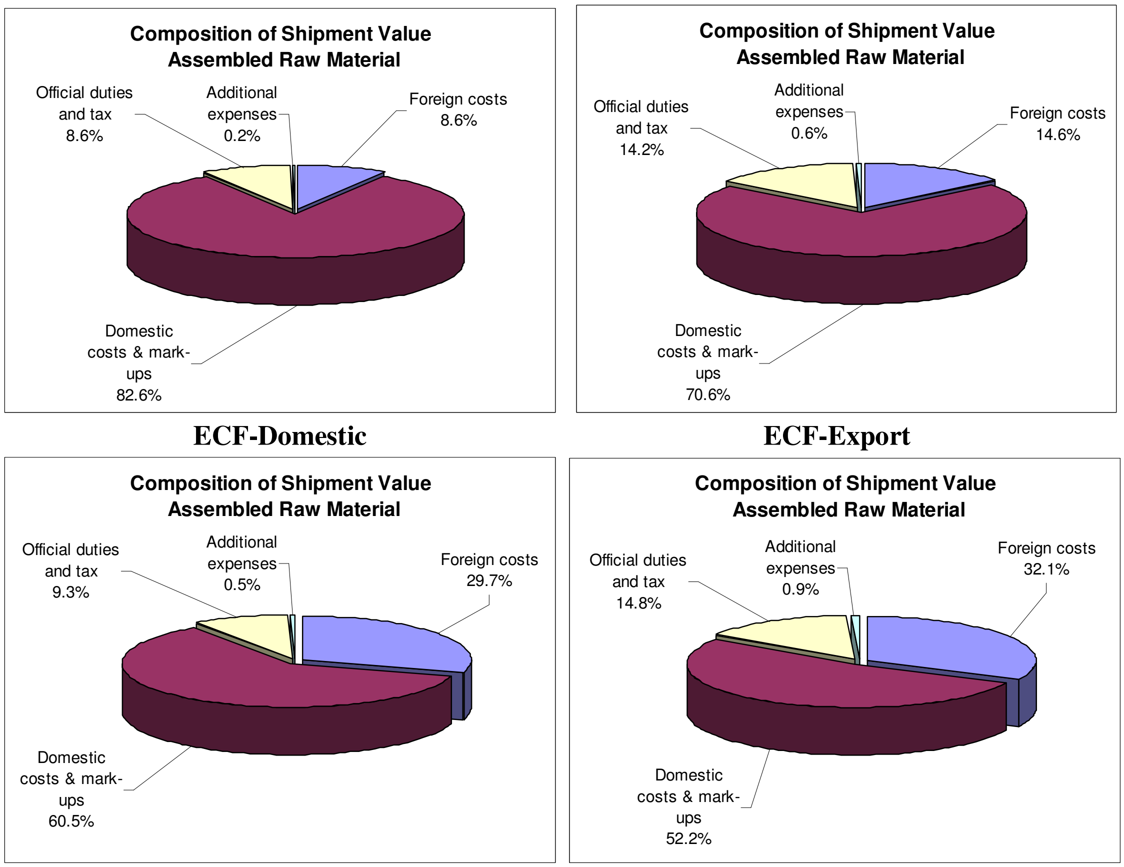
Maize (ECF)	FARM GATE PRODUCT		ASSEMBLED RAW MATERIAL			
			Domestic (Beira)		Export (Blantyre)	
	MZN	USD	MZN	USD	MZN	USD
Domestic Value Added						
Costs & mark-ups	705	28.19	1,721	68.84	1,783	71.31
Official duties & tax	26	1.04	264	10.56	506	20.23
Additional costs	8	0.33	14	0.54	29	1.17
Total DVA	**739**	**29.56**	**1,999**	**79.94**	**2,318**	**92.71**
Foreign costs	613	24.51	845	33.80	1,097	43.90
Total Shipment Value	**1,352**	**54.07**	**2,844**	**113.74**	**3,415**	**136.61**

162. The next set of pie charts looks at the composition of the shipment values at the farm level both considering maize as an import substitute as well as an export product. These graphics clearly show that the domestic component contributes by far with the largest proportion of the total shipment value in both cases even though foreign costs are slightly higher in the for-export case. The conclusion here would be that maize competitiveness can be improved if domestic components are looked with care and important reductions can be reduced in domestic costs. As the southern African region is becoming cyclically affected by droughts or floods and real prices in South Africa seem to be increasing over the last years, increasing competitiveness of Mozambique's maize sector can be key for the country's position especially in the regional market.

163. The shipment values at the assembly level also indicate that domestic costs are more important than foreign costs for the total shipment value, and are more significant when maize is looked at as an import substitute. However, foreign costs are higher at the assembly stage than they are at the farm gate. This suggests that, at the assembly level, interventions could be directed to both components of the total shipment value.

Figure 12: Maize, Composition of Final Value Chain Indicators

FAM-Domestic **FAM-Export**



164. **Parity price comparisons.**

- Mozambique produces white maize, not yellow corn so SV cannot be compared directly with the global market figures provided by FAO.

- The estimated import parity for South African grain landed in Beira is MZN 7,850 (USD 314) calculated on a per MT basis as follows:

  - FOB Randfontein (price quoted by SAFEX) ZAR 1,876
  - Convert to MZN/USD MZN 6,475 (USD 259)
  - Plus overland transport to Maputo MZN 375 (USD 15)
  - Plus sea freight to Beira MZN 1,000 (USD 40)
  - Equals Beira import parity for white maize MZN 7,850 (USD 314)

- The total SV for FAM and ECF maize from Manica delivered to Beira is MZN 2,844 (USD 113.74), which shows that domestic production is extremely competitive with imports. However, a caution must be taken in reading the Randfontein prices for two reasons. First, current maize price in South Africa might be a reflection of current maize shortage in South Africa. Historical prices have shown that import parity prices of maize imported from South Africa do not always indicate competitiveness pf domestic maize. Second, maize produced in Manica does hardly compete with imported maize in Beira as central Mozambique is not a deficit region hence there is no evidence of maize imported from Douth Africa ever reaching Beira.

- On the export side prices in Malawi can vary quite significantly depending on the time of year and competition from other regional producers. For this analysis the price quoted in Blantyre is MZN 3,900 (USD 156) per MT.

- Total SV for FAM and ECF maize from Manica delivered to Blantyre is MZN 3,415 (USD 136.61), which shows that Mozambican farmers are competitive at the current price assumption. It is not unusual for grain prices in Malawi to sometimes go above USD 200/MT and Mozambique would, of course, be even more competitive at those prices.

- As a commodity with very cyclical prices, investments in storage are important at all levels of the value chain, including the subsistence level for households looking to retain enough grain to feed their family throughout the year.

D. Rice

Qualitative Background

165. Mozambique is endowed with a good agronomic potential for rice production in several areas from north to south, and more than 630,000 households produce it. Countrywide, 16.5% of the growers who produce rice sell their rice (TIA 2006). Rice production by province reached 97,611 tons, 56% of which was produced in Zambezia province. Table 34 presents the area cultivated for rice for the past 14 seasons.

Table 34: Area Cultivated for Rice in Mozambique, 1993/94 – 2006/07

Province	**Annual Cultivated Area('000 Hectare)**													
	93/94	**94/95**	**95/96**	**96/97**	**97/98**	**98/99**	**99/00**	**00/01**	**01/02**	**02/03**	**03/04**	**04/05**	**05/06**	**06/07**
Cabo Delgado	8.60	9.15	9.31	10.66	11.74	11.66	13.42	14.39	14.65	14.93	15.25	15.52	15.80	16.10
Niassa	2.32	2.50	2.71	3.42	4.13	3.52	3.97	4.47	4.58	4.69	4.82	4.96	5.26	7.46
Nampula	26.63	28.59	30.54	35.31	36.89	35.91	34.32	30.82	35.50	35.91	36.70	37.91	38.61	39.34
Zambezia	44.85	56.26	63.66	76.12	83.63	78.09	73.80	80.57	80.66	83.65	85.84	89.29	90.27	92.30
Tete	0.06	0.16	0.20	0.26	0.20	0.27	0.27	0.31	0.28	0.30	0.30	0.32	0.32	0.33
Manica	0.20	0.24	0.24	0.30	0.68	0.70	0.54	0.66	0.71	0.75	0.78	0.79	1.03	1.09
Sofala	17.56	21.80	23.45	28.42	29.78	28.59	25.04	29.74	29.31	30.68	30.43	31.59	32.55	35.18
Inhambane	2.90	3.16	3.48	3.67	3.85	3.21	3.16	3.10	3.35	3.45	3.54	3.66	3.73	3.95
Gaza	12.83	2.79	4.89	10.47	5.50	6.31	9.53	4.82	2.84	2.90	3.17	3.14	4.17	5.72
Maputo	5.31	4.97	5.11	5.19	4.55	4.48	4.87	5.26	1.80	1.73	2.08	2.21	2.51	2.56
National	121.27	129.61	143.58	173.82	180.95	172.75	168.92	174.14	173.67	178.99	182.91	189.39	194.25	204.03

Source: Ministry of Agriculture, Early Warning Unit

166. As table 34 indicates, Zambezia province has contributed with the highest share of land allocated to rice production in Mozambique in the past 14 seasons. Along with, it, Zambezia province has the highest potential for rice production in Mozambique. In 2006, Cabo Delgado, Sofala and Nampula provinces were the three other provinces with fairly contributions to Mozambique's rice production. Gaza province has contributed with very limited amounts of rice production in Mozambique, regardless of the potential in Chokwe district, where lays Mozambique's most important large-scale irrigation system, and production in the colonial period was higher than the current levels. Countrywide, increased investments on rice production in those provinces can result on high opportunities for import substitution.

Table 35: Rice Yields in Mozambique, 1993/94 – 2006/07

Province	Annual Cultivated Area('000 Hectare)													
	93/94	94/95	95/96	96/97	97/98	98/99	99/00	00/01	01/02	02/03	03/04	04/05	05/06	06/07
Cabo Delgado	0.002	0.011	0.007	0.007	0.022	0.022	0.016	0.013	1.141	1.174	1.155	1.163	1.114	1.116
Niassa	0.000	0.000	0.000	0.000	0.008	0.010	0.009	0.000	0.794	0.901	0.905	0.883	0.938	0.736
Nampula	0.027	0.028	0.029	0.026	0.004	0.004	0.003	0.003	0.907	0.949	0.970	0.993	0.692	0.697
Zambezia	0.014	0.012	0.004	0.004	0.024	0.027	0.014	0.010	0.979	1.206	0.953	0.514	1.072	1.125
Tete	0.031	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.720	0.700	0.710	0.355	0.359	0.074
Manica	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.700	0.800	0.911	1.000	0.653	0.650
Sofala	0.018	0.020	0.023	0.020	0.025	0.027	0.026	0.019	0.794	0.985	1.103	0.021	0.697	0.692
Inhambane	0.000	0.000	0.001	0.002	0.001	0.001	0.001	0.001	0.640	0.593	0.621	0.001	0.419	0.358
Gaza	0.334	0.387	1.037	1.722	1.160	1.261	0.684	0.782	3.052	2.664	2.451	1.899	2.117	2.049
Maputo	0.151	0.076	0.117	0.172	0.331	0.355	0.260	0.136	0.928	1.711	1.544	0.476	1.088	1.161
National	0.056	0.027	0.051	0.119	0.061	0.074	0.058	0.035	0.967	1.120	1.023	0.605	0.940	0.960

Source: Ministry of Agriculture, Early Warning Unit

167. Of the 182,000 hectares dedicated to rice, 90% is in rain-fed lowlands, principally in Zambezia and Sofala provinces, 7% in rain-fed highlands and merely 3% irrigated plots or schemes (Muendane and Zandamela *circa* 2001:6).[25] Yields are low (1.02 t/ha) and, in recent years, have been static. That is not surprising because only 3.3% of small- and medium-size rice farmers use improved seeds. Contributing to this failure is the lack of rice specialists in the extension services. "Subject matter specialists … for the rice sector do not exist. Evidence shows that 'generalist' extension workers, as they exist today, can hardly provide relevant advice to farmers in relation to a crop such as rice" (Alasia 2005:15). Moreover, in the large irrigation schemes, the infrastructure is highly deteriorated and often abandoned. Indeed, between 1997/8 and 2003/4, in the south when much of the large-scale irrigation occurs, the area under rice shrank by 16% in Gaza Province and by 19% in Maputo Province.

168. **Under assault by cheap rice imported from the Indian and Pakistani Punjab, schemes for** intensive irrigated rice production are deemed "an unlikely economic proposition" both in the south and the Chókwè region (Walker et al. 2006:46; Alasia et al. 2005:18). Though currently such production is not economic, Gergely (2005:5) argues that "it would become profitable for farmers under the improved technical itinerary, with a relatively high return per day of work". The latter position seems to have won out.

> The Chókwè irrigation scheme in one of Mozambique's most fertile zones was rehabilitated not long ago with 15 million euros from the Japanese government plus subsequent assistance from France. As part of its goal to increase national rice production, the government is also rehabilitating the schemes in Maputo and Inhambane in the south and in Sofala and Zambézia in the center of the country (*Canal de Moçambique* 5/4/2006).

169. Of total rice production, 30.8% occurs in the north of the country, 62.2% in the center and merely 7% in the south. Historically, this represents a huge change. "In the 1960s, just one province in the South, namely Gaza, contributed to 50% of the total national production; currently it produces about 4%" (Alasia et al. 2005:10). Recently, in all provinces except Maputo, farmers have been fast abandoning rice cultivation. For example, in 2002, 33.4% of small- and medium-size farmers cultivated rice as against 19.5% in 2005 though the provincial variations were great, for example, in 2005, 46.4% in Zambézia and 33.0% in Sofala as against 4.2% in Gaza and 1.7% in Maputo Province.

[25] In recent years, the Ministry of Agriculture has been encouraging farmers' associations to invest in peddle pumps for small-scale vegetable and rice farming.

170. Distinct, largely unconnected marketing chains exist for imported and domestically grown rice. The import and processing sectors are capital intensive whereas the production and distribution of domestically produced rice is "dominated by a multitude of small … operators, whose technology and operations are highly labor intensive" (Alasia et al. 2005:25). With present yields,

171. Moreover, up to 15% of the rice is lost after harvest as against 9% in South East Asia (AgriFood Consulting International 2005:3). Next in the value chain, the roads are bad and transportation is costly, representing 30% to 40% of the consumer price of rice.

172. Medium- and large-scale rice mills are few and merely 50 to 60 small millers exist in the country, leaving some key districts with no mill at all. Where they exist, however, they usually buy directly from the farmers, thus eliminating the collectors' or traders' margins. Though typically using less than half their capacity, the millers are local monopsonists realizing profits of about 20% for large mills and 30% for small ones. On average, the costs per ton (between 1.00 and 2.50 MZN/ton) run 2.5 times what mills in South East Asia spend (AgriFood Consulting International 2005:2-3).[26] Since most locally-produced rice is consumed within 300 kilometers of its point of production, the mills also enjoy considerable protection and market leverage due to transport costs. Moreover, the final retailers in this market chain are fairly numerous and competitive and, as a result, realize but tiny margins.

173. With all these advantages, the mills have little incentive to invest to upgrade their technology. Thus, they remain obsolete and ill repaired and, as a result, create 25% to 46% broken grains thus reducing the value of their milled rice. Lacking separation and cleaning equipment before dehusking, the small mills also suffer a high ratio of foreign matter, which further lowers their milling efficiency, and few use by-products or separate husk and bran for special markets (Alasia et al. 2005:22). Mozambique's mills are very old (the newest is 30 years old) and have a conversion ratio of 60% to 62%, which is much lower than Zambia's 69%. This suggests that the mills are probably over-polishing the grain thus destroying 7% to 9% of its value. Of the initial weight of the paddy, 25% becomes usable bran and 13%, waste.[27] The bran is used to make rations for rabbits and other animals but the animal-ration industry is sorely underdeveloped and unable to buy all the bran produced. This suggests an opportunity to improve efficiency and stimulate a downstream industry.

174. The market for imported rice is highly concentrated. "Eight importers supply around 90% of the rice available in the national markets. In 2004, three companies handled around 84% of the imported rice (or 290,000 tons). The major import companies integrate warehousing, transportation, and wholesaling through a fairly developed in-house distribution network" extending to the major cities. Most of the big importers use a branding strategy to distinguish their product though quality standards are far from uniform and "the units of measure are rarely standardized particularly at the extreme ends of the value chain" for farm-gate transactions and small retail sales (Alasia et al. 2005:23).

175. In 2004/05, farm-gate prices for paddy varied between 2.00 MTn/kg and 5.00 MTn/kg with Mozambique's aromatic varieties gaining a preference margin. "In the south, the prevailing price was 3,000 MZM/kg, as set by the major buyer ... [in] the region. In the center and north the spatial pattern of variation appears greater and scattered". Over the last 10 years, the price of rice relative to maize has tended to decline rather sharply from 2.0 in 1995 to 1.0 in 2002 and1.5 in 2005. This, plus rising incomes and the convenience of cooking rice, has spurred demand from 10 kg to over 20 kg per capita/year (Alasia et al. 2005:23-24). Curiously, government fiscal policy has also encouraged the trend. It charges 17% value added tax on maize grain but *none on rice* or *wheat.* Theoretically, maize

[26] "The cost of milling in Mozambique is about four to five times more expensive than in Thailand. The estimated total cost of milling in Mozambique varies between $40 to $63 [per ton] for medium/large and small mill, respectively. The milling cost for comparable operations in Thailand are $11 to $14 per ton respectively" (Alasia et al. 2005:29).

[27] interview with João Tinga, GAPSCA, 7/4/07

millers should get the tax refunded since maize flour is VAT exempt but, in practice, small millers get no refund and even the large ones complain of long delays in obtaining the refund. The tax discrimination and refund inefficiency, thus, further encourage the consumption of rice as opposed to maize (Tschirley, Abdula and Weber 2005:2).[28]

176. There is correlation between geographical distribution of rice production in Mozambique and population concentration as well as with poverty incidence. While central and northern provinces are key in rice production, theses provinces are also the most populous in the country. This suggests that a strategy aiming the improvement of rice production in the country is likely to heavily contribute to poverty reduction. Furthermore, relative share of rice production has been increasing over time in northern and central provinces compared to the south. However, this scenario does not seem to be in line with a perceived significant effort for concentrated investments in rice production in southern Mozambique. Perhaps, these efforts are inspired by good production of rice in southern Mozambique, especially in Gaza province, which contributed for 50% of Mozambique's rice production in the 1960s regardless of its decline, contributing now for only 4% of the national production. Zambezia province, on the other hand, is the most populous province in Mozambique, has a very high potential for increased production, and more than half of the population produce rice.

177. Over the last decades, rice imports have been increasing. Estimates indicate that, out of the 440,000 MT that were consumed in Mozambique in 2004/05, over 340,000 MT were imported, resulting in a total cost of USD 70 million. This level of consumption makes rice the third source of calories intake in Mozambique, only falling behind cassava and maize.

178. In terms of policy implications, data suggests that Mozambique relies very much on imported rice, and this is likely to continue over the next decades unless there is a major investment in the sub-sector. Indeed, after a rapid growth of rice production in the 1990s with an 18.1% annual growth rate, it decreased to only0.5% from 1997.98 to 2003/04. Moreover, observed growth rate since the 1990s has always be correlated with increase in cultivated land rather than increase in yields.

179. **Quantitative assumptions.** The quantitative analysis for rice covers all stages of value chains from farming to distribution for the FAM and ECF sectors. The farm level assumptions for rice production both by FAM and ECF farmers are summarized in Table 36. At the FAM level, farm yield is 1.0 MT/ha, while the ECF farmers yields are assumed to be 3.00 MT/hectare. Farm production is assumed to take place in Zambezia Province, and the final market where domestic rice is assumed to compete with imports is Beira. The distance from rural mill for paddy is 50km; then 500km to Beira.

Table 36: Rice, Main Value Chain Assumptions

Sector	Yield (MT/ha)	Farmer Inputs	Assembly	Processing	Distribution
FAM	1.00 (rain fed)	Recycled seed, 90 days family labor + 20 days hired labor	50km from farm to small mill	Broken rice (62%)	Analysis of rice only
ECF	3.00	Improved seed, 2x2		Rice Bran	500 km to Beira

[28] Maize dealers resent the VAT on maize because of the gymnastics, delays and cost in obtaining refunds when the grain is sold to millers, who in turn get a refund albeit with delays. The net effect for the Treasury is nil for maize that is eventually milled. Moreover, the tax is bizarrely discriminatory. Consumers who buy maize grain pay, those who buy maize flour do not.

	(irrigated)	fertilizer, irrigation fee, 90 days family labor + 60 days hired labor	(trader provides grain bags)	(25%) Rest is trash	wholesale (compare with Thai import parity)

180. Table 37 summarizes the commodity price assumptions used for the analysis of rice. Although rice produced in rural Zambezia also enjoys market outlets in Quelimane, Beira was chosen for analysis as the final delivery point instead since this is a more competitive market (both because the extra cost of domestic road freight increases total SV of the domestic product, and because Beira is a much larger port city and an important destination center hence with lower shipping costs for imports).

Table 37: Rice, Summary of Commodity Price Assumptions

	MZN per MT	USD per MT	Product Form	Location
Farm gate price	3,000	120.00	loose paddy	Zambezia farm
Assembled raw material	4,100	164.00	bagged paddy	Rural Zambezia
Ex-factory price				
Broken rice	7,200	288.00	Broken rice (62%)	Rural Zambezia
Rice bran	2,675	107.00	Rice bran (25%)	Rural Zambezia
Trash	-	-	Trash (13%)	Rural Zambezia
Final traded price				
Broken rice	9,725	389.00	Broken rice	Beira
Rice bran	??	??	Rice bran	Feed producer
Trash	-	-	Trash	Disposed at mill

181. **Farm production.** The farm level production assumptions for FAM and ECF rice are summarized in Table 38. At the FAM level, the farm yield of 1.0 MT/ha is correlated with low production investments, and results in a total gross revenue of USD 120 per hectare or per ton. Given that production costs do not exceed USD 25.00 per hectare, net profit is around USD 95.11 per hectare or per ton. In the ECF sector, however, the higher yields of 3.00 MT per hectare are correlated with relatively higher production costs, and the final profitability of this sector suggests that yields should increase to take advantage of the investment and invert the current situation where the FAM sector farmers invest very little but have higher profits per ton.

Table 38: Rice, per Hectare and per MT Farm-Level Financial Indicators

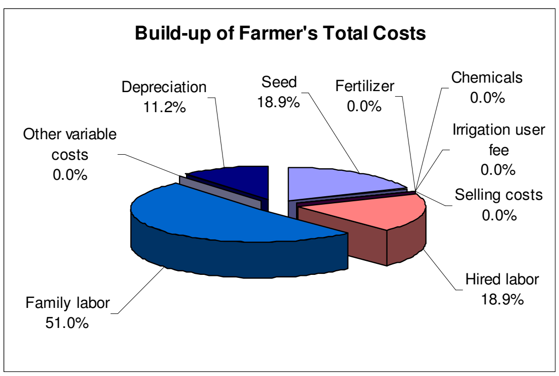
FARM PRODUCTION Rice (FAM)	Per Hectare		Per Ton	
	MZN	USD	MZN	USD
Gross revenue (yield * price)	**3,000**	**120.00**	**3,000**	**120.00**
Production costs				
Variable costs	480	19.20	480	19.20
Investment costs	142	5.69	142	5.69
Total costs	**622**	**24.89**	**622**	**24.89**
Farmer income				
Gross margin (revenue - var costs)	**2,520**	**100.80**	**2,520**	**100.80**
Net profit (gross margin - invest costs)	**2,378**	**95.11**	**2,378**	**95.11**

FARM PRODUCTION Rice (ECF)	Per Hectare		Per Ton	
	MZN	USD	MZN	USD
Gross revenue (yield * price)	**9,000**	**360.00**	**3,000**	**120.00**
Production costs				
Variable costs	2,779	111.16	926	37.05
Investment costs	213	8.54	71	2.85
Total costs	**2,992**	**119.70**	**997**	**39.90**
Farmer income				
Gross margin (revenue - var costs)	**6,221**	**248.84**	**2,074**	**82.95**
Net profit (gross margin - invest costs)	**6,008**	**240.30**	**2,003**	**80.10**

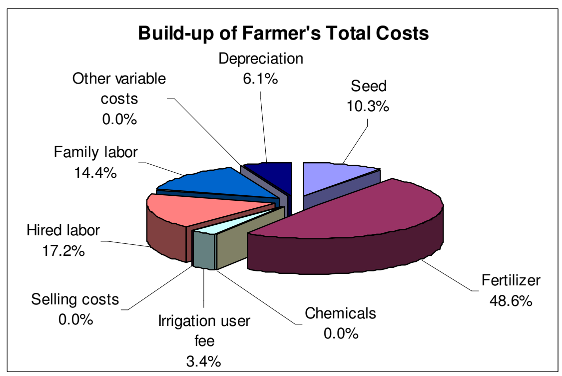
182. The pie charts below show the composition of farm total production costs, indicating the fact that family labor is the most important component of production costs in the FAM sector, while fertilizer accounts for about 50% of the production costs in the ECF sector. This implies that, while yields are higher in the ECF sector, the cost of fertilizer is likely to increase total costs faced by ECF farmers thus reducing the competitiveness of the commodity. On the other hand, the FAM sector does not use fertilizer and other inputs but also faces very low yields. A conclusion would therefore be that use of inputs needs to be improved in Mozambique's rice sub-sector, but input costs need to be assessed for further price reductions and increase in competitiveness.

Figure 13: Rice, Composition of Farm-level Costs

FAM



ECF



183. The cost and profitability indicators of rice production in Mozambique are summarized in Table 39. These data show that, in addition to being profitable for FAM and ECF farmers, rice is also profitable for the other participants in the food supply chain of this commodity.

Table 39: Rice, per MT Financial Costs and Profits (all stages)

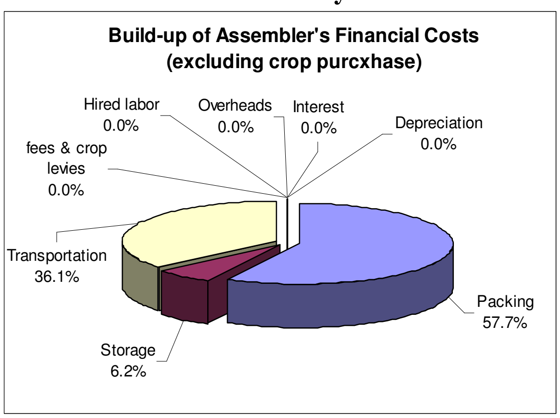
Rice (FAM)	FARM GATE PRODUCT		ASSEMBLED RAW MATERIAL		PROCESSED RAW MATERIAL		TRADED FINAL PRODUCT (Rice)	
	MZN	USD	MZN	USD	MZN	USD	MZN	USD
Gross revenue	**3,000**	**120.00**	**4,100**	**164.00**	**5,133**	**205.31**	**9,725**	**389.00**
Production costs								
Crop purchase		-	3,000	120.00	4,100	164.00	7,200	288.00
Other variable costs	480	19.20	243	9.70	239	9.58	982	39.27
Investment costs	142	5.69	-	-	120	4.80	75	3.00
Total costs	**622**	**24.89**	**3,243**	**129.70**	**4,459**	**178.38**	**8,257**	**330.27**
Final income								
Gross margin	2,520	100.80	858	34.30	793	31.73	1,543	61.73
Net profit	**2,378**	**95.11**	**858**	**34.30**	**673**	**26.93**	**1,468**	**58.73**
Rates of return								
Gross margin/total VC		5.25		0.26		0.18		0.19
Net profit/total costs		3.82		0.26		0.15		0.18

Rice (ECF)	FARM GATE PRODUCT		ASSEMBLED RAW MATERIAL		PROCESSED RAW MATERIAL		TRADED FINAL PRODUCT (Lint)	
	MZN	USD	MZN	USD	MZN	USD	MZN	USD
Gross revenue	**3,000**	**120.00**	**4,100**	**164.00**	**5,133**	**205.31**	**9,725**	**389.00**
Production costs								
Crop purchase		-	3,000	120.00	4,100	164.00	7,200	288.00
Other variable costs	926	37.05	243	9.70	292	11.69	982	39.27
Investment costs	71	2.85	-	-	200	8.00	75	3.00
Total costs	**997**	**39.90**	**3,243**	**129.70**	**4,592**	**183.69**	**8,257**	**330.27**
Final income								
Gross margin	2,074	82.95	858	34.30	741	29.62	1,543	61.73
Net profit	**2,003**	**80.10**	**858**	**34.30**	**541**	**21.62**	**1,468**	**58.73**
Rates of return								
Gross margin/total VC		2.24		0.26		0.17		0.19
Net profit/total costs		2.01		0.26		0.12		0.18

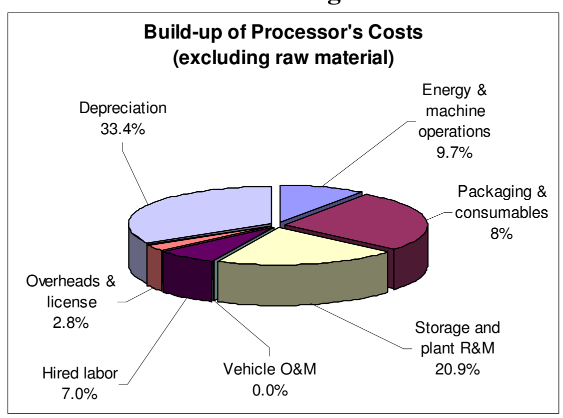
184. The next set of pie charts show that, by accounting for a considerable portion of the total costs, packing and transport costs are the most important components of the rice total shipment value faced by assemblers and distributors in Mozambique, correspondingly.

Figure 14: Rice, Composition of Assembly, Processing and Final Distribution Costs

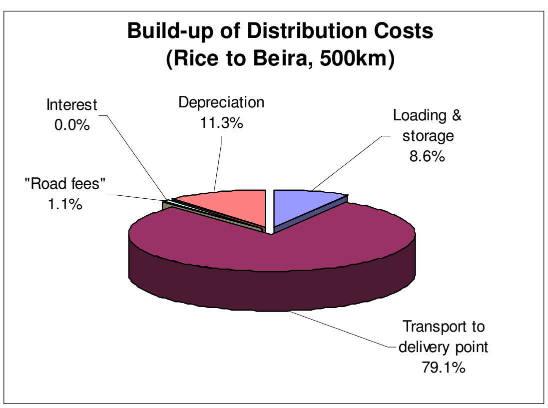
Assembly



Processing



Distribution



185. **Value chain indicators.** Some conclusions can be drawn from the rice value chain indicators in Mozambique. First, ECF farmers produce at a slightly lower cost than FAM farmers due to higher costs and mar-ups at faced by FAM farmers. Second, while the farm and processing stages in both the FAM and ECF sectors contribute with only about 15% of the total shipment value, distribution alone contributes with more than 45% of that value. And third, foreign costs are more important in the ECF than in the FAM sector as a component of the total shipment value.

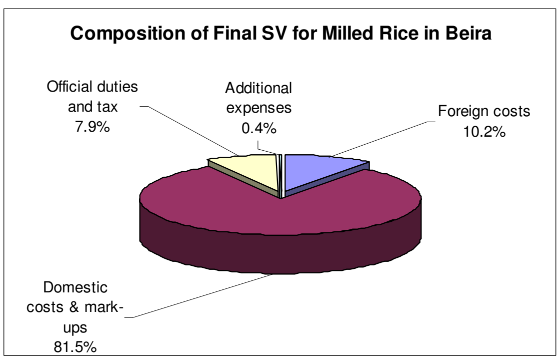
Table 40: Rice, per MT Value Chain Indicators

Rice (FAM)	FARM GATE PRODUCT		ASSEMBLED RAW MATERIAL		PROCESSED RAW MATERIAL		TRADED FINAL PRODUCT (Rice)	
	MZN	USD	MZN	USD	MZN	USD	MZN	USD
Domestic Value Added								
Costs & mark-ups	1,249	49.94	3,057	122.27	4,074	162.98	6,773	270.91
Official duties & tax	7	0.27	95	3.80	148	5.94	652	26.09
Additional costs	1	0.03	2	0.10	5	0.21	32	1.27
Total DVA	**1,256**	**50.24**	**3,154**	**126.16**	**4,228**	**169.13**	**7,457**	**298.27**
Foreign costs	14	0.57	88	3.54	234	9.34	850	34.00
Total Shipment Value	**1,270**	**50.81**	**3,243**	**129.70**	**4,462**	**178.47**	**8,307**	**332.27**

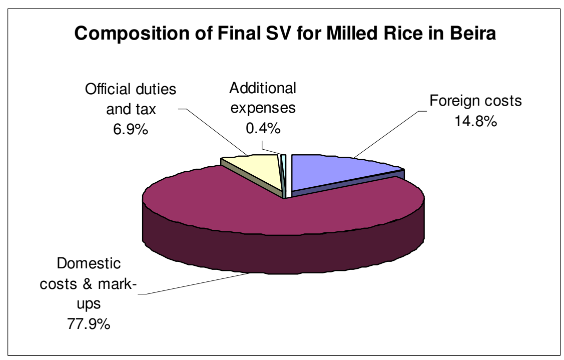
Rice (ECF)	FARM GATE PRODUCT		ASSEMBLED RAW MATERIAL		PROCESSED RAW MATERIAL		TRADED FINAL PRODUCT (Rice)	
	MZN	USD	MZN	USD	MZN	USD	MZN	USD
Domestic Value Added								
Costs & mark-ups	689	27.54	2,601	104.06	3,671	146.86	5,906	236.24
Official duties & tax	17	0.68	105	4.21	180	7.20	703	28.12
Additional costs	6	0.24	8	0.31	12	0.50	43	1.73
Total DVA	**711**	**28.46**	**2,714**	**108.57**	**3,864**	**154.55**	**6,652**	**266.10**
Foreign costs	454	18.16	528	21.13	732	29.29	1,654	66.17
Total Shipment Value	**1,165**	**46.62**	**3,243**	**129.70**	**4,596**	**183.85**	**8,307**	**332.27**

Figure 15: Composition of Final Value Chain Indicators

FAM



ECF



186. **Parity price comparisons.**

- The estimate import parity for milled rice from Thailand delivered to Beira is MZN 10,825 (USD 433) per MT.

- The final SV of the domestic product is about 20% lower than import parity suggesting Mozambique enjoys a robust competitive advantage with Thailand as an import substitute.

- Because of quality differences, however, the two products cannot really be compared directly. Specifically, Mozambican rice has a high percentage of broken grains which is acceptable on the domestic market, but not suitable for export except perhaps for some cross border trade with its neighbors.

- Unlike maize, however, Malawi is unlikely to be a good market outlet for exports because Malawi already has surplus rice domestic production.

E. Soya

Qualitative Background

187. Mozambique is at its first stage in soybean production. Although this very recent history, combined efforts for investment are taking place, driven by (i) a strong interest among NGOs and donors to promote domestic soybean production in selected provinces in the Gurue/Cuamba area of northern Zambézia/Southern Niassa; (ii) renewed interest in the use of soybean in Mozambique's feed and oil sectors; (iii) a commitment of Mozambique's government to introduce alternative crops for smallholder crop diversification as farm-gate real prices for important food staples including maize have been declining over the past years and; (iv) emerging trade opportunities in Europe.

188. **Farm Production**. In Mozambique, soybean is produced both by smallholders and by large-scale farmers. Although smallholders are the majority of farm producers, they mostly cultivate it intercropped with the cassava and maize, do not use improved tools or inputs, and usually cultivate in less than 0.5 hectares, resulting in very low yields. Larger farmers, who grow soybean in 5 or more hectares, also face challenges including market risk and high production costs. Poor transport infrastructure and lack of improved mechanisms for accessing markets in a less risky manner are the roots causes of instable investment by large-scale farmers.

189. These efforts are resulting in the use of different varieties including Santa Rosa, Zuma and Solitaire, all of them recently introduced from Zambia and Malawi (Estrada, 2005). But concerns about the introduction of genetically modified organisms (GMOs) is reducing the enthusiasm around the use of different seed varieties, as it appears that there are some informal seed imports from Brazil (Estrada, 2005).

190. Despite the absence of data on soybean production in Mozambique, it is estimated that 700 to 800 tons of soybean were produced in Mozambique in the 2003/04 season. Out of this volume 250-300 tons were estimated to have been produced in Nampula province, where smallholder farmers have been benefiting from a project implemented by CARE, Instituto Nacional de Investigacao Agricola (INIA) and CLUSA (the Cooperative League of the United States). Despite low soybean production in Mozambique, importing this commodity has not been economically relevant for Mozambique, because of modest processing capacity in the country (Estrada, 2005). Nevertheless, estimations indicate that 25,000 to 30,000 tons of soybean are imported per year, especially for livestock feed industries.

191. Investing in soybean production can be of important economic value for the country, as there is a significant market for edible oil, whose annual industrial production is estimated to be as high as 110,000 tons. Although Mozambique's edible oil is made from coconut, groundnut and maize, soybean can play an important role in increasing domestic production. Because of existing and very likely increasing market for edible oil and animal feed cake, demand for soybean meal is likely to continue growing in the country. Of course, Mozambique needs to look at other uses of its soybean, in addition to the production of edible oil and the chicken industry that seems to be one of the most important current driving forces. Other options including exports to Europe (Norway showed high interest in importing soybean seed from Mozambique) need to be taken into account.

192. **Marketing**. Because of very limited soybean production in Mozambique, there is insufficient evidence of traditional channels for trading this commodity in the country. However, the little experience to date in soybean production has shown that, except the Zambezia/Niassa/Nampula area of northern Mozambique, other smallholders especially in Tete and Manica provinces in central Mozambique have been selling their soya to small-scale traders who in turn had Malawi or Zimbabwe as the main destinations. However, new domestic markets are expected to emerge both in central and principally in northern Mozambique, where a soya processing unit is expected to start operating soon.

193. Soybean is a fairly new crop in Mozambique, but agricultural and market scenarios suggest a high potential in the northern Zambezia/southern Niassa area of northern Mozambique, and in Manica and Tete provinces in central Mozambique. In both production areas, improved soybean production can strongly benefit from a local good demand of soybean sub-products and investments in new industrial units, and from already existing roads and railways linking to the important consumer markets of Beira in the center and Nampula and Nacala in the north.

194. **Quantitative assumptions.** The main assumptions used for the analysis of soybeans in Mozambique are summarized below. As a nitrogen fixing legume, fertilizer is rarely applied to soybeans even in advanced commercial farm systems in other countries. As with all other crops, ECF farmers are assumed to use oxen for cultivation and so enjoy a significant labor savings during cultivation. The production model is based around, Cuamba in southern Niassa Province where soybeans are most widely grown in Mozambique and the assembly point is a new processing factory being built at Namialo some 500km away from the farm area. Because commercial processing is a completely new enterprise, cost information was not available.

Table 41: Soybeans, Main Value Chain Assumptions

FARM LEVEL			ASSEMBLY LEVEL
Sector	**Yield (MT/ha)**	**Main Inputs (per ha)**	
FAM	0.5	Unimproved seed and inoculant, 65 days labor (est. 60 days family and 5 days hired)	500km to Namialo Trader collects loose soybeans, stores for a short while and transports to new factory.
ECF	1.6	Improved seed and inoculant, 1lt herbicide, 55 days labor (est. 35 days family and 20 days hired)	

195. The farm gate and assembly level price assumptions for soybeans are summarized below. FAM and ECF farmers are assumed to produce an identical product and there is no distinction between the prices paid to each category of farmer.

Table 42: Soybeans, Summary of Commodity Price Assumptions

	MZN per MT	USD per MT	Product Form	Location
Farm gate price	5,500	220.00	loose soybean	Southern Cabo del Gado
Assembled raw material	6,650	266.00	bagged soybeans	Namialo

196. **Farm Production.** Financial indicators for soybeans excluding the value of family labor are summarized below in per hectare and per ton terms for FAM and ECF farmers.

Table 43: Soybeans, per Ha and per MT Farm-level Financial Indicators

FARM PRODUCTION Soya (FAM)	Per Hectare		Per Ton	
	MZN	USD	MZN	USD
Gross revenue (yield * price)	2,750	110.00	5,500	220.00
Production costs				
Variable costs	910	36.40	1,820	72.80
Investment costs	142	5.69	285	11.38
Total costs	1,052	42.09	2,105	84.18
Farmer income				
Gross margin (revenue - var costs)	1,840	73.60	3,680	147.20
Net profit (gross margin - invest costs)	1,698	67.91	3,395	135.82

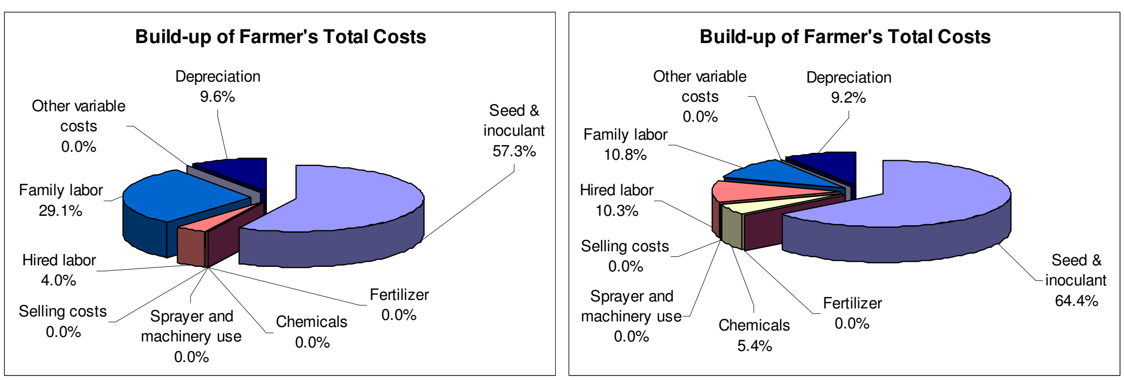
FARM PRODUCTION Soya (ECF)	Per Hectare		Per Ton	
	MZN	USD	MZN	USD
Gross revenue (yield * price)	8,800	352.00	5,500	220.00
Production costs				
Variable costs	1,865	74.60	1,166	46.63
Investment costs	213	8.54	133	5.34
Total costs	2,078	83.14	1,299	51.96
Farmer income				
Gross margin (revenue - var costs)	6,935	277.40	4,334	173.38
Net profit (gross margin - invest costs)	6,722	268.86	4,201	168.04

- Far more profitable at ECF level suggesting an investment in improved seed and other simple aspects of on-farm management can make a big difference to rural incomes. Total costs per hectare are about double, but total profits increase almost four times.

- From a competitiveness point of view, the data also show that ECF soybeans cost less to produce on a per MT basis.

197. The composition of farm level costs for FAM and ECF farmers are illustrated in Table 44.

Figure 16: Soybeans, Composition of Farm-level Costs



198. **Financial costs and profits at assembly.** Table 44 looks at the financial costs and profitability of assembly over a 500km delivery distance from southern Niassa to Namialo. Although traders deal in tons, the per hectare data are still helpful because they showing something about the total area of production that might be needed to sustain an assembler dealing in this commodity. More specifically, a margin of only MZN 100 per MT several hectares are needed to make the assembly of soybeans a viable business. Clearly traders also benefit as farmers move from the FAM to ECF level of production.

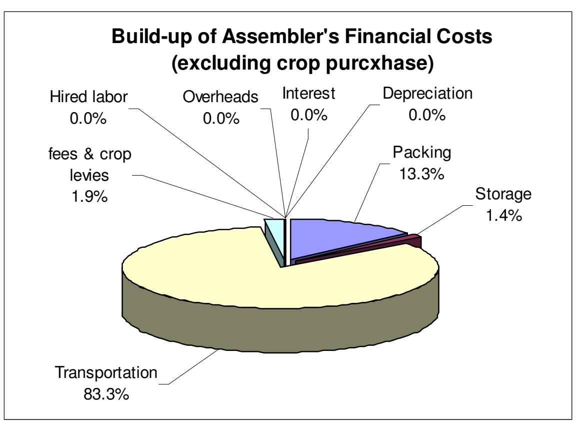
Table 44: Soybeans, Financial Costs and Profits at Assembly

ASSEMBLY Soya (FAM)	Per Hectare		Per Ton	
	MZN	USD	MZN	USD
Gross revenue (qty sold * price)	**3,325**	**133.00**	**6,650**	**266.00**
Production costs				
Crop purchases (payment to farmer)	2,750	110.00	5,500	220.00
Other variable costs	525	21.00	1,050	42.00
Investment costs	-	-	-	-
Total costs	**3,275**	**131.00**	**6,550**	**262.00**
Assembler's income				
Gross margin (revenue - total var costs)	**50**	**2.00**	**100**	**4.00**
Net profit (gross margin - invest costs)	**50**	**2.00**	**100**	**4.00**

ASSEMBLY Soya (ECF)	Per Hectare		Per Ton	
	MZN	USD	MZN	USD
Gross revenue (qty sold * price)	**10,640**	**425.60**	**6,650**	**266.00**
Production costs				
Crop purchases (payment to farmer)	8,800	352.00	5,500	220.00
Other variable costs	1,680	67.20	1,050	42.00
Investment costs	-	-	-	-
Total costs	**10,480**	**419.20**	**6,550**	**262.00**
Assembler's income				
Gross margin (revenue - total var costs)	**160**	**6.40**	**100**	**4.00**
Net profit (gross margin - invest costs)	**160**	**6.40**	**100**	**4.00**

199. The per MT composition of assembly costs is illustrated below.

Figure 17: Soybeans, Composition of Assembly Costs



200. **Value chain indicators**

Table 45: Soybeans, per MT Value Chain Indicators

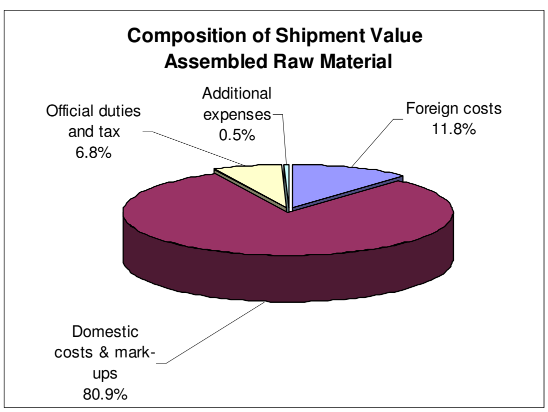
Soya (FAM)	FARM GATE PRODUCT		ASSEMBLED RAW MATERIAL	
	MZN	USD	MZN	USD
Domestic Value Added				
Costs & mark-ups	2,590	103.62	5,297	211.87
Official duties & tax	26	1.03	448	17.91
Additional costs	4	0.16	34	1.35
Total DVA	**2,620**	**104.80**	**5,778**	**231.13**
Foreign costs	348	13.94	772	30.87
Total Shipment Value	**2,969**	**118.74**	**6,550**	**262.00**

Soya (ECF)	FARM GATE PRODUCT		ASSEMBLED RAW MATERIAL	
	MZN	USD	MZN	USD
Domestic Value Added				
Costs & mark-ups	1,249	49.97	5,468	218.70
Official duties & tax	12	0.49	434	17.38
Additional costs	2	0.08	32	1.27
Total DVA	**1,264**	**50.54**	**5,934**	**237.35**
Foreign costs	193	7.72	616	24.65
Total Shipment Value	**1,457**	**58.26**	**6,550**	**262.00**

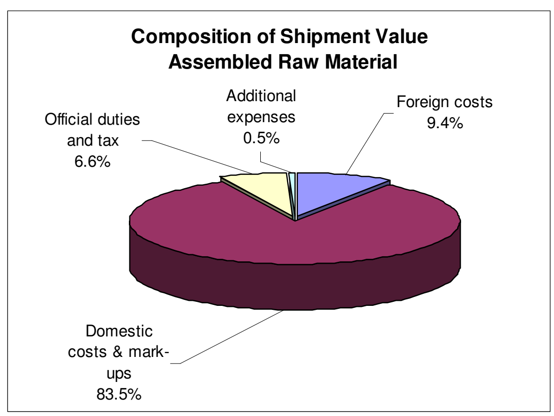
- Significantly lower SV for ECF soya before profit margins are added to the calculations. As a fundamental matter of trade competitiveness, this provides further good reason to invest in improved technology as part of any effort to introduce soybeans in northern areas of Mozambique.

Figure 18: Soybeans, Composition of Value Chain Costs

FAM



ECF



201. **Parity price comparison.**

- The estimated import parity price for soybeans at Namialo is MZN 10,625 (USD 425) per MT (based on the fob price in Rotterdam of USD 254/MT provided to CCAA teams by FAO).

- The SV figures for domestic production are only about 61% of import parity, suggesting that Mozambican farmers can be extremely competitive with global imports.

- That said, the market in Mozambique is still very underdeveloped and the data also show that farmers could not be competitive with exports since the SV in Namialo is about the same as the fob price in Rotterdam.

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