COMPETITIVE COMMERCIAL AGRICULTURE IN AFRICA (CCAA)

ZAMBIA COMPETITIVENESS REPORT

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EXECUTIVE SUMMARY

Introduction

1. This paper presents the Country Competitiveness Analysis for Zambia undertaken as part of the Competitive Commercial Agriculture in Africa (CCAA) study. The primary objective of the CCAA study is to explore 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 all CCAA countries covers seven important commodities and three farm sectors ranging from individual family farms to large-scale commercial enterprises; the commodities are cassava, cattle, cotton, maize, rice, soybeans, and sugar.

2. In Africa, the CCAA competitiveness analysis is being undertaken in Mozambique, Nigeria, and Zambia. 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 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. Cross-country comparisons and final conclusions 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 Zambia.

4. The paper is organized in six sections including an introduction. Section II provides an overview of the Zambia country context and factors that shape the opportunities for competitive development. Section III introduces the quantitative methodology used for the CCAA study and Section IV summarizes results of the input analysis of materials used for agriculture production and marketing. Section V presents the main value chain analysis for each of the seven CCAA commodities and the discussion concludes in Section VI with a summary of important findings and areas for further analysis. Results of various sensitivity tests of alternative price and yield assumptions are presented in Appendix 3 and the full set of spreadsheet templates completed for the Zambia analysis is presented in a quantitative annex.

Approach and Limitations

5. The analysis 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 Zambia's trading relations. This part of the country work began with an extensive literature review carried out as a distinct first phase of the Zambia analysis. [1] The review is presented separately and includes a wealth of information relevant to the planning of effective development strategies and opportunities for renewed agriculture competitiveness. In addition to the seven core commodities, for example, the literature review also provides information on coffee, dairy, export vegetables, floriculture, and paprika which are products that have either done well in Zambia in the recent past or are thought to offer special growth potential.

[1] Agridev Consult Ltd, 2006.

6. On the quantitative side, the analysis was prepared using an original methodology designed for the CCAA study to calculate a set of standard indicators and benchmark prices.[2] 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. By filling in the elements of each template for individual commodities and farm systems, the approach offers a practical way of establishing benchmark prices for each value chain that can be compared with world standards as measures of international competitiveness. The methodology also helps to identify specific areas where domestic costs could most effectively be reduced to improve performance.

7. 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. For cross-country 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, international competitiveness is determined by comparing SV at the final destination (sale point) with a benchmark parity price (usually a domestic fob price for exports or cif price for import substitutes).

8. By looking at the composition of SV, including the elements of DVA that contribute to this total figure, the methodology also provides insight where costs can most effectively be reduced. If some cost accounts for a large share of total value, or is significantly higher than the international benchmark, then new policies or investments focused on reducing that cost would likely be an effective strategy for enhanced competitiveness. Similarly, by looking at the build-up of SV (and DVA) from stage to stage, the methodology helps to reveal the competitiveness of individual participants. If assembly or processing, for example, account 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 those stages of the value chain may be an effective strategy for enhanced competitiveness.

9. Although the spreadsheet templates provide a powerful tool for agriculture analysis, this is the first time the methodology has been used in a fully operational sense and several important limitations also need to be recognized. Most importantly, the methodology is very data intensive and 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 and best guesses have sometimes been used. Accordingly, the results need to be interpreted as indicative estimates only rather than as definitive measurements. Much further analysis is required before recommending any specific investment program or policy reform package.

Summary Findings

10. **General considerations.** The analysis shows that Zambia has considerable potential for economic growth and poverty reduction through expanded agriculture trade. The country is endowed with vast natural resources, land remains largely unexploited, and there is abundant water that could be used for irrigation. Because of these natural conditions, Zambia has been able to develop a successful sugar industry based on extremely low field costs. The country has also done well in other high-value crop sectors like cotton and tobacco for which natural growing conditions are well suited.

11. As a land-locked country, it is also apparent that high transportation costs have a major bearing on the opportunities for agriculture trade and investment. It is no accident that relatively high value commodities like sugar, tobacco, horticulture, coffee, and cotton lint account for a large share of Zambia's agriculture exports. Lower value products like maize and soybeans, on the other hand, are better suited for production as import substitutes or for trade with regional neighbors where high transport costs are less of a factor and still provide some protection from global competition. Zambia enjoys a significant cost advantage in the production of maize as an import substitute, for example,

[2] Keyser, 2006.

but is much less competitive as an export producer except for regional markets where short-term deficits sometimes exist.

12. High transport costs are also an important component of most input prices. Although this can be quite low as a share of total SV for some high value inputs, an estimated 30% of the value of fertilizer at the farm gate is accounted for by international freight. Certainly, the fact that Zambia imports nearly all of its farm inputs adds to the costs of production at every stage and is a basic reality that any competitiveness strategy must account for. In general terms, this add emphasis to the importance of focusing on import substitution to meet domestic demand while also targeting regional markets for bulk exports when possible and high value commodities for the global market.

13. Other important considerations in developing a competitiveness strategy relate to the very real need for more volumes of product to create better economies of scale and minimize transaction costs when sourcing raw material. This is especially true in outlying areas where production is quite dispersed and therefore involves a high cost to bring the product into a formal, commercial market. Just like Zambia enjoys a degree of natural protection from competition with regional and global imports, producers in the outlying areas also have a strong incentive to produce crops for their own consumption and have difficulties competing in other markets.

14. The opportunities for export development and import substitution also depend on Zambia's ability to meet international standards. This is particularly noticeable in the cattle sector, where beef exports are not possible due to disease restrictions in the EU, SACU, and most other potential markets except some regional neighbors including the Democratic Republic of Congo (DRC). Even for bulk commodities like maize, rice, and soybeans, it is clear that Zambia still has some way to go to develop (and enforce) standards covering things like moisture content, contamination with foreign matter, and guarantees on availability.

15. **Input supply.** Import duties on most agriculture inputs are low and do not attract VAT. The major exceptions are insecticides (15% duty), spraying equipment (5% duty and 17.5% VAT) and, until recently, irrigation equipment (15% duty and 17.5% VAT). If a farmer is VAT registered they can reclaim VAT or apply for a deferment, but the tax still gets passed on in the supply chain to the next level consumer. For other inputs like fertilizer and herbicides, the current tax regime (0% duty, 0% VAT) is an important advantage to agriculture competitiveness for which government should be commended. Overall, import duties and VAT translate into a fairly modest share of the final SV of most finished commodities. This is especially true for individual family farmer (FAM) and emerging commercial farmer (ECF) products in which producers and traders use relatively fewer taxed inputs than at the large commercial farm (LCF) level.

16. This is not to say that input taxes and other domestic transfers cannot be reduced or eliminated for strategic advantage. Council levies, for example, account for 75% of the total tax on FAM maize and 43% of the tax on LCF maize. District councils obviously require adequate funding, but the decision to raise revenue through crop levies cannot be viewed in isolation from Zambia's efforts to develop competitive agriculture.

17. **Farm production.** After the input supply stage, agriculture competitiveness depends on the efficiency of farm production. The CCAA methodology measures per ton SV of each farm product. These results are summarized below in Table ES-1 for unprocessed commodities at the first point of sale. These benchmark values can be compared with other CCAA farm level indicators.

18. In addition to analyzing farm level shipment values, it is also important to look at costs and profitability of each enterprise. Agriculture production and competitiveness begins with the decisions farmers make and, encouragingly, the per hectare data show that all enterprises return positive financial return except LCF cassava (which was analyzed for illustrative purposes as a hypothetical possibility only). Whereas the total SV of all LCF commodities is higher compared with FAM and ECF commodities the inverse is most often true in terms of gross and net profit.

Table ES-1: Summary of Farm Level per MT Shipment Values (USD)

Product	Location	FAM	ECF	LCF
Cassava (tubers)	Roadside (farm gate)	33.87	41.59	62.56*
Cattle (24-month long weaner)	Into feedlot	685.04	900.48	1,096.89
Cotton (un-ginned seed cotton)	Rural depot	181.75	234.17	408.88*
Maize (bagged grain)	Roadside (FAM) Shed (ECF and LCF)	136.27	151.58 (3mos storage)	176.48 (6mos storage)
Rice (un-milled paddy)	Rural depot	128.54	173.81	n/a
Soybeans (bagged seed)	Rural depot	90.69	119.68	206.39
Sugar (unprocessed cane)	Factory gate	19.73†	17.90‡	22.68§

* hypothetical possibility; † independent LCF low; ‡ independent LCF high; § LCF estate. LCF cotton, soybeans, and sugar include irrigation.

19. **Assembly.** The next step in the agriculture value chain is assembly. Although many farmers in Zambia perform the delivery function themselves, this operation was analyzed as a separate activity for most commodities. More specifically, it was usually assumed that FAM farmers sell to an informal roadside buyer. These traders pay a low price, but always pay with cash or bartered goods at the time of delivery. ECF and LCF farmers, on the other hand, usually sell to a larger-scale transporter or commodity broker. The main per ton SV indicators for unprocessed farm commodities delivered at the final assembly point are summarized below. These indicators include all accumulated values from farm production and input supply and do not merely show the incremental cost of assembly.

Table ES-2: Summary of Assembly Level per MT Shipment Values (USD)

Product	Assembly Point	FAM	ECF	LCF
Cassava (tubers)	Kasama	95.22	95.22	97.50
Cattle (24-month long weaner)	Feedlot	*Farm data covers assembly into feedlot*		
Cotton (un-ginned seed cotton)	Katete (FAM and ECF) Lusaka (LCF)	318.20	318.20	476.50
Maize (bagged grain)	Nearest mill (FAM) Lusaka mill (ECF, LCF)	141.62 (no storage)	218.98 (6 mos store)	230.00 (6 mos store)
Rice (un-milled paddy)	Kasama	205.62	205.62	n/a
Soybeans (bagged seed)	Lusaka	205.62	235.00	267.50
Sugar (unprocessed cane)	Factory gate	*Farm data covers assembly into mill*		

20. For many commodities, per ton measurements of SV at the assembly point are sufficient to evaluate international competitiveness. Maize, for example, is nearly always traded as unprocessed grain and the total SV of domestic production at the mill gate is the place to measure international competitiveness. Soybeans are another commodity often traded in its unprocessed form, so the accumulated SV at the assembly point is sufficient. Products like seed cotton and paddy rice, on the other hand, still have to undergo some type of processing to reach a stage that can be compared directly with import or export parity.

21. **Processing.** At the processing stage, data limitations became a serious constraint for carrying out the template analysis. In most cases, some very rough (and old) data were available, but this information was usually not very detailed and less certain compared with other stages. Bearing this limitation in mind, the final SV indicators for one ton of finished commodity are summarized below. These figures comprise all accumulated costs from input supply, farm production, and assembly included in amount of raw material required to produce one ton of processed product.

Table ES-3: Summary of per MT Shipment Values for Processed Raw Material (USD)

Product	Outturn	FAM	ECF	LCF
Cassava (tubers)	Data not available	*Compare at assembly stage with regional parity*		
Cattle (24-month long weaner)	Data not available	*Compare at assembly stage with into feedlot costs for other countries*		
Cotton lint Katete ginnery for FAM and ECF Lusaka ginnery for LCF	40.5% GOT for FAM and ECF 43% GOT for LCF	1,047.09	1,047.89	1,433.70
Cotton seed Katete ginnery for FAM and ECF Lusaka ginnery for LCF	55% seed for FAM and ECF 53.5% seed for LCF	771.04	771.04	1,080.79
Maize	Rough data available, but not necessary	*Compare at assembly stage with regional parity for white maize (and seasonal variations)*		
Rice Packaged mixed and broken rice, delivered Lusaka	FAM = 38% whole, 31% broken; ECF = 43% whole, 26% broken	478.39	496.50	n/a
Soybeans (bagged seed)	Rough data available, but not necessary	*Compare at assembly stage with regional parity for unprocessed beans*		
Sugar (unprocessed cane)	Data not available	*More information on processing costs and fob prices at factory gate required.*		

22. **Final comparisons.** From the preceding data, a final summary table can be complied of all relevant domestic benchmark prices at the most relevant point of international competition. These results are listed in the "Final Summary of Parity Price Comparisons" on Page xi. In addition to the final measurements of SV, this table summarizes the best available reference price information provided by CCAA study coordinators together with a short description of the ideal parity price calculation.

Summary Interpretation

23. Several conclusions can be drawn from the detailed value chain information. Together with the background analysis and more detailed quantitative results discussed in the main report, this summary helps to identify some basic observations about Zambia's competitiveness options.

24. **Cassava.** Cassava is mainly grown for household food security in the north and northwestern regions of Zambia. There are no large commercial producers and processing is entirely informal. There are reports of cross border trade with DRC and other regional neighbors, but the main market for cassava is for local trade and sale to urban consumers in Lusaka and the Copperbelt. The international parity price of USD 50 per ton fob Northern Europe provided by FAO for CCAA analysis is not particularly useful since Zambia's competitiveness needs to be measured in the context of regional market opportunities. From the financial perspective, one of the most appealing features of cassava is that it is extremely inexpensive for small farmers to produce and could offer a good

opportunity for commercial development in outlying areas. As a low value, bulky commodity, however, this is likely to depend on investment in new processing facilities. There has been a surge in cassava production recently, but as a food security crop there is still an open ended question about whether traders can amass enough as raw material to sustain a processing facility. LCF farmers are all a long way from the main cassava growing areas and are unlikely to participate in this value chain.

25. **Cattle.** The opportunities to trade beef are severely restricted by the size of the domestic market and demanding veterinary and public health requirements in potential export destinations. Like cassava, the DRC probably offers the best opportunity for export growth because animal health requirements and sanitary controls are little problem in that market. Exports to the European Union or even South Africa are not possible until internationally certified veterinary systems and abattoirs can be put in place. That said, the into feedlot SV for Zambian beef is reasonably competitive with the equivalent price in Argentina suggesting that Zambia could do well in this commodity if markets were opened up. Although feedlot costs were not available, these are likely to be higher in Zambia than elsewhere and further analysis of this stage is also needed to get a fuller picture of development opportunities.

26. **Cotton.** Cotton is an important export commodity for Zambia and is especially well suited to production by FAM and ECF-type farmers. The commodity has done very well in recent years, especially as the two major ginning companies have apparently solved many of the problems around the risk of side selling by farmers to avoid repaying input loans. The total estimated SV for FAM and ECF cotton is slightly higher than the estimated export parity price, but this can easily be explained by data deficiencies (especially at the processing level, but also at other stages of the value chain). Until more data become available, the most reliable conclusion is to say that any reduction in world price will lead very quickly to a need for a realignment of profits between value chain participants. For this reason, new policies in the cotton sector are often controversial. Looking ahead, yield improvements are important to sustain Zambia's place in the global marketplace. Many small farmers still produce only 500 or 600kg/ha, but a realistic expectation for a competent family grower is closer to 800kg/ha.

27. **Maize.** As Zambia's staple food, white maize is of enormous strategic importance to the entire economy. Far more area is given to this commodity than any other and maize production is very simply the basis of most rural livelihoods. As an import substitute, the SV calculations all show that Zambia has a strong incentive to produce maize and is extremely competitive with imports. Further analysis of seasonal price cycles would help to clarify some of the circumstances around this, but it is abundantly clear that Zambia has significant economic, political, and food security reasons for producing its own maize crop and should continue to emphasize this commodity. Export opportunities, on the other hand, are less certain, but can still be a good target in years with a maize surplus. The DRC usually demands large volumes of imported maize and Zambia could do well to explore this market where it alone has a transport advantage over other competitors. Maize, typically sells for 20-30% more in the DRC than in Zambia, but so far most trade takes place only on an informal cross-border basis. Government interference in the sector, particularly in the form of export bans and efforts to enforce pan-territorial pricing through the Food Reserve Agency have seriously constrained regional export development.

28. **Rice.** Rice is a minor commodity for Zambia, but appears to have done well in recent years. Prices are determined by competition with imports and the SV calculations for polished rice landed in Lusaka show that domestic crop is marginally more expensive compared with the cost of importing rice from Thailand. All rice in Zambia is grown in very remote areas and the high costs of production together with domestic transport costs combine to make it very difficult for Zambia to compete with imports. The problem of broken grains is another constraint. That said, domestic production appears to have increased recently and regional export opportunities may now exist, especially to the DRC which is closer to Zambia's rice growing areas than Lusaka where the final comparison of SV was made. Export prices in the DRC, together with logistical requirements for trade with that country need to be better understood.

29. **Soybeans.** Opportunities in the soybean sector depend on continued growth in poultry production. Soybean oil can be sold on the local market, but these opportunities are limited by competition from inexpensive Asian palm oil that is refined in Kenya and imported duty free as a COMESA product. Even at these highly competitive prices, soybean oil appears to be more profitable than the cake, but processors must still sell the cake (which is the main product in volume terms) to cover processing, which is why growth of the poultry industry is critical to the success of soybeans. As an import substitute, and even as export product, the SV calculations are encouraging and show that unprocessed beans are competitive under both trade scenarios. Import substitution is the most likely trade scenario, but Zambian soybeans are sometimes also exported to regional markets. As with all of Zambia's commodities, however, the closer the goods travel to an international port, competition from lower costs producers worldwide becomes increasingly stiff. The main advantage of Zambian soybean exports is the ability to supply relatively small quantities compared with very large orders from Brazil and Argentina. More detailed analysis of regional parity prices is needed to assess the true potential for this type of trade. More information is also needed on growth prospects in the poultry sector, including the potential for supplying chicken and eggs to the DRC..

30. **Sugar.** Sugar is an important commodity for Zambia and presently accounts for around 4% of total merchandise exports. Although most sugar exports go to regional neighbors north of Zambia, growth in the sugar industry has, until recently, been constrained by European quotas. New EU trade policy will now give Zambia unfettered access for about 95% of current production equal to a maximum of 250,000 MT refined sugar from 2009 until at least 2015. This change represents a significant challenge for Zambia, not least because the new policy is expected to result in a 32.5% effective price cut from current protected levels, but also because of the vast development opportunity it offers. The estimated SV of processed crystal works out to be USD 11.81 higher than the estimated fob factory gate price at unprotected world levels (USD 266/MT refined sugar) which would appear to suggest that Zambia should not concentrate on serving the EU market from 2009. The implicit loss of USD 11.81/MT, however, is relatively small and could fairly easily be offset with savings at the processing level and/or international distribution. The analysis also underscores the importance of focusing on regional trade as the most competitive market outlets. Whereas high transport costs to Europe account for an estimated 45% of export parity on the world market, lower freight costs to inland markets north of Zambia are likely to provide a trade advantage, especially compared to the high cost global competitors face in reaching these destinations. Zambia is regarded as the world's sixth lowest cost cane producer and the Zambia Sugar estate is currently expanding its operations by 85% from 247,000 MT total sugar production to 440,000 MT by 2009.

Other Conclusions

31. **Regional markets are the most important.** One of the most important general conclusions is that regional markets are often the most important for Zambia, both as a source of competition and likely export destination. Because of Zambia's reliance on imported inputs and physical position as a landlocked country, transport costs mean that commodities with a relatively low value to weight ratio such as maize, soybeans, and cassava are unlikely to compete in global export markets. Closer to home, however, Zambia does begin to enjoy a competitive advantage. Because Zambian agriculture has not developed to the stage of producing regular surpluses, however, and because many neighbors produce the same commodities, such advantages are often short-lived, but could perhaps be developed over time particularly with respect to feed ingredients, cassava, and possibly even maize.

32. **High value commodities are likely to do better in global markets.** For the same reason that Zambia does well with import substitution, higher value commodities are the most likely to cover transport costs and succeed in global export markets. This applies to products like cotton and refined sugar, where Zambia's growing conditions are an important competitive advantage. Other commodities like coffee, paprika, tobacco, and export horticulture (consisting of cut flowers and fresh vegetables) are also important high value products for Zambia that enjoy a competitive place in the global market. The possibility of expanding counter-seasonal fresh fruit production to supply markets in South Africa is another area of high value agriculture that Zambia may want to explore.

33. **Look north for opportunities.** Although trade with the Democratic Republic of Congo is complicated by border inefficiencies and lack of security for financial transactions, this market undoubtedly offers Zambia the best potential for rapid agriculture export development. Bulk food commodities like cassava, beef, maize, and rice are all in great demand in the DRC and typically trade for about 20-30% more compared with domestic prices. Katanga Province is the one geographic area where Zambia enjoys a transport advantage over all other competitors and is the natural place to look for export opportunities. Beef is of special interest because veterinary and food safety standards do not prevent trade with the DRC. Before this potential can be realized, very serious problems relating to basic physical security, transparency and rule of law at the border, freedom from extortion at roadblocks, and even the risk of non-payment by importers all need to be addressed. This will likely require concerted effort by governments, donors, and private investors alike.

34. **Sensitivity to yield.** To help identify areas for strategic intervention to improve competitiveness, a sensitivity analysis of the effects of yield improvement on accumulated SV at the final stage of international competition was carried out. These results are described in Appendix 3 and show that even a 50% yield improvement is unlikely to change the overall competitiveness scenario for most commodities. Although the gap between domestic SV and the international parity price does become narrower (and sometimes significantly narrower) with better yields, there are only a few cases where yield improvements alone are sufficient to provide Zambia a competitive advantage without changes in other areas. As noted elsewhere, savings on transport costs are likely to be a more effective intervention point, both in terms of investments that reduce current costs for long-distance routes and through regional trade where transport will always account for a smaller share of final SV.

35. **Farmers account for a large part of total agriculture value.** Although this point may seem obvious, it is worth emphasizing that primary producers account for and receive the greatest share of total value (by far) in each commodity chain. Often the discussion of Zambian agriculture becomes sidetracked by allegations of "unfair" trading practices by bulking agents or processors who are said to capture a disproportionate share total value added. Although it is certainly true that FAM farmers face a difficult (and largely uncompetitive) trading environment at the farm gate, primary producers without doubt account for the greatest share of agriculture value added. An improved understanding among value chain participants of how the decisions at one level affect total competitiveness could therefore go a long way to improving overall sector performance.

Next Steps

36. For the CCAA analysis, the next steps in identifying competitive growth options for Zambia is to compare the measurements of total SV and other value chain and financial indicators with the data from other countries. At what stage of the value chain is Zambia most and least competitive? Compared with recognized global leaders, are Zambia's costs at the factory, assembly point, and farm gate higher or lower than the world standards? Only by looking at the Zambia data in the context of the larger CCAA results can the full methodology be put to use through international comparison. A greater consideration of regional parity prices should also be included as part of this next stage analysis for the reasons described above.

37. Despite current limitations, it is hoped that this report at least helps to show how production decisions at one stage of the value chain affect other participants and shape Zambia's final ability to compete in the global, regional, and domestic marketplace. In the absence of a well defined methodology for assessing these processes, sector planning can easily become an exercise in guesswork based on presuppositions about which crops and trading arrangements are best. The approach followed here cannot point to all the issues that need to be considered in developing new strategies for agriculture, but does help to identify some of the major trade-offs between important investment decisions sector participants should be aware of and discuss.

LIST OF ABBREVIATIONS

ACP	African, Caribbean, and Pacific Countries
CCAA	Competitive Commercial Agriculture in Africa
CF	Conversion factor
cif	Cargo, insurance and freight
COMESA	Common Market of East and Southern Africa
CSO	Central Statistics Office
DRC	Democratic Republic of Congo (or Domestic Resource Cost Ratio)
DVA	Domestic value added
ECF	Emergent commercial farmer
ERC	Expected recoverable crystals (% sugar from cane)
EU	European Union
FAM	Family farmer
FAO	Food and Agriculture Organization
fob	Free on board
Forex	Foreign exchange
FRA	Food Reserve Agency
FSRP	Food Security Research Project (implemented by MSU)
GMO	Genetically modified organism
GOT	Ginning outturn (% lint)
GRZ	Government of the Republic of Zambia
HACCP	Hazard Analysis and Critical Control Point
INESOR	Institute for Economic and Social Research, University of Zambia
ISO	International Standards Organization
JICA	Japan International Cooperation Agency
LCF	Large commercial farmer
LCU	Local currency unit
MACO	Ministry of Agriculture and Cooperatives (formerly MAFF)
MAFF	Ministry of Agriculture, Food, and Fisheries (now MACO)
MSU	Michigan State University (MSU/FSRP)
O&M	Operation and maintenance
PAM	Policy analysis matrix
R&M	Repairs and maintenance
SACU	Southern Africa Customs Union
SADC	Southern Africa Development Community
SV	Shipment value
UNZA	University of Zambia
USAID	United States Agency for International Development
VAT	Value added tax
VDP	Value for duty purposes
ZACA	Zambia Agriculture Commodity Agency
ZRA	Zambia Revenue Authority
ZSC	Zambia Sugar Company

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

USD 1.00	=	ZMK 4,000
ZMK 10,000	=	USD 2.50

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

	FAM	ECF	LCF
Cassava	Northern	Northern	*Central*
Cattle	Southern	Southern	Southern
Cotton	Eastern	Eastern	*Southern - irrigated*
Maize	Central	Central	Central
Rice	Northern (or Western)	Northern (or Western)	n/a
Soybeans	Central	Central	Central - irrigated
Sugar	n/a	n/a	Southern* - irrigated

Commodities listed *in italics* are hypothetical possibilities; * for sugar, analyzed 3 LCF variations.

SUMMARY OF FINAL PARITY PRICE COMPARISONS

Product	Final Stage for SV Comparison	Final Shipment Value per MT			Ideal Parity Comparison	Available Reference Price
		FAM	ECF	LCF		
Cassava	Assembled tubers (at Kasama)	$95	$95	$97*	Regional export parity to DRC	$50/MT cif Northern Europe
Cattle (24-month long weaner)	Farm (live animal into feedlot)	$685	$900	$1,097	Import parity or regional export parity	$870/MT at Argentina feedlot
Cotton lint	Processing (fob factory gate)	$1,047	$1,047	$1,433*	Confirm local export parity with gin operators	$978/MT for FAM & ECF $1,303 for LCF (varies by staple length)
Cotton seed	Processing (fob factory gate)	$771	$771	$1,080*	Analyze value as feed ingredient	$90/MT fob factory gate
White Maize	Assembly (un-milled grain)	$141 (June)	$219 (Dec)	$230 (Dec)	Regional import (and export?) parity including seasonal price cycles	$338/MT cif Lusaka (ex Randfontein, October)
Rice	Logistics (polished rice delivered Lusaka)	$478	$496	n/a	Thai import parity and regional export parity	$460/MT cif Lusaka (ex Thailand)
Soybeans	Assembly (bagged seed)	$206	$235	$268	RSA import/export parity	M = $489/MT cif Lusaka X = $215/MT fob Lusaka (ex Randfontein)
Sugar (all LCF)	Farm (cane delivered to factory)	$19.73 (low)	$17.90 (high)	$22.68 (estate)	Various (including current and future EU price and regional prices)	$266 MT refined sugar factory gate w/o protection (+/-$33.93/MT cane equiv. ex processing)

* Hypothetical possibility. Available reference prices provided by FAO and/or own calculations from alternative sources.

TABLE OF CONTENTS

COMPETITIVE COMMERCIAL AGRICULTURE IN AFRICA (CCAA)

ZAMBIA COMPETITIVENESS REPORT

I. INTRODUCTION

1. This paper presents the Country Competitiveness Analysis for Zambia undertaken as part of the Competitive Commercial Agriculture in Africa (CCAA) study. The primary objective of the CCAA study is to explore 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 all CCAA countries covers seven important commodities and three farm sectors ranging from individual family farms to large-scale commercial enterprises; the commodities are cassava, cattle, cotton, maize, rice, soybeans, and sugar.

2. In Africa, the CCAA competitiveness analysis is being undertaken in Mozambique, Nigeria, and Zambia. 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 Zambia.

A. Objectives

4. Within this context, the specific objectives of the Zambia 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 six sections including the current introduction. Following a few additional remarks about the overall approach and limitations, the competitiveness analysis begins Section II with an overview of the Zambia country context. For this part of the report, special attention is given to describing Zambia'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 summarizes results of the input analysis of materials used for agriculture production and marketing. In value chain analysis, all commodities carry forward the accumulated costs from all previous stages. Input cost components are therefore the foundation on which the analysis of each commodity system is based and the essential starting point for understanding Zambia's current and future competitiveness from a value chain perspective.

7. Section V presents the main value chain analysis for each of the seven commodities selected for CCAA coverage. 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.

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

B. Approach and Limitations

9. As described, the analysis for Zambia 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 Zambia's 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.

10. The qualitative work is based on an extensive literature review that was carried out as a distinct first phase of the Zambia analysis. The complete literature review includes far more information than could be summarized here and is presented separately.[1] This background document should, however, be read as an integral part of the CCAA work in Zambia and includes a wealth of information relevant to the planning of effective development strategies and opportunities for renewed agriculture competitiveness. In addition to the seven core commodities, for example, the literature review also provides information on coffee, dairy, export vegetables, floriculture, and paprika which are products that have either done well in Zambia in the recent past or are thought to offer special growth potential. Due to time and data limitations, these additional commodities could not be covered by the quantitative part of the CCAA study, but would be a good area for further analysis. Qualitative results are summarized in Section II on the Zambia Country Context and in Section V with the main discussion of each of the seven focal commodities.

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.[2] 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

[1] Agridev Consult Ltd, 2006.

[2] Keyser, 2006.

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. This 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 study 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 existing 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 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 absolutely 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 very little reliable information was available and these costs should be investigated further as part of any follow-on activity. The data here should still provide a reasonably accurate picture of underlying competitiveness, but the analysis is no substitute for 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 a 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 any great detail.

14. Indeed, many other factors than could possibly be covered here also shape Zambia's competitiveness. The analysis touches on a great many aspects including exchange rate policy, customs policy, customs administration, 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 other 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 Zambia 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.

II. COUNTRY CONTEXT

16. Before turning to the detailed commodity analysis, it is useful to describe some basic characteristics of Zambian agriculture. This information is taken largely from the initial literature review prepared for the Zambia case study.[3]

A. General Considerations

17. Zambia has considerable potential for economic growth and poverty reduction through agriculture expansion. The country is endowed with a large natural resource base for agricultural production, land resources remain largely unexploited, and the country has abundant water resources that could be used for irrigation. Furthermore, with the declining role of Zimbabwe's exports of agricultural commodities in the region, Zambia has ample scope for filling the gap. The Democratic Republic of Congo is a traditional importer of smallholder commodities from the Copperbelt, Luapula, and Northwestern Provinces and the return to normalcy and peace in Angola could bring about significant market opportunities, especially for farmers in the west.

18. Contribution of the sector to broad-based economic growth, however, has been limited due to the dual nature of Zambian agriculture in which low productivity subsistence farming contrasts with emerging and large-scale farming systems. Past Government attempts to improve productivity of smallholder agriculture through supporting commercialization process have generally not achieved expected results. Among other factors, attempts to support commercialization through provision of subsidized inputs and credit, public extension services and market price interventions failed to yield the desired results due to lack of business orientation of public services and absence of linkages with the markets.

19. **Historical context.** For many years, the agricultural sector in Zambia, like the rest of the economy in general, operated under a controlled policy environment. Economic management was mainly through state institutions using various instruments, such as agricultural input and marketing subsidies, foreign exchange controls and controls on interest rates. Revenue, mainly from copper, was used to invest in parastatal firms and high tariffs and import licensing ensured their protection. Inevitably, this stifled private investment in productive sectors and retarded the development of the agricultural sector that became entirely dependent upon an increasingly inefficient public sector.[4]

20. At the close of the Second Republic in Zambia, in the wake of dismal agricultural performance, serious economic reforms were undertaken that continue to have a profound effect on most of the economy. The liberalization of the agricultural sector which began in earnest in early-1992 included the near total retreat of government from its previously primal role in every aspect, from the inputs markets to final retailing. Most of the agricultural sector was unprepared for the consequences of this rapid shift to a market economy. Because of the abrupt retreat of government without the concurrent creation of new support systems, agriculture was left in an institutional vacuum from which it still recovering.[5]

21. Concerted efforts have been made since 1992 to liberalize the agricultural sector. Notable policy measures undertaken include the elimination of price controls and subsidies, privatization of former parastatal companies, increased private sector involvement in commodity marketing and input supply and also the restructuring of the Ministry of Agriculture to account for its new responsibilities in a market economy compared with the days of central planning. There is, however, still an unfinished policy agenda for the sector given existing major constraints and challenges. These include poor service delivery particularly for small-scale farmers, marketing constraints especially in outlying areas as a result of poor infrastructure notably feeder roads, a void in agricultural finance and credit,

[3] Agridev Consult Ltd, 2006 unless noted.

[4] Keyser, Heslop, and Abel, 2001

[5] World Bank, 1996.

weak regulatory framework and poor enforcement of legal framework, and poor accessibility and administration of land in Zambia. These constraints need to be seriously and urgently addressed if agriculture is to develop.[6]

B. Natural Resources

22. Compared with many other southern Africa countries, Zambia has relatively abundant land, water and other natural resources for agriculture. Some 58% of Zambia's total land area equal to about 42 million hectares is classified as medium to high potential for agricultural production, with rainfall varying between 800 and 1,400 mm annually. A total of 60 million hectares is considered arable. On the plateaus in close proximity to Lusaka, Livingstone, Kabwe and Chipata, soils are generally fertile and rainfall is sufficient for the production of a broad range of crops. Population density is extremely low in most of the productive regions, ranging from 1 to 11 persons per square kilometer. Further north, the soils are less productive under natural conditions, however, many of the physical constraints could be overcome with small investments in fertilizer and lime. The northern regions receive ample rainfall and are quite sparsely populated. Overall, only 15% of Zambia's total arable land is currently being utilized.

23. Estimates of the technically irrigable area in Zambia range from 80,000 to more than 300,000 hectares. Thus far, only about 50,000 hectares have been developed – predominantly on large commercial farms. Past experience with government-developed and managed irrigation schemes was very poor although some donor-supported programs have been able to assist smallholder producer groups develop gravity fed water furrows, treadle pumps and dam construction to improve year-round water access for both crops and livestock. Thus far, very little attention has been given to the potential use of windmills for irrigation and it is only reasonable to assume that there could be good demand for this technology if effectively promoted through public and private channels.[7]

24. The country is divided into three major agro-ecological zones as follows (see Map of Agri-Ecological Zones in Appendix 1).

- **Region I** is characterized by low rainfall of less than 800 mm annually with a growing period of 80-120 days. This area constitutes 12 percent of Zambian's total area. It covers the Gwembe Valley, Lusenfwa Valley and Luangwa Valley in Southern, Central and Eastern Provinces, as well as the plains of Western and Southern Provinces. The region is suitable for production of drought tolerant crops (cotton, sesame, sorghum, millet) and has a potential for production of irrigated crops. It is also suitable for small livestock. The valley parts of the region are hot and humid and not suitable for cattle rearing because of tsetse flies.
- **Region II** is located through the middle belt plateau and constitutes 42% of the country. The region receives 800–1000 mm of rainfall annually and has a growing season of 100-140 days. Some of the most fertile agricultural soils are located in Region II. This region is considered to have the highest agricultural production and permanent settled systems of agriculture are practiced. The Region is divided into two sub-regions. **Region II a** covers Central, Lusaka, Southern and Eastern Provinces and generally contains fertile soils. Crops grown include maize, cotton, tobacco, sunflower, soybeans, irrigated wheat, groundnuts, and other arable crops, while the area is also highly suitable for flowers, paprika and vegetable production. **Region II b** covers Western Province and consists mainly of sandy soils, suitable for the production of cashew nut, rice, cassava and millet, as well as beef, dairy and poultry.

[6] Keyser, Heslop, and Abel, 2001.

[7] Ibid.

- **Region III** has the highest rainfall in Zambia, and constitutes 46% of the country. It receives more than 1000-1500 mm per annum and has a growing season of 120 to 150 days. It includes most of Northern, Luapula, Copperbelt and Northwestern Provinces and some parts of Central Province. With the exception of the Copperbelt the zone is characterized by highly leached, acidic soils that limit production to tolerant crops unless liming is practiced. The region has a good potential for the production of millet, cassava, sorghum, beans and groundnuts, while coffee, sugarcane, rice and pineapples are also grown in this area.

C. Farm Sectors

25. 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.

26. With respect to actual conditions in Zambia, farmers are normally classified according to the four main groups set out below. Throughout the report it is tried as much as possible to use the standard CCAA terms when referring to certain categories of farmers. In actual practice, however, the lines between these growers are often blurred and it is sometimes more convenient to talk about *smallholder farmers*, *emergent farmers*, and *commercial farmers* in more general terms than according to the rigid definitions applied by the quantitative part of the CCAA study in particular.

27. The main farm sectors normally referred to in Zambia are:

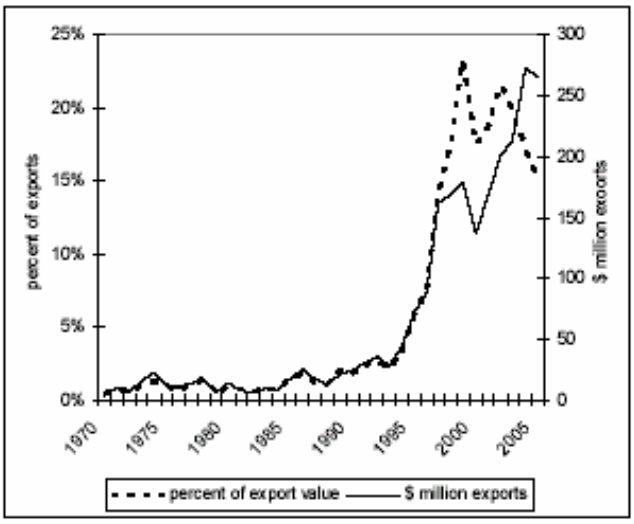
- **Smallholder farmers.** Small-scale farming households together cultivate about 80% of the total land with farm sizes from 1 to 5 hectares, with an average area of 2 hectares. They practice low-input, low-output production and depend on family labor and hand tools with limited use of oxen. This group produces mainly maize and other staple food crops such as cassava, sorghum, millet, groundnuts, and mixed beans although cash crops like cotton and tobacco have also become popular in recent years in areas with good market access and outgrower support. This sector generally corresponds with the definition of FAM farmers called for by the formal CCAA methodology.
- **Emergent farmers.** There are some 40,000-60,000 medium-scale or emergent farmers with farm sizes of between 5 and 20 hectares. These farmers produce largely for the market and employ both hired and family labor. The majority of emergent farmers use animal traction although some may also have a second-hand tractor. This group is especially important for producing maize, soybeans, tobacco and cotton. This sector mostly corresponds with the CCAA definition of ECF.

- **Commercial farmers.** There are some 600-750 large-scale commercial farmers with agricultural holdings that sometimes go up to several thousand hectares. These are mainly located along the line of rail or near urban centers. Large-scale commercial farming is mechanized and often employs high-level production and management technology. Irrigation is sometimes also used for winter crops. Commercial farmers are important growers of maize, soybeans, tobacco, wheat, coffee, and cattle (for dairy and beef). This sector encompasses the LCF growers described in the CCAA methodology. There is also an important sub-set of specialized horticulture producers not covered here.
- **Corporate farmers.** In addition to family-owned commercial farms, there is a growing assortment of even larger-scale corporate entities. These tend to be very large scale operations covering 1,000ha or more and often include vertically integrated processing units. Maize and other important crops including sugar, coffee, and cattle are among the main activities at the corporate level. The CCAA analysis of LFC sugar is based on corporate production.

D. Recent Developments

28. Over the past 15 years, agriculture has proven one of the most dynamic components of Zambia's export economy as a foreign exchange earner. In the 1960's and 1970's, agriculture accounted for less than 5% of total exports, while in the first five years of the new century that share has risen to between 15% and 25%. Agricultural exports such as cotton, cut flowers, fresh vegetables, and tobacco have formed the core of Zambia's diversification away from dependence on volatile mineral exports. In value terms, agricultural exports amounted to $276 million in 2005 and provided employment 142,000 commercial farm workers (see Figure 1).[8]

Figure 1: Agriculture Export Trends



Source: ZNFU/FSRP, 2005

29. Some 56% of Zambia's food and agricultural exports are sold within the region, the largest single markets being South Africa, Democratic Republic of Congo, and Kenya. Most of the remainder of the trade - and most of the country's exports of high-value perishable commodities (i.e. vegetables and cut flowers) - is oriented toward Western Europe, with the UK being the single largest

[8] ZNFU/FSRP, 2005

destination. Zambia presently undertakes minimal exports to other regions outside of Africa or Europe.[9]

30. **Cropping patterns.** Cropping patterns and production trends have changed significantly since the start of liberalization. The breakdown in maize marketing arrangements and the rising cost of fertilizers resulted in a noticeable shift in production patterns of smallholder family farmers, especially those in remote areas, with a reduction in maize plantings and a corresponding increase in the low-input production of an array of drought tolerant crops for home consumption as well as crops that do not require much fertilizer, such as legumes. These changes were most pronounced in the first half of the decade since liberalization. For some crops, these same trends continued, while for others the trends were partly reversed in following years. Basic data on cropping patterns and production trends for crops reported on by the Central Statistics Office (CSO) are presented in Appendix 2.

31. Importantly, these figures show that agriculture production in Zambia has been extremely volatile from year to year. This is largely explained by the lack of irrigation development and there is always a strong correlation between seasonal rainfall and agricultural output. The volatility of production is especially large among FAM and ECF farmers, who rely almost entirely on rain fed production. Even crops grown predominantly by commercial farmers (including wheat, soybean, and Virginia tobacco) exhibit significant year-to-year variability.

32. **Commercialization.** Although farming is still practiced on a very basic level by most households, an increasing number of smallholder family farmers are beginning to expand and intensify their production in response to market liberalization. This commercialization process has been progressing at different rates in different parts of the country and still remains at relatively early stage compared with other countries of the region, especially SACU.[10] Most gains have been achieved in traditional and non-traditional cash crop sectors on the back of outgrower relations between private agribusiness firms and FAM and ECF type farmers (see box).

33. Development of the outgrower schemes has been limited to areas with relatively better access to markets and productivity. Productivity of smallholder farmers in other areas not reached by these programs remains low. In addition to the non-availability of input support through an outgrower arrangement, factors that constrain small farmers in these locations include (i) limited access to credit/financial resources to augment/capitalize farm operations and to use modern inputs and technologies; (ii) lack of access to markets and market information; (iii) lack of adequate infrastructure; (iv) limited use of irrigation; and (v) inadequate advisory services.

34. **Smallholder input supply.** Reform of agricultural service agencies in the public sector in the period of market liberalization proceeded quite rapidly, including an accelerating process of privatization. Following the removal of subsidies, the market share of Nitrogen Chemicals of Zambia (which assumed prime responsibility for public fertilizer distribution after the dissolution of NAMBOARD in 1989) fell rapidly due to loss of access to finance and to external competition, particularly from South African firms. However, neither these alternative sources of supply nor continued direct and indirect subsidization of fertilizer prevented a sharp fall in its overall availability to smallholder farmer. For example, official post-harvest surveys indicated that while 366,000 smallholders purchased 122,000 ton of fertilizer in 1990/91, the corresponding figures for 1993/94 were 166,000 smallholders purchasing 72,000 ton.[11]

35. In 1995/96 the Zambian Government launched the "Agricultural Credit Management Programme" (ACMP). During the first two years of operation, the management of fertilizer credit was subcontracted to private firms (Cavmont Merchant Bank and SGS) who in turn hired small traders to

[9] World Bank, 2003

[10] SACU countries include Botswana, Lesotho, Namibia, South Africa, and Swaziland.

[11] Copestake, 1997 (from CSO data).

act as input distributors, marketing, and loan collection agents. The program got off to a bad start as a result of political interference in the selection of agents, and repayment rates were also very low, with many farmers continuing to regard the fertilizer distributed as a Government hand-out despite the private sector intermediation.

Box 1: Outgrower Schemes

An emerging pattern in Zambia's agro-food system has involved efforts to reconfigure the backward linkages between agribusiness companies and farmers. Outgrower schemes are facilitating small-scale production of targeted products, such as cotton, tobacco, and paprika through provision of agricultural services such as extension, credit, and marketing, which were previously supplied by the government. For the cotton sub-sector, it is estimated that some 260,000 smallholder family farmers currently participate in outgrower schemes. For the paprika sector the number is varying between 3,000 and 5,000 smallholder farmers, for the tobacco sector (primarily burley tobacco) the number is estimated at 15,000 smallholder farmers (up from 6,000 a few years ago). For crops such as export vegetables and coffee, mainly involving emergent commercial farmers, the number is counted in hundreds, rather than in thousands.

Successful outgrower schemes can serve many valuable functions:

- Cost-effective means of production
- Means of transferring technology
- Training of farmers in advanced production skills
- Transmission of market information and grades & standards
- Distribution of risk
- Facilitate credit for inputs
- Reduce transaction costs of getting produce to the market place

Outgrower schemes also have distinct drawbacks. The contracting company invests in growers without much assurance of receiving the agreed upon products or quality levels. When there is more than one buyer, the opportunity exists for **side-selling** to someone other than the original contractor who extended the loan. In some schemes, contractors have reported side-selling in excess of 30%, with the outgrower scheme quickly becoming unprofitable. Not being able to recover its investments was an important reason for Lonrho Cotton pulling out of Zambia. Growers lose because contractors are reluctant to invest in providing inputs and training, and contractors lose because their investment is stolen and anticipated production does not materialize.

There is currently no effective recourse in the case of side-selling, and in as far as there is, growers rarely have assets worth pursuing. Side-selling and contractual defaults are currently not addressed or enforceable under the Agricultural Credit Act. Introduction of the small claims court or fast track legal option has not been able to effectively address the issue, as it is still considered time consuming and costly. Many contractors claim new legislation is necessary, and some have suggested that the buyers who purchase from those side-selling be held legally liable, i.e. addressing the issue of **side-buying** rather than side-selling.

36. By 1999/2000 it was estimated that fewer than 20% of Zambian smallholder farmers used fertilizer. GRZ feared that discontinuing fertilizer subsidies would exacerbate food security problems. There were serious concerns over private traders' willingness to deliver inputs on credit to resource-poor farmers, and the Government concluded that government fertilizer and credit distribution were indispensable for promoting smallholder agricultural productivity and growth.[12]

[12] Govereh, et. al, 2002.

37. Government through the Food Reserve Agency (FRA) has continued to play an active role in the distribution of inputs. In the crop season 2000/2001, the FRA distributed 24,000 MT of fertilizer (basal and topdressing in equal proportions) and 50 MT of maize seed. A total of 60,000 farmers benefited from this distribution exercise.[13]

38. Recent programs to improve smallholder access to fertilizer are the Ministry of Agriculture and Cooperatives (MACO) fertilizer Support Program (50% subsidy program), and the Food Security Pack program (100% grant). In the first year of implementation (2002/2003), these programs were each supposed to reach about 200,000 households. About to two-thirds of the planned number of households received assistance in the first year, but problems persisted, such as: late delivery, limited program benefits per household, seemingly inefficient use of subsidized fertilizer, reselling of subsidized fertilizer and/or use on other crops, and high costs to maintain the program (even if the major share of costs are borne by donors and NGOs).[14] More recently, experts with the Michigan State University Food Security Research Project (MSU/FSRP) estimated that fewer than half of all smallholders are able to access subsidized fertilizer and that most of those are in Southern Province only. For all types of farmers, timely access to fertilizer can be more important than its cost. Government-supplied inputs, although less expensive, have a history of not being provided on time. Late application of fertilizers can result in significant reductions in yields. Many studies highlight the lack of timely inputs as a major constraint for smallholder farmers.

E. Other Competitiveness Considerations[15]

39. **Transportation.** As a land-locked country, high transportation costs have a major bearing on the opportunities for trade and investment in Zambia. It is no accident that relatively high value commodities like sugar, tobacco, horticulture, coffee, paprika, and cotton lint account for a relatively large share of Zambia's agriculture exports. Unlike products with a low value to weight ratio including maize, sorghum and sunflower, for example, these higher value commodities are better able to cover high overland transportation costs and still provide the exporter an attractive profit.

40. High transportation cost and the poor condition of Zambia's rural road network also restrict the opportunities of investment in outlying areas. This is most obvious in the case of small-scale farmers living far from the main road network where the high cost of bringing inputs to the farm and outputs to market often leave the grower with little choice except to produce for home consumption and limited sales in local and district-level markets. Even for commercial farmers, however, this can be a major constraint where most farmers must maintain their own feeder road network at considerable expense and effort.

41. Transportation by road is the most common way of moving agricultural commodities in and out of Zambia. In this respect, it is should be noted that large differences exist between front and back load rates along most major routes. Between Lusaka and Johannesburg, for example, typical prices quoted for northbound freight are around USD 90.00 per ton compared with USD 45.00 for exports going south. These lower prices for back load freight give a good opportunity to export, and it is interesting to note that the price of USD 45.00 per ton is about the same as the cost of moving bulk commodities from the port of Durban to Johannesburg. In other words, all other conditions being equal, Zambian produce is just about able to compete in the Johannesburg market based on transport costs alone, but would face increasingly stiff competition going further south. Rail freight is also available, but costs about the same as road and is much less predictable. Airfreight is only possible for very high-value commodities like export horticulture (roses and specialty vegetables).

[13] ICC, 2002.

[14] Siegel and Alwang, 2004.

[15] This section is drawn from Keyer, Heslop, and Able, 2001.

42. **Transaction costs in outlying areas.** Apart from transportation, other transaction costs for business deals with small-scale farmers can also be high, especially in outlying areas. Much of the trade in Northern Province, for example, is still through independent traders who take cash or goods to barter, such as used clothing, salt, and blankets. These traders typically travel to an area by public transport and then spend two or three weeks camping and traveling on foot between isolated villages to buy small quantities of produce (usually beans, groundnuts and maize) until they have enough for trade. The trader has to pay local labor to carry the produce to the roadside, and the cost of hiring a truck to move purchases from the roadside into town, and then further beyond to a more substantial marketplace can be very high.[16] For these reasons, mill operators in outlying areas often report that it is cheaper to buy maize from distant commercial growers than small farmers located in the region.[17]

43. In more central locations and parts of Eastern Province, the situation is somewhat more advanced with larger operators working around the main provincial and district centers. For the most part, agricultural trade is just one aspect of these businesses, which may include wholesale shops in town and transport services. A few companies also have a limited capacity to process maize and oilseeds to meet local demand. To source raw materials, these medium-scale firms typically send their own buyers into the field with a small truck to buy directly from farmers. Because there are very few established bush markets in these areas, the time it takes to collect a full load depends on the buyer's knowledge of the area and ability to get to a location first before another buyer comes in.[18]

44. In practice, an especially important function of these medium-scale traders is to serve as intermediaries between the large companies based in Lusaka and small-scale farmers. Many of the purchases carried out at the village-level are, in fact, undertaken as part of a contract to supply large processors and trading companies. If one of these firms wants to obtain 500mt of soybeans, for example, a common practice is to contract one or two medium-scale buyers to source the commodity on its behalf. In some cases, this may even involve some form of pre-finance for the trader to allow the purchase of the required commodity.

45. **Uncertainty and risk.** Another factor that adds significantly to the cost of doing business in Zambia is the uncertain nature of business transactions at virtually every level of the commodity value chain. This begins at the farm level where local traders often have problems sourcing sufficient commodities to justify trading in a particular sector. As described above, it can be very time consuming and costly to amass sufficient bulk commodities including maize, beans, groundnuts, sunflower and soybeans to justify doing business with smallholder farmers who often sell only very small quantities just to raise cash when needed. With higher value cash crops like cotton, tobacco and paprika, smallholder production in recent years has depended on input support through various types of outgrower arrangements, but the risk of side selling to an agent who did not provide pre-finance as been a constant threat and has even led to the failure of some businesses.

46. At the international level, uncertain business transactions are also important including the possible risk of export bans and price manipulation for maize and other strategic commodities. Large grain trading companies in South Africa interviewed in 2001 even went as far as to say they have little to no interest in doing business with Zambia until they can be certain the commodities they buy actually exist and are available for export. They noted that several trading houses have lost large sums of money in the past doing business in Zambia, either because commodities they bought on forward contract turned out not to exist or because of export restrictions and price interference by government. As one South African trader explained, the best thing the South African government has done to help agriculture is to maintain a completely hands-off policy with no price or trade interference. Until this type of security exists in other African countries including Zambia, South African traders quite simply

[16] IFAD, 2001.

[17] FAO, 1998.

[18] CLUSA, 1998.

prefer to buy any commodities they can't source on their own domestic market from overseas rather than from within the region.

47. **Macroeconomic uncertainty.** Zambia's weak macroeconomic environment is another important constraint to successful new investment and enhanced trade performance. Specifically, problems with high inflation rates, erratic exchange rate movements, steep interest charges, and high import duties on fuel and other essential inputs together militate against the opportunities for successful agriculture investment. Individual entrepreneurs naturally have to find some way of working within this context and cannot plan on any major improvement in the macroeconomic situation anytime soon. Over the long run, these areas certainly offer scope for policy dialogue and international agencies can certainly play a useful role in bringing key issues to the attention of national decision makers and potential investors alike.

48. **Limited production base.** Although Zambia's climate is ideally suited to the production of a great many commodities, only a relatively few items well suited to export production are grown in any great abundance. Even in relatively well-established crops like cotton, tobacco, coffee, paprika, and horticulture, there is still an urgent need to increase domestic production to allow more efficient economies of scale and increased export revenue. With respect to basic commodities like sunflower, soybeans, wheat, and rice, on the other hand, Zambia's small production base adds substantially to the cost of doing business and restricts the opportunities for profitable trade and processing without major investments to build new production. Other crops like groundnuts, maize and beans are generally grown in greater abundance throughout the country, but only a small (and unpredictable) share of total production is sold for cash thereby also restricting investment opportunities.

III. METHODOLOGY

49. This section introduces the basic methodological concepts and assumptions readers should be familiar with to interpret the quantitative results for Zambia. 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.[19] Additional procedures are discussed in Section IV with the analysis of input prices and in Section V with the results for each commodity.

50. The quantitative methodology is expressed exclusively in financial prices and 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 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.

51. While great care has gone to ensure that the most reliable data possible was 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. Especially at the processing stage, reliable data was extremely scarce this is one key area where more attention is needed from any follow-on activity.

A. Concepts and Definitions

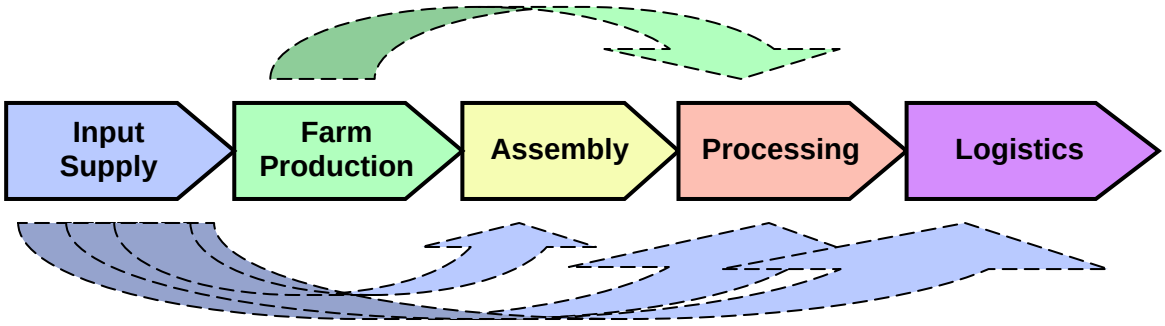
52. This section introduces some essential value chain concepts and definitions applied for the analysis. These points not only help to interpret the quantitative data, but are also useful to bear in mind when looking at value chain performance from a qualitative perspective.

53. **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.

54. 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 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.

[19] Keyser, 2006.

Figure 2: Stages of the Value Chain



55. 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 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. In the case of livestock operations, assembly is defined in a broader sense to include the feedlot process for delivery of fattened animals to an abattoir. 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.

56. **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 Zambia that is almost always processed locally for domestic consumption, the final competitiveness can be compared as an assembled raw material with the import parity price for an equivalent product.

57. 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.

58. **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), crushing or solvent extraction of soybeans (to produce crude soybean oil and soybean cake), 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.

59. 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.

60. **Time requirements.** The spreadsheet templates also provide space to estimate the time requirements for major transactions at each major stage of the supply chain. Because of data limitations it was not possible to complete this part of the analysis for Zambia. One lesson learned from the exercise, in fact, is that it is probably not necessary to try and capture time requirements in as much detail as the spreadsheet methodology calls for. Instead, the approach taken for this paper was to note any time factors that seem out of the ordinary or otherwise contribute to or prevent Zambia from realizing a competitive advantage in agriculture.

B. Value Chain Indicators

61. 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.

62. 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 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]

63. 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)

64. 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.

65. 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.

66. An example of how the spreadsheet templates measure DVA and SV together with the required conversion factors is given below.[20] 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

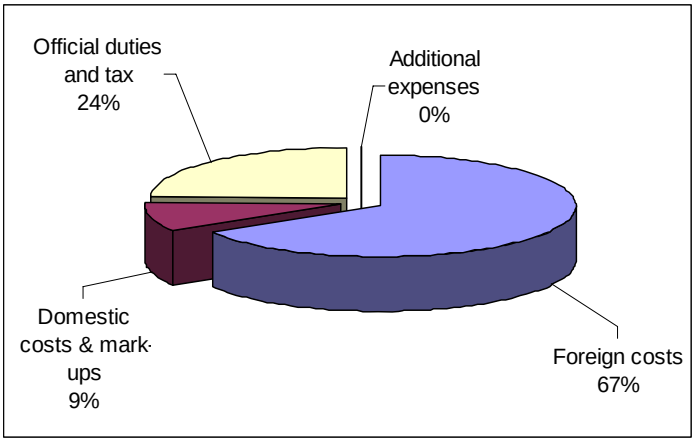
	ZMK per unit	USD per unit	% of DVA	% of SV
Domestic Value Added (DVA)				
Domestic costs and mark-ups	7,110,962	1,777.74	28%	9%
Official duties and tax	18,601,279	4,650.32	72%	24%
Additional costs of business	-	-	0%	0%
Total DVA	**25,712,241**	**6,428.06**	**100%**	**34%**
Foreign costs	50,699,325	12,674.83	197%	66%
Total Shipment Value (SV)	**76,411,566**	**19,102.89**	**297%**	**100%**

foreign conv factors (cf)		**domestic conv factors (cf)**	
% foreign	66.35%	tax as % DVA	0.723
foreign cf	1.000	extras	-

[20] See Section IV for more information on price decomposition and estimation of conversion factors.

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

Figure 3: Graphic Representation of the Composition of SV



68. **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 domestic costs account for an estimated 33% of the product's final shipment value which is likely to provide ample scope for policy makers and private investors to improve the product's competitiveness by focusing on domestic factors alone. As shown, official taxes account for an estimated 24% of the final shipment value suggesting that policy changes in this area could have an important bearing on final SV and international competitiveness. If, however, total DVA were only 5% of total SV, for example, then domestic policymakers would have far less scope to improve the country's competitiveness without investments in new technologies or process improvements that reduce costs by other means.

69. DVA and SV calculations may also be compared across stages of the value chain as shown in the next example. In this table, the calculations are per MT of raw material and are cumulative of the inherited value from the each previous stage. More specifically, the indicators for farm gate product show what it costs to produce 1 MT of primary traded commodity; the indicators for assembled raw material show what it costs to procure and deliver that product to the place where it is processed; and the indicators for processed raw material show what it costs to farm, assemble, and process one MT of unfinished good. Because the prices include all values from each previous stage, the assembly value includes the profit margin paid to the farmer. Likewise, the value for processed raw material includes the profit margin paid to the assembler, which, of course also has to cover all costs paid to the farmer. Again, all values are cumulative of costs from the previous stage.

Table 2: Example of DVA and SV Value Chain Indicators for 1MT of Raw Material (including value from previous stages)

Cotton - FAM	FARM GATE PRODUCT		ASSEMBLED RAW MATERIAL		PROCESSED RAW MATERIAL	
	ZMK	USD	ZMK	USD	ZMK	USD
Domestic Value Added						
Costs & mark-ups	248,986	62.25	1,009,156	252.29	1,263,932	315.98
Official duties & tax	30,259	7.56	52,629	13.16	127,531	31.88
Additional costs	-	-	-	-	-	-
Total DVA	**279,245**	**69.81**	**1,061,785**	**265.45**	**1,391,464**	**347.87**
Foreign costs	180,753	45.19	211,034	52.76	304,818	76.20
Total Shipment Value	**459,998**	**115.00**	**1,272,820**	**318.20**	**1,696,282**	**424.07**

70. After processing, DVA and SV are measured per MT of finished commodity. These products may or may not be the best comparison point of a country's international competitiveness. In the case of maize, for example, the analysis in Zambia can end at the assembled raw material stage since that is where local production competes with imported grain (compared with un-milled white maize, Zambia imports relatively little finished mealie meal and maize bran).

71. For products that always undergo some form of domestic processing like cotton and sugar, the best international comparison is per ton of finished commodity. Value chain calculations for these finished goods are summarized below using the example of cotton. In this case, the raw material (assembled, un-ginned seed cotton) is transformed into two internationally traded products being lint and seed which are produced at the indicated ratios.

Table 3: Example of DVA and SV Value Chain Summary for Final Traded Commodities (including value from previous stages)

Cotton - FAM	TRADED COMMODITIES (1 MT Final Traded Product)					
	Lint (40.5%)		Seed (55%)		Trash (4.5%)	
	ZMK	USD	ZMK	USD	ZMK	USD
Domestic Value Added						
Costs & mark-ups	3,120,821	780.21	2,298,059	574.51		-
Official duties & tax	314,892	78.72	231,875	57.97		-
Additional costs	-	-	-	-		-
Total DVA	**3,435,713**	**858.93**	**2,529,934**	**632.48**	**-**	**-**
Foreign costs	752,638	188.16	554,215	138.55		-
Total Shipment Value	**4,188,351**	**1,047.09**	**3,084,149**	**771.04**	**-**	**-**

72. In this example, one ton of lint has the final shipment value at the gin gate of USD 1,047 per MT, which is inclusive of all the farm level, assembly, and processing costs for 2.47 MT of un-ginned seed cotton (At 40.5% ginning outturn, 2.47 MT of seed cotton required to 1 produce MT lint). The other product, fuzzy seed, has a final SV of USD 771 per MT, which is inclusive of the accumulated value of 1.82 MT of processed raw material.

73. Finally, the measurements of DVA and SV may be compared an 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.

74. Again with reference to the data for cotton, if the export parity value of lint at the gin gate is greater than the estimated costs of domestic production (USD 1,047 per MT) then Zambia can be said to be internationally competitive. If the final shipment value is greater than the comparable parity price, however, then Zambia 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

75. The CCAA value chain methodology begins at the financial level with enterprise budgets for each stage of production. 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.

76. 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.

77. 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. Details of how the required conversion factors were calculated for Zambia are discussed in Section IV.

- **% Forex.** This conversion factor is an expression of foreign costs as a share of total SV. With reference to Table 1 above, the % forex is 66% or 0.6635. 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 duties and tax as a share of total DVA. Again with reference to Table 1, the cf for domestic tax works out to 0.723, 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 Zambia, specific information on these costs was not available so the cf for extras always equals zero.

- **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.[21]

D. Summary of Cost Categories

78. 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 4 below. 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; all costs are expressed per ton of farm gate product (not per hectare).

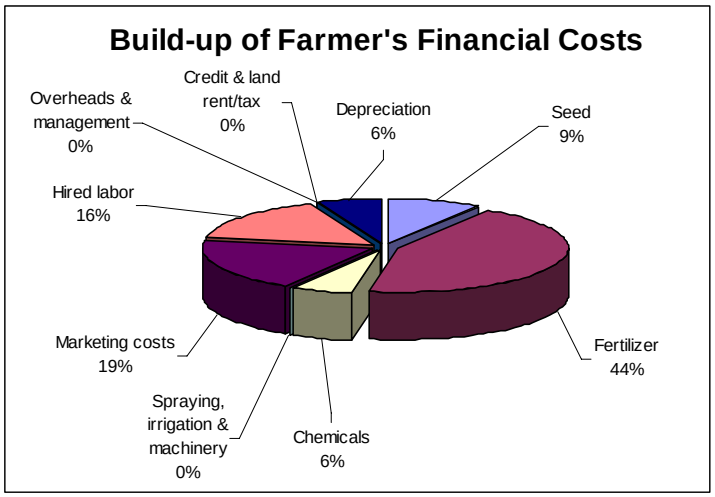
[21] Because the analysis of SV and DVA is carried out in financial prices, economic calculations are supplemental to the value chain analysis. Through the decomposition of DVA into its three constituent parts, however, the economic value of domestic inputs is already known. Having come this close to 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.

Table 4: Example of Cost Summary by Input Category at Farm Production (LCU per ton 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	48,718	8.9%	43,846	-	-	43,846	90%	4,872	10%
Fertilizer	238,872	43.7%	20,521	4,624	-	25,145	11%	213,727	89%
Chemicals	33,103	6.1%	6,213	1,464	-	7,677	23%	25,426	77%
Spraying costs	-	0.0%	-	-	-	-	#DIV/0!	-	#DIV/0!
Irrigation costs	-	0.0%	-	-	-	-	#DIV/0!	-	#DIV/0!
Machinery O&M	-	0.0%	-	-	-	-	#DIV/0!	-	#DIV/0!
Packing materials	22,800	4.2%	17,124	3,396	-	20,520	90%	2,280	10%
Selling expenses	81,600	14.9%	28,759	48,516	-	77,275	95%	4,325	5%
Hired labor	88,463	16.2%	88,463	-	-	88,463	100%	-	0%
Family labor	-	0.0%	-	-	-	-	#DIV/0!	-	#DIV/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	**513,555**	94.0%	**204,926**	**58,000**	**-**	**262,926**	**51%**	**250,629**	49%
Fixed Investments	**32,782**	6.0%	**7,239**	**5,994**	**-**	**13,232**	**40%**	**19,550**	60%
TOTAL	**546,338**	100.0%	**212,165**	**63,993**	**-**	**276,158**	**51%**	**270,179**	49%
Totals in USD	136.58	100.0%	53.04	16.00	-	69.04	51%	67.54	49%

79. 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.

Figure 4: Graphic Representation of Cost Build-up



80. 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.

81. 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 5. 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 5: Categories of Variable Costs by Value Chain Stage

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

E. Financial Costs and Profitability

82. **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 6: Sample Calculation of Basic Financial Indicators

FARM PRODUCTION Maize - ECF	Per Hectare		Per Ton	
	ZMK	USD	ZMK	USD
Gross revenue (yield * price)	**2,769,000**	**692.25**	**710,000**	**177.50**
Production costs				
Variable costs	2,002,866	500.72	513,555	128.39
Investment costs	127,851	31.96	32,782	8.20
Total costs	**2,130,717**	**532.68**	**546,338**	**136.58**
Farmer income				
Gross margin (revenue - var costs)	**766,134**	**191.53**	**196,445**	**49.11**
Net profit (gross margin - invest costs)	**638,283**	**159.57**	**163,662**	**40.92**

83. 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

84. **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.

85. **Summary of costs and profitability.** Similar to the summary tables for value chain indicators discussed above, the spreadsheet templates also produce a set of tables for financial costs and profitability. An example of how these indicators are presented for ECF maize is given in the 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 7: 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		PROCESSED RAW MATERIAL		FINAL COMMODITIES			
							Mealie Meal (86%)		Maize Bran (11%)	
	ZMK	USD	ZMK	USD	ZMK	USD	ZMK	USD	ZMK	USD
Gross revenue	**710,000**	**177.50**	**930,000**	**232.50**	**1,022,750**	**255.69**	**980,400**	**245.10**	**42,350**	**10.59**
Production costs										
Crop purchase		-	710,000	177.50	930,000	232.50	799,800	199.95	102,300	25.58
Other variable costs	513,555	128.39	143,614	35.90	81,500	20.38	70,090	17.52	8,965	2.24
Investment costs	32,782	8.20	22,306	5.58	7,130	1.78	6,132	1.53	784	0.20
Total costs	**546,338**	**136.58**	**875,920**	**218.98**	**1,018,630**	**254.66**	**876,022**	**219.01**	**112,049**	**28.01**
Final income										
Gross margin	196,445	49.11	76,386	19.10	11,250	2.81	110,510	27.63	(68,915)	(17.23)
Net profit	**163,662**	**40.92**	**54,080**	**13.52**	**4,120**	**1.03**	**104,378**	**26.09**	**(69,699)**	**(17.42)**
Rates of return										
Gross margin/total VC		0.38		0.09		0.01		0.13		-0.62
Net profit/total costs		0.30		0.06		0.00		0.12		-0.62

86. In this example, the data show that all aspects of the production system are profitable, except for the production of maize bran as a single product. Because the miller sells both mealie meal and maize bran, however, the total milling enterprise is still profitable as indicated by the middle column for processed raw material. Regarding the estimated rates of return the analysis shows that the best returns are available at the farm level (where growers produce and handle only a few tons of product), then at the assembly level, and finally processing levels. At these subsequent stages, the per ton rates of return are actually quite low showing that it is volume turnover that matters most to these businesses.[22] This table is presented again in the discussion of maize along with the cost and profitability tables for FAM and LCF growers. At that level, other interesting differences between the farm sectors and possible priorities for each sector start to become clear. The point now in the discussion of methodology is still mostly to raise the reader's awareness of what data the analysis has produced and how to interpret these figures.

F. Main Assumptions

87. To apply the CCAA methodology to Zambia, a great many assumptions have had to be made covering everything from the location of analysis, expected yields, detailed prices for inputs and outputs at different value chain stages, and so on for each commodity and enterprise variation. 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

[22] This emphasizes the point made in the country context section that one of the things Zambia needs most for improved agriculture competitiveness is increased production in order to achieve better economies of scale.

data. Particularly since the CCAA study is very far reaching in scope and did not provide time for primary data collection, these limitations must be kept in mind when interpreting the data that follows.

88. 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 that 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.

89. **Farm sectors.** Consistent with CCAA design requirements, the analysis covers three very carefully defined farm sectors as described in the section on Country Context. Briefly, these sectors include (i) family farmers (FAM), who are assumed to cultivate using a hand hoe over a limited area and mostly sell to informal buyers (or an outgrower representative) shortly after harvest; (ii) emerging commercial farmers (ECF), who are assumed to cultivate using ox drawn equipment and generally enjoy better trading relations including access to storage compared with most Zambian smallholders; and (iii) large commercial farmers (LCF), who are assumed to cultivate with modern machinery and have access to irrigation, crop storage, and professional technical advice.

90. **Farm location.** Because of the emphasis of CCAA on international competitiveness, the locations selected for analysis correspond with the main (or most ideal) growing areas in Zambia. These locations are set out by Province and farm sector in the table below.

Table 8: List of Commodities by Farm Sector and Location

	FAM	ECF	LCF
Cassava	Northern	Northern	*Central*
Cattle	Southern	Southern	Southern
Cotton	Eastern	Eastern	*Southern - irrigated*
Maize	Central	Central	Central
Rice	Northern (or Western)	Northern (or Western)	n/a
Soybeans	Central	Central	Central - irrigated
Sugar	n/a	n/a	Southern – irrigated*

Commodities listed *in italics* are hypothetical possibilities. *For sugar analyzed 3 LCF possibilities.

91. Because all sectors do not grow each crop, some hypothetical possibilities are also covered as indicated by *italics* in the table above. In even more extreme cases, some sectors simply do not grow, or cannot grow, a particular commodity and the analysis of that enterprise was not carried out. Sugar is the main example of this since all cane is grown either on a centrally managed estate or by an independent LCF. In this case, three LCF variations are analyzed covering direct estate production and high and low level input management for independent LCF producers.[23] It is not realistic to expect a small farmer with hand hoe or ox cultivation to manage this crop successfully. Likewise, for rice, there are simply no LCF-type farmers in the few areas where rice is grown. This is a minor crop for Zambia and has been promoted almost entirely by donor organizations at the family farm level.

92. Because 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 stage and location where the final comparison of each commodity's international competitiveness is made is set out below.

[23] These variations help illustrate how the templates can be used in a lateral sense to analyze different input possibilities at one stage of the value chain rather than always in a vertical sense from one stage to the next Zambia Sugar does operate a "smallholder" program, but this is mainly a issue of individual shareholdings and all production is still managed centrally by the main estate using identical technology. There are no hand hoe or ox based emerging commercial farmers producing sugar.

Table 9: List of Commodities by Stage and Place of Final Comparison

	Final Stage	FAM	ECF	LCF
Cassava	Assembly	Kasama	Kasama	*Kasama*
Cattle	Farm	Chismaba	Chisamba	Choma
Cotton	Processing	Katete	Katete	*Lusaka*
Maize	Assembly	Lusaka	Lusaka	Lusaka
Rice	Distribution	Lusaka	Lusaka	n/a
Soybeans	Assembly	Lusaka	Lusaka	Lusaka
Sugar	Farm	n/a	n/a	Mazabuka

Commodities listed *in italics* are hypothetical possibilities. Analysis of cattle ends on the delivery of live weaners to a feedlot; analysis of sugar ends on the delivery of cane to the factory.

93. Unfortunately, for cattle, time and data limitations meant that it was not possible to carry the analysis of cattle through until the final stage of a slaughtered animal in the form of chilled or frozen sides of beef. As shown, the calculations for that commodity end at the farm stage (with the production of live weaner animals for delivery to a feedlot). More time and primary information is needed to complete the analysis at the feedlot and abattoir stages to bring the analysis to the stage of an internationally traded commodity. Likewise, for sugar, full information on processing costs was not available and the template analysis ends at the factory gate for sugar cane. In this case, however, some rather old data from about 10 years ago were available on processing and the analysis is carried through on a very limited basis to the stage of a refined product.

94. **Yield.** Consistent with the emphasis of the CCAA study on understanding Zambia's potential competitiveness, yield assumptions on a fairly high (but still realistic) level of management and input use in a year with normal rainfall. Many farmers, therefore, do not normally achieve the types of yields used here. This is particularly true for the FAM sector where most farmers produce at a very basic level without any commercial orientation as described in Section II. A useful area for further study, therefore, would be to analyze additional farm scenarios based on different management assumptions. This is particularly important if the CCAA data are to be used for planning new investment programs and policy recommendations.

95. **Crop marketing.** Marketing arrangements vary by crop and sector and are described more carefully as part of the analysis of each enterprise. In general, however, it is assumed that FAM farmers sell their crop soon after harvest to an informal "roadside" trader, while ECF and LCF farmers may store their commodity for a few months before selling to a licensed buyer. In actual fact, LCF farmers (and even many ECF and some FAM farmers) sometimes also deliver their crop direct to a processor themselves. For this analysis, however, it is assumed the delivery function is performed separately in order to isolate the cost structure at that stage of the value chain. The only exceptions to this are for sugar and cattle. In the case of sugar, the integrated estate based model includes delivery to the factory as part of the in-field operations. For cattle, LCF farmers are assumed to have their own feedlot whereas FAM and ECF farmers sell to a trader who delivers to a commercial feedlot.

96. **Parity prices.** All activities analyzed are assumed to produce tradable outputs – either commodities that substitute for imports or which are exported. If increased production substitutes for imports, then an import parity prices was used. This is determined by first finding the price Zambia is most likely to pay in order to import the commodity and then by adding transport costs to this price to obtain the landed, cif price at the point of final comparison. If it was assumed that increased will be exported, then an export parity price was used (usually quoted as a fob price at the point of final comparison, with the costs of transportation to the domestic location subtracted).

97. A summary of the parity price calculations used for the CCAA comparisons is set out below. These prices are calculated from the best information available at the time of writing. Additional price information is still meant to be forthcoming from FAO as an input to the CCAA study and these

figures may need to be updated at that stage. As indicated, regional price information for the markets Zambia is most likely to trade and compete with is especially important.

Table 10: Summary of Parity Price Assumptions

	Parity Basis	International Reference Price	Total Transport and Handling	Final Parity Price	Notes
Cassava	M/X	$50/mt fob Northern Europe	? (data not available)	? (but will be less than zero if start in N. Europe)	N. Europe price provided by FAO team working on CCAA; should use DRC or other regional price. Also need to compare with import parity as an ingredient for stock feed.
Cattle	M	$870 per MT for 100kg weaners in Argentina (should eventually convert to frozen side, but data not yet available)	? (data not available)	? (data not available)	Despite potential for expansion, disease restrictions prevent beef exports from to all developed country markets. Until this is resolved, beef is effectively an import substitute although some products are sold to DRC.
Cotton lint (FAM, ECF)	X	61.4 cents/lb	$375/mt	$978/mt fob Katete gin	Cotlook index + 2 cents/lb premium because of typical staple length
Cotton lint (LCF)	X	73.4 cents/lb	$315/mt	$1,303 fob Lusaka gin	Cotlook index + 14 cents/lb premium for long staple irrigated cotton
Cotton seed	M	n/a	n/a	$90/mt fob any gin gate	Price quoted by ginners
White Maize	M	$173/mt ex Randfontein (RSA, Oct-06)	$165/mt (including 15% duty)	$338/mt cif Lusaka (Oct-06)	Price quoted on Safex Exchange (varies greatly by time of year and source); regional export parity to DRC and/or Zimbabwe should also be considered
Rice	M	$300/mt fob Bangkok	$160/mt (Containerized via sea to Durban and road to Lusaka, no duty on rice)	$460/mt cif Lusaka	Quality of Thai rice much higher than local product (less broken grain)
Soybeans (whole)	M/X	$296/mt ex Randfontein (RSA, Oct-06)	$193/mt (including 15% duty and VAT)	M = $489/mt cif Lusaka X = $215/mt fob Lusaka	Price quoted on Safex Exchange by local broker
Refined Sugar	X	$386/mt cif London	$120/mt (Containerized via road to Durban and sea to Europe)	$266/mt fob factory gate (unprotected)	Estimated value before processing costs and conversion to cane.

Source: Various, including draft FAO data supplied for CCAA for cassava, cattle, and rice; CHC Commodities Ltd (October 2006) for maize and soya; Cotton Outlook (Dec, 2006) for lint; local information for cotton seed, Illovo (Dec 2006) for sugar; and discussions with various freight forwarders, transport companies, and commodity brokers for information on shipping. Export parity price for sugar varies by market.

98. **Financial prices.** Current prices for inputs and outputs prevailing in the third and fourth quarters of 2006 are applied to the analysis of each enterprise. Because the original CCAA design called for the use of secondary data, some of prices have been updated from past studies on the basis

of the old and new exchange rates. Much more detailed work is needed to verify the prices used for the analysis, especially at the processing level where data limitations were especially problematic.

99. **Exchange rate.** The analysis is based on prices in the third and fourth quarters of 2006 and the prevailing price of ZMK 4,000 = USD 1.00 was used to convert all foreign and domestic values as required. Zambia imposes no controls on the exchange of foreign currency and the financial and economic exchange rates are assumed to be equivalent.

100. That said, Zambia did experience an unprecedented period of exchange rate appreciation during most of 2005 and the first half of 2006, which is widely regarded as having eroded the competitiveness of several important export industries (including industries like horticulture, floriculture, and tobacco that have high labor content). During this period, the exchange rate appreciated from around ZMK 5,000 = USD 1.00 at the start of 2005 to ZMK 2,800 = USD 1.00 in April 2006. Since then, the currency has returned to a more "normal" level, but several industries are still reeling from the effects of this unexpected development since labor and other domestic costs still had to be paid at the same ZMK prices, but exports earned less local currency in foreign markets. For the CCAA analysis, no attempt was made to model the effects of exchange rate movements since this would require detailed analysis of how such changes trickle through to affect the prices of domestic and imported inputs and outputs.

101. **Investment costs.** The annual per hectare (or per ton) cost of long term investments used at each stage of the value chain have been estimated using the *capital recovery cost* method. Specifically, 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.[24] Irrigation equipment is depreciated over twice the total area it covers in a single rotation because the investment allows for double cropping.

102. **Crop finance.** Charges for credit or other crop finance are not included in any production budget. Although farmers do borrow for seasonal inputs this mainly applies to LCF farmers who all have different credit requirements depending on their own mix of enterprises and cash flow requirements. Rather than risk giving a false impression of financial costs and profitability, the approach taken here has been to exclude finance charges from the analysis of all enterprises. Although this means that some crops will not be as profitable as shown when finance charges are included, the benefit of this approach is allows all enterprises to be compared on as equal (and reliable) terms as possible.

103. **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.

104. 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 Zambia of all factors used in the production

[24] 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.

and marketing of each agricultural commodity. Because family labor often accounts for a large share of production inputs with FAM and ECF-type systems in particular, some proxy value needed to be applied.

105. For this reason, 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 used by each farm sector. 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.

106. **Smallholder fertilizer.** According to current policy, FAM farmers who belong to a government registered co-op are able to purchase fertilizer with a 50% subsidy to use on maize. According to MSU/FSRP, however, administrative inefficiencies and resource constraints mean that less than half of FAM farmers actually have access to subsidized fertilizer in practice. According to these experts, access is especially limited outside of Southern Province where the subsidy program has mainly been concentrated.

107. For these reasons, a decision was made in consultation with CCAA team leaders to carry out the base analysis of FAM maize using commercial (unsubsidized) fertilizer prices. This approach illustrates the total profitability of maize for the majority of small farmers who are not able to access subsidized fertilizer and is consistent with the calculation of DVA and SV as total costs to the Zambian economy. Because it is the State's policy to provide subsidized fertilizer, however, and because a great many farmers are able to access this input at discounted prices, a simple sensitivity analysis of financial costs and profitability was carried out using the subsidized prices. These results are presented in Appendix 3 and are discussed briefly in Section V with the main results for Maize.

IV. ANALYSIS OF INPUT PRICES

108. As described in the methodology section, the quantitative analysis begins at the input level with the separation of known financial prices into their main value chain components (foreign costs, domestic costs and mark-ups, domestic tax, and unofficial extras). The estimation of reliable conversion factors (CFs) that can be applied to these prices in the enterprise budgets is therefore the first critical step of the value chain analysis. Every value chain depends on the efficiency (and competitiveness) of the domestic input supply system and great care is needed at this stage to produce a reliable set of CFs to measure agriculture competitiveness.

109. The calculation of reliable conversion factors requires consideration of all the component costs or *price build-up* of each individual input up to the place where that input is used. According to the CCAA methodology, these component costs include all foreign costs for imported goods, transportation to the border, customs duty and excise, VAT or other sales tax, clearing fees, wholesale and retail profit margins, transportation to the place of use, and any additional charges or "unofficial extras" that sometimes also have to be paid. For items that are produced domestically, imported costs are still incurred and these must be reflected in the analysis.

A. Derivation of Conversion Factors

110. **Detailed CF calculations.** An example of the detailed price build-up for domestically blended fertilizer (made of imported ingredients) is given in the table below. Based on some fairly simple assumptions, the spreadsheet methodology provides a direct way to break down the costs according to their constituent parts. As shown in this example, the total value of raw materials that make up one 50kg bag of blended fertilizer is estimated at ZMK 54,400 (USD 13.61), transport to the border is ZMK 28,288 (USD 7.07), and so on. Fertilizer is not subject to any import duty or tax so these values are left blank. Domestic clearing fees, blending expenses, wholesale mark-ups, and transport to the place of use do incur local tax as indicated. When all these costs are added up the final shipment value for a bag of fertilizer at its final place of use works out to ZMK 93,222 (USD 23.21) composed of foreign costs, "official" domestic costs and mark-ups, known extras, and local taxes.

Table 11: Price Build-up for Domestically Blended Fertilizer (ZMK per 50kg bag unless noted)

	Financial Prices					Domestic Tax Transfers
		Domestic			Total	
	Foreign	Official	Extras	DVA	SV	
Price at origin	54,400	-	-	-	54,400	
Transport to frontier	27,722	566	-	566	28,288	
Customs duty & excise	-	-	-	-	-	-
VAT or other sales tax	-	-	-	-	-	-
Domestic clearing fees	-	1,654	-	1,654	1,654	289
Extra charges	-	-	-	-	-	
Domestic blending costs	93	1,763	-	1,763	1,856	176
Wholesale mark-up	215	4,094	-	4,094	4,310	409
Transport to place of use	979	1,737	-	1,737	2,715	929
TOTAL (SV at point of use)	**83,409**	**9,813**	**-**	**9,813**	**93,222**	**1,804**
Totals in USD	20.85	2.45	-	2.45	23.31	0.45

111. From this information, it is possible to derive the required CFs as shown in the next table. Because all types of fertilizer in Zambia (except subsidized fertilizer for smallholder maize) will have the same approximate cost build-up these conversion factors can be applied universally at all stages whenever fertilizer is used.

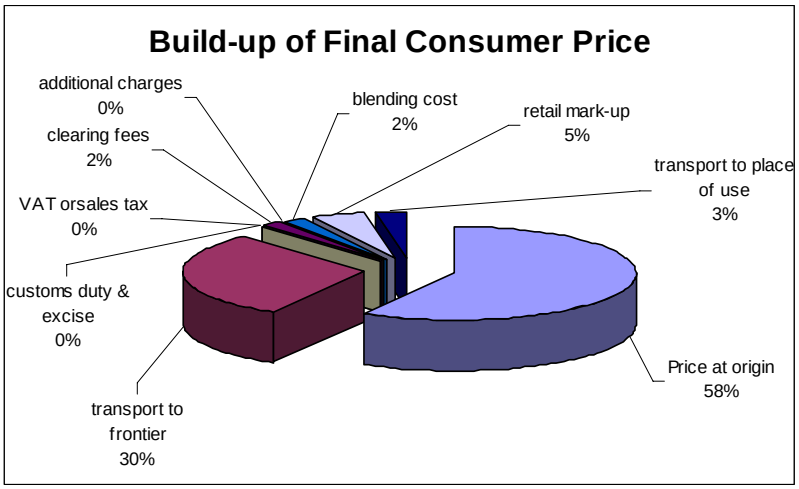
Table 12: Summary of Value Chain Indicators and CFs for Commercial (unsubsidized) Fertilizer.

	ZMK per 50kg	USD per 50kg	% of DVA	% of SV
Domestic Value Added (DVA)				
Domestic costs and mark-ups	8,009	2.00	82%	9%
Official duties and tax	1,804	0.45	18%	2%
Additional costs of business	-	-	0%	0%
Total DVA	**9,813**	**2.45**	**100%**	**11%**
Foreign costs	83,409	20.85	850%	89%
Total Shipment Value (SV)	**93,222**	**23.31**	**950%**	**100%**

foreign conv factors (cf)		domestic conv factors (cf)	
89.47%		tax as % DVA	0.184
1.000		extras	-

112. It is also possible to look at the detailed cost components graphically to get an idea of where the best leverage points might be found for reducing an input's final shipment value. The graphic for fertilizer is shown below, which indicates there is very little scope for reducing costs by trimming anything other than foreign costs (including the price at origin and transportation to the border). For inputs with a greater share of domestic tax or other local charges in the final SV, policymakers and domestic investors would be likely to have more options for improving competitiveness through price interventions.

Figure 5: Fertilizer Cost Components



113. Using this approach (and the CCAA templates), it is relatively easy to derive the required CFs for other inputs used at different stages of an agriculture value chain. For Zambia, detailed unit price models were prepared for the following items, which come from different sources, attract different taxes, or incur different transportation or other logistics costs. For inputs with the same (or similar) cost structure, separate analysis is not needed. The full set of spreadsheets templates used to analyze these commodities (including pie charts and all other detailed information) is presented in Annex 2.

- Fertilizer (commercial)
- Fertilizer (subsidized)
- Agri-chemicals (excluding insecticides)
- Insecticides
- Vet medicines
- Vehicles
- Tractors
- Farm implements (excluding sprayers & irrigation)
- Sprayers
- Irrigation equipment
- Fencing
- Office equipment.

114. **Simple CF calculations.** A second approach recommended by the CCAA methodology for estimating the required conversion factors is to calculate what is called "simple CFs". This method may be applied either when detailed price components are not known, or when an input's value is relatively small so that the extra effort to calculate "detailed CFs" may not be necessary. The complete set of simple CFs used for Zambia is set out below. These figures are based on reasonable assumptions about the % forex and verifiable information about customs duty and other local taxes.

Table 13 List of Simple Conversion Factors Used for Zambia Analysis

Input	% Forex (share of total SV)	% Total SV			Domestic CFs	
		% customs duty	% other local tax	% local extras	Tax	Extras
Auto spares	70.0%	15.0%	17.5%		0.8665	-
Batteries	70.0%	15.0%	17.5%		0.8665	-
Bicycle	65.0%	5.0%	17.5%		0.5413	-
Boilers	75.0%	5.0%	17.5%		0.7579	-
Bore hole construction	10.0%	0.0%	17.5%		0.1655	-
Building mat (basic const)	20.0%	0.0%	17.5%		0.1862	-
Building mat (mostly cement)	10.0%	0.0%	17.5%		0.1655	-
Building mat (office & housing)	45.0%	15.0%	17.5%		0.4726	-
Bull (LCF & ECF)	0.0%	0.0%	17.5%		0.1489	-
Combine hire	0.0%	0.0%	17.5%		0.1489	-
Cotton seed (hybrid)	10.0%	15.0%	17.5%		0.2888	-
Cotton seed (w/ seed dressing)	30.0%	0.0%	0.0%		-	-
Dam construction	5.0%	0.0%	17.5%		0.1568	-
Electric operation & pumping	25.0%	0.0%	17.5%		0.1986	-
Electrification	55.0%	15.0%	17.5%		0.5777	-
Grain bags	10.0%	0.0%	17.5%		0.1655	-
Grain storage & handling	0.0%	0.0%	17.5%		0.1489	-
Innoculant	50.0%	15.0%	17.5%		0.5199	-
Mill operation (ex R&M & labor)	20.0%	0.0%	17.5%		0.1862	-
Mill operation (R&M)	40.0%	5.0%	17.5%		0.3158	-
Mill, hammer (small scale)	30.0%	15.0%	17.5%		0.3713	-
Mill, roller (med/large scale)	65.0%	15.0%	17.5%		0.7427	-
Seed (maize, soya w/ dressing)	10.0%	0.0%	0.0%		-	-
Seed (other local w/o dressing)	0.0%	0.0%	0.0%		-	-
SOCOTEC Fees (gran handling)	0.0%	0.0%	17.5%		0.1489	-
Supplemental feeds (beef)	5.0%	0.0%	17.5%		0.1568	-

Source for customs and tax information, ZRA (2006).

115. **Investment cost modules.** In addition to CFs for individual inputs, the methodology also provides for the estimation of CFs on investment modules. As described already, the approach taken for estimating annual depreciation is based on the capital recovery method. By combining individual capital recovery costs (and CFs for each individual input), it is possible to calculate the total annual cost and corresponding CFs for any set of equipment. Once these numbers are known, the module can be inserted into the analysis of any product that uses that set of equipment. Using the inputs listed above, the investment modules prepared for this study of Zambia include the following. The full set of investment models is presented in Annex 2. A summary example based on the set of basic equipment charged to LCF enterprises is given below.

- LCF basic equipment (760ha)
- ECF basic equipment (10ha)
- FAM basic equipment (5ha)
- Pivot irrigation unit (80ha)
- LCF, ECF, and FAM ranch
- Cattle vaccines
- Sugar establishment
- Small trader (roadside buyer)
- Commodity broker/transporter (large assembler)
- Roller mill (5mt/hr, 10mt/hr)
- Soy extruder
- Rice mill

Table 14: LCF Basic Investment Module (to serve 760ha)

Description	Unit Cost (USD)	Qty	Useful Life (yrs)	Replacement Value		CRF	Share of Use	Annual Depreciation Cost (SV)	
				ZMK	USD			ZMK	USD
Tractor (90hp)	42,000	3	7	504,000,000	126,000	0.1605	0.00132	106,441	26.61
Tractor (80hp)	34,400	3	7	412,800,000	103,200	0.1605	0.00132	87,180	21.80
Tractor (60hp)	24,290	5	7	485,800,000	121,450	0.1605	0.00132	102,597	25.65
Vanette	18,000	3	5	216,000,000	54,000	0.2184	0.00132	62,059	15.51
Truck, 8.5 mt	31,000	1	10	124,000,000	31,000	0.1172	0.00132	19,127	4.78
Motorbikes	2,100	6	5	50,400,000	12,600	0.2184	0.00132	14,480	3.62
Planter	8,400	4	10	134,400,000	33,600	0.1172	0.00132	20,731	5.18
Ripper	4,700	3	7	56,400,000	14,100	0.1605	0.00132	11,911	2.98
Plow	4,200	4	7	67,200,000	16,800	0.1605	0.00132	14,192	3.55
Disk Harrow	3,000	3	7	36,000,000	9,000	0.1605	0.00132	7,603	1.90
Cultivator	1,740	4	10	27,840,000	6,960	0.1172	0.00132	4,294	1.07
Boom Sprayer	3,670	3	10	44,040,000	11,010	0.1172	0.00132	6,793	1.70
Knapsack sprayer	90	30	5	10,800,000	2,700	0.2184	0.00132	3,103	0.78
Fert spreader	5,700	4	5	91,200,000	22,800	0.2184	0.00132	26,203	6.55
Trailer	5,290	6	10	126,960,000	31,740	0.1172	0.00132	19,584	4.90
Rotary slasher	3,820	2	8	30,560,000	7,640	0.1425	0.00132	5,728	1.43
Maize Sheller	9,000	2	12	72,000,000	18,000	0.1005	0.00132	9,517	2.38
Workshop & office	35,000	1	30	140,000,000	35,000	0.0510	0.00132	9,398	2.35
Store & other buildings	40,000	1	20	160,000,000	40,000	0.0672	0.00132	14,151	3.54
Staff housing	300	120	20	144,000,000	36,000	0.0672	0.00132	12,736	3.18
Sm tools (3% of total)	22,008	1	5	88,032,000	22,008	0.2184	0.00132	25,292	6.32
TOTAL LCF farm equipment				**3,022,432,000**	**755,608**			**583,122**	**145.78**

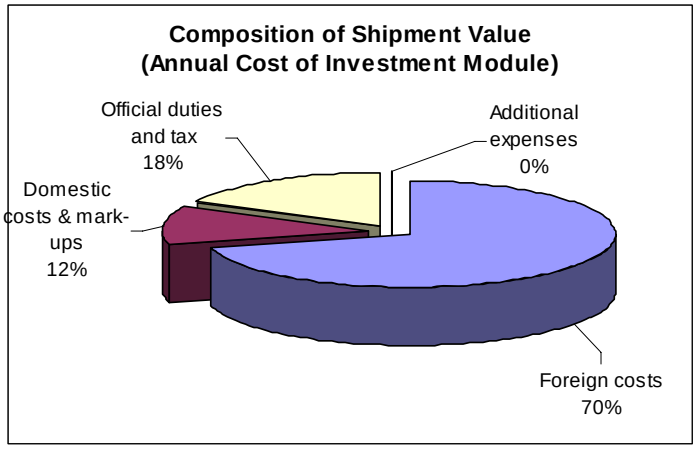
116. Based on these assumptions, another part of the template applies the specific CFs for each item to its annual depreciation value to produce the following breakdown.

Table 15: Summary of Value Chain Cost Components and Conversion Factors for LCF Investment Module

	ZMK	USD	% of DVA	% of SV
Total Investment Module (annual cost)				
Domestic costs	67,802	16.95	40%	12%
Duties and tax	102,387	25.60	60%	18%
Additional expenses	-	-	0%	0%
Total DVA	**170,189**	**42.55**	**100%**	**29%**
Foreign costs	412,933	103.23	243%	71%
Total SV	**583,122**	**145.78**	**343%**	**100%**

foreign conv factors (cf)		domestic conv factors (cf)	
% foreign	70.81%	tax as % DVA	0.602
foreign cf	1.000	extras	-

Table 6: Graphic Representation of Value Chain Components for LCF Investment Module



B. Factors Affecting Domestic Prices

117. As described, the derivation of reliable conversion factors for individual items and composite investment models requires careful consideration of many different factors that contribute to these values and final price. The spreadsheet templates were designed to make these calculations straightforward and focus attention on aspects of the domestic and international value chain that are likely to have the greatest impact on total cost and competitiveness. For the Zambia analysis, the following factors were taken into account.

118. **Transportation to the border.** As noted already, front load transportation costs to Zambia are high and have a negative impact on the country's competitiveness. For the template analysis, a standard price of ZMK 420,000 (USD 105.00) per MT was used for most heavy goods on north-bound routes from South Africa to Zambia with corresponding adjustments for backload freight, liquids, and light bulky items such as cotton lint.[25] In cases where sea freight is used, this was either treated as part of the same cost or added as a separate line item (both are foreign costs so any differences in the relative tax rates are of no consequence to the Zambian value chain – assuming, the best, lowest cost option is used).

119. As a share of an input's cost its place of use, international transport to the Zambian frontier is typically around 5-8% of total shipment value. For some very high value or light items, this can go as low as 2%. The one exception with a very high share of international transport costs in the domestic price build up is fertilizer. At 30% of total landed value at the farm gate, this result is somewhat of an outlier, but not entirely unexpected because of the bulk values involved. Although fertilizer is far from a "low value" commodity, its fob equivalent in the source country is only around USD 250-300 per ton, which is far lower compared to many high value items like vet medicines, agrichemicals, and even tractors. Importantly, many of Zambia's most important farm commodities like maize and soybeans also have a relatively low value to weight ratio. Cotton lint does much better on a per ton basis, but is still bulky and expensive to move. Sugar is also of similar value per ton to fertilizer, but very inexpensive to produce in Zambia and highly profitable for growers.

120. **Sea freight.** Sea freight for containerized items, including all documentation and port costs, was charged at the following rates quoted by a local freight forwarding agency.

- Northern Europe to Durban - $42/mt ($140/mt for cotton)
- Adibya (Egypt) to Durban - $40/mt
- Tampa (USA) to Durban - $50/mt
- Bangkok to Durban - $59/mt
- Santos (Brazil) to Dar es Salaam - $141/mt

121. **Domestic transportation costs.** Because of Zambia's size and poorly developed infrastructure, high domestic transport costs have long been a usual suspect for lack of agriculture competitiveness. Whether or not this is true, depends on many things including a comparison of transportation costs in Zambia with other competitor countries. It also depends on the share of transportation costs in each item's final shipment value to say whether or not this has a major impact.

122. To try and answer these questions (or at least provide the raw data that allows these questions to be examined), great care was taken to collect primary data for fuel and other vehicle operating costs. The detailed assumptions used for this analysis came from a meeting with the Zambia Energy Regulation Board (ERB) and are shown in the table below. The resulting % forex and domestic cf

[25] Adjustments are also needed for the transport of frozen beef, but this information was not available.

calculations for local tax are applied to the standard per ton per kilometer price of ZMK 400 (USD 0.10) per ton per kilometer, which was used for all domestic routes.[26]

123. Rather surprisingly, these calculations yield a rather low % forex for petrol and diesel of only 28% and 36% respectively. Not only do local taxes make up a large share of the total costs, but local refining costs also add greatly to the final pump price. Possible measures to reduce the total domestic costs through new investment at the refining stage could have an enormous benefit to Zambia's competitiveness in agriculture and other economic sectors.

Table 16: Parity Price Build-up for Petrol and Diesel

Derivation of % Forex and Conversion Factors for Fuel
Based on own calculations from ERB import parity price model for October 2006.

	Petrol	Diesel
USD per MT for refined product		
Foreign costs	596.01	603.14
Local costs	83.03	81.96
Indeni price to OMC (per MT)	**679.04**	**685.10**
% forex (if imported refined product)	87.8%	88.0%
Conversion to m3 (1,000 liters)		
Conv ratio to m3	0.75	0.84
Indeni wholesale price to OMC (USD per m3)	509.28	575.48
Indeni wholesale price to OMC (ZMK per lt)	**1,986**	**2,244**
Build-up to final pump price (ZMK per liter)		
Terminal fee	25	25
Road levy	370	415
Excise duty (45% petrol; 15% diesel)	1,072	403
Ex refinery gate price	**3,453**	**3,087**
Transport margin	105	105
OMC margin	245	245
OMC cost of finance	190	190
Dealer margin	163	163
ERB fees	35	32
Strategic Reserve Fund	152	65
VAT	760	680
Computed final pump price for (retail)	**5,103**	**4,567**
Foreign costs	1,743	1,976
Local costs (DVA)	3,359	2,591
% forex at pump (if imported refined product)	34%	43%
Total tax	**2,389**	**1,595**
Adjustments because of own refining at Indeni (own estimates)		
Foreign costs - subtract 15%	1,482	1,680
Local costs (DVA) - add 15%	3,863	2,980
Adjusted pump price	**5,345**	**4,660**
Adjusted % forex (based on local refining)	**28%**	**36%**
Total tax as share of DVA (conv factor)	**0.6183**	**0.5352**

Notes: Top part of table above double line based on ERB import parity price model for Oct 2006, which is based on import parity price for refined products. In actual fact, Zambia refines imported crude so the % forex that can be calculated from the ERB's pricing model needs to be adjusted to reflect actual conditions more accurately. This is done in the bottom part of the table. The final (imputed) % forex and tax as % of DVA assumptions will be slightly different for LCF farmers and other large-scale consumers

[26] This price is a standard "rule of thumb" rate charged by private transporters for "heavy goods" like maize and fertilizer. Because operators at the assembly level are assumed to use their own vehicles, only 70% of this rate was charged in these cases; other adjustments have been made for sugar, cotton, and live cattle.

124. **Duty on agriculture inputs.** Zambia's policy is to pursue an agriculture friendly tax regime. How well the government is achieving that goal is, of course, a matter for some debate and requires a long-term perspective and further analysis beyond the scope of the CCAA study. For the present purpose, the most current tax rates available at the time of analysis were applied as shown in Table 17 (and in Table 13 as part of the summary of simple CFs).

Table 17: Customs and Tax Regime for Imported Inputs

	Duty	VAT	Comments
Seed			
- Maize, soy, most other	5%	0%	Most use domestic seed
- Cotton	15%	0%	Imported hybrid for possible LCF
Fertilizer			
- All types	0%	0%	Mostly blended locally
Agrichemicals			
- Herbicides	0%	0%	
- Fungicides	0%	0%	
- Plant growth regulators	0%	0%	Duty because also have hh use.
- Insecticides	15%	0%	
- Vet medicines	0%	0%	
Implements			
- Tractors	5%	17.5%	Dealer reported 0% duty on tractor
- General implements	0%	17.5%	
- Sprayers	5%	17.5%	
- Irrigation equipment	0%	0%	Specific items only; taxes eliminated in 06/07
- Fencing	15%	17.5%	
Vehicles			
- Most types of motor vehicle & truck	15%	17.5%	

Source: Zambia Revenue Authority (2006). VAT on most implements can be reclaimed or deferred if the farmer (or other value chain participant) is VAT registered.

125. From the 2006/07 agricultural season, irrigation equipment used for wheat, cotton, tobacco, sugar, and vegetables were exempted from 15% import duty and 17.5% VAT.[27] Because irrigated soybeans and maize are grown in rotation with wheat, the exemptions should normally apply to these crops as well. This change is clearly a positive move for Zambian agriculture since the lack of investment in irrigation is widely acknowledged to be a significant constraint. Farmers who already installed irrigation equipment must, of course, continue to bear the cost of previous taxes as part of annual depreciation, but the potential savings on new investments is an important incentive for agriculture expansion and a clear step in the right direction. The detailed price effects of this policy change are considered in more detail below in the section with examples from the analysis.

126. **Notable features of tax policy.** Overall, the tax rates listed above appear to translate into a fairly modest share of tax in the final shipment value of most commodities. As summarized in the table below, this is especially true for FAM and ECF farmers, where the cumulative tax burden (including all farm level, assembly, and processing taxes up to the final competitiveness stage) account for just 4.7% to 13.4% of total SV. LCF value chains, on the other hand, attract far greater tax at a range of 11.3% to 22.5%.

[27] Duty and VAT are still imposed on multi-purpose equipment including as some pumps and other materials sometimes included as part of an irrigation installation.

Table 18: Cumulative Tax as % of Final SV

	Final Stage	FAM	ECF	LCF
Cassava	Assembly	4.7%	4.9%	22.5%
Cattle	Farm	7.6%	13.3%	15.1%
Cotton lint	Processing	7.5%	7.5%	11.3%
Maize	Assembly	11.9%	12.1%	16.5%
Rice	Distribution	13.3%	13.4%	n/a
Soybeans	Assembly	10.7%	10.5%	19.7%
Sugar	Farm/Assembly	n/a	n/a	17.3%*

* Estate sugar

127. Whether or not these policies are efficient or equitable is, of course, a major question beyond the scope of the current discussion. One simple observation, however, is that there may be good leverage for Zambia to increase its total output by focusing on tax reductions along the LCF value chains where taxes account for a relatively higher share of total SV than at the FAM and ECF levels. Although government policy is rightly concerned with poverty reduction and helping smallholder farmers, Zambia's limited production base is an important crosscutting competitiveness constraint that impacts market opportunities for large and small-scale producers alike. Policies designed to bring the tax on LCF value chain in line with those for other sectors could be one good way to increase total output and encourage new investments that enhance overall sector competitiveness. Of course, the reason LCF taxes are higher is because of the greater reliance on purchased (taxed) inputs and it is unsurprising that these value chains bear the greatest tax burden.

128. Apart from fuel used for mechanical cultivation, the sources of additional taxes are fairly easy to identify from the information in Table 17. Notably, insecticides, tractors, sprayers, fencing, and vehicles are all taxed at a higher rate than more basic equipment typically used in FAM and ECF value chains. In the case of insecticides, the reason for the differential compared with other agrichemicals is because of an institutional weakness in the Customs Department, which says its officers cannot distinguish between insecticides for domestic use and agriculture. Hence, all insecticides are charged at higher tax rate.

129. The price build-ups for agrichemicals and insecticides are shown in the charts below. As shown in Chart 8 for insecticides, import duty accounts for around 10% of the farm gate price. These products are especially important for cotton (including FAM and ECF cotton), and for LCF maize. A policy change to reduce the tax burden would therefore be of direct benefit to agriculture competitiveness, both in terms of per hectare savings compared to current production costs and, in a more dynamic sense, by encouraging better management through more intensive use of these inputs.

Figure 7: Agrichemical Cost Components (ex insecticides)

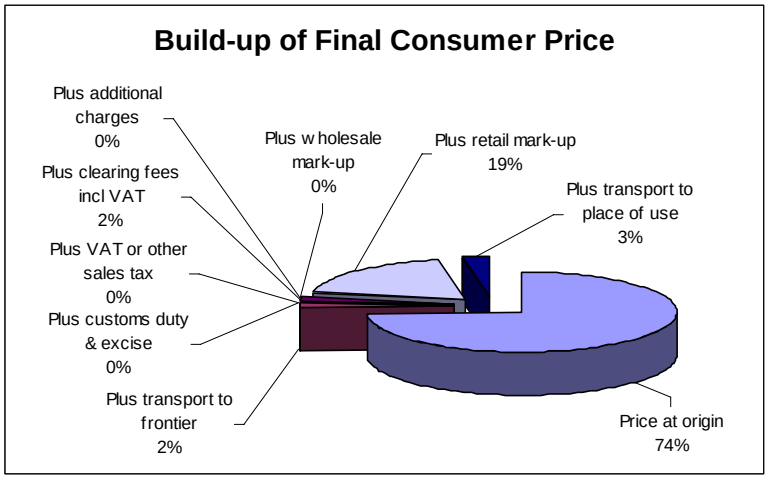
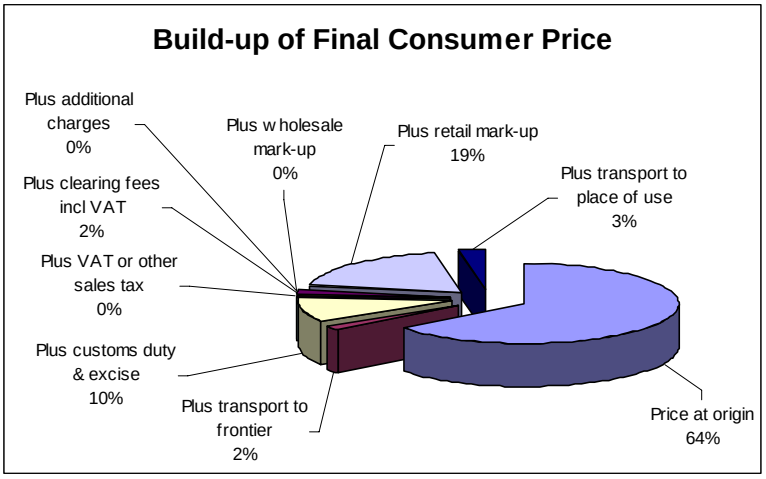
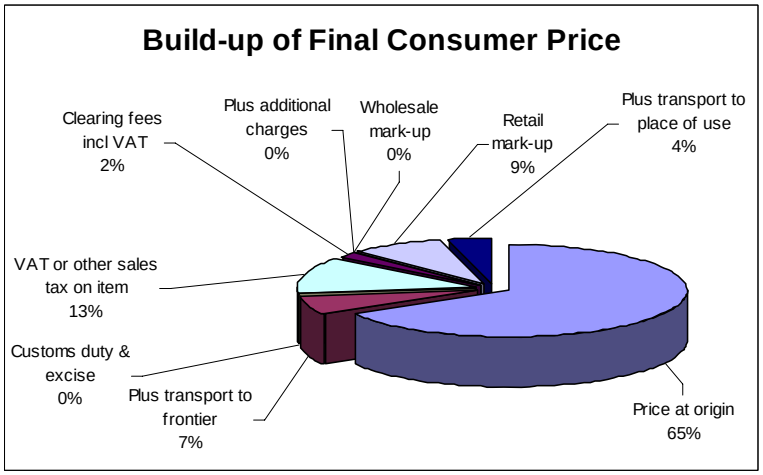


Figure 8: Insecticide Cost Components



130. The price build-up for tractors is illustrated in the next figure and shows that VAT accounts for roughly 13% of the implement's final SV. Farmers that are VAT registered are normally able to claim this money back (which passes the cost on to others in the value chain), but many LCF farmers are not VAT registered and so bear this cost directly.

Figure 9: Tractor Cost Components



131. **Clearing procedures.** Clearing procedures for imported inputs are normally handled by a freight forwarder (or clearing agent) who interacts with the ZRA Customs Department. Although a detailed assessment of these processes was not possible given other competing demands for this study, customs procedures are typically regarded to work reasonably well. There were no reports, for example, of customs officials "demanding" extra payments to allow a shipment through although extra payments in "appreciation" do sometimes help to expedite the process. Long delays at the border of 3-4 days (or more) are not unusual any such payments are usually quite small in relation to the value of merchandise.

132. Large quantities of merchandise sometimes also slip through the border without incurring any tax at all. It is very easy to imagine, for example, that insecticides would be loaded in the front of a truck and under-declared (or declared along with other chemicals) to avoid the extra tax on this input. These tricks are, of course, much more difficult to play with large items like tractors or irrigation equipment, but are nevertheless a very real feature of Zambian customs administration. More

research, however, is needed to understand the detailed cost implications for agriculture competitiveness.

133. **Wholesale and retail trade.** Most inputs are sold at the wholesale level. There are relatively few rural input dealers in Zambia and LCF farmers typically source their inputs from a large wholesale supplier in Lusaka. ECF farmers often do the same as do some FAM farmers although these producers tend to rely on outgrower support as described above. Many of the input supply companies are from South Africa. There are currently around four or five international (South African) chemical companies operating at the wholesale level.

134. **Unofficial extras.** Zambia ranked 111th out of 163 countries on Transparency International's Corruption Perceptions Index for 2006. This placed Zambia along with countries like Albania, Guatemala, Kazakhstan, Laos, Nicaragua, Paraguay, and Vietnam. Mozambique ranked 99th along with Georgia, Mongolia, and Ukraine and Nigeria ranked 142nd along with Angola, Kenya, Pakistan, and Sierra Leone. Brazil and Thailand ranked 70th and 63rd respectively (Brazil is also reported to have a significant worsening in perceptions of corruption).[28]

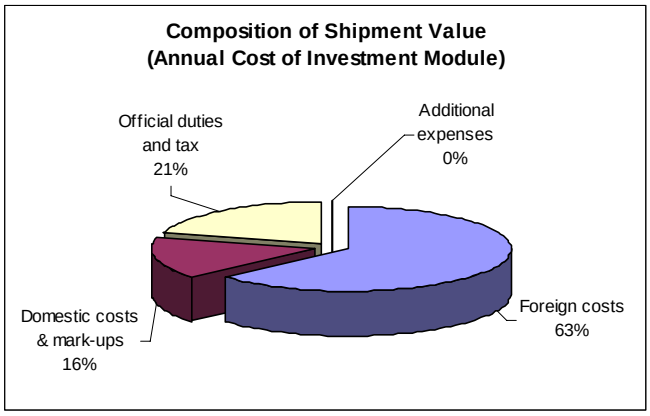
135. Among other things, this suggests a strong correlation between the perceptions of corruption and Africa's rather weak record of agriculture development. Because the type of specific information on unofficial extras needed to complete the CCAA templates was not available, this part of the analysis was left blank in all cases. Indeed, rather than raise the cost of doing business, "extras" are often paid to save on costs instead as described in the example for customs procedures above.

C. Examples from the Analysis

136. Before turning to the results on a commodity by commodity basis, it is worth noting a few main results from the input analysis. All of the detailed tables, pie charts, value chain summaries, and other indicators are presented in Annex 2.

137. **Value chain components of basic investment items.** The value chain components of FAM, ECF, and LCF investment modules is are summarized in the figures below. These data show that imported costs account for a large share of total investment costs for all types of farmers. Even FAM farmers who use very little equipment still rely on imported inputs (bicycle, hand sprayer, small tools, etc.) and actually bear the highest proportional tax burden compared with ECF and LCF farmers. At 18% to 21% of total investment costs, the analysis shows there is good scope for tax savings to improve the overall competitiveness of Zambian agriculture and promote new investment.

Figure 10: Value Chain Components – FAM Investment Module



[28] Transparency International, 2006.

Figure 11: Value Chain Components – ECF Investment Module

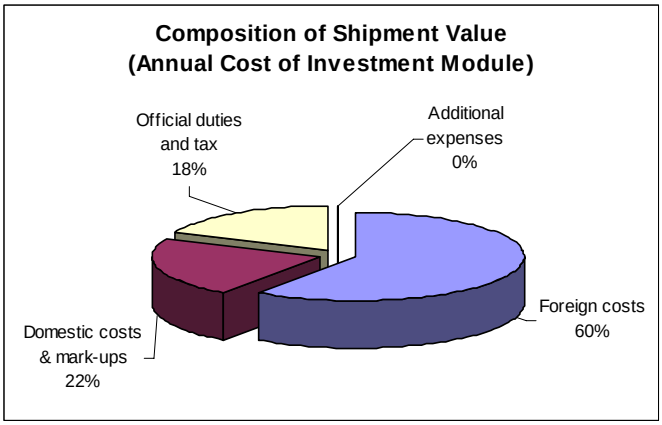
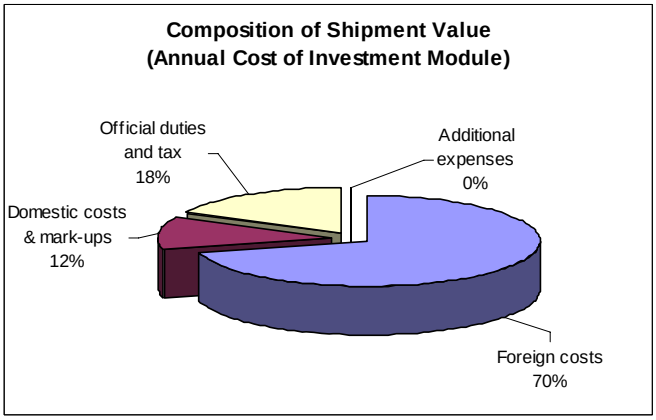


Figure 12: Value Chain Components – FAM Investment Module



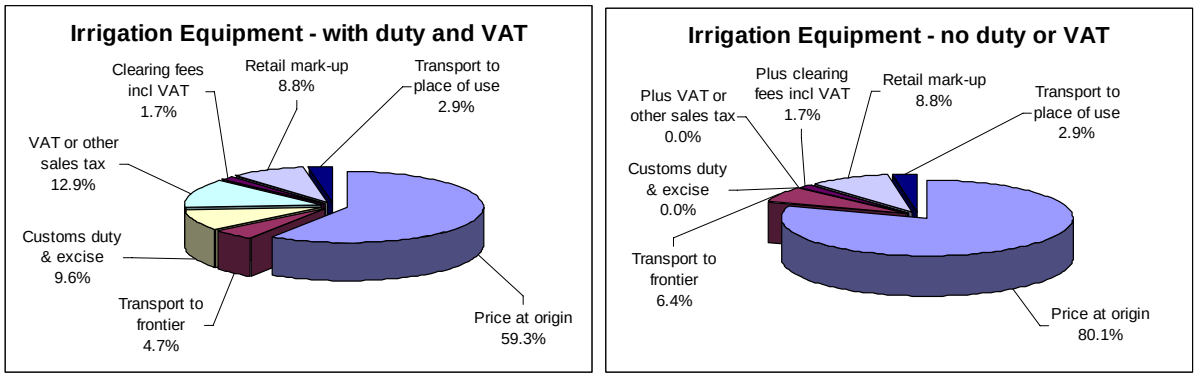
138. **Irrigation equipment.** The next set of tables and charts look at the composition of irrigation investment costs. As noted, specific types of irrigation pumps, fittings, and switch gear were recently exempted from 15% import duty and 17.5% VAT. Because Zambia is only using a small fraction of its total irrigation capacity, new investments in irrigation are likely to offer some of the best potential for increased agricultural production. The CCAA methodology provides a useful way to understand the effects of this policy change and quantify the likely outcome on agriculture competitiveness.[29] The base analysis of irrigated LCF cotton and soya was prepared using current prices that exclude these taxes, but is fairly straightforward to run the numbers again to include the former charges.[30]

139. Towards this end, the first set of pie charts looks at the price composition of irrigation equipment with and without 15% import duty and 17.5% VAT. As shown, these taxes account for a combined 22.5% of the total shipment value at the place of use once all other costs and charges are taken into account.

[29] Of course, these price effects can only be measured in a static sense and the CCAA templates make no attempt to show how producers would adjust their input use and cropping patterns at new price levels. This type of analysis would require more detailed models specifying elasticities of supply and demand.

[30] For LCF sugar, it was not possible to disaggregate the precise cost of irrigation equipment (let alone the taxes paid on that equipment) since the farm-level analysis was prepared using an overall figure for "general depreciation" provided by ZSC.

Figure 13: Irrigation Equipment Cost Components, With and Without Import Duty and VAT



140. The next set of tables show the estimated replacement value of a complete 80ha central pivot irrigation system and single rotation per hectare depreciation cost with and without import duty and VAT. As shown, the total replacement value works out to an estimated ZMK 982.4 million (USD 245,000) with duty and VAT compared to only ZMK 764 million (USD 191,000) without these taxes. On a single rotation basis, the tables show that the savings on duty and VAT reduce total depreciation costs by ZMK 95,800 (USD 23.95) per hectare. In net terms, therefore, assuming everything else remains unchanged, total crop profits also change by exactly this amount. Irrigated LCF soybeans, for example, are shown to provide a net income of ZMK 435,541 (USD 108.98) per hectare in the current policy environment, but would have generated only ZMK 339,741 (USD 84.94) net profit if the taxes on irrigation equipment were still included as part of the depreciation figure.

Table 19: Investment Modules for 80ha Central Pivot Irrigation Unit with and without Import Duty and VAT.

WITH TAX	Unit Cost (USD)	Qty	Useful Life (yrs)	Replacement Value		CRF	Share of Use	Per Rotation Depreciation Cost (SV)	
				ZMK	USD			ZMK	USD
Pump (70 kW)	20,250	1	10	81,000,000	20,250	0.1172	0.00625	59,348	14.84
Pivot irrig unit	162,000	1	20	648,000,000	162,000	0.0672	0.00625	272,224	68.06
Fittings	16,200	1	40	64,800,000	16,200	0.0433	0.00625	17,521	4.38
Bore hole const	5,000	1	40	20,000,000	5,000	0.0433	0.00625	5,408	1.35
Concrete pipes	30,000	1	40	120,000,000	30,000	0.0433	0.00625	32,447	8.11
Switch gear	12,150	1	20	48,600,000	12,150	0.0672	0.00625	20,417	5.10
TOTAL 80 ha pivot irrigatoin (taxed)				**982,400,000**	**245,600**			**407,364**	**101.84**

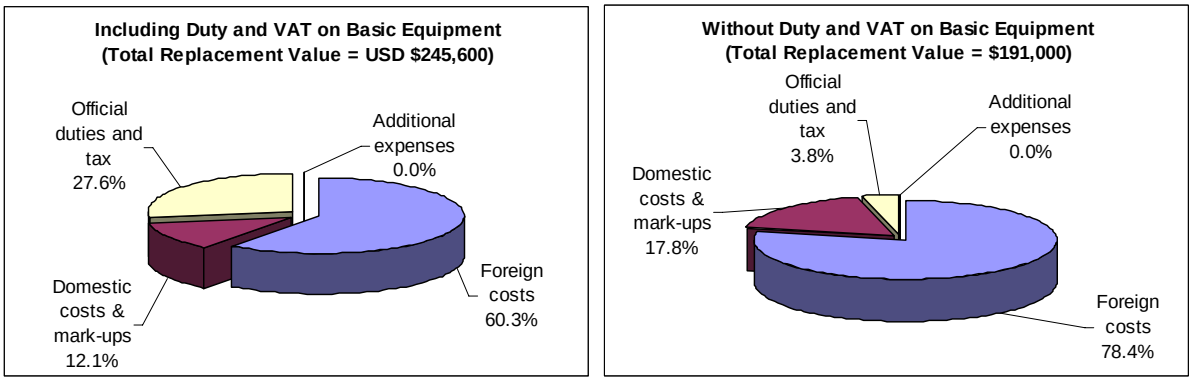
WITHOUT TAX	Unit Cost (USD)	Qty	Useful Life (yrs)	Replacement Value		CRF	Share of Use	Per Rotation Depreciation Cost (SV)	
				ZMK	USD			ZMK	USD
Pump (70 kW)	15,000	1	10	60,000,000	15,000	0.1172	0.00625	43,961	10.99
Pivot irrig unit	120,000	1	20	480,000,000	120,000	0.0672	0.00625	201,647	50.41
Fittings	12,000	1	40	48,000,000	12,000	0.0433	0.00625	12,979	3.24
Bore hole const	5,000	1	40	20,000,000	5,000	0.0433	0.00625	5,408	1.35
Concrete pipes	30,000	1	40	120,000,000	30,000	0.0433	0.00625	32,447	8.11
Switch gear	9,000	1	20	36,000,000	9,000	0.0672	0.00625	15,124	3.78
TOTAL 80 ha pivot irrigatoin (no duty)				**764,000,000**	**191,000**			**311,565**	**77.89**

Note: Per hectare depreciation = 1/160 (0.00625) since each hectare covered by the 80ha pivot unit is double cropped.

141. Finally, the next set of pie charts look at the composition of total SV for the two irrigation investment modules with and without duty and VAT. As shown, even when customs charges and VAT are eliminated, an estimated 3.8% of the cost of irrigation equipment is still accounted for by tax. This is because irrigation equipment still attracts tax on clearing fees, transportation, and on concrete pipes that were not exempted by the specific policy change. The pie charts also suggest there is little more scope for reducing the cost of irrigation equipment, since dealer costs and mark-ups and

remaining duties and tax only account for a combined 21.6% of the total cost (compared with 39.7% before the policy change). Further reductions in cost would likely need to come from improved sourcing arrangements in the foreign market.

Figure 14: Value Chain Components – 80ha Pivot Irrigation Module with and without Import Duty and VAT



142. Many other conclusions can be drawn by looking in a similar way at the detailed spreadsheet pages and summary tables presented in the quantitative annex. The purpose of presenting these few examples was not only to identify important policy options with regards to general investment items and irrigation equipment, but also to help readers to understand how to interpret the data on their own. The analysis is quite comprehensive and provides a rich database that can be looked at from different perspectives depending on specific interests. By adding new production systems and input items to the country data, the CCAA approach could be used to look at other policy options and investment strategies.

V. COMMODITY ANALYSIS

143. Having set out the basic context of the Zambia case study, main features of the quantitative methodology, and findings from the input analysis, this section now presents the country-level results for each of the seven CCAA commodities being studied. As noted, more information was available for some products than others and it was not possible to complete the analysis at every single stage for all commodities. Data from other CCAA countries are also not yet available which will allow the value chain indicators for Zambia to be compared with these other international benchmarks. That part of the analysis will be completed at a later stage by CCAA team leaders.

144. For each commodity, the discussion begins with qualitative background information on recent production trends, marketing constraints, and other factors that shape Zambia's competitiveness in that product. 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 Zambia's competitiveness options should also look carefully at the template pages that are reproduced in the quantitative annexes.

A. Cassava

145. Cassava is mainly grown by small-scale family farmers and some emergent farmers as a subsistence crop for food security. Most production is centered in the northern and northwestern parts of the country where cassava is an important staple along with maize; in other parts of Zambia, cassava is much less widely cultivated. There are no large commercial producers of cassava and, from available information, it appears processing is entirely informal with no dedicated processing plants. Evidence was, however, found of cassava being traded minimally across districts and provinces. It is estimated that between 60% and 70% of farmers sell dried cassava chips or flour, while the remaining 30% to 40% sell fresh roots.[31] Processing (drying and slicing or pounding) usually takes place at home with the cassava dried on reed mats in the sun. Some farmers may also take their cassava to local hammer mill if they have a large enough quantity, but again this would mainly be to produce flour for home use.

146. **Production and market trends.** Until the early 1990s cassava production remained extremely low at less than 300,000MT per year. Since market liberalization, however, cassava production increased rapidly to an estimated 958,000MT in 2002/03 equivalent to around 240,000 MT of dry cassava flour. This is equivalent to annual growth of between 6% and 8%, which is one of the fastest growth rates for cassava anywhere in the world.[32] This rapid increase is most often attributed to the removal of fertilizer subsidies and price controls for maize as well as the series of droughts that struck Zambia in the immediate post-liberalization period, which together led farmers to favor less expensive and less risky enterprises like cassava. The epidemic outbreak of HIV/AIDS probably also contributed to the growth of cassava since a diminished rural labor supply naturally leads growers to focus on labor saving, low-input crops.

147. Despite the surge in production, cassava is still mainly a subsistence crop. A 1996 study, estimated that only 9% of total cassava grown in Zambia is sold for cash. Whilst cassava production seems to be growing, therefore, very little has been done in the area of marketing such as creation of allied industries like starch and stock feed industry. Sales have remained localized and there is no

[31] USAID, 2004.

[32] One of the main problems with cassava statistics in Zambia (and elsewhere) is that they often do not record whether the figure is for dry tuber, wet tuber, or flour. There are very large conversion ratios on the order of four to six tons wet tuber to dry flour, but Zambian record keepers and policy makers are often uncertain about which form is being measured. This fact alone represents an important competitiveness constraint for cassava and is indicative of how little attention the commodity has received. CSO crop estimates, in fact, do not even report data for cassava like they do for all other main agriculture enterprises and even for other secondary food crops like millet and sorghum. The cassava data presented here are from Haggblade and Zulu, 2003.

formal domestic and external market. Some district officials in Luapula Province have reported that increasing volumes are being exported to the Democratic Republic of Congo by small and medium-scale traders, but is mainly an ad hoc activity and little information was available on the nature of these transactions.

148. In Zambia itself, commercial brewers and stock feed manufacturers have expressed interest in developing cash markets for cassava.[33] The size and scope of these opportunities, however, are severely constrained by the absence of processing plants in the major producing areas of Luapula and Northern Provinces. These areas are around 600-850km away from the formal sector brewers and stock feed makers so without local processing facilities there would seem to be few opportunities for true commercialization. A Root and Tuber Baseline Survey undertaken by USAID established that the common marketing problems included lack of enough buyers and unstable/unreliable markets.[34]

149. **Production constraints.** Cassava is particularly attractive as it is a drought-tolerant crop and can be grown with few external inputs. The value chain models at the FAM and ECF levels in fact only include labor, transport, packing materials, and depreciation of basic farm equipment, which makes cassava one of the most affordable crops to grow. A hypothetical LCF model that includes fertilizer for high yields was also constructed to try and get a better understanding of the opportunities for market development, and this system is likewise the least expensive of all LCF scenarios(at less than 35% of the estimated costs for growing LCF maize).

150. Apart from the long distances between the main producing and areas and potential commercial markets (brewers, stock feed, etc), the other main production constraint is an acute shortage of improved planting material. Farmer demand for cuttings of the recommended high-performing local cassava varieties far exceeds available supply. Currently, there are only around 23 hectares of primary sites for production of disease-free improved cassava varieties in Zambia, supporting about 100 hectares of tertiary plots producing planting materials through farmer and community managed nurseries. Given a ratio of about 7:1, these sites would permit distribution of planting material sufficient to plant 700 hectares of cassava each year. Given the 300,000 hectares currently planted to cassava, this formal seed multiplication capacity offers prospects for rejuvenating less than 1% of the currently planted area annually. A survey in 2000 concluded that 60% of farmers in northern Zambia were growing the three improved varieties that had been released to then, but that these only accounted for 22% of the total cassava area.[35]

151. **Market prospects.** Marketing and processing need to improve dramatically if the highly perishable cassava crop is to continue growing rapidly. Population density in Zambia is low and distances to urban centers are large. Drying and processing are therefore central to any commercialization strategy for cassava to offset high transport costs to the major markets where the crop could be used commercially. Zambia could learn from the cassava mechanization and processing technology that has been developed over many decades in West Africa. Anecdotal information, in fact, suggests that private Nigerian businessmen who grew up on *gari* are undertaking some of the interesting experimental cassava processing work in Zambia today. Yet considerable resources and efforts will still be required to master cassava processing and marketing in Zambia. Without such efforts, the cassava boom will stall.

152. **Quantitative analysis.** The quantitative value chain analysis of cassava is based on realistic models for FAM and ECF farmers currently operating in Northern Province and a hypothetical LCF model for Central Province. The final market for all types of producers is assumed to be Kasama which is one reasonable place where a new processing plant to serve the FAM and ECF sectors could be built. While the literature search did reveal some evidence of cassava being processed in small

[33] Haggblade and Zulu, 2003.

[34] USAID, 2004.

[35] Haggblade and Zulu, 2003.

hammer mills, detailed information on the cost of this operation and milling outturns for cassava were not available. The analysis therefore ends at the assembly stage for industrial raw material.

153. The farm level marketing assumptions for cassava are summarized in the table below. As already noted, FAM and ECF farmers are assumed to follow a very basic regime in which the main difference between the two sectors is the amount of attention given to weed control and other simple matters of crop husbandry. The LCF model is a hypothetical possibility for the closest commercial farm block to the main areas of cassava production in the north. Other than investing in a completely new "cassava estate" in the north, Mkushi is the most likely area for any type of commercial investment, but this is still 550km from Kasama where a processing plant might be built.[36]

154. In deciding on the farm yield and price estimates, some fairly broad assumptions have had to be made based a 1996 analysis of Zambia and a 1997 study in Malawi where similar farm conditions apply.[37] The figure for LCF farmers in particular must be reviewed as this is little more than a total guess based on some very broad yield figures for countries with a commercial cassava sector.[38] The literature search on Zambia otherwise provided none of the information needed for the quantitative analysis. Consistent with the approach for all commodities, FAM farmers are assumed to sell to an informal roadside buyer 10km away from the farm. For other crops, ECF farmers sometimes sell to larger-scale (more formal) buyers, but none of these traders are currently operating in cassava and the same roadside marketing arrangement was also assumed for this sector at the first point of sale. For the hypothetical LCF model, it is assumed that the farmer sells literally at the farm gate to a registered transporter who takes the crop to the (imaginary) processing plant. At the farm level, all yield figures are expressed in dry weight per hectare.[39]

Table 20: Cassava, Farm Level Marketing Assumptions

Sector	Location	Yield (MT dry tuber/ha)	Sale Point	Farmer's Delivery Distance	Buyer	Price per MT	
						ZMK	USD
FAM	Kasama	4.00	Roadside	10 km	Informal Trader	350,000	87.50
ECF	Kasama	4.50	Roadside	10 km	Informal Trader	350,000	87.50
LFC*	Mkushi	12.00	Farm gate	0 km	Transporter	290,000	72.50

* Hypothetical possibility only (yield coefficients from improved material and response to fertilizer must be verified). LCF paid lower price because of distance to main cassava growing areas, which would be the most likely location for any new processing plant.

155. At the assembly stage, further assumptions have had to be made as summarized below.

Table 21: Cassava, Assembly Level Marketing Assumptions

Sector	Type of Trader	Assembly Delivery Distance	Delivery Point	Price per MT (dry tuber)	
				ZMK	USD
FAM	Informal Trader	80 km	Kasama	410,000	102.50
ECF	Informal Trader	80 km	Kasama	410,000	102.50
LFC*	Transporter	550 km	Kasama	410,000	102.50

* Hypothetical possibility only.

[36] In fact, this is actually taking LCF cassava further away from the main markets where it would eventually be used as a stock feed ingredient or raw material by the breweries, suggesting that some type of on-farm processing might be more appropriate for the LCF sector. In this case, the analysis could stop at the farm level, since the commodity is already "assembled" at that location.

[37] See Keyser, 1996, 1997.

[38] Data from FAOSTAT.

[39] Care is therefore needed in comparing the yield estimates with other CCAA countries where local analysts may have expressed yields in wet tubers. Typically, dry cassava weighs about 1/6 as much as wet cassava.

156. The next tables are copied from the spreadsheet templates and summarize the estimated benchmark indicators for cassava at the farm and assembly levels. As explained in the methodology section, all value chain indicators are cumulative. This means that the values at the assembly stage include all farm level costs, purchases from the farmer, and transportation to the assembly point. These indicators also do not show anything about profitability for individual participants. In the case of FAM cassava, for example, the data show that it costs ZMK 135,465 (USD 33.87 to produce a ton of dry cassava tubers including the imputed value of family labor, but of course this is not the same as farmer profit.

Table 22: Cassava – FAM per MT Value Chain Indicators

Cassava - FAM	FARM GATE PRODUCT		ASSEMBLED RAW MATERIAL	
	ZMK	USD	ZMK	USD
Domestic Value Added				
Costs & mark-ups	112,187	28.05	337,442	84.36
Official duties & tax	8,216	2.05	17,851	4.46
Additional costs	-	-	-	-
Total DVA	**120,403**	**30.10**	**355,293**	**88.82**
Foreign costs	15,061	3.77	25,606	6.40
Total Shipment Value	**135,465**	**33.87**	**380,899**	**95.22**

Table 23: Cassava – ECF per MT Value Chain Indicators

Cassava - ECF	FARM GATE PRODUCT		ASSEMBLED RAW MATERIAL	
	ZMK	USD	ZMK	USD
Domestic Value Added				
Costs & mark-ups	137,293	34.32	331,661	82.92
Official duties & tax	8,960	2.24	18,594	4.65
Additional costs	-	-	-	-
Total DVA	**146,253**	**36.56**	**350,256**	**87.56**
Foreign costs	20,098	5.02	30,643	7.66
Total Shipment Value	**166,351**	**41.59**	**380,899**	**95.22**

Table 24: Cassava – LCF per MT Value Chain Indicators (hypothetical)

Cassava - LCF*	FARM GATE PRODUCT		ASSEMBLED RAW MATERIAL	
	ZMK	USD	ZMK	USD
Domestic Value Added				
Costs & mark-ups	145,956	36.49	155,157	38.79
Official duties & tax	26,878	6.72	87,817	21.95
Additional costs	-	-	-	-
Total DVA	**172,834**	**43.21**	**242,974**	**60.74**
Foreign costs	77,405	19.35	147,046	36.76
Total Shipment Value	**250,239**	**62.56**	**390,020**	**97.50**

157. Several conclusions can be drawn from the value chain indicators for cassava. These include:

- FAM and ECF farmers are able to produce a ton of cassava for much less than LCF farmers (assuming the hypothetical LCF model is correct); FAM farmers are the lowest cost producers, followed by ECF then LCF.
- Assembly accounts for about 64% and 56% of the total shipment value for FAM and ECF cassava respectively, but only about 36% of the cost for LCF. This is because of the higher cost of production for the LCF sector.

- Domestic costs and mark-ups at the assembly level are lower for LCF than FAM or ECF because these farmers are assumed to be paid a lower due to their distance from the (imaginary) processing plant.

158. Further insight to the composition of costs for each sector is provided by the farm and assembly level pie charts as follows.

Figure 15: Build-up of Farm and Assembly Level SV – FAM Cassava

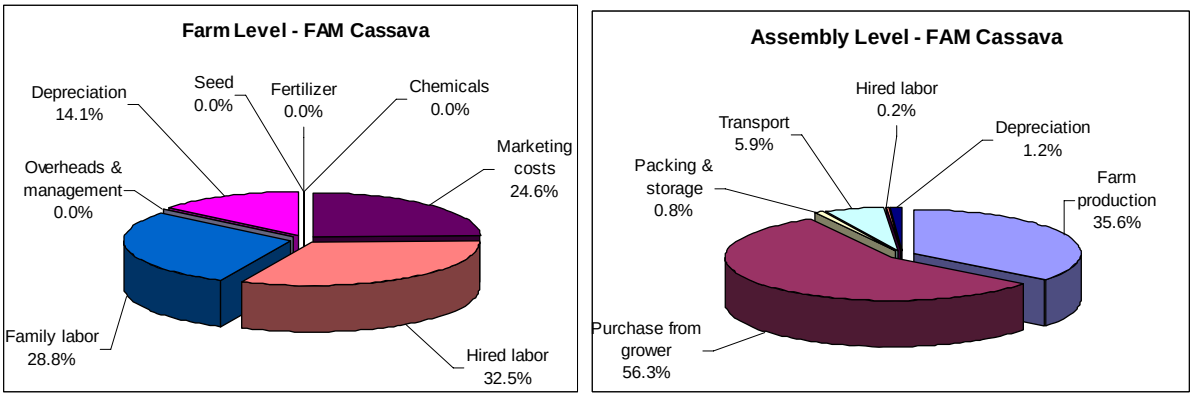


Figure 16: Build-up of Farm and Assembly Level SV – ECF Cassava

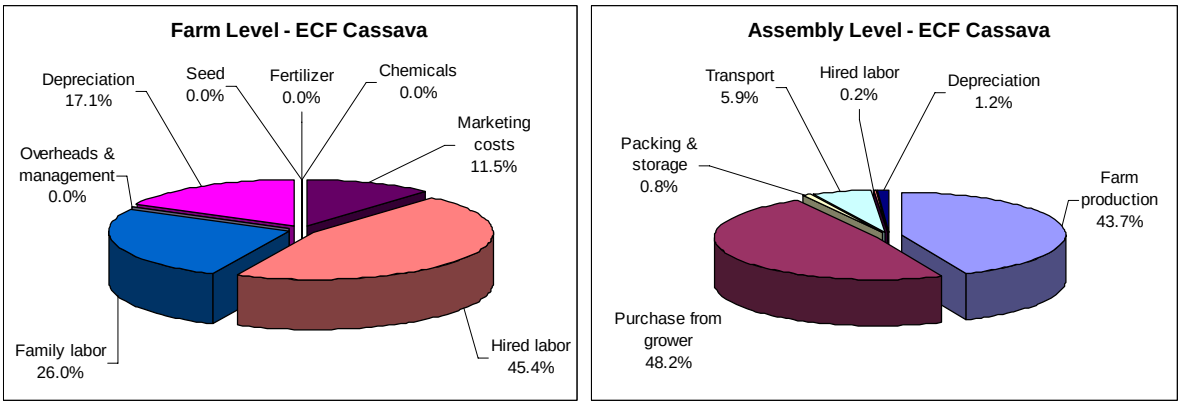
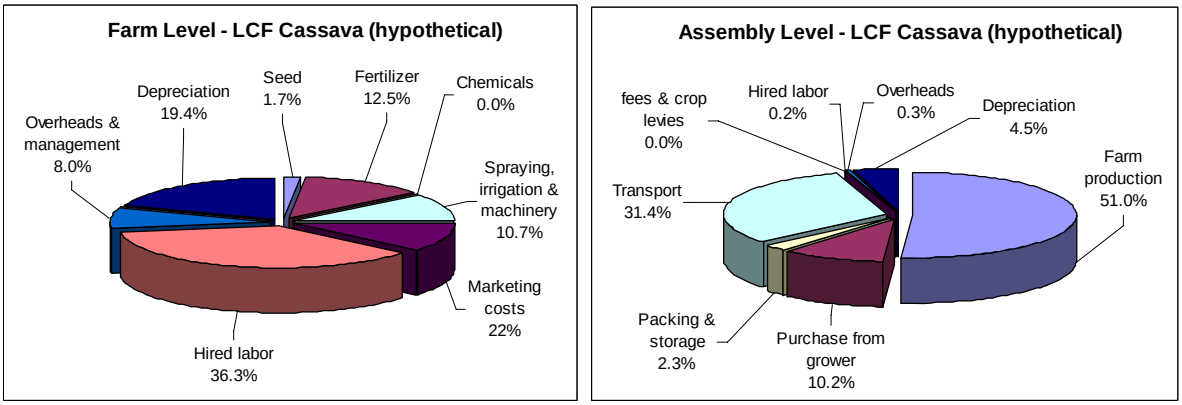


Figure 17: Build-up of Farm and Assembly Level SV – LCF Cassava (hypothetical)



159. These graphics show much more clearly how transportation costs are a major component for LCF cassava because of the distance involve in moving the commodity. The first two sets of charts also show that farm production and purchases from the grower (i.e. the farmer's profit margin)

account for the majority of costs at the FAM and ECF levels. This provides relatively little room to intervene to improve the competitiveness of these sectors, although for the LCF sector possible savings on transport costs would be the obvious area to look at. For FAM and ECF farmers, family and hired labor account for an accumulated 61.3% and 71.4% of total costs respectively.

160. The next tables summarize the private costs and profitability indicators on a per ton basis. As with all estimates of private profitability, these figures exclude the imputed value of family labor.

Table 25: Cassava – FAM, per MT Financial Indicators

Cassava - FAM	FARM GATE PRODUCT		ASSEMBLED RAW MATERIAL	
	ZMK	USD	ZMK	USD
Gross revenue	**350,000**	**87.50**	**410,000**	**102.50**
Production costs				
Crop purchase		-	350,000	87.50
Other variable costs	77,300	19.33	26,514	6.63
Investment costs	19,165	4.79	4,385	1.10
Total costs	**96,465**	**24.12**	**380,899**	**95.22**
Final income				
Gross margin	272,700	68.18	33,486	8.37
Net profit	**253,535**	**63.38**	**29,101**	**7.28**
Rates of return				
Gross margin/total VC		3.53		0.09
Net profit/total costs		2.63		0.08

Table 26: Cassava – ECF, per MT Financial Indicators

Cassava - ECF	FARM GATE PRODUCT		ASSEMBLED RAW MATERIAL	
	ZMK	USD	ZMK	USD
Gross revenue	**350,000**	**87.50**	**410,000**	**102.50**
Production costs				
Crop purchase		-	350,000	87.50
Other variable costs	94,607	23.65	26,514	6.63
Investment costs	28,411	7.10	4,385	1.10
Total costs	**123,018**	**30.75**	**380,899**	**95.22**
Final income				
Gross margin	255,393	63.85	33,486	8.37
Net profit	**226,982**	**56.75**	**29,101**	**7.28**
Rates of return				
Gross margin/total VC		2.70		0.09
Net profit/total costs		1.85		0.08

Table 27: Cassava – LCF, per MT Financial Indicators (hypothetical)

Cassava - LCF*	FARM GATE PRODUCT		ASSEMBLED RAW MATERIAL	
	ZMK	USD	ZMK	USD
Gross revenue	**200,000**	**50.00**	**410,000**	**102.50**
Production costs				
Crop purchase		-	200,000	50.00
Other variable costs	201,645	50.41	167,714	41.93
Investment costs	48,593	12.15	22,306	5.58
Total costs	**250,239**	**62.56**	**390,020**	**97.50**
Final income				
Gross margin	(1,645)	(0.41)	42,286	10.57
Net profit	**(50,239)**	**(12.56)**	**19,980**	**5.00**
Rates of return				
Gross margin/total VC		(0.01)		0.11
Net profit/total costs		(0.20)		0.05

161. These data show that cassava is quite profitable per ton for FAM and ECF farmers and would be a good choice to promote from a poverty reduction point of view. The farm level rates of return are particularly outstanding and show that cassava can provide farmers in the north an excellent return on very little investment. LCF farmers, on the other hand, appear to lose money from cassava production and the crop is unlikely to be a good choice for this sector.[40]

162. Taken together, this leads to the conclusion that the development of new processing facilities in the northern areas where smallholder production is based could be an excellent strategy for commercial market development in some of Zambia's most remote locations. Achieving the type of economies of scale needed to sustain a new processing plant without a foundation of LCF production, however, might be difficult to achieve. These conclusions, of course, require much more detailed analysis to verify (including an analysis of processing operations and international and domestic cost competitiveness), but at least from the data here there is more than one reason to say that cassava is an interesting crop that has much more commercial potential than Zambia has been able to realize so far.

163. **Parity price comparison.** The final element of the analysis of cassava is to look at the product's final shipment value compared with an international reference price. For this commodity, however, very little information is available. Only one price was provided by FAO of around USD 50.00 per MT fob northern Europe. Because the total SV for cassava as an assembled raw material is greater than this amount, it would be extremely unlikely for Zambia ever to trade cassava with Europe. This, however, is the wrong question, and what Zambia really needs to look at are regional export prices in the Democratic Republic of Congo and import parity prices for milled cassava (or another substitute ingredient) used in the manufacture of stock feed or by the brewing industry. The world market price of cassava in northern Europe is of little practical consequence to the commercial opportunities for Zambia.

B. Cattle

164. There are three fundamental categories of cattle farmers in Zambia. First are the large-scale commercial farmers who produce good quality beef from ranching and feedlots. Second are the smaller farmers who supply a substantial portion of the domestic market but produce a poorer quality product than commercial farmers. These farmers also provide many of the weaner animals used by commercial farmers for feedlots. Finally, the third category is the traditional farmers who keep cattle mainly as a symbol of wealth and as a buffer against economic hardship. These animals are usually only ever sold under duress or slaughtered for wedding and funeral ceremonies.[41]

165. Local experts estimate there are a total of 1.8 million cattle in the traditional sector and around 450,000 beef animals in the commercial sectors (comprising LCF, ECF and market-oriented FAM farmers). Most cattle are raised in Southern and Western Provinces where this is a part of traditional rural life. Copperbelt, Northern, and Northwestern Provinces by contrast have very few cattle and hardly any tradition of keeping beef or dairy animals at all. The country's largest feedlot and abattoir are in Central Province near Chisamba, roughly 70km and 250km from the main domestic markets Lusaka and the Copperbelt respectively.

166. Zambian beef has one inherent advantage and another balancing disadvantage compared with other countries. On the one hand, Zambian beef can be fed relatively cheaply from grazing at low stocking densities over large areas. Conversely, production costs are increased by the need for a continual veterinary input to combat the high level of tick-borne and other endemic diseases. As a result, almost all Zambian beef is sold on the domestic market. These outlets have been expanding in recent years, but are still extremely small with annual beef consumption of only 4kg per capita due to

[40] Although these data for LCF are entirely hypothetical and need much closer examination, simple sensitivity tests during the process of budget construction suggest that the financial loss is a relatively robust result if other possible yield and price assumptions are used.

[41] Keyser, Heslop, and Abel, 2001.

the weak purchasing power of most individuals. If the Zambian beef industry is to expand, it must access wider markets by exporting.[42] For comparison, annual per capita consumption data for a few other countries are summarized below.

Table 28: Beef – Annual per Capita Consumption (kg per person)

	2001	2005 (p)	2006 (f)
Argentina	66.3	61.9	65.2
Brazil	34.8	36.4	37.4
European Union	16.9	17.9	17.9
South Africa	14.9	15.6	15.8
United States	43.3	42.8	43.8

Source: USDA -FAS (2006). (p) preliminary; (f) forecast

167. There are potential export markets for Zambian beef in Europe, the Middle East, and southern Africa. Most of these markets, however, are presently closed to Zambia and the possibility of future trade depends firstly on the institution of internationally accredited systems for controlling endemic diseases such as foot and mouth and corridor disease. Export opportunities also depend on the construction (and certification) of new abattoir facilities according to international standards. Botswana and Namibia have achieved the requirements to export beef to the EU, but this required considerable public and private investment over many years. South Africa and the Middle East would likely be far easier markets for Zambia to access than the EU, but these countries also have very strict veterinary and food safety requirements that Zambian beef producers are presently unable to meet.

168. Together, these factors mean that regional markets within southern Africa are likely to offer the greatest potential export opportunities. Sector participants have previously stated that the most likely opportunities for trade are with the Democratic Republic of Congo. Katanga Province alone has a population that is at least the same as Zambia's and food hygiene and veterinary regulations are relatively weak. Most beef currently exported in fact goes to this market. Over the longer-term, other neighboring countries such as Malawi, southern Tanzania, and possibly eastern Angola could also offer potential for export growth.

169. **Quantitative analysis.** Due to data and time limitations, the quantitative analysis of beef only covers the farm stage. This ends with the sale of live weaner calves into a feedlot. Specifically, most Zambian ranchers produce 2-year-old ***long weaners*** that weigh between 200-260kg. Beef animals are then fattened over about 100 days to a finished live weight of about 410kg (the aim being for the animal to gain 1.5kg per day). Fattening either takes place in the farmer's own feedlot or another commercial facility. Some very large farmers also have their own abattoir and even retail butcheries as part of a vertically integrated supply chain.

170. At the farm stage, the main differences between sectors (other than herd size) are the amounts of supplemental feed given to the herd, management costs, and depreciation on fencing, boreholes, dams, and other ranch equipment. FAM farmers almost never use supplemental feeds and normally just graze their animals freely on communal land (except at night when the livestock are usually brought to a central kraal). ECF farmers may provide some supplements during the dry season when fresh fodder is scarce, and LCF farmers usually follow an intensive feeding regime. Many combinations are used, but a typical ration consists of maize bran, wheat bran, chicken litter, urea, molasses, salt, and di-calcium phosphate. According to one farmer interviewed for this study, animals receive an average of 0.5kg per day, but this increases over time to 2kg per day in the driest part of the year before the rains begin.

[42] Ibid.

171. The main management assumptions applied for the quantitative analysis are summarized in the table below. Notably, LCF farmers are assumed to deliver long-weaners to their own feedlot for finishing. FAM and ECF farmers, on the other hand, are assumed to sell their animals to trader who in turn transports the animals to a large commercial feedlot. One exception for cattle compared with the procedures for other CCAA commodities, therefore, is that the cost of delivery to the feedlot is treated as part of farm production rather than as a separate assembly operation. This is because the feedlot operation has been reinterpreted as assembly. If data for this and other stages become available, the analysis of cattle can be continued to cover fattening, slaughter; and final delivery of chilled or frozen sides of beef. For indicative purposes, the analysis is based on farm production near Choma in Southern Province; FAM and ECF farmers are assumed to deliver to Zambia's largest feedlot in Chisama, but may sometimes also sell to closer-by LCF farmers either to spend more time on the range or to enter the LCF's own feedlot..

Table 29: Cattle, Farm Level Marketing Assumptions

Sector	Stocking Density	Main Product	Sold To	Farmer's Delivery Distance	Distance to Feedlot	Price per MT (live into feedlot)	
						ZMK	USD
FAM	1 cow per 20ha + 2 followers	210kg long-weaner at 24 months + cull cows	Large Feedlot	10km by foot	350km	4,700,000	1,175.00
ECF	1 cow per 15ha + 2 followers	240kg long-weaner at 24 months + cull cows	Large Feedlot	10km by foot	350km	5,000,000	1,250.00
LFC	1 cow per 12 ha + 2 followers	250kg long-weaner at 24 months + cull cows	Own Feedlot	0km	0km	5,000,000	1,250.00

For all sectors, delivery to the feedlot is included as part of the farm budget. FAM farmers are paid a lower price because their animals are smaller and take proportionately longer to fatten. To allow for a direct comparison between sectors, all farmers are assumed to produce weaners over 24 months (ECF and FAM farmers use fewer supplemental feeds and so achieve less weight over this period than LCF). In actual fact, an ECF farmer (or at least an LCF farmer with out an integrated feedlot) may raise weaners for longer than 24 months to produce a larger animal (say 280kg) to get a higher price.

172. Next, the table below summarizes the farm-level value chain indicators for each of the three farm sectors analyzed. All figures are per ton live-weight. As shown, it appears that FAM farmers are able to produce long-weaners for about 62% of the cost compared with LCF farmers. This is because the FAM sector has almost no overheads and few production costs other than routine dipping against tick-borne diseases. Total SV of the ECF product is about 82% of the shipment value of LCF weaners.

Table 30: Cattle – Per MT Value Chain Indicators (long-weaner, live)

	FAM		ECF		LCF	
	ZMK	USD	ZMK	USD	ZMK	USD
Domestic Value Added						
Costs & mark-ups	961,912	240.48	1,644,915	411.23	2,119,553	529.89
Official duties & tax	208,597	52.15	479,232	119.81	661,464	165.37
Additional costs	-	-	-	-	-	-
Total DVA	**1,170,509**	**292.63**	**2,124,147**	**531.04**	**2,781,016**	**695.25**
Foreign costs	1,569,661	392.42	1,477,770	369.44	1,606,557	401.64
Total Shipment Value	**2,740,170**	**685.04**	**3,601,917**	**900.48**	**4,387,573**	**1,096.89**

173. Although LCF beef is more expensive to rear at the farm stage than cattle from other sectors, LCF producers account for the vast majority of commercially marketed cattle. Reasons for the higher costs relate to the use of supplemental feeds, hired managers, electricity for pumping water, fence and borehole maintenance and many other costs that FAM farmers simply do not bother with.

174. The composition of total SV by value chain category is summarized in the next table. These data suggest that government has relatively more scope for improving the profitability of beef production at the LCF level through changes to tax policy than with any other sector. Very simply, this is because LCF farmers make much more intensive use of purchased inputs like supplemental feed, electricity, and fencing equipment. Rather surprisingly, FAM farmers have a higher share of foreign costs in total SV than other sectors, but this is because things like imported vet medicines and acaracides are more or less fixed and cannot be compromised on if the farmer is to sell into the commercial value chain. To achieve export standards, even more intensive attention to animal health and disease control would probably be required by all sectors.

Table 31: Farm Level Value Chain Components for Cattle

	FAM	ECF	LCF
Costs & mark-ups	35%	46%	48%
Duties & tax	8%	13%	15%
Foreign costs	57%	41%	37%

175. Further insight to farm level cost structures is provided in the pie charts that follow.

Figure 18: Build-up of Farm Level SV – FAM Cattle

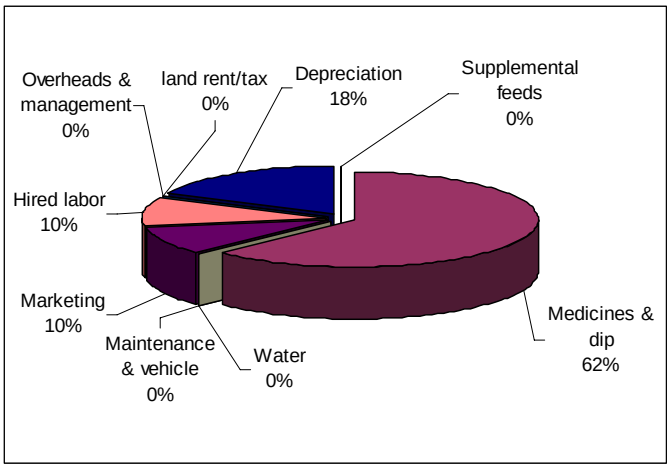


Figure 19: Build-up of Farm Level SV – ECF Cattle

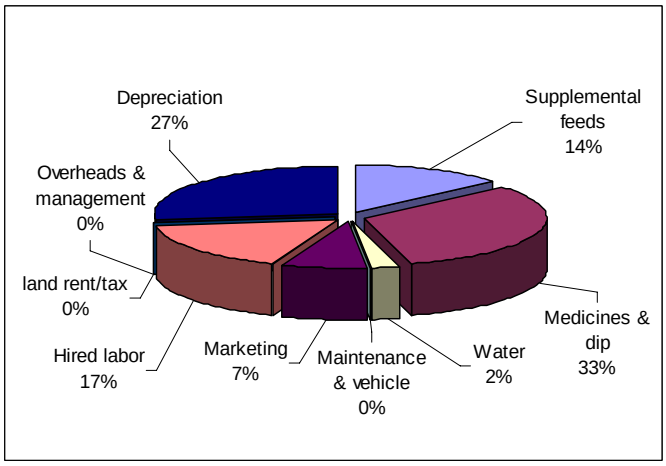
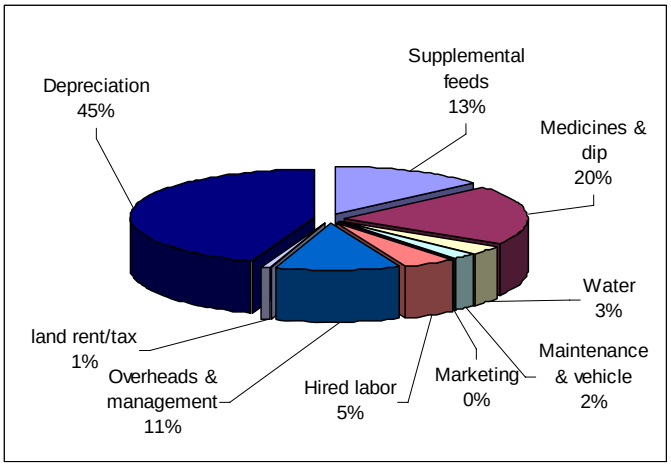


Figure 20: Build-up of Farm Level SV – LCF Cattle



176. As shown, medicines and dip account for the majority of costs at the FAM level giving way to increased feed costs and depreciation for ECF and LCF producers respectively. At the LCF level, depreciation, in fact, accounts for the majority of farm costs. A commercial ranch consists of fencing and boreholes, watering tanks, cattle handling facilities, vehicles, motorbikes, and a tractor and trailer for hauling supplemental feeds. Marketing costs cover delivery from the farm to feedlot. FAM farmers are assumed to let their animals drink from communal dams and natural streams whereas ECF and LCF obtain at least part of their water from a borehole.

177. The next table summarizes the private costs and profitability indicators on a per ton basis for 24-month long-weaners.

Table 32: Cattle – per MT Financial Indicators (long-weaner, live)

	FAM		ECF		LCF	
	ZMK	USD	ZMK	USD	ZMK	USD
Gross revenue	**4,700,000**	**1,175.00**	**5,000,000**	**1,250.00**	**5,000,000**	**1,250.00**
Production costs						
Crop purchase		-		-		-
Other variable costs	2,250,923	562.73	2,634,705	658.68	2,439,057	609.76
Investment costs	489,247	122.31	967,212	241.80	1,948,516	487.13
Total costs	**2,740,170**	**685.04**	**3,601,917**	**900.48**	**4,387,573**	**1,096.89**
Final income						
Gross margin	2,449,077	612.27	2,365,295	591.32	2,560,943	640.24
Net profit	**1,959,830**	**489.96**	**1,398,083**	**349.52**	**612,427**	**153.11**
Rates of return						
Gross margin/total VC		1.09		0.90		1.05
Net profit/total costs		0.72		0.39		0.14

178. In net terms, these data show that FAM production is more profitable per ton than ECF and LCF production in that order. Again, this is because FAM farmers use very few inputs and have very little fixed costs. In gross terms (before depreciation), however, LCF production is the most profitable. Among the most attractive features of cattle production for all sectors is that is a low-cost alternative to intensive cultivation and can be done on un-cleared land. This means that the per hectare profits from cattle are very low compared with all other enterprises, but this is offset by the fact that cattle are raised over a very large area. The CCAA methodology does not make any attempt to calculate whole farm profits or cash flow requirements for different enterprises and this would be good area for further study in deciding which enterprises to promote in a competitiveness strategy.

179. **Parity price comparison.** Although the farm level analysis needs to be carried through the assembly (feedlot) and processing (abattoir) stages to finish with a chilled or frozen side of beef or

some other internationally traded product, an international comparison can still be made using the data provided to the CCAA study teams by the FAO. Specifically, FAO quotes a figure from Argentina of USD 870 per MT for live weaner animals. This is about 27% more than the SV of FAM sector weaners; roughly the same as ECF shipment value; and about 20% less than the SV of LCF production. At least at the farm stage, Zambia seems to be well within the range of competitiveness compared with one of the world's best beef producers.

180. The final competitiveness of traded beef, however, depends enormously on the efficiency of feedlot production and the cost of grain and other feed ingredients in particular. In addition to further template analysis of the feedlot and abattoir stages of beef production, any further study of growth opportunities for cattle sector should also consider the cost of feed ingredients and competitiveness of Zambian produced stock feed.

C. Cotton

181. Cotton has long played an important role in Zambian agriculture as one of the most widely grown smallholder cash crops, major earner of foreign exchange, and important source of employment both in direct production and downstream processing. According to the most recently available EBZ Exporter Audit Report, the sector generated around USD 32.1 million in gross export revenue from lint in 2003 and another USD 6.6 million in export revenue from seed. Together, this total value (USD 38.7 million) was equivalent to almost 40% of Zambia's total primary agriculture exports. Including horticulture and floriculture, cotton accounted for around 23% of recorded agriculture exports.[43] As of the 2004/05 growing season, an estimated 1 in 5 Zambian smallholders were involved in cotton production.

182. **Production trends.** Cotton in Zambia is grown almost entirely by small family farmers using hand hoe cultivation. Some larger-scale emergent farmers also grow cotton using ox cultivation, but the average plot size for all types of producers rarely exceeds 2ha. Until the late 1990s, large-scale commercial farmers sometimes also grew long-staple, irrigated cotton on extensive parcels, but this system has since been abandoned and the only cotton grown by the LCF sector today is as a seed crop produced on contract to a ginning company. Dunavant, the largest ginning company in the country, also operates its own estate farm, but this is not considered a core business for anything other than seed production.

183. Regionally, Eastern Province (Lundazi, Chipata, Chadiza, Katete and Petauke districts) is the most important area for cotton and typically accounts for about 70% of Zambia's total output, with parts of Central, Lusaka, and Southern Provinces accounting for the balance. These areas all have a climate and soils that are favorable to cotton production. FAM and ECF farmers generally grow a medium-staple variety that is suitable for making good cotton fabrics and for blending with longer staples in finer goods.

184. Since privatization cotton production has increased several times over. The pace of this development, however, has been uneven with periods of significant gains and major set-backs. From approximately 36,500 metric tons of un-ginned seed cotton in 1990, for example, cotton production increased to around 75,500 tons in 1997. The number of smallholder producers likewise increased to an estimated 86,000 farmers, but then fell-off to only 50,000 growers over the next two years. Low international prices for cotton, a succession of poor growing seasons, and difficulties by gin operators in recouping credits from defaulting smallholder farmers all contributed to this decline. Since about 2001/02 cotton production has again been on the increase. According to most recent CSO data, total production reached a record of almost 145,000 tons of un-ginned seed cotton in 2003-04 (the latest season for which official data are available).

[43] EBZ, 2003.

185. This latest growth trend more or less coincided with sale of Lonrho Cotton to Dunavant Cotton and Clark Cotton, who between them now control around 90% of the market. Critically, these companies took aggressive steps to address the problem of side-selling with their outgrower programs through an improved horizontal coordination and dialogue to ensure a reliable supply of raw cotton these companies needed to sustain their operations. At farmer level, Dunavant introduced the "distributor model", which was specifically designed for and has been very effective in reducing credit default. Clark has followed a different approach, but still reports that it has improved credit recovery rates on input loans from 60% or less, to 85%-90% in recent years. [44]

186. Consistent with the reliance on distributors and other field agents, private input dealers play very little direct role in the cotton value chain other than at the wholesale level in Lusaka where large companies (mostly from South Africa) are engaged to procure the inputs that are assembled into standard "cotton packs" for distribution to small farmers. The costs of these inputs are deducted when the cotton is sold.

187. Despite good progress with development of outgrower schemes and smallholder supply networks, cotton yields in Zambia remain extremely low compared to world and even other African standards. While there has been some improvement since the mid-1990s when cotton yields were around 500-600kg per hectare on most smallholder farms, current average yields are still only around 700-800kg per hectare, which is very low compared with Cameroon, Mali, and other West African countries where smallholders often achieve yields of 1,200kg/ha or more.[45] Reasons for the low yields in Zambia relate to late planting date by smallholder farmers who prefer to sow maize first, limited attention to weed control, and poor timing of chemical application. Small farmers in Zambia almost never use fertilizer on cotton although yields could improve substantially with only 2-3 bags of Compound C per hectare (for indicative purposes, 100kg of basal fertilizer is included at the ECF level; it is naturally included at the LCF level). Because Zambia has taken a very strong stance against genetically modified organisms (GMOs), Bt cotton and other GM varieties are not present.

188. **Processing.** Cotton lint production is directly related to seed cotton production. Between 1997/1998 and 2001/2002 cotton lint production varied between 18,000 and 42,000 tons per annum. Total seasonal ginning capacity in Zambia was estimated at 170,000 tons, and therefore the industry's average capacity utilization in the five-year period was approximately 45-50%. On this basis, the industry would be able to accommodate a 100% increase in seed cotton production without any immediate capacity constraints. There would also be nothing to stop the ginneries extending the ginning period beyond October, which is the usual cut off point. The current ginning outturn in Zambia is around 39-42% lint, although this can sometimes go much lower depending on maintenance of the ginning machines.

189. **Marketing.** Since liberalization, opportunities in marketing have attracted many new entrants onto the scene, both in ginning and in assembly. The two largest ginners (Dunavant and Clark) devote over 90% of their lint for export while the smaller gins devote over 70% of the lint for local consumption. Mulungushi and Mukuba, being owners of spinning plants, devote 100% of their production to this operation. Historically, lint exports by Dunavant have been destined primarily to Europe, while Clark mainly supplies the South African market. Other authors report on an average of 30% of cotton lint production in Zambia being sold on the local market, with the remainder being exported.[46] Prices for are determined with reference to the world price for lint, usually quoted as a cif price in Liverpool with the cost of transportation from the gin gate subtracted to determine the local fob equivalent at the gin gate.

[44] Zulu and Tschirley, 2004.

[45] Teft, 2003; and Burgess and Keyser, 1996.

[46] Zulu and Tschirley, 2004.

190. With regard to potential for market expansion, South Africa has traditionally been an export destination for lint exporters from Zambia. South Africa's cotton lint consumption (70-80,000 tons/year between 1997 and 2002) continues to exceed its local lint production (20,000 tons – 2001/2002 estimate). Zimbabwe was the largest producer and exporter of cotton lint in the SADC region and an important source of supply to South African spinners. However, Zimbabwe's lint production is expected to decline due to prevailing political problems. The markets for seed are also determined by international competition, but much less so than lint since this is a lower value commodity. Seed that is recycled for planting (usually as a de-linted or double de-linted product with gromoxone or other seed dressing added) is either sent to a local crushing facility or may be exported. Most ginners quote a standard fob factory gate price for seed.

191. **Quantitative analysis.** The quantitative analysis is based on FAM and ECF production in Eastern Province and a hypothetical model for LCF irrigated production in Southern Province where this was once a common enterprise. For all farmers, yield assumptions are based on very good (but still realistic) management. FAM and ECF farmers are assumed to sell to a ginner's agent (i.e. a "distributor" if sold to Dunavant) that is 10km from the actual farmstead. LCF growers are assumed to sell to a transporter at the farm gate. In actual fact, LCF producers are likely to deliver cotton directly to the ginnery, but the separation of this phase allows the assembly stage to be analyzed as a distinct operation. Farm gate prices have been a matter of some controversy in recent years, especially following the rapid appreciation of the local currency in 2005 to about mid-2006, which resulted in reduced payments in USD terms.

Table 33: Cotton, Farm Level Marketing Assumptions

Sector	Location	Yield (MT seed cotton/ha)	Sale Point	Farmer's Delivery Distance	Buyer	Price per MT	
						ZMK	USD
FAM	Katete	0.80	Rural Depot	10km	Ginner's Agent	1,200,000	300.00
ECF	Katete	1.30	Rural Depot	10km	Ginner's Agent	1,200,000	300.00
LFC*	Mazabuka	3.00	Farm gate	0km	Transporter	1,800,000	450.00

***** Hypothetical model for long staple, irrigated cotton. Actual ZMK prices can fluctuate depending on USD exchange rate. Price differential between farm gate and gin not really known, assumptions here are based on a plausible range (farmer could get something closer to assembly price, or ginnery could capture this difference instead).

192. Detailed assumptions from the assembly stage are summarized in the next table. Due to data limitations, the exact differences between the price paid to the farmer and assembler upon delivery to the gin gate were not known. Much more detailed analysis of current assembly arrangements is therefore specifically needed to provide a more accurate picture of the value chain for cotton. Although FAM and ECF farmers sell to a ginner's agent, for example, these individuals are not actually responsible for transporting seed cotton to the gin gate and this normally paid for by the gin operator. For present purposes, best efforts have been made to separate these activities as distinct stages according to the CCAA methodology.

Table 34: Cotton, Assembly Level Marketing Assumptions

Sector	Type of Trader	Assembly Delivery Distance	Delivery Point	Price per MT (seed cotton)	
				ZMK	USD
FAM	Agent	80km	Katete Gin	1,310,000	327.50
ECF	Agent	80km	Katete Gin	1,310,000	327.50
LFC*	Transporter	125km	Lusaka Gin	1,925,000	481.25

***** Hypothetical model for long staple, irrigated cotton.

193. The quantitative assumptions used at the processing stage are summarized in the next table. As an export commodity, the price received by the gin operator is equal to the estimated fob parity price for lint and seed at the gin gate. These prices have been calculated from international reference

data and best available information on the costs of transporting lint, which is lighter and bulkier than many other commodities and so is more expensive to move. Actual prices received by Zambian ginners were not determined by the literature review and further investigation of these prices is still required. Better information on the costs of ginning is also required. The estimate used here is from a comparative advantage analysis carried out 10 years ago and some approximate adjustments for inflation.[47]

Table 35: Cotton, Processing Level Assumptions

Sector	Gin Location	Ginning Outturn (GOT)		Parity Value at Gin Gate (per MT)			
				Lint		Seed	
		% Lint	% Seed	ZMK	USD	ZMK	USD
FAM	Katete	40.5	55.0	3,915,000	978.75	360,000	90.00
ECF	Katete	40.5	55.0	3,915,000	978.75	360,000	90.00
LFC*	Lusaka	43.0	53.5	5,210,000	1,302.50	360,000	90.00

***** Hypothetical model for long staple, irrigated cotton. Balance from GOT is trash.

194. Based on these and other detailed assumptions included in each spreadsheet model, the main value chain indicators for FAM, ECF, and LCF seed cotton are summarized in the tables below. Because of the lack of clear information at the assembly and processing stages, these data should be treated with some caution. Nevertheless, the fact that assembly accounts for a relatively large share of total SV is consistent with the transportation of light bulky commodities. The figures for assembly also include the farmer's profit margin as explained in the methodology section.

Table 36: Cotton – FAM per MT Value Chain Indicators

Cotton - FAM	FARM GATE PRODUCT		ASSEMBLED RAW MATERIAL		PROCESSED RAW MATERIAL	
	ZMK	USD	ZMK	USD	ZMK	USD
Domestic Value Added						
Costs & mark-ups	515,986	129.00	1,009,156	252.29	1,263,932	315.98
Official duties & tax	30,259	7.56	52,629	13.16	127,531	31.88
Additional costs	-	-	-	-	-	-
Total DVA	**546,245**	**136.56**	**1,061,785**	**265.45**	**1,391,464**	**347.87**
Foreign costs	180,753	45.19	211,034	52.76	304,818	76.20
Total Shipment Value	**726,998**	**181.75**	**1,272,820**	**318.20**	**1,696,282**	**424.07**

Table 37: Cotton – ECF per MT Value Chain Indicators

Cotton - ECF	FARM GATE PRODUCT		ASSEMBLED RAW MATERIAL		PROCESSED RAW MATERIAL	
	ZMK	USD	ZMK	USD	ZMK	USD
Domestic Value Added						
Costs & mark-ups	655,512	163.88	938,990	234.75	1,193,766	298.44
Official duties & tax	29,112	7.28	51,482	12.87	126,384	31.60
Additional costs	-	-	-	-	-	-
Total DVA	**684,623**	**171.16**	**990,472**	**247.62**	**1,320,150**	**330.04**
Foreign costs	252,066	63.02	282,348	70.59	376,132	94.03
Total Shipment Value	**936,690**	**234.17**	**1,272,820**	**318.20**	**1,696,282**	**424.07**

[47] Keyser, 1996.

Table 38: Cotton – LCF per MT Value Chain Indicators (hypothetical)

Cotton - LCF*	FARM GATE PRODUCT		ASSEMBLED RAW MATERIAL		PROCESSED RAW MATERIAL	
	ZMK	USD	ZMK	USD	ZMK	USD
Domestic Value Added						
Costs & mark-ups	884,991	221.25	1,083,948	270.99	1,321,726	330.43
Official duties & tax	153,503	38.38	185,690	46.42	260,680	65.17
Additional costs	-	-	-	-	-	-
Total DVA	**1,038,494**	**259.62**	**1,269,638**	**317.41**	**1,582,406**	**395.60**
Foreign costs	597,018	149.25	636,382	159.10	730,476	182.62
Total Shipment Value	**1,635,512**	**408.88**	**1,906,020**	**476.50**	**2,312,882**	**578.22**

195. The next table helps to interpret the value chain indicators by looking at the incremental costs incurred at each stage excluding crop purchases and profit margins. Despite the problem with low yields, this shows that FAM farmers are far lowest cost producers of seed cotton. Identical quality ECF cotton, in fact, costs about 60% more to grow per ton despite the use of fertilizer. The long-staple irrigated cotton grown (hypothetically) by LCF farmers is a completely different crop and costs about 3.5 times as much to produce as FAM cotton on a per ton basis. Assembly costs an estimated ZMK 72,800 (USD 18.20) per ton to move FAM and ECF seed cotton 80km to the gin gate and ZMK 106,000 (USD 26.50) per ton for LCF cotton. Ginning costs slightly less than ZMK 400,000 (USD 100) per ton in all cases, although this is a very rough estimate and needs to be verified.

Table 39: Cotton – Summary of Incremental Costs by Stage, Excluding Crop Purchases and Profit Margins (USD per MT raw material)

	Farm	Assembly	Processing
FAM	181.75	18.20	96.57
ECF	234.17	18.20	96.57
LCF*	408.88	26.50	96.97

***** Hypothetical model for long staple, irrigated cotton.

196. The next set of pie charts summarizes farm level costs for each sector by major cost category. Other charts for assembly and processing are included as part of the spreadsheet pages in the quantitative annex, but the farm level data are the most reliable and therefore the most insightful.

Figure 21: Build-up of Farm Level SV – FAM Cotton

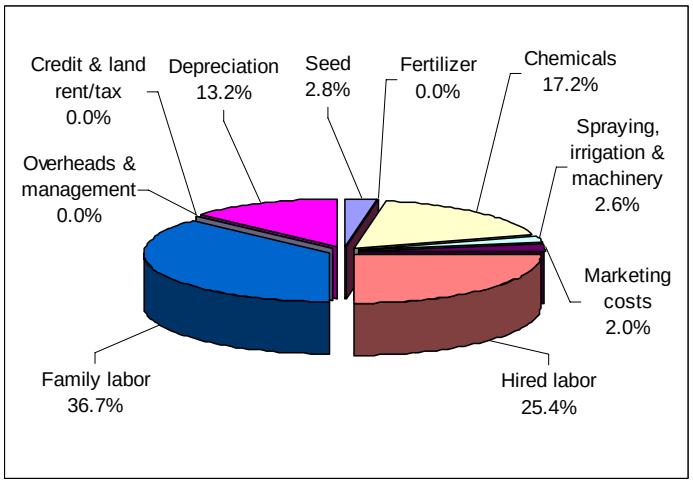


Figure 22: Build-up of Farm Level SV – ECF Cotton

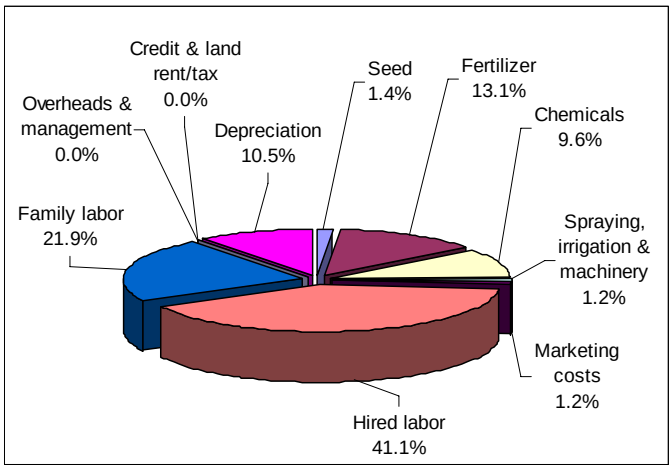
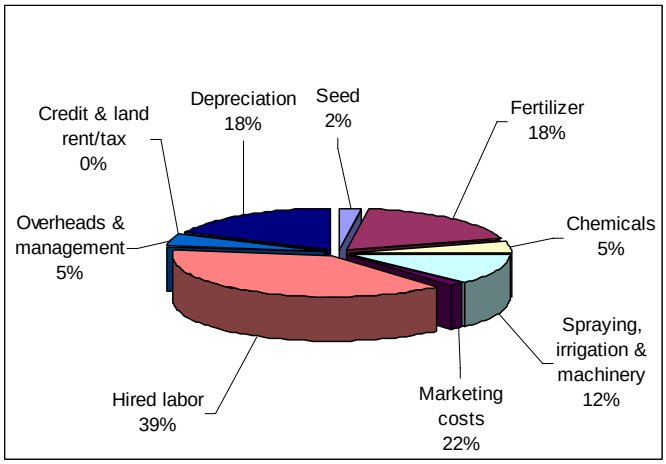


Figure 23: Build-up of Farm Level SV – LCF Cotton (hypothetical)



197. The most immediately noticeable feature of the farm level cotton charts is that family and hired labor account for a very large share of total costs for all sectors. This is because the crop in Zambia is always hand picked. One person can pick about 15kg of seed cotton per day and there are, of course, a limited number of days in the agriculture calendar for this work to be complete. As for FAM and ECF costs, seed and chemicals are the main ingredients supplied on loan in the farmer's cotton pack and all other costs have to be financed by the grower.

198. Next, the group of tables summarizes the financial costs and profitability of cotton on a per ton basis. These figures suggest that FAM cotton is more profitable than ECF cotton because of the additional expenditure on fertilizer. Yield assumptions are believed to be realistic, but this should be looked into in much more detail before making specific recommendations on the use of fertilizer as part of a competitiveness strategy.

Table 40: Cotton – FAM, per MT Financial Indicators

Cotton - FAM	FARM GATE PRODUCT		ASSEMBLED RAW MATERIAL		PROCESSED RAW MATERIAL	
	ZMK	USD	ZMK	USD	ZMK	USD
Gross revenue	**1,200,000**	**300.00**	**1,310,000**	**327.50**	**1,783,575**	**445.89**
Production costs						
Crop purchase		-	1,200,000	300.00	1,310,000	327.50
Other variable costs	364,175	91.04	50,514	12.63	343,500	85.88
Investment costs	95,823	23.96	22,306	5.58	42,782	10.70
Total costs	**459,998**	**115.00**	**1,272,820**	**318.20**	**1,696,282**	**424.07**
Final income						
Gross margin	835,825	208.96	59,486	14.87	130,075	32.52
Net profit	**740,002**	**185.00**	**37,180**	**9.30**	**87,293**	**21.82**
Rates of return						
Gross margin/total VC		2.30		0.05		0.08
Net profit/total costs		1.61		0.03		0.05

Table 41: Cotton – ECF, per MT Financial Indicators

Cotton - ECF	FARM GATE PRODUCT		ASSEMBLED RAW MATERIAL		PROCESSED RAW MATERIAL	
	ZMK	USD	ZMK	USD	ZMK	USD
Gross revenue	**1,200,000**	**300.00**	**1,310,000**	**327.50**	**1,783,575**	**445.89**
Production costs						
Crop purchase		-	1,200,000	300.00	1,310,000	327.50
Other variable costs	632,958	158.24	50,514	12.63	343,500	85.88
Investment costs	98,347	24.59	22,306	5.58	42,782	10.70
Total costs	**731,305**	**182.83**	**1,272,820**	**318.20**	**1,696,282**	**424.07**
Final income						
Gross margin	567,042	141.76	59,486	14.87	130,075	32.52
Net profit	**468,695**	**117.17**	**37,180**	**9.30**	**87,293**	**21.82**
Rates of return						
Gross margin/total VC		0.90		0.05		0.08
Net profit/total costs		0.64		0.03		0.05

Table 42: Cotton – LCF, per MT Financial Indicators (hypothetical)

Cotton - LCF*	FARM GATE PRODUCT		ASSEMBLED RAW MATERIAL		PROCESSED RAW MATERIAL	
	ZMK	USD	ZMK	USD	ZMK	USD
Gross revenue	**1,800,000**	**450.00**	**1,925,000**	**481.25**	**2,432,900**	**608.23**
Production costs						
Crop purchase		-	1,800,000	450.00	1,925,000	481.25
Other variable costs	1,337,283	334.32	83,714	20.93	345,100	86.28
Investment costs	298,229	74.56	22,306	5.58	42,782	10.70
Total costs	**1,635,512**	**408.88**	**1,906,020**	**476.50**	**2,312,882**	**578.22**
Final income						
Gross margin	462,717	115.68	41,286	10.32	162,800	40.70
Net profit	**164,488**	**41.12**	**18,980**	**4.75**	**120,018**	**30.00**
Rates of return						
Gross margin/total VC		0.35		0.02		0.07
Net profit/total costs		0.10		0.01		0.05

199. For LCF farmers, the data show that irrigated cotton provides less profit per ton than FAM or ECF cotton. As an irrigated crop, however, LCF yields about 2.5 to 3 times higher than ECF and FAM cotton respectively and the per hectare profits for LCF growers (ZMK 493,465 or USD 123.37) compare quite favorably with other enterprises suggesting there may be a potential to revive this activity.

200. At the ginning level, the estimated net profits per MT of seed cotton are between ZMK 87,293 (USD 21.82) for the FAM and ECF value chains and ZMK 120,018 (USD 30.00) for the LCF value chain. Total production has recently been estimated at 144,000 MT implying that the total profitability of the ginning industry may be around ZMK 12.56 billion (USD 3.14 million). As already stated, these figures need to be treated with extreme caution because of the limited availability of processing cost data. Rather than argue that the ginning industry has a social obligation to pass a greater share of total value back along the value chain (as some local commentators have done), a better way to interpret these figures is to say that profitability results are relatively robust for all sectors, or at least that there is further potential for Zambia to cope with lower world prices by rearranging some of the total profits between different participants.

201. Another interesting observation is that longer-staple LCF cotton is more profitable at the ginning stage than FAM and ECF cotton. This is because of the higher value and better ginning outturns associated with long-staple varieties. Although many things need to be considered in deciding what seeds to promote, this could suggest that Zambia would do well to invest in new varieties and improved ginning maintenance as strategies to improve the overall competitiveness of the cotton sector. By improving the profitability at the processing stage, this could be one of the best leverage points for creating new revenue that can be transmitted back along the value chain to individual producers. This kind of strategy would at least be one way of contributing to poverty reduction through market-based development, and could even be more cost-effective than other ongoing (and essential) investments in farmer extension and rural infrastructure. Zambia has chosen not to follow the path of developing genetically modified cotton, but there is no doubt that the quality of local seed is still one of the most important contributing factors to international competitiveness.[48]

202. **Parity price comparisons.** The final step of the value chain analysis for cotton is to compare the accumulated shipment values for lint and seed with appropriate international parity prices. All value chain indicators to this point have been expressed per ton of raw material (seed cotton); the final value chain indicators for internationally traded commodities (lint and seed) are summarized below. Ultimately, it is the total shipment value of each product that must be compared with world standards.

Table 43: Final Value Chain Indicators – FAM Cotton

FAM - Cotton	Lint (40.5%)		Seed (55%)	
	ZMK	USD	ZMK	USD
Domestic Value Added				
Costs & mark-ups	3,120,821	780.21	2,298,059	574.51
Official duties & tax	314,892	78.72	231,875	57.97
Additional costs	-	-	-	-
Total DVA	**3,435,713**	**858.93**	**2,529,934**	**632.48**
Foreign costs	752,638	188.16	554,215	138.55
Total Shipment Value	**4,188,351**	**1,047.09**	**3,084,149**	**771.04**

Table 44: Final Value Chain Indicators – ECF Cotton

ECF - Cotton	Lint (40.5%)		Seed (55%)	
	ZMK	USD	ZMK	USD
Domestic Value Added				
Costs & mark-ups	2,947,571	736.89	2,170,484	542.62
Official duties & tax	312,059	78.01	229,789	57.45
Additional costs	-	-	-	-
Total DVA	**3,259,630**	**814.91**	**2,400,273**	**600.07**
Foreign costs	928,721	232.18	683,876	170.97
Total Shipment Value	**4,188,351**	**1,047.09**	**3,084,149**	**771.04**

203. At the outturn ratios indicated above, one ton of FAM and ECF lint includes the accumulated value of 2.47 MT of un-ginned seed cotton and one ton of fuzzy seed includes the accumulated value of 1.82 MT of un-ginned seed cotton. For the LCF sector, the ratios are slightly different at 2.33 and 1.87 MT of seed cotton per ton of lint and seed respectively.

[48] Dunavant and Clark certainly recognize this and have been investing in seed multiplication and improvement as one of their biggest priorities. Because of time limitations, it was not possible to collect information on this aspect of the ginner's work under the current contract, but something on the importance of plant genetics (GM or otherwise) and importance of private investments in seed research and multiplication would still be useful to include in the final CCAA analysis. The case of Zambian cotton may provide a interesting example of a much larger issue relevant to all CCAA countries.

Table 45: Final Value Chain Indicators – LCF Cotton (hypothetical)

LCF - Cotton	Lint (43%)		Seed (53.5%)	
	ZMK	USD	ZMK	USD
Domestic Value Added				
Costs & mark-ups	3,061,577	765.39	2,460,707	615.18
Official duties & tax	666,441	166.61	535,644	133.91
Additional costs	-	-	-	-
Total DVA	**3,728,018**	**932.00**	**2,996,351**	**749.09**
Foreign costs	1,650,778	412.69	1,326,793	331.70
Total Shipment Value	**5,378,796**	**1,344.70**	**4,323,144**	**1,080.79**

204. As shown, the final SV of FAM and ECF lint works out to an estimated USD 1,047 per MT; longer staple lint from a hypothetical LCF value chain would have a higher SV of USD 1,345 per ton. Seed, on the other hand, has an accumulated SV of USD 771 and USD 1,081 per MT from the FAM/ECF and LCF sectors respectively, which is far greater than the factory gate price quoted locally of only USD 90 pert MT. For this reason, ginners actually lose money on the sale of seed as a single product and must make their profit from lint.

205. The international parity price calculations made for lint are summarized below. As shown, FAM and ECF cotton actually has a higher SV than the estimated parity price (USD 987.63), suggesting a possible problem with international competitiveness. At a difference of just USD 59.46 per ton, however, the difference is not insurmountable and can easily be explained by data deficiencies. Likewise, the final SV of LCF cotton is USD 41.51 greater than the estimated per ton parity price. On these orders of magnitude, the best conclusion is say that any further reduction in world price would very quickly cause a need to realign the distribution of profits between value chain participants. This in fact happened quite dramatically with the appreciation of the Kwacha and adds extra emphasis to the earlier conclusion about the need to pursue new technologies and other process improvements as fundamental requirements for sustained international competitiveness.

Table 46: Detailed Parity Price Estimates for Cotton

FAM and ECF Cotton (normal staple length)

Cotlook Index (Dec 2006) = 59.4 cents per lb
Plus premium for Zambia cotton = 2 cents per lb.
Total cif (Cotlook) value of Zambia cotton = 61.4 cents per lb.
Convert to kg = $1.35 per kg or $1,353.63 per MT
Less sea freight to Durban $140
Less road freight to Lusaka $175
Less road freight to Katete (500km) $60
Equals Katete gin fob equivalent lint revenue $978.63/mt or ZMK 3,914,520/mt

LCF Irrigated Cotton (hypothetical possibility for extra long staple length)

Colook Index (Dec 2006) = 59.4 cents per lb
Plus premium for Zambia cotton = 2 cents per lb.
Plus premium for long staple cotton = 12 cents per lb
Total cif (Cotlook) value of Zambia cotton = 73.4 cents per lb.
Convert to kg = $1.62 per kg or $1,618.19 per MT
Less sea freight to Durban $140
Less road freight to Lusaka $175
Equals Lusaka gin fob equivalent lint revenue $1,303.19/mt or ZMK 5,212,760

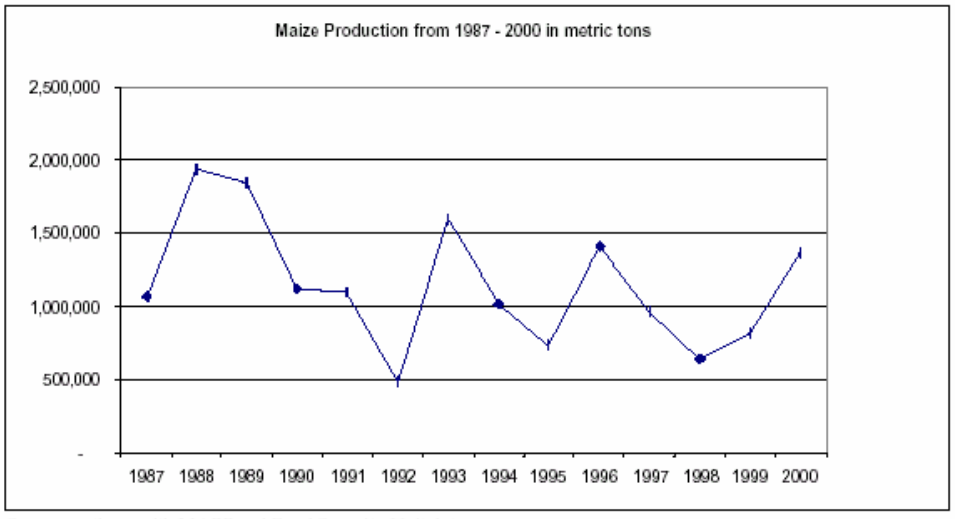
D. Maize

206. White maize is Zambia's basic staple food and is without doubt the country's leading agricultural activity. At the smallholder and emergent farmer level, maize is primarily grown for personal subsistence although traditional and emerging commercial farmers are also important for supplying informal traders who deliver the milling industry particularly early after harvest. It has been estimated that smallholder and emergent farmers account for around 65% of total maize production and contribute some 25% of marketed maize although these figures should be confirmed.[49]

207. In addition to traditional smallholder producers, larger-scale commercial farmers are also very important maize growers and are especially important for meeting the food requirements of urban consumers. Often LCF-type growers will store maize in their own shed or a certified warehouse facility to capture a higher price. With an into mill price range of USD 150 to 240 per MT, seasonal fluctuations for maize are notoriously large and storage is one of the best ways to increase profitability when sold for cash. Even at the subsistence level, seasonal price fluctuations provide a strong incentive for small farmers to grow maize for their own consumption in order to avoid paying high prices later in the season.[50] The possibility of exporting maize during a national surplus does sometimes exist, but continued interference by government in the form of export bans and other unpredictable policy changes severely constrain these opportunities.

208. **Production trends.** More area is given to maize in Zambia than any other crop. According to the latest CSO data, some 631,000ha were given to maize in 2003/04, which is about five times more area than the next most widely grown crop, cotton.[51] From this area, the total production was estimated at around 1.2 million tons. The chart below provides some further indication of the variability of maize production, which fluctuates greatly with seasonal rainfall. Only on large-scale commercial farms is maize sometimes grown as an irrigated crop and the failure of rain fed crops on smallholder farms is still an important cause of food insecurity across the nation.

Figure 24: Zambia's Record of Maize Production in Metric Tons.



Source: authors with MAFF and Food Security Unit data

209. Other than the preference of all Zambian's for maize as the staple food, reasons for dominance include the expansion of maize-only credit facilities in the mid-1980s, the "one crop" message propagated through the extension services, and previous policies that enforced pan-territorial

[49] Saasa, 2003.

[50] See Keyser 2002 and 2002a for calculations of imputed profits from storing grain for home consumption.

[51] Like all CSO data, these numbers mainly capture production by the FAM and ECF sectors and do a relatively poor job of capturing information from large commercial farmers.

maize pricing and subsidies on transportation, seed, and fertilizer. As a result of these developments, many Zambian farmers became near mono-culture producers by the early 1990s and an aerial survey of Southern Province conducted in 1992 (just before liberalization policies began to take effect) found that only about 2% of smallholder lands were utilized for crops other than maize.[52]

210. Since economic liberalization, this situation has gradually changed with many farmers (especially in outlying areas) now pursuing a more diversified strategy, concentrating on cheaper to grow and more drought tolerant staples for on-farm consumption like cassava, sweet potato, and sorghum, or giving increased priority to higher value cash crops when outgrower support is available. The decline in maize area has been most substantial in agro-ecological Zones 1 and 3, where the cash returns to maize cultivation are lowest, and the impact of past government subsidies was the greatest. In Northern, Southern and Western Provinces, smallholders have increased production of sorghum, millet, cassava, and groundnuts at the expense of maize, and in Eastern Province, farmers are giving increased emphasis to cotton and groundnuts.[53]

211. **Domestic marketing.** Although maize is produced primarily for household consumption, any surplus can be sold as a cash crop or, if an acceptable market price is not found, it can be stored and consumed during lean periods. Maize also produces good quantities of fodder for livestock and can be eaten early (green) in the season if alternative food is not available. Other crops offer fewer of these advantages. Markets for sorghum, cassava, and millet are smaller and unpredictable, and perishable garden vegetables must be marketed immediately. In addition to human consumption as a subsistence food, maize is also used in large quantities by the brewing industry and to manufacture stock feed.

212. Smallholder farmers in Zambia tend to market the bulk of their maize in the immediate post-harvest period, their decisions to sell being dictated by the need for cash rather than whether or not prevailing prices are remunerative. Often, these producers cannot sell in the relatively more formal market due to bulking constraints and quality variability, which leads to their crop being significantly discounted. Quality analysis is usually by sight and is highly subjective and disadvantageous to most growers. The itinerant traders, who dominate the trade in the smallholder crop, are unable to absorb the substantial surplus on the market during the harvest season, resulting in very low prices at harvest, often below costs of production, thus reducing incentives for smallholders to invest in productivity-enhancing inputs from commercial sources. Small-scale farmers are also unable to defer sale for better prices because of lack of access to credit to meet household consumption needs. Emergent and larger-scale commercial farmers generally enjoy better market conditions and, depending on their own cash flow situation, are likely to store the grain for several months, either in their own shed or a commercial warehouse before selling.[54]

213. Recently, with donor assistance, the Zambia Agriculture Marketing Agency (ZACA) has begun to operate a warehouse receipt program. The ZACA system specifically enables farmers, traders, and processors to deposit stocks of non-perishable agricultural commodities with certified private sector run commercial warehouses. These warehouses issue transferable warehouse receipts as evidence that named persons have deposited stated quantities of named commodities of stated quality at specified warehouse locations. The warehouses ensure the safe keeping of the depositors' commodities and guarantee delivery against the issued warehouse receipts. ZACA is currently able to accommodate groundnuts, maize, sorghum, soybeans, sunflower, and wheat.

214. **International trade.** For all value chain participants, a number of factors together militate against the opportunities for international trade and investment. These include:

- Large annual variation in total production and sales;

[52] Keyser, 1996; Saasa, 2003.

[53] Keyser, Heslop and Abel, 2001; Saasa, 2003

[54] ZACA, 2006.

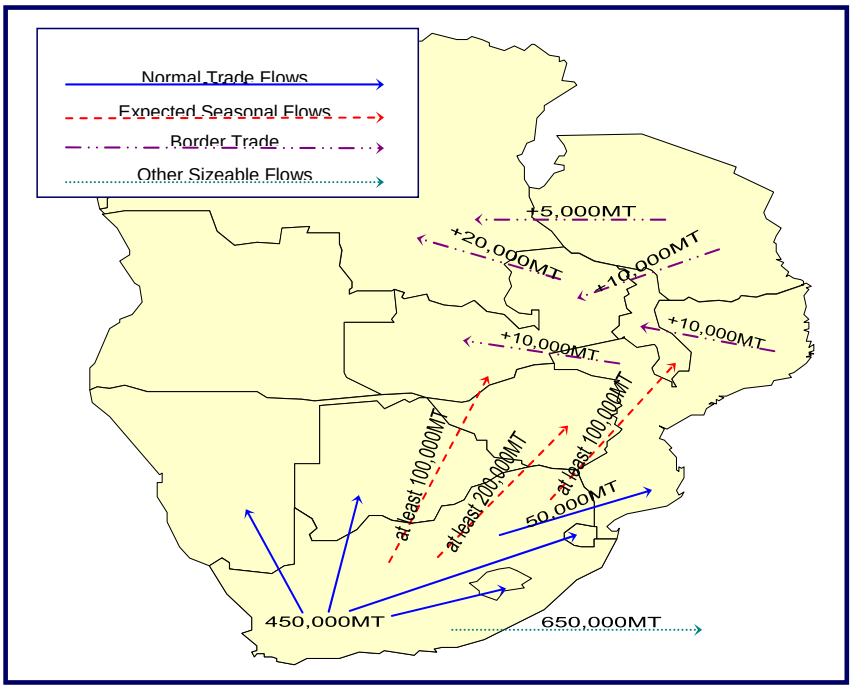
- Low value to weight ratios that restrict the opportunities for long distance transactions;
- Risk of interference from government in the form of politically motivated imports at below market prices and/or export restrictions; and
- Limited availability of bulk handling facilities.

215. With respect to the first constraint, large variations in production and sales mean that Zambia's maize traders and milling companies must constantly monitor local conditions and those throughout the region to anticipate and respond to local surpluses and shortages as they become apparent.[55] Although this means good profit margins are sometimes available for certain business transactions, maize trade is one of the most competitive industries in southern Africa and any advantage is often short lived. Total domestic consumption for all uses is estimated to be around 1.2 million tons and Zambia has only been in surplus two times since 1995. Of Zambia's total maize crop only about 30% is sold for cash with the balance retained for on-farm consumption.[56]

216. A projection of regional maize transactions for 2001 is given in the figure below, which illustrates both the complexity of maize flows and fact that most transactions are with neighboring countries on the basis of local surpluses and shortages. Although the regional picture can differ enormously from year to year (and has changed in particular since 2001 because of the decline of agriculture in Zimbabwe), a good example of regional trade patterns is maize from northern Mozambique, which is often sold to its natural markets in Malawi and Zambia. Another example is the Southern Highlands in Tanzania, which often produces surplus maize whose natural markets are Malawi, Zambia, and Democratic Republic of Congo.[57]

Figure 25: Illustration of Regional Trade Flows for Maize

Expected Regional Trade Flows for Maize, 2001-2002



Source: FSRP, 2001

[55] FAO, 1998.

[56] MAFF, 2001.

[57] FSRP, 2001.

217. In a year when export permits are available, Zambia typically exports about USD 1.5 to 3.0 million of white maize and mealie meal normally to Katanga Province in the Democratic Republic of Congo where proximity provides an advantage over other regional competitors. Export opportunities now also exist in Zimbabwe, but problems with currency controls and other marketing conditions make this a difficult outlet to target. South Africa has a surplus in most years and cannot be considered a potential market for Zambian maize.

218. The uncertain nature of business transactions for maize, including the possible risk of export bans and price manipulation, are therefore important constraints to enhanced sector performance. During interviews in 2001, large trading companies in South Africa reported they had no interest to import grain from Zambia (or any other southern Africa country) until they can be certain the commodities they buy actually exist and are available to ship wherever a shortage exists. They noted that several trading houses lost large sums of money doing business with Zambia in the 1990s, either because the commodities they bought on forward contract turned out not to exist or because of export restrictions and price interference by government. Furthermore, given that the cost of ocean freight from other world growers is usually less than road transport from Zambia, there is a strong preference for South Africa to buy grain from outside the region when necessary. The South African trading houses also noteed that Zambia did not have any bulk handling facilities so that all maize had to be shipped in bags, which adds considerably to total cost (National Milling has since installed bulk grain facilities).[58]

219. **Processing.** Before liberalization, the combined capacity of over 30 mills surveyed in Zambia was about 1.3 million MT while only 696,000 MT was actually milled representing a national capacity utilization of 54%. In the years following liberalization, overall capacity utilization in the large and medium scale formal milling sector dropped to an all-time low of 26%. However, several mills were running continuously at over 70% and at least two large private mills running at over 80% capacity utilization, emphasizing the difficulties that many mills were facing in sourcing enough grain. Several of these mills have since closed.[59]

220. By 2002, there were 19 large and medium scale mills remaining in Zambia with a total installed annual capacity of 1,136,878 MT of maize. In that year, the amount of maize processed in the formal milling sector was 900,758 MT, indicating an average capacity utilization of 82%, up from 54% in 1990. According to a study by Food Security Research Project (FSRP) in October 2003, the small-scale informal hammer mill sector was likely to have the capacity to process as much maize as the industrial mills. These smaller scale operators are also important to urban and rural food security and FSRP suggested that hammer mills would likely continue to take over a significant proportion of the capacity of industrial mills.[60]

221. **Quantitative analysis.** Farm level marketing assumptions for the quantitative analysis of maize are summarized in the table below. Consistent with the CCAA emphasis on the potential for commercial development, all farmers are assumed to use reasonably advanced management for their level. FAM farmers, for example, are assumed to achieve a yield of 2.75 MT grain per hectare by using hybrid seed and 4 bags of subsidized compound D fertilizer and 4 bags of subsidized urea. Most traditional smallholders produce below this level, but these expectations are still realistic for an advanced, commercially-minded grower. Likewise, the yield figure used for ECF farmers is 3.9 MT/ha (6 bags compound D and 4 bags urea plus herbicides) and for LCF growers the figure is 5.75 MT/ha (6 bags D, 4 bags urea, and 4 bags lime plus herbicides and insecticides).[61] All production models are based on farms near Mkushi in Central Province, which usually enjoys good rainfall and has reasonable proximity to the main urban markets by being between Lusaka and the Copperbelt. A

[58] Keyser, Heslop and Able, 2001.

[59] ICC, 2002.

[60] USAID, 2004.

[61] 50kg bags

sensitivity analysis of farm-level FAM maize without the subsidized inputs was carried out and is presented in Appendix 3. Briefly, the main finding is that the financial returns fall from an attractive gross margin of ZMK 554,400/ha (USD 138.60) with the subsidy to only ZMK 179,200 (USD 44.80) without the subsidy. In other words, maize remains profitable without the fertilizer subsidy, but is significantly less attractive for FAM farmers as a commercial cash crop.

Table 47: Maize, Farm Level Marketing Assumptions

Sector	Location	Sale Point	Farmer's Delivery Distance	Buyer	Time of Sale	Price per MT	
						ZMK	USD
FAM	Mkushi	Roadside	10km	Sm. Trader	June	530,000	133.50
ECF	Mkushi	Shed	25km	Broker/Transporter	Sept	710,000	177.50
LFC	Mkushi	Shed	25km	Broker/Transporter	Dec	820,000	205.00

Farm costs and yields based on Mkushi (Central Province).

222. Another important difference between the three value chains is the time of sale. As shown, family farmers are assumed to sell to a small trader as soon as possible after harvest and so receive a low price of ZMK 530,000 (USD 132.50) per MT. ECF farmers are assumed to store their maize for three months after harvest in a certified warehouse and then sell to a commodity broker/transport agent for ZMK 710,000 (USD 177.50) per MT who stores the grain for another three months at their own expense. LCF farmers are assumed to store maize for a full six months at their own cost and so receive the best farm gate price of ZMK 820,000 (USD 205.00) per ton.

223. Although many LCF, ECF, and even some FAM farmers, deliver direct to a mill operator, all farmers here are assumed to sell to an intermediary so that the costs of assembly can be isolated in the CCAA value chain analysis. Further details of the assembly level assumptions are given below. Similar to the farm level assumptions, the main distinction at this stage is that the small trader in the FAM value chain sells immediately to the nearest commercial mill, the broker/transporter in the ECF value chain stores the grain for three months after buying in September, and the LCF-level trader is assumed to buy late in the season and deliver immediately.

Table 48: Maize, Assembly Level Marketing Assumptions

Sector	Type of Trader	Assembly Delivery Distance	Buyer	Location	Time of Sale	Price per MT	
						ZMK	USD
FAM	Sm. Trader	90km	Large Mill	Kapiri Mposhi	June	600,000	150.00
ECF	Broker/Transporter	300km	Large Mill	Lusaka/C'belt	Dec	940,000	235.00
LFC	Broker/Transporter	300km	Large Mill	Lusaka/C'belt	Dec	940,000	235.00

At FAM level, sell and delivery immediately; at ECF level, farmer stores for 3 months and assembler stores for 3 months (assume 5% loss); at LCF level, farmer stores for 6 months and then sells to assembler who delivers immediately.

224. Although assembled raw material at the mill gate is the best point of international comparison for the competitiveness of Zambian Maize, the analysis was also carried through to the processing stage as shown. Like all processing models, these data need to be treated with special care because of questions about the actual costs. Local informants, for example, suggested that the cost of milling a ton of maize is somewhere between USD 10 and 20 per ton plus another USD 10 to 20 fixed overheads. Whether the total cost is USD 20 or 40, therefore, has important competitiveness implications that should be looked into in more detail.

Table 49: Maize, Processing Level Marketing Assumptions

Sector	Milling Outturn (%)			Time of Sale	Price per MT			
	Meal	Bran	Trash		Mealie Meal		Maize Bran	
					ZMK	USD	ZMK	USD
FAM	84%	11%	5%	June	820,000	205.00	200,000	50.00
ECF	86%	11%	3%	Dec	1,140,000	280.00	385,000	96.25
LFC	89%	9%	2%	Dec	1,140,000	280.00	385,000	96.25

Farm costs and yields based on Mkushi (Central Province).

225. The main value chain indicators based on these assumptions and other detailed coefficients set out in the enterprise budgets for maize are summarized below. Like other commodities, these indicators show that (ton for ton) FAM farmers are the lowest cost producers of maize followed by ECF and then LCF growers in that order.

Table 50: Maize – FAM per MT Value Chain Indicators (no subsidy)

Maize - FAM	FARM GATE PRODUCT		ASSEMBLED RAW MATERIAL		PROCESSED RAW MATERIAL	
	ZMK	USD	ZMK	USD	ZMK	USD
Domestic Value Added						
Costs & mark-ups	216,149	54.04	213,458	53.36	299,096	74.77
Official duties & tax	56,097	14.02	67,648	16.91	83,816	20.95
Additional costs	-	-	-	-	-	-
Total DVA	**272,246**	**68.06**	**281,106**	**70.28**	**382,912**	**95.73**
Foreign costs	272,829	68.21	285,393	71.35	305,719	76.43
Total Shipment Value	**545,076**	**136.27**	**566,499**	**141.62**	**688,630**	**172.16**

Values at harvest time without storage.

Table 51: Maize – ECF per MT Value Chain Indicators

Maize - ECF	FARM GATE PRODUCT		ASSEMBLED RAW MATERIAL		PROCESSED RAW MATERIAL	
	ZMK	USD	ZMK	USD	ZMK	USD
Domestic Value Added						
Costs & mark-ups	272,165	68.04	442,100	110.53	548,317	137.08
Official duties & tax	63,993	16.00	105,721	26.43	121,888	30.47
Additional costs	-	-	-	-	-	-
Total DVA	**336,158**	**84.04**	**547,821**	**136.96**	**670,206**	**167.55**
Foreign costs	270,179	67.54	328,099	82.02	348,425	87.11
Total Shipment Value	**606,338**	**151.58**	**875,920**	**218.98**	**1,018,630**	**254.66**

Values after 3 months storage by farmer and 3 months storage by assembler.

Table 52: Maize – LCF per MT Value Chain Indicators

Maize - LCF	FARM GATE PRODUCT		ASSEMBLED RAW MATERIAL		PROCESSED RAW MATERIAL	
	ZMK	USD	ZMK	USD	ZMK	USD
Domestic Value Added						
Costs & mark-ups	259,644	64.91	392,345	98.09	456,130	114.03
Official duties & tax	114,891	28.72	151,870	37.97	166,370	41.59
Additional costs	-	-	-	-	-	-
Total DVA	**374,536**	**93.63**	**544,215**	**136.05**	**622,500**	**155.62**
Foreign costs	331,394	82.85	375,805	93.95	396,131	99.03
Total Shipment Value	**705,930**	**176.48**	**920,020**	**230.00**	**1,018,630**	**254.66**

Values after 6 months storage by farmer.

226. The next table helps to interpret the value chain indicators by looking at the incremental costs incurred at each stage excluding crop purchases and profit margins. In addition to the differences between farm level costs noted above, this table shows that ECF and LCF maize is more expensive to assemble because of the additional investment in storage. At the ECF level, the farmer is assumed to

sell after three months and the crop is still stored another three months by the trader. 5% losses are therefore budgeted as part in the ECF value chain plus an additional weighing operation. Processing level data are not essential to determine Zambia's competitiveness in maize because the crop is traded internationally as un-milled grain, but an indicative analysis was still carried out using a total price for milling equal to USD 22.16 per ton including variable costs and depreciation.

Table 53: Maize – Summary of Incremental Costs by Stage, Excluding Crop Purchases and Profit Margins (USD per MT raw material)

	Farm	Assembly	Processing
FAM	136.27	9.12	22.16
ECF	151.58	32.60	22.16
LCF	176.48	30.00	22.16

227. The next table provides an additional view on the build up of total SV to the point of international comparison including the crop purchases and profit margins. As shown, farm production accounts for the majority of cots in each value chain ranging from 96% of the total for the FAM sector to 69% for the ECF system. Although competitiveness gains can certainly be realized at the assembly level (through storage to increase farmer payments, for example), these figures suggest that a focus on farm production is likely to offer the greater scope for improvement than interventions in other areas. As noted, assembly accounts for a relatively larger share of total value at the ECF level because of specific storage/marketing assumptions involving an additional operation.

Table 54: Maize, Build-up of Final SV

	Farm		Assembly		TOTAL	
	USD	% total	USD	% total	USD	% total
FAM	136.27	96%	5.35	4%	**141.62**	100%
ECF	151.58	69%	67.40	31%	**218.98**	100%
LCF	176.48	88%	53.52	12%	**230.00**	100%

228. The next set of pie charts looks at farm level costs in more detail. In addition to accounting for the majority of value chain costs, the farm level data are also the most reliable compared to the budgets for assembly and processing where broader assumptions had to be used. Charts for these other stages are included in the quantitative annex.

Figure 26: Build-up of Farm Level SV – FAM Maize (no subsidy)

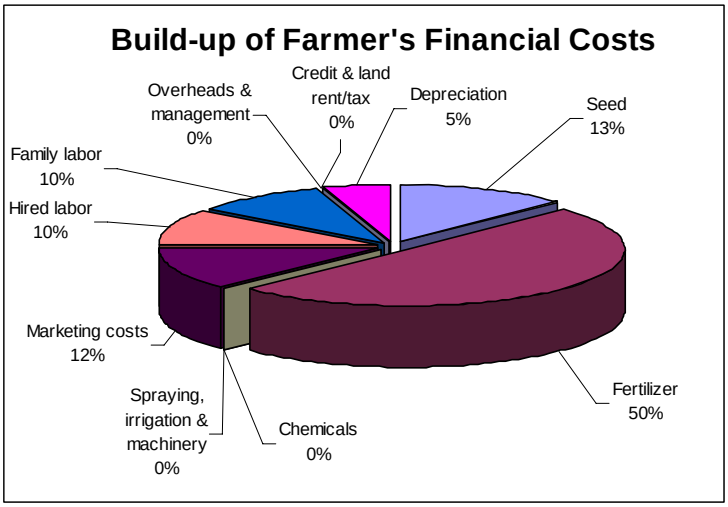


Figure 27: Build-up of Farm Level SV – ECF Maize

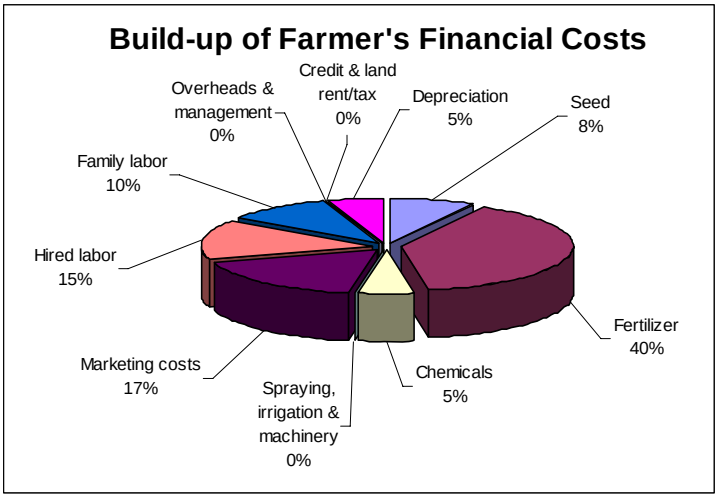
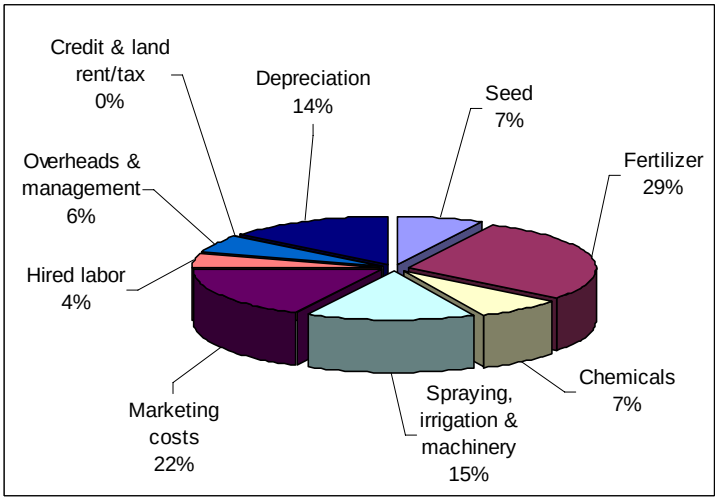


Figure 28: Build-up of Farm Level SV – LCF Maize



229. As shown, fertilizer is the largest cost category for FAM farmers and investments that reduce this cost are likely to be the best way to increase production and overall profitability. Even for farmers who are able to buy fertilizer at subsidized prices, however, fertilizer still accounts for an estimated 38% of total financial costs (see Appendix 3). Seed is another significant cost for FAM farmers (at 13% of total estimated costs), and efforts to improve farmer access to good planting material would be another good way to improve Zambia's competitiveness since a crop will only ever be as good as the seed it is sown with. Marketing costs, including grain bags, delivery to the collection point are another important cost category for all farm sectors. For ECF and LCF farmers, this category includes storage. At the LCF level, maize is cultivated by machinery and combine harvested so generates relatively little employment for hired labor. Family and hired labor accounts for 20% and 25% of total financial costs for FAM and ECF farmers respectively.

230. The next set of tables summarizes the financial indicators for each value chain stage analyzed in per ton terms. As shown, the net profit from FAM maize is quite low at only ZMK 37,288 (USD 9.32) per ton without the fertilizer subsidy. With subsidized fertilizer, the net profits improve by almost five times to an estimated ZMK 173,724 (USD 44.43) per ton assuming input use (and yield) remains constant. More details of the with and without fertilizer subsidy comparison are presented in Appendix 3. Since all types of farmer are assumed to produce more than one ton of maize per hectare, these data must not be confused with per hectare profits, which are higher than the values shown below.

Table 55: Maize – FAM, per MT Financial Indicators (no subsidy)

Maize - FAM	FARM GATE PRODUCT		ASSEMBLED RAW MATERIAL		PROCESSED RAW MATERIAL	
	ZMK	USD	ZMK	USD	ZMK	USD
Gross revenue	**530,000**	**132.50**	**600,000**	**150.00**	**731,150**	**182.79**
Production costs						
Crop purchase		-	530,000	132.50	600,000	150.00
Other variable costs	464,836	116.21	32,114	8.03	81,500	20.38
Investment costs	27,876	6.97	4,385	1.10	7,130	1.78
Total costs	**492,712**	**123.18**	**566,499**	**141.62**	**688,630**	**172.16**
Final income						
Gross margin	65,164	16.29	37,886	9.47	49,650	12.41
Net profit	**37,288**	**9.32**	**33,501**	**8.38**	**42,520**	**10.63**
Rates of return						
Gross margin/total VC		0.14		0.07		0.07
Net profit/total costs		0.08		0.06		0.06

Table 56: Maize – ECF, per MT Financial Indicators

Maize - ECF	FARM GATE PRODUCT		ASSEMBLED RAW MATERIAL		PROCESSED RAW MATERIAL	
	ZMK	USD	ZMK	USD	ZMK	USD
Gross revenue	**710,000**	**177.50**	**930,000**	**232.50**	**1,022,750**	**255.69**
Production costs						
Crop purchase		-	710,000	177.50	930,000	232.50
Other variable costs	513,555	128.39	143,614	35.90	81,500	20.38
Investment costs	32,782	8.20	22,306	5.58	7,130	1.78
Total costs	**546,338**	**136.58**	**875,920**	**218.98**	**1,018,630**	**254.66**
Final income						
Gross margin	196,445	49.11	76,386	19.10	11,250	2.81
Net profit	**163,662**	**40.92**	**54,080**	**13.52**	**4,120**	**1.03**
Rates of return						
Gross margin/total VC		0.38		0.09		0.01
Net profit/total costs		0.30		0.06		0.00

Table 57: Maize – LCF, per MT Financial Indicators

Maize - LCF	FARM GATE PRODUCT		ASSEMBLED RAW MATERIAL		PROCESSED RAW MATERIAL	
	ZMK	USD	ZMK	USD	ZMK	USD
Gross revenue	**800,000**	**200.00**	**930,000**	**232.50**	**1,049,250**	**262.31**
Production costs						
Crop purchase		-	800,000	200.00	930,000	232.50
Other variable costs	604,517	151.13	97,714	24.43	81,500	20.38
Investment costs	101,412	25.35	22,306	5.58	7,130	1.78
Total costs	**705,930**	**176.48**	**920,020**	**230.00**	**1,018,630**	**254.66**
Final income						
Gross margin	195,483	48.87	32,286	8.07	37,750	9.44
Net profit	**94,070**	**23.52**	**9,980**	**2.50**	**30,620**	**7.65**
Rates of return						
Gross margin/total VC		0.32		0.04		0.04
Net profit/total costs		0.13		0.01		0.03

231. Without the smallholder fertilizer subsidy, ECF maize is the most profitable followed by LCF and FAM production in that order. With the fertilizer subsidy, FAM produced maize is the most profitable followed by ECF and LCF production. Assemblers make the most money at the ECF level because of the storage function they are assumed to perform (albeit for an additional cost). Processing is more profitable at the LCF level where a better milling outturn can sometimes be achieved compared with ECF maize because of grain size. Milling of the FAM sector maize is shown to be the most profitable, which in this case is mainly indicative of the profits paid early in the season by paying very little for maize when supplies are plentiful. For all types of operator, storage is one of the best ways to improve profits and would likely be an excellent area for future investment.

232. **Parity price comparisons.** Because of the cyclical nature of maize prices throughout southern Africa, import parity also varies greatly. In years with a severe drought when the entire region is in deficit, grain sometimes has to be imported from as far away as Argentina. Normally, however, South Africa is able to supply any local deficit, just like Zimbabwe used to do before the collapse of commercial agriculture there. In these cases, grain imports can be very expensive.

233. Parity price calculations quoted by a Lusaka-based grain trader for South African maize (and other crops) in October 2006 are summarized in the box below. Usually, import parity can vary between USD 250 and 400 per MT, which is higher than the estimated SVs for assembly level maize shown above (USD 142 to 230) implying that Zambia is highly competitive in growing maize for its own domestic consumption and should continue to invest in this enterprise. Althlough total SV for LCF maize is higher than other farm sectors, these growers are still very important to sector competitiveness because of the larger quantities traded and capacity to store maize for delivery when other local supplies begin to run scarce. In this respect, the value of USD 230/MT needs to be compared with the higher-end (or late-season) import parity prices whereas the SV for FAM and ECF maize can be compared with the lower-end (early-season) values.

234. Analysis of export competitiveness requires more information on regional prices in potential markets. Because Zambia enjoys a transport advantage into the DRC, this market is clearly a good outlet for surpluses when they exist. Likewise, a recent news item stated that Zimbabwe is looking to import at least 100,000 tons of maize from Zambia in the current 2007 season at fob prices between USD 230 and 240 per ton.[62] As the calculations of total SV show, Zambian maize is competitive as an export commodity at these values.

Box 2: Safex Future Prices for October 2006, *(ex Randfontein, RSA as at 13/10/06).*

	UNIT	BIDS	OFFERS	MTM	ESTIMATED IMPORT PARITY
Soya bean	USD/MT	294.53	296.81	296.81	489.02 (DDP)
Sunflower	USD/MT	314.58	316.32	315.38	510.92 (DDP)
Wheat	USD/MT	255.51	257.92	255.91	440.81 (DDP)
White Maize	**USD/MT**	**169.05**	**169.85**	**169.05**	**338.41 (DDP)**
Yellow Maize	USD/MT	168.52	169.72	169.72	339.20 (DDP)

Source: CHC Commodities Limited, Lusaka.
Notes from source: *Prices quoted on the Safex table above contain South African duties and taxes and therefore do not reflect prices prevailing in regional trade. The table above is an indication of prices prevailing in the South African market. Estimated import parity prices do not reflect actual DDP, Lusaka prices and are intended as a guide for information purposes only and not as a basis for establishing local prices.*

Exchange rate from Xe.com U.S.$1.00 : SAR7.48 @ 13/10/06
Estimated Import parity Price assumptions:
Are based on the Safex MTM price, which may include South African duties & taxes.
Zambian Duty @ 15% on Soya, Sunflower, Wheat, White & Yellow Maize.
Bagging & Handling ex silo estimated @ U.S.$13.00 per metric tonne
Wheat price excludes VAT @ 17.5%
Insurance @ 1%
Clearing costs @ 1.5%
Rail Freight rate estimated @ U.S.$105.00/mt Randfontein to Lusaka
DDP: Incoterm"Delivered Duty Paid"
DDU: Incoterm "Delivered Duty Unpaid"

[62] The Daily Mail, 14 June 2007.

E. Rice

235. Rice is not a major commodity for Zambia. CSO does not record data for rice as part of its normal agriculture statistics, and the literature review undertaken for CCAA found almost no information on this commodity. One reason for the difficulty obtaining information on rice is that the crop is only grown in the remote western and northern parts of Zambia that are some 600 to 1,000 km from Lusaka respectively. Traders in these areas would no doubt have more current information on rice production and marketing, but resources for CCAA did not permit travel to these faraway locations.

236. That said, domestic rice is increasingly available in Lusaka supermarkets at a price around ZMK 4,000 to 4,500 per kg (USD 1.00 to 1.13) for a mixed broken and whole grain product. Higher quality imported rice from Thailand and other Asian producers, sells for about the same price indicating that imports dictate the local price. Domestic rice usually has more than 30% broken grains; imported rice is sometimes repackaged locally in consumer size bags.

237. Most Zambian rice is grown under natural flood conditions rather than in paddies. In particular, the flood plains near Kasama, the Bangweulu swamps, and Zambezi flood plain in Western Province are all well suited to rice production. Because all of these areas are very remote, however, an important problem is that rice farmers generally face high input prices and correspondingly low output prices. Nearly all rice production in Zambia has been initiated under donor-driven development projects, including an irrigation project that has reportedly been built in Western Province by JICA (although no more specific information on this was discovered during the literature review).

238. A major problem in the marketing of Zambian rice is the poor quality of grain. This is mainly the result of a failure to use pure seed of a single variety. Because four or five seed varieties have typically become mixed on many farms, it is virtually impossible to adjust the huskers to clean the paddy rice and avoid breaking individual grains. Furthermore, many of the huskers themselves have been poorly managed by cooperatives, which have generally failed to maintain the machines to a proper standard.

239. For these reasons, it is generally regarded that Zambia is not competitive with rice imports from the Far East or even Malawi, which both produce a higher quality grain and can land rice in Zambia for roughly the same price as the cost of local production (the rice growing areas in Malawi, for example, are about the same distance from Lusaka as the rice growing areas in Zambia). Past studies have consistently found the domestic resource cost ratio for rice to be above 1 indicating this enterprise is not economically efficient given the yield and price assumptions at the time these calculations were made.[63] Once again, however, the lack of current information makes this conclusion difficult to substantiate and further investigation of possible improvements (including the JICA irrigation project) should be carried out. In 2002, SACU imports of rice and rice flour were substantial at around USD 138 million for all products (including pre-cooked "minute rice"), implying a good potential market for any increased production, but more than 99% of this was imported from outside the SADC region.

240. **Quantitative analysis.** The quantitative analysis of rice only covers value chains for the FAM and ECF sectors. Similar to cassava, LCF producers do not grow rice and are unlikely to invest in this activity because conditions in the main commercial farm blocks are not well suited to this enterprise. Unlike cassava, which could easily be introduced in a LCF crop mix, the development of rice would require considerable investment in flood irrigation and other production technology.

241. The farm level marketing assumptions for FAM and ECF rice are summarized in the table below. At the FAM level, farm yield is 1.5 MT/ha from 2 bags of compound D and 1 bag of ammonium nitrate; ECF farmers are assumed to achieve 2.0 MT/ha by using twice as much fertilizer

[63] Keyser, 1996; Saasa, et. al., 1999.

(4 bags of D and 2 of AN). All production is assumed to take place in Northern Province, 60km from a cooperative-run rice mill in Kasama; the farmer delivers 10km to the collection point and the assembler delivers 50km. Output price assumptions have been updated from old crop budget analysis and need to be verified.

Table 58: Rice, Farm Level Marketing Assumptions

Sector	Location	Farmer's Delivery Distance	Buyer	Time of Sale	Price per MT	
					ZMK	USD
FAM	Roadside/shed	10km	Sm. Trader	Harvest	800,000	200.00
ECF	Roadside/shed	10km	Sm. Trader	Harvest	800,000	200.00

Farm costs and yields based on Kasama (Northern Province). Farm gate prices need further verification, assumptions here are based on prices that prevailed during previous studies in the 1990s with adjustments for inflation and exchange rate movements (Keyser 1997; Saasa et. al, 1999).

242. The assembly level assumptions are summarized in the next table. At this stage, the operations are identical and there is no difference between the assembly of FAM and ECF rice. The product sold is dry, un-milled paddy.

Table 59: Rice, Assembly Level Marketing Assumptions

Sector	Type of Trader	Assembly Delivery Distance	Buyer	Location	Time of Sale	Price per MT	
						ZMK	USD
FAM	Sm. Trader	50km	Co-op Mill	Kasama	Harvest	900,000	225.00
ECF	Sm. Trader	50km	Co-op Mill	Kasama	Harvest	900,000	225.00

243. The most important differences between the FAM and ECF value chains are realized at the processing stage. Specifically, the analysis assumes that ECF plant improved seed compared with the mixed varieties cultivated at the FAM level. This results in a better milling outturn and a higher composite price for the final product (consisting of mixed whole and broken grain at the percentages shown). For the analysis here, processing also involves the packaging of rice into consumer bags that are effectively supermarket ready.

Table 60: Rice, Processing Level Marketing Assumptions

Sector	Milling Outturn (%)		Type of Mill	Price per MT					
				Whole		Broken		Composite	
	Whole	Broken		ZMK	USD	ZMK	USD	ZMK	USD
FAM	38%	31%	Co-op	2,100,000	525.00	1,100,000	275.00	1,650,720	412.68
ECF	43%	26%	Co-op	2,100,000	525.00	1,100,000	275.00	1,723,200	430.80

Assume lower % broken for EFC rice because use improved (single variety) seed. There is no hard evidence to suggest this is what farmers are actually doing, but for CCAA purposes, it is still useful to consider this possibility since the problem with mixed seed is regarded as one of the main competitiveness constraints. All milling assumed to take place in Kasama to produce a composite product based on the milling outturns shown.

244. Finally, at the distribution stage the final (composite) product is delivered 850km by road from Kasama to Lusaka. Mongu in Western Province is about 240km closer to Lusaka and the shorter delivery distance for rice from the west would provide farmers a limited advantage over those in the north (assuming all other conditions are held constant). The final delivered price into a Lusaka retail shop is assumed to be ZMK 2,900,000 (USD 725) per MT. At the retail level, local rice currently sells for ZMK 4,000 to 5,000 (USD 1.00 to 1.25) per kg.

245. The value chain indicators for FAM and ECF rice up to the processing stage are summarized below. The final value chain indicators for milled (mixed grain) rice are presented later with the parity price comparison.

Table 61: Rice – FAM per MT Value Chain Indicators

Rice - FAM	FARM GATE PRODUCT		ASSEMBLED RAW MATERIAL		PROCESSED RAW MATERIAL	
	ZMK	USD	ZMK	USD	ZMK	USD
Domestic Value Added						
Costs & mark-ups	296,749	74.19	590,799	147.70	775,888	193.97
Official duties & tax	19,064	4.77	25,823	6.46	57,683	14.42
Additional costs	-	-	-	-	-	-
Total DVA	**315,813**	**78.95**	**616,623**	**154.16**	**833,571**	**208.39**
Foreign costs	198,359	49.59	205,876	51.47	237,747	59.44
Total Shipment Value	**514,172**	**128.54**	**822,499**	**205.62**	**1,071,319**	**267.83**

Table 62: Rice – ECF per MT Value Chain Indicators

Rice - ECF	FARM GATE PRODUCT		ASSEMBLED RAW MATERIAL		PROCESSED RAW MATERIAL	
	ZMK	USD	ZMK	USD	ZMK	USD
Domestic Value Added						
Costs & mark-ups	393,039	98.26	506,033	126.51	693,249	173.31
Official duties & tax	21,879	5.47	28,638	7.16	61,531	15.38
Additional costs	-	-	-	-	-	-
Total DVA	**414,918**	**103.73**	**534,671**	**133.67**	**754,779**	**188.69**
Foreign costs	280,311	70.08	287,828	71.96	321,789	80.45
Total Shipment Value	**695,228**	**173.81**	**822,499**	**205.62**	**1,076,569**	**269.14**

246. As shown, ECF rice is more expensive per ton at the farm level than FAM rice because of the additional use of inputs. Duties and tax account for very little cost at any stage in the value chain and any change in fiscal policy would provide little incentive for increased rice production or improved competitiveness.

247. The incremental build up of total SV through the processing stage excluding crop purchases and profit margins for the FAM and ECF value chains are summarized below. As shown assembly costs account for only a small share of incremental SV in that the operation mainly consists of moving un-milled rice 50km from the collection point to a processing facility. At the next stage, the processing costs for rice are about twice as expensive compared with maize because of the extra procedures for de-husking and polishing. As will all processing figures, however, these data need to be confirmed and should be treated with special care.

Table 63: Rice – Summary of Incremental Costs by Stage, Excluding Crop Purchases and Profit Margins (USD per MT raw material)

	Farm	Assembly	Processing
FAM	128.54	5.62	42.83
ECF	173.61	5.62	44.14

248. The pie charts below look at farm production costs in more detail. These figures show there is very little difference in cost structure for FAM and ECF growers. Fertilizer is an important cost component for both categories of farmers followed by hired labor, depreciation, and marketing. Fertilizer in particular can be an expensive input in the remote areas where rice is grown because of the extra costs of transportation.

Figure 29: Build-up of Farm Level SV – FAM Rice

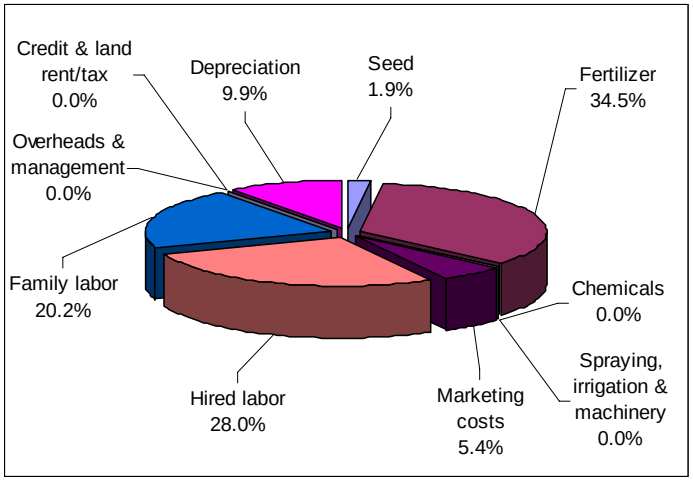
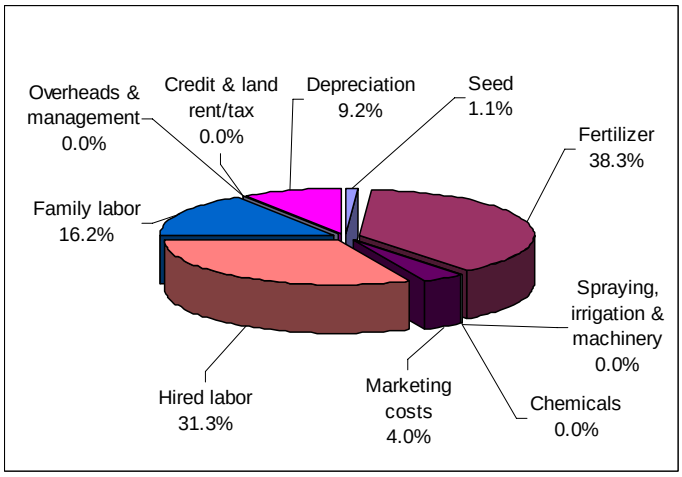


Figure 30: Build up of Farm Level SV – ECF Rice



249. The cost and profitability indicators are summarized in the next set of tables. These data show that rice is actually a reasonably profitable activity for FAM and ECF farmers and offers good potential for excellent rates of return. At 1.23 the rate of return to variable costs for FAM farmers is the best result compared to all other enterprises and value chain activities analyzed.

Table 64: Rice – FAM, per MT Financial Indicators

Rice - FAM	FARM GATE PRODUCT		ASSEMBLED RAW MATERIAL		PROCESSED RAW MATERIAL	
	ZMK	USD	ZMK	USD	ZMK	USD
Gross revenue	**800,000**	**200.00**	**900,000**	**225.00**	**1,139,000**	**284.75**
Production costs						
Crop purchase		-	800,000	200.00	900,000	225.00
Other variable costs	359,067	89.77	18,114	4.53	161,250	40.31
Investment costs	51,106	12.78	4,385	1.10	10,069	2.52
Total costs	**410,172**	**102.54**	**822,499**	**205.62**	**1,071,319**	**267.83**
Final income						
Gross margin	440,933	110.23	81,886	20.47	77,750	19.44
Net profit	**389,828**	**97.46**	**77,501**	**19.38**	**67,681**	**16.92**
Rates of return						
Gross margin/total VC		1.23		0.10		0.07
Net profit/total costs		0.95		0.09		0.06

Table 65: Rice – ECF, per MT Financial Indicators

Rice - ECF	FARM GATE PRODUCT		ASSEMBLED RAW MATERIAL		PROCESSED RAW MATERIAL	
	ZMK	USD	ZMK	USD	ZMK	USD
Gross revenue	**800,000**	**200.00**	**900,000**	**225.00**	**1,189,000**	**297.25**
Production costs						
Crop purchase		-	800,000	200.00	900,000	225.00
Other variable costs	518,803	129.70	18,114	4.53	166,500	41.63
Investment costs	63,925	15.98	4,385	1.10	10,069	2.52
Total costs	**582,728**	**145.68**	**822,499**	**205.62**	**1,076,569**	**269.14**
Final income						
Gross margin	281,197	70.30	81,886	20.47	122,500	30.63
Net profit	**217,272**	**54.32**	**77,501**	**19.38**	**112,431**	**28.11**
Rates of return						
Gross margin/total VC		0.54		0.10		0.11
Net profit/total costs		0.37		0.09		0.10

250. The next set of pie charts look at processing level costs, which account for around 19% of total SV in both the FAM and ECF value chains. These costs are estimated from known prices for packaging materials, but are otherwise based on very general assumptions about the total cost of processing and plausible cost breakdown.

Figure 31: Build-up of Processing Level SV (excluding crop purchase) – FAM Rice

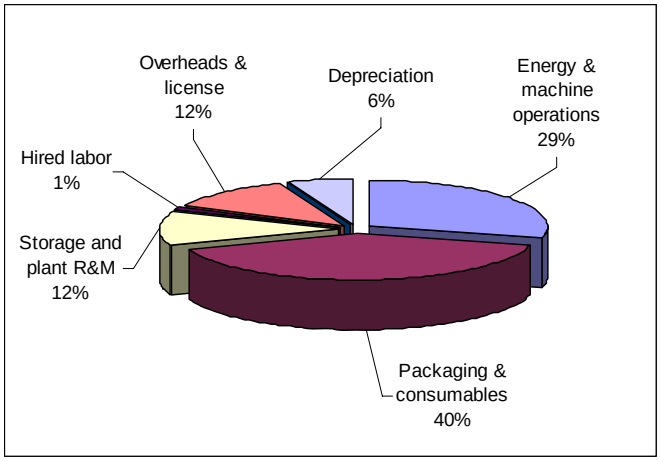
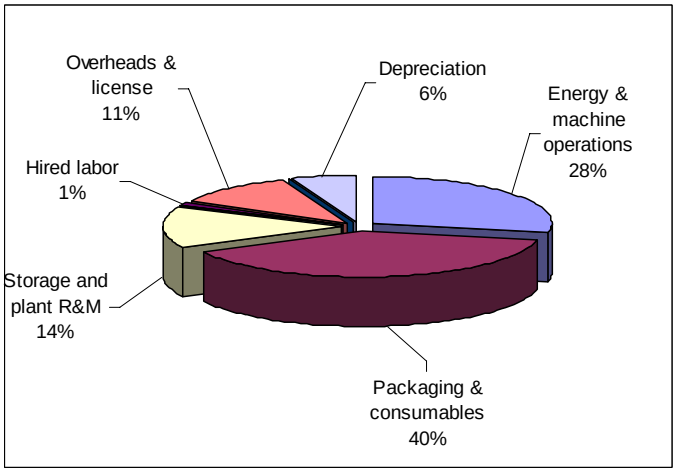


Figure 32: Build-up of Processing Level SV (excluding crop purchase) – ECF Rice



251. **Parity price comparison.** The final step of the analysis for rice is to compare the total shipment value of milled rice delivered to the main urban markets with an appropriate import parity

price. In this case, the value of Zambian rice can be compared with the cif import parity price for rice from Thailand, which is a world leader in this commodity and a current source of imports for Zambia. As set out in methodology section in the table of parity prices, the estimated cif value of Thai rice landed in Lusaka is USD 460 per ton.

252. The final values for milled and packaged Zambian rice delivered to Lusaka for the FAM and ECF value chains are summarized in the tables below. As shown, the total estimated SV of FAM and ECF rice are both slightly higher than import parity implying that Zambia may not be competitive in this product. Like the data for cotton, however, the difference between the domestic SV figures and the international price is great and could easily be explained by data deficiencies. Zambian rice does find its way to local supermarkets and so must be marginally competitive with imports. To improve Zambia's competitiveness, however, will likely require new investments in improved seeds and better processing technology to produce a more attractive product with a greater share of whole grain rice.

Table 66: Final per MT Value Chain Indicators for Milled Rice Delivered to Lusaka

	FAM		ECF	
	ZMK	USD	ZMK	USD
Domestic Value Added				
Costs & mark-ups	869,284	217.32	686,996	171.75
Official duties & tax	255,220	63.80	266,372	66.59
Additional costs	-	-	-	-
Total DVA	**1,124,504**	**281.13**	**953,368**	**238.34**
Foreign costs	789,041	197.26	1,032,640	258.16
Total Shipment Value	**1,913,544**	**478.39**	**1,986,008**	**496.50**

F. Soybeans

253. Soybean production in Zambia has increased significantly in recent years. From only about 11,700 hectares in the late 1990s, CSO reported 33,000 hectares were given to this crop in 2003/04. This increase is mainly associated with growth in the poultry sector, which until recently has been growing at around 20% per year. Around 90% of domestic soybean cake goes to the poultry sector and approximately 10% to swine. Very little soy is used for beef or dairy production and hardly any is used as a direct human food except for the edible oil. All large and most medium scale poultry farms have their own extruder to make meal for stock feed.

254. **Farm production.** At the farm level, more than 90% of soybeans are produced by LCF-type farmers either under natural conditions (40%) or irrigation (60%). Soybeans are typically grown on large plots in rotation with maize or irrigated winter wheat. This rotation is an important part of many farm systems, not only in terms of the revenue generated, but also because soybeans are a nitrogen fixing legume and help to maintain soil fertility. LCF production is concentrated in the main commercial farm blocks along the line of rail in Southern Province, around Lusaka, and in Mkushi.

255. Smallholder farmers grew very little soybean until the introduction of the naturally nodulating varieties in the 1980s. This removed the constraint of needing to keep rhizobial inoculums at temperatures below 5°C before sowing, which was well beyond the capacity of most smallholder producers. The availability of a liquid inoculum from South Africa, which did not require cool storage and could tolerate temperatures up to 40°C, led to the introduction of other varieties and with this development, smallholder production grew rapidly in the early and mid-1990s and now stands at around 5,000 MT or about 10% of total production in the last growing season. Some NGOs like Africare and CLUSA are specifically promoting soybeans at the smallholder level, but report this is still a difficult enterprise due to the incidence of disease and sensitivity of the crop to moisture stress. Smallholder production is concentrated in Eastern Province and to a lesser extent along the line of rail in Central and Southern Provinces.

256. Although Zambia is normally deficit in soybean cake, the 2005/06 season saw a surplus production of for the first time in recent years with total output around 50,000 MT. In the first place, the season was just right for the soybean crop with excellent rains at the right time of the year. Yields on LCF farms of 4 MT/ha were not uncommon, and some commercial farmers produced up to 5 MT/ha. The normal LCF average is around 3.5 MT/ha.

257. Unfortunately, this increase coincided with a significant decline in the poultry sector due to the erratic supply of maize (another important feed ingredient), introduction of VAT on stock feed, and the global scare about bird flu. The poultry industry is expected to recover (as is currently happening), but the decline of 30-40% in 2006 meant that many farmers had problems selling their soybean crop. Local experts therefore anticipate that many smallholder farmers will switch away from this enterprise in the 2006/07 season because of the problems with marketing and low prices the previous year.

258. **Domestic marketing.** Domestic markets for soybean are largely driven by the poultry industry's demand for cake. Large scale processors such as Amanita (which manages the country's only hexane extraction unit) and National Milling, typically absorb around 1/3 of the total crop. The cake from these units is sold to stock feed manufactures and the crude oil goes to a refinery for further processing before human consumption. With hexane extraction, the oil content of cake is around 2%. The remaining 2/3 of total soybean crop, goes to individual poultry farms where it processed using mechanical extruders to produce cake with a high oil content around 8%. This product is better for stock feed, but has a shorter shelf life than the product from solvent extraction.

259. Local processors who purchase from smallholder farmers have complained that soybeans from these growers sometimes have a high stone, dust, and humidity content. Accordingly, they say it is often easier and more cost-effective to import higher-quality soybeans to meet domestic needs than deal with grading of the local smallholder crop.[64] For this and other reasons related to volume, large scale farmers are usually paid a higher price than FAM and ECF-type farmers who are less reliable producers and sell smaller quantities. For the template analysis, prices at the farm gate were assumed to range from ZMK 730,000 (USD 182.50) to ZMK 950,000 (USD 237.50). All categories of farmer either sell their crop to a trader or deliver it to a poultry farm or processing facility.

260. In addition to cake, the other main product from soybeans is crude oil that can be refined into edible cooking oil. Soybeans themselves have 18% oil content and the typical extraction rate from a mechanical extrusion (ram or screw press) is around 9% meaning that the cake has very high oil content and correspondingly short shelf life. All large and most medium scale poultry farms have their own extruder and about 2/3 of the total crop is processed this way. Solvent extraction is the other option for processing soybeans and Zambia has one such facility where an extraction rate of 16% oil is obtained (leaving 2% of total oil in the cake).

261. One important problem currently faced in the domestic markets for soybean oil is stiff competition from Asian palm oil. Specifically, very low cost crude oil from palm is now being imported to Kenya where it is refined and packaged as a consumer product. Because this value adding activity takes place in a COMESA country, the finished oil is entitled to enter Zambia without duty thereby undercutting domestically produced soybean oil.[65]

262. **Trade opportunities.** Zambian soybeans are of above average quality. The protein content, particularly of the widely grown Kaleya variety is substantially above the standard world specification. This, however, is largely ignored by buyers who until now have not paid any premium for Zambian soybeans. Fat levels are adequate, and significantly higher than Argentine soybeans with which Zambia must compete in regional markets.

[64] ICC, 2002.

[65] This development is also credited with decimating the Zambian sunflower industry.

263. Soybeans are in fact a complicated crop from Zambia's trade perspective. On the one hand, the country is very heavily deficit in edible oil so any soybean oil that is manufactured from the domestic crop is a clear import substitute. The one price provided for crude oil by FAO for CCAA analysis was around USD 575 per ton (fob Rotterdam), which is roughly equivalent to a cif price in Lusaka USD 770 per ton once international shipping and handling charges are taken into account. As described, however, that is the wrong comparison for Zambian edible oil since the real competition comes from cheap palm oil imported from Asia and refined in Mombassa. Prices for this product were not available.

264. With respect to soybean meal, on the other hand, Zambia is usually deficit and the processed product may be considered an import substitute. At the same time, however Zambia often exports soybeans to its regional neighbors, sometimes even placing the country in a deficit and forcing those who need stock feed to import cake for a higher price than if the seed had been processed locally.

265. In 2000, SACU imported a total of USD 18.9 million of soybeans, including USD 8.5 million from SADC countries. Of this total, Zambia supplied roughly USD 2.1 million compared with USD 9.5 million from Zimbabwe.[66] Since the collapse of Zimbabwe agriculture, regional trade opportunities are even more open to Zambia, but are still constrained by high overland transport costs and competition from other producers worldwide who can access the South African market by sea. In this respect, the competitive advantage of Zambia compared to the other major producers is that regional buyers can purchase smaller quantities more frequently rather than the 40,000 or so ton boatloads that come from Brazil and Argentina.[67]

266. In October, the price of soybeans on the Safex commodity exchange was quoted at USD 295 per MT.[68] On an export parity basis, this is roughly equivalent to USD 215 per ton fob Lusaka after the costs of transportation on a back load rate and other handling charges are taken into account. Import parity, on the other hand, works out to around USD 489/MT cif Lusaka, inclusive of logistics and 15% Zambian import duty and 17.5% VAT. Because of the complicated trade situation described above, these prices for assembled raw material are the best benchmarks for comparison of Zambia's international competitiveness in soybeans.

267. **Quantitative analysis.** The farm level marketing assumptions used for the value chain analysis are summarized in the table below. At this first stage of the value chain, FAM and ECF farmers are assumed to achieve a yield of 2.0 and 2.5 MT/ha respectively from rain fed production; LCF farmers are assumed to use irrigation and receive a yield of 3.5 MT/ha. As a rotation crop, fertilizer is not specifically applied to soybeans although farmers may increase their application on maize or wheat so that the soy can absorb the residual nutrients. On this basis, one bag of compound D is in included LCF crop budget.

Table 67: Soybeans, Farm Level Marketing Assumptions

Sector	Location	Delivery Distance	Buyer	Time of Sale	Price per MT	
					ZMK	USD
FAM	Roadside	10km	Sm. Trader	May	730,000	182.50
ECF	Shed	25km	Broker/Transporter	May	820,000	205.00
LFC	Shed	25km	Broker/Transporter	March	950,000	237.50

Farm costs and yields based on Mkushi (Central Province); LCF soybeans are irrigated for early start. FAM prices lower because sell to trader and deliver smaller quantities. Most LCF (and many ECF) farmers actually deliver directly to the mill or poultry producer with a feed making unit. CCAA calculations assume transaction takes place at a nearby shed in order to distinguish the specific costs of assembly.

[66] Keyser, Heslop and Abel, 2001.

[67] Giovannucci, et. al, 2001.

[68] CHC Commodities, 2006.

268. The assembly level assumptions are shown below. As indicated, FAM and ECF soybeans are assumed to end up at a poultry farm and LCF soybeans go to a large commercial mill. LCF soybeans are sold earlier than the FAM and ECF crop because of supplemental irrigation, which results in an early yield. The precise timing of these sales and differences in seasonal prices should, however, be confirmed. Seasonal price cycles are not normally regarded as a major factor with soy production, but this crop is one of the commodities ZACA deals in so warehouse receipt based marketing is a possibility. The main reason LCF and ECF farmers receive a higher price than FAM is because of the quantities each sector delivers.[69]

Table 68: Soybeans, Assembly Level Marketing Assumptions

Sector	Type of Trader	Deliv. Dist.	Buyer	Location	Time of Sale	Price per MT	
						ZMK	USD
FAM	Sm. Trader	300km	Poultry farm	Lusaka/C'belt	May	860,000	215.00
ECF	Broker/Transporter	300km	Poultry farm	Lusaka/C'belt	May	1,000,000	250.00
LFC	Broker/Transporter	300km	Large Mill	Lusaka/C'belt	March	1,080,000	270.00

At ECF level, assembler stores for 3 months.

269. For the purpose of international comparison, the price for assembled soybeans at the processor's gate is probably the best comparator. As described, Zambia has a complicated trade situation for soybeans that demands a separation of the product in to its various constituent parts. An attempt was made to do that with a processing level analysis, but these data are not certain and need to be investigated further.

Table 69: Soybeans, Processing Level Marketing Assumptions

Sector	Milling Outturn (%)			Type of Mill	Price per MT			
	Cake	Oil	Trash		Oil Cake		Unrefined Oil	
					ZMK	USD	ZMK	USD
FAM	89%	9%	2%	Extruder	1,100,000	275.00	3,550,000	887.50
ECF	89%	9%	2%	Extruder	1,100,000	275.00	3,550,000	887.50
LFC	82%	16%	2%	Solvent	1,200,000	300.00	3,600,000	900.00

Farm costs and yields based on Mkushi (Central Province).

270. The per ton value chain indicators for soybeans are summarize in the tables below. Like other commodities, FAM and ECF farmers appear to be lower cost producers on a per ton basis than LCF farmers. This is because of the additional inputs LCF growers use to achieve a high yield over a large area. For the analysis of international competitiveness, total shipment value for assembled raw material in the middle column is the best price to compare with import and export parity. This value includes all accumulated costs for the crop to reach the assembly point, including payments and profit margins taken by farmers.

Table 70: Soybeans – FAM per MT Value Chain Indicators

Soya - FAM	FARM GATE PRODUCT		ASSEMBLED RAW MATERIAL		PROCESSED RAW MATERIAL	
	ZMK	USD	ZMK	USD	ZMK	USD
Domestic Value Added						
Costs & mark-ups	255,298	63.82	651,551	162.89	765,601	191.40
Official duties & tax	57,543	14.39	88,262	22.07	109,937	27.48
Additional costs	-	-	-	-	-	-
Total DVA	**312,842**	**78.21**	**739,813**	**184.95**	**875,537**	**218.88**
Foreign costs	49,938	12.48	82,686	20.67	105,034	26.26
Total Shipment Value	**362,779**	**90.69**	**822,499**	**205.62**	**980,572**	**245.14**

[69] Very simply, the processor pays a higher price per ton to someone who shows up at the factory gate with a full 30 ton truck load compared to five 50kg bags.

Table 71: Soybeans – ECF per MT Value Chain Indicators

Soya - ECF	FARM GATE PRODUCT		ASSEMBLED RAW MATERIAL		PROCESSED RAW MATERIAL	
	ZMK	USD	ZMK	USD	ZMK	USD
Domestic Value Added						
Costs & mark-ups	353,479	88.37	733,382	183.35	869,911	217.48
Official duties & tax	62,186	15.55	99,165	24.79	120,840	30.21
Additional costs	-	-	-	-	-	-
Total DVA	**415,665**	**103.92**	**832,547**	**208.14**	**990,750**	**247.69**
Foreign costs	63,062	15.77	107,472	26.87	129,821	32.46
Total Shipment Value	**478,727**	**119.68**	**940,020**	**235.00**	**1,120,572**	**280.14**

Table 72: Soybeans – LCF (irrigated) per MT Value Chain Indicators

Soya - LCF	FARM GATE PRODUCT		ASSEMBLED RAW MATERIAL		PROCESSED RAW MATERIAL	
	ZMK	USD	ZMK	USD	ZMK	USD
Domestic Value Added						
Costs & mark-ups	332,461	83.12	495,532	123.88	124,276	31.07
Official duties & tax	173,634	43.41	210,613	52.65	24,444	6.11
Additional costs	-	-	-	-	-	-
Total DVA	**506,096**	**126.52**	**706,145**	**176.54**	**148,720**	**37.18**
Foreign costs	319,464	79.87	363,875	90.97	45,309	11.33
Total Shipment Value	**825,560**	**206.39**	**1,070,020**	**267.50**	**194,030**	**48.51**

271. The next table looks at the composition of total shipment value for each sector at the farm and assembly point stages of the value chain. As shown, the LCF product includes a larger share of foreign costs and taxation than in the FAM and ECF value chains. Foreign costs are generally beyond the control of Zambia to influence, but changes in tax policy offer some of the best opportunities for government to have a direct and immediate influence on total competitiveness. For FAM and ECF farmers, the main source of domestic transfers is the council levy, which is charged at ZMK 40,000 (USD 10.00) per ton in the farm budgets. For LCF farmers, the other major sources of domestic transfers are various fuel taxes that apply to machinery operation. At the assembly stage, the accumulated tax burden becomes less important, but is still significant and represents an obvious area for possible government intervention. In all cases, however, domestic costs and mark-up account for the majority of soybeans total value such that investments in yield enhancing technology and other process improvements may be an even more effective way to increase international competitiveness.

Table 73: Soybeans -- Composition of SV at Key Stages

	Farm Level			Assembly Level		
	Foreign Costs	Domestic Costs	Domestic Transfers	Foreign Costs	Domestic Costs	Domestic Transfers
FAM	14%	70%	16%	10%	79%	11%
ECF	13%	74%	13%	11%	78%	11%
LCF	37%	39%	24%	32%	46%	22%

272. The pie charts below look in more detail at the structure of farm level costs to give an indication of the most important cost components for individual producers. As shown, seed is far the most important cost category for FAM and ECF farmers followed by marketing costs and hired labor. Marketing costs consist of gain bags, delivery to the collection point, and council levy. Consistent with the discussion of domestic taxes above, the levy accounts for roughly 2/3 of total marketing costs for all categories of farmer, including LCF growers. Hired labor at the FAM and ECF levels is mainly used for hand weeding and harvesting; at the LCF level the crop is treated with herbicides and combine harvested so this accounts for only a small share of total costs.

Figure 33: Build-up of Farm Level SV – FAM Soybeans

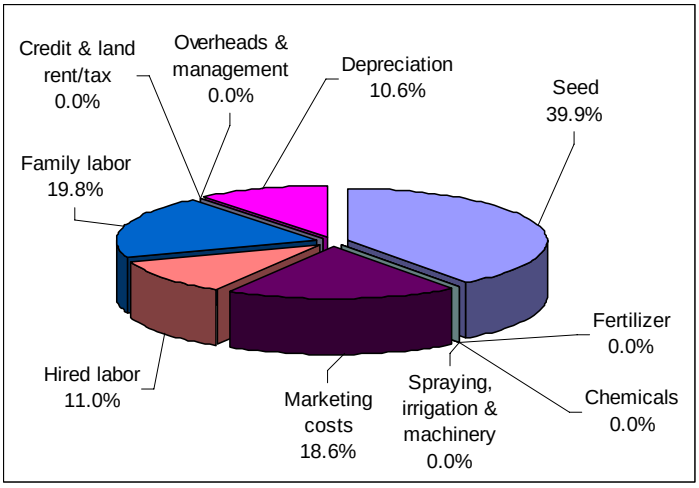


Figure 34: Build-up of Farm Level SV – ECF Soybeans

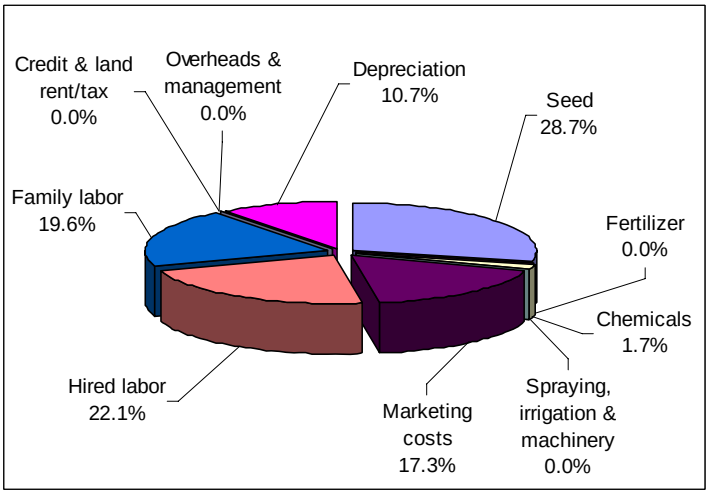
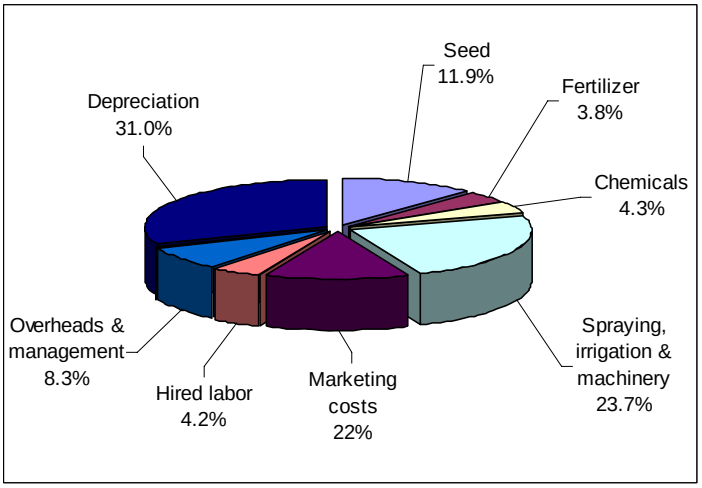


Figure 35: Build-up of Farm Level SV – LCF Soybeans (irrigated)



273. The per ton financial indicators for soybeans are summarized in the next set of tables. These data show that FAM and ECF farmers enjoy excellent rates of return on the costs of production. For LCF farmers, the gross rate of return is also very attractive, although after depreciation of fixed assets

is taken into account the enterprise is much more marginal. Because soybeans are usually grown as a rotation crops, and are at least partly included to improve soil fertility, these numbers do not tell the full story about the incentives for soybean production.

Table 74: Soybeans – FAM, per MT Financial Indicators

Soya - FAM	FARM GATE PRODUCT		ASSEMBLED RAW MATERIAL		PROCESSED RAW MATERIAL	
	ZMK	USD	ZMK	USD	ZMK	USD
Gross revenue	**730,000**	**182.50**	**860,000**	**215.00**	**1,267,000**	**316.75**
Production costs						
Crop purchase		-	730,000	182.50	860,000	215.00
Other variable costs	252,450	63.11	88,114	22.03	108,800	27.20
Investment costs	38,329	9.58	4,385	1.10	11,772	2.94
Total costs	**290,779**	**72.69**	**822,499**	**205.62**	**980,572**	**245.14**
Final income						
Gross margin	477,550	119.39	41,886	10.47	298,200	74.55
Net profit	**439,221**	**109.81**	**37,501**	**9.38**	**286,428**	**71.61**
Rates of return						
Gross margin/total VC		1.89		0.05		0.31
Net profit/total costs		1.51		0.05		0.29

Table 75: Soybeans – ECF, per MT Financial Indicators

Soya - ECF	FARM GATE PRODUCT		ASSEMBLED RAW MATERIAL		PROCESSED RAW MATERIAL	
	ZMK	USD	ZMK	USD	ZMK	USD
Gross revenue	**820,000**	**205.00**	**1,000,000**	**250.00**	**1,267,000**	**316.75**
Production costs						
Crop purchase		-	820,000	205.00	1,000,000	250.00
Other variable costs	333,986	83.50	97,714	24.43	108,800	27.20
Investment costs	51,140	12.79	22,306	5.58	11,772	2.94
Total costs	**385,127**	**96.28**	**940,020**	**235.00**	**1,120,572**	**280.14**
Final income						
Gross margin	486,014	121.50	82,286	20.57	158,200	39.55
Net profit	**434,873**	**108.72**	**59,980**	**15.00**	**146,428**	**36.61**
Rates of return						
Gross margin/total VC		1.46		0.09		0.14
Net profit/total costs		1.13		0.06		0.13

Table 76: Soybeans – LCF, per MT Financial Indicators

Soya - LCF	FARM GATE PRODUCT		ASSEMBLED RAW MATERIAL		PROCESSED RAW MATERIAL	
	ZMK	USD	ZMK	USD	ZMK	USD
Gross revenue	**950,000**	**237.50**	**1,080,000**	**270.00**	**1,528,000**	**382.00**
Production costs						
Crop purchase		-	950,000	237.50	1,080,000	270.00
Other variable costs	569,935	142.48	97,714	24.43	131,900	32.98
Investment costs	255,625	63.91	22,306	5.58	28,521	7.13
Total costs	**825,560**	**206.39**	**1,070,020**	**267.50**	**1,240,421**	**310.11**
Final income						
Gross margin	380,065	95.02	32,286	8.07	316,100	79.03
Net profit	**124,440**	**31.11**	**9,980**	**2.50**	**287,579**	**71.89**
Rates of return						
Gross margin/total VC		0.67		0.03		0.26
Net profit/total costs		0.15		0.01		0.23

274. As with other commodities, the per ton profits are generally lower at the assembly and processing level compared with farm production because of the greater quantities being handled at these stages. The data for processed raw material are somewhat of an exception to this and show soybeans to be extremely profitable on a per ton basis. Like all processing level data these numbers need to be confirmed, but if the picture is correct, this result would appear to suggest an opportunity to pass a greater value of the final product back along the chain to the farm level in particular. To the extent that processors are suffering from limited capacity utilization, there may be some potential for

dialogue on this strategy as a way to increase thru-put and attract more growers to soybean production.

275. Additional financial indicators for the finished products at the processing level are summarized in the next group of tables copied from the spreadsheet templates. As with all processing level data, these results need to be treated with caution but the data do still point to some interesting features about the soybean processing industry that are worth noting (and looking into further). While soybeans from all categories of farmer can go to any processor, the FAM and ECF level value chain data are based on mechanical technology, and the LCF data are based on hexane extraction. This explains the different product outturns indicated below.

Table 77: Soybeans – FAM, per MT Financial Indicators for Processed Commodities

Soya - FAM	Soy Cake (89%)		Crude Oil (9%)	
	ZMK	USD	ZMK	USD
Gross revenue	**979,000**	**244.75**	**288,000**	**72.00**
Production costs				
Crop purchase	765,400	191.35	77,400	19.35
Other variable costs	96,832	24.21	9,792	2.45
Investment costs	10,477	2.62	1,059	0.26
Total costs	**872,709**	**218.18**	**88,251**	**22.06**
Final income				
Gross margin	116,768	29.19	200,808	50.20
Net profit	**106,291**	**26.57**	**199,749**	**49.94**
Rates of return				
Gross margin/total VC		0.14		2.30
Net profit/total costs		0.12		2.26

Table 78: Soybeans – ECF, per MT Financial Indicators for Processed Commodities

Soya - ECF	Soy Cake (89%)		Crude Oil (9%)	
	ZMK	USD	ZMK	USD
Gross revenue	**979,000**	**244.75**	**288,000**	**72.00**
Production costs				
Crop purchase	890,000	222.50	90,000	22.50
Other variable costs	96,832	24.21	9,792	2.45
Investment costs	10,477	2.62	1,059	0.26
Total costs	**997,309**	**249.33**	**100,851**	**25.21**
Final income				
Gross margin	(7,832)	(1.96)	188,208	47.05
Net profit	**(18,309)**	**(4.58)**	**187,149**	**46.79**
Rates of return				
Gross margin/total VC		-0.01		1.89
Net profit/total costs		-0.02		1.86

Table 79: Soybeans – LCF, per MT Financial Indicators for Processed Commodities

Soya - LCF	Soy Cake (82%)		Crude Oil (16%)	
	ZMK	USD	ZMK	USD
Gross revenue	**984,000**	**246.00**	**544,000**	**136.00**
Production costs				
Crop purchase	885,600	221.40	172,800	43.20
Other variable costs	108,158	27.04	21,104	5.28
Investment costs	23,388	5.85	4,563	1.14
Total costs	**1,017,146**	**254.29**	**198,467**	**49.62**
Final income				
Gross margin	(9,758)	(2.44)	350,096	87.52
Net profit	**(33,146)**	**(8.29)**	**345,533**	**86.38**
Rates of return				
Gross margin/total VC		-0.01		1.81
Net profit/total costs		-0.03		1.74

276. Although the precise numbers are unlikely to accurate, these data show very clearly that the production of soybean oil is more profitable than soybean cake. Only in FAM value chains, where soybeans are traded for a lower price, is the production of cake shown to be profitable in its own right. At all other levels, processing is only profitable because of the sale of crude oil. For a poultry farm, this finding may be of little consequence since soybean meal is not the final product, but the data do still emphasize the importance of focusing on Zambia's competitiveness in edible oil sector. As described, duty-free imports of Asian palm oil imported that is refined in Kenya is one of the most important sources of competition for the entire soybean sectors. The data above underscore this point quite clearly since crude oil is where most of the profits are made.

277. **Parity price comparison.** The most relevant import and export parity prices based on soybeans traded at Safex Commodity Exchange are summarized below together with the final shipment values for unprocessed beans at an international assembly point. Taken together, these indicate that Zambia is only marginally competitive with the production of soybeans as an export crop since total SV is greater than export parity for all value chains except at the FAM level. At USD 267.00 per MT, for example, the data show it costs USD 52.00 per ton more than export parity to produce and assemble one ton of LCF soybeans. Export parity can, however, change depending on regional supply and demand and export opportunities are sometimes available, especially for small shipments going south as backload freight.

Table 80: Comparison of Estimated Parity Prices for Soybeans with Total Shipment Value of Domestic Product (USD per MT)

Estimated Parity Prices	Total Shipment Value at Assembly Point		
	FAM	ECF	LCF
Export Parity = 215.00 Import Parity = 489.00	205.62	235.00	267.00

278. As an import substitute on the other hand, the data show that Zambia is highly competitive in soybean production. Again with respect to LCF soybeans (which account for around 90% of the total domestic crop), import parity is an estimated USD 222.00 per MT grater than total SV at the assembly point. Whether or not Zambia's soybean producers will find a competitive outlet for their product, therefore, depends extensively on growth in the livestock sector (and poultry production in particular) where bulk of the commodity is consumed.

G. Sugar

279. Sugar is an important export commodity for Zambia and is classified separately from primary agriculture as a distinct category of exports covering processed and refined food. Since liberalization, the sugar industry has been one of Zambia's most successful non-traditional export sectors and currently generates almost USD 45 million in gross export revenue annually or about 4% of total merchandise exports in 2005. In the mid-1990s, sugar exports stood at around USD 25 million annually, meaning that the sector has nearly doubled in value over the last decade.

280. **Production and marketing.** A major advantage of Zambian sugar is that climatic conditions in certain localized areas are ideally suited to this crop, including a virtually frost-free winter, more than 2,800 hours of sunshine per year and a mean summer temperature of 25°C. As a result of these factors, Zambia enjoys very high yields by world standards along with low field costs. Per ton of white sugar, Zambia is the world's sixth lowest cost producer after Brazil, Malawi, Zimbabwe, Australia and Swaziland in that order. Mozambique ranks in 11th place. [70]

[70] Illovo Group, 2006 (online data http://www.illovosugar.com/worldofsugar/internationalSugarStats.htm)

281. More than 80% of cane production in Zambia is centered on the Zambia Sugar Company's (ZSC) estate of 10,500 hectares at Nakambala on the Kafue Flats near Mazabuka. Cane is also supplied to the ZSC by independent commercial farmers (4,400ha) and through the Kalaya Smallholder Outgrower Scheme (2,164ha), which is managed centrally as an extension of the ZSC estate. The only difference at Kalaya is for the way small landowners are paid based on their shareholdings in the company. All external growers, including independent LSC-type producers and Kalaya, are no more than about 30 km from Zambia Sugar's processing plant. Cane haulage accounts for at least 25% of in-field costs (including variable costs and depreciation) and it is not normally viable to transport raw cane further than this distance.

282. In addition to ZSC, two new sugar projects have been set up by private investors within the past five years. The first of these is a relatively small investment near Kasama in Northern Province (Kalungwishi Estates - 500 hectares) where lower irrigation costs and closer proximity to markets in the great lakes region are likely to be significant advantages. The other new investment (Kafue Sugar – 2,000 hectares) is on the other side of the Kafue River from Nakambala and came into production in 2005/2006. Both operations have their own factory for crushing cane and producing refined sugar.

283. In 2006, ZSC crushed a total of 1.89 million tons of cane including deliveries from its own estate and outgrowers. This yielded a record 239,000 tons of processed sugar. Of the total output, around 92,000 tons (38%) was sold into the domestic market and 147,000 (62%) was exported. Most sugar exports are destined for the Democratic Republic of Congo (80,000 tons), followed by the great lakes region (30,000 tons), European Union (28,000 tons) and SACU (20,000 tons).[71] Zambia Sugar accounts for the more than 80% of total cane production in Zambia and over 90% of sugar exports. ZSC is currently in a major expansion phase and production is expected to increase to 440,000 tons of processed sugar by 2009.

284. **European markets.** The European Union (EU) is Zambia's most lucrative export market. Under the Lomé and Contonou Agreements, Zambia has enjoyed protected, quota-based access to the European Union for a maximum of 28,000 tons per annum. This regime, however, is now set to change under the new "Everything but Arms" agreement between the EU and African, Caribbean, and Pacific (ACP) countries.

285. Reform of the EU sugar regime was finalized in early 2006 when the proposals were ratified by the European Parliament and will be effective until 2015. Under the new regime, the EU raw sugar reference price payable to quota holders under the APC Sugar Protocol was reduced by 5% in July 2006 in order to equalize the price paid for all raw sugar imports into the EU. The price for all suppliers of raw sugar will then remain unchanged until 30 September 2008, after which it will be reduced in two tranches on 1 October 2008 and 1 October 2009. Whilst this will eventually translate into an effective price cut of 32.5% in the raw sugar reference price and impact negatively on revenue from existing export quotas into the EU, the volume quotas is being and the change will also provide Zambia substantial opportunities to increase exports quantities and extend the range of sugar products it supplies. These changes are important to the expansion phase of ZSC described above and recent investments in sugar production by other private operators.

286. **Quantitative analysis.** The quantitative analysis of sugar was constrained by lack of any current or detailed information on costs at the processing level. Export parity prices are also not clear because Zambia receives different prices in different markets, even at the factory gate in Nakambala. Despite these limitations, it was possible to obtain very good first hand information about the in-field costs of production at the estate level. As described, cane is grown to a very uniform standard by all farmers in Zambia and the estate model is indicative of 80% or so of total cane produced. Even the so-called Kalaya smallholder model, is effectively an extension of the estate and is managed very much the same.

[71] Illovo Group, 2006.

287. Despite the data limitations, it was fairly straightforward to prepare a few variations from the one estate model to gain an insight to areas where new investments might be important or attractive from a competitiveness perspective. Discussions with industry experts, for example, revealed that the most important cost difference for independent growers relates to the arrangements for cane haulage. An independent LCF farmer will almost certainly use an independent contractor for haulage and will be further away from the factory than the estate average 9.6km. In financial terms, the difference between using a contractor and operating with own equipment is a 50% savings on depreciation, but is more or less equally offset by higher variable costs for the haulage service. Other differences relate to yield and expected recoverable crystals per ton of cane, which are likely to be lower for some (but not all) independent LCF farmers and on the new sugar estates mentioned above.

288. On this basis, the main assumptions for the farm level analysis of sugar are summarized in the table below. As shown, these models cover three types of LCF production including the estate model and high and low input variations for independent LCF outgrowers (that are possibly indicative of the new estates). It is not practical for an individual hand hoe or ox plow farmers to engage in commercial cane production due to their lack of irrigation and high costs per hectare. All models include cane haulage for delivery at the factory gate.

Table 81: Sugar, Farm Level Assumptions

Sector	Location	Delivery Distance	Buyer	Cane Yield (MT/ha)	Expected Recoverable Crystals (ERC)	Price per MT Cane	
						ZMK	USD
Estate (and Kalaya)	Nakambala	9.6 km (own haul)	Own Factory	116	12.75% (14.79 MT/ha)	143,310	35.83
Independent LCF - high	Mazabuka	15 km (contractor)	Factory	110	12% (13.2 MT/ha)	134,880	33.72
Independent LCF - low	Mazabuka	15 km (contractor)	Factory	90	11% (12.1 MT/ha)	123,640	30.91

Price per MT cane based on USD 281.00 (ZMK 1,124,000) per ton crystals.

289. The value chain indicators for the three farm level sugar models are summarized below. Most notably, these data show that the estimated benchmark value of unprocessed cane on the LCF estate at Nakambala is an estimated USD 22.68 (ZMK 90,710) per ton delivered at the factory gate. This first model covers the vast majority of total cane produced in Zambia and is the most reliable price to use for international comparison.

Table 82: Sugar – LCF per MT Value Chain Indicators for Cane

	LCF ESTATE		INDEPENDENT LCF (high)		INDEPENDENT LCF (low)	
	ZMK	USD	ZMK	USD	ZMK	USD
Domestic Value Added						
Costs & mark-ups	47,449	11.86	27,004	6.75	30,680	7.67
Official duties & tax	15,707	3.93	15,391	3.85	16,432	4.11
Additional costs	-	-	-	-	-	-
Total DVA	**63,156**	**15.79**	**42,395**	**10.60**	**47,112**	**11.78**
Foreign costs	27,554	6.89	29,216	7.30	31,794	7.95
Total Shipment Value	**90,710**	**22.68**	**71,611**	**17.90**	**78,907**	**19.73**

290. The other value chain indicators for independent LCF farmers with high and low input management are even more attractive as shown by the lower total SV per ton of cane. Although these numbers are indicative only, they do suggest that even lower costs are obtainable. High input management by independent LCF growers, for example, appears to be the most competitive option of the scenarios analyzed. Even the low input LCF model gives a more competitive SV than the estate

model due mainly to savings on overhead costs despite lower total yield and ERC ratio. Taken together, these numbers are encouraging. Already the estate model is regarded as one of the world's most cost effective and it appears that even lower costs can be obtained with different production systems.

291. The pie charts below looks in closer detail at the structure of farm costs including delivery of cane to the factory gate. As a perennial crop that is only replanted every eight years, seed is included as part of depreciation along with other investment costs. Marketing costs in this case refer to cane haulage; at the estate level about 50% of depreciation is also accounted for by cane haul equipment. Other farmers without their own hauling equipment are able to save on this cost, but instead must pay a higher price to a cane haul contractor.

292. As shown, one major difference between the estate and independent LCF models is the share of overhead costs in total SV. At the estate level, overheads account for more than 34% of total costs compared with less than 3.5% independent growers who don't have the same requirements of running a large corporation. Marketing costs, on the other hand, are much higher with independent production because of the use of a private cane haul contractor rather than the farmer's own equipment.

Figure 36: Sugar Cane -- Build-up of Farm Level SV, LCF Estate

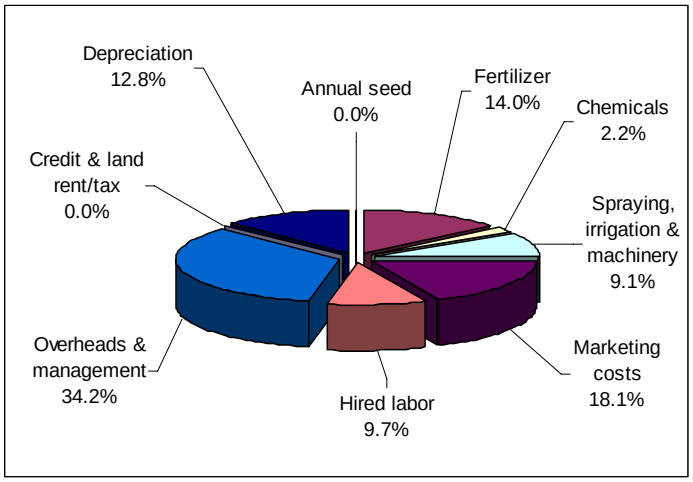


Figure 37: Sugar Cane – Build-up of Farm Level SV, Independent LCF (high)

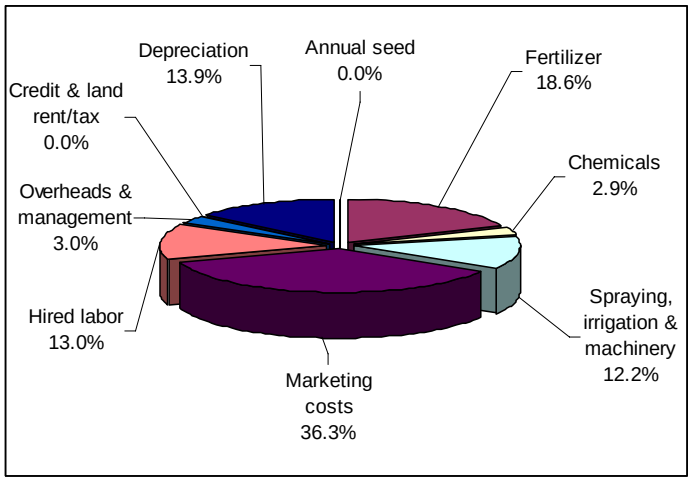
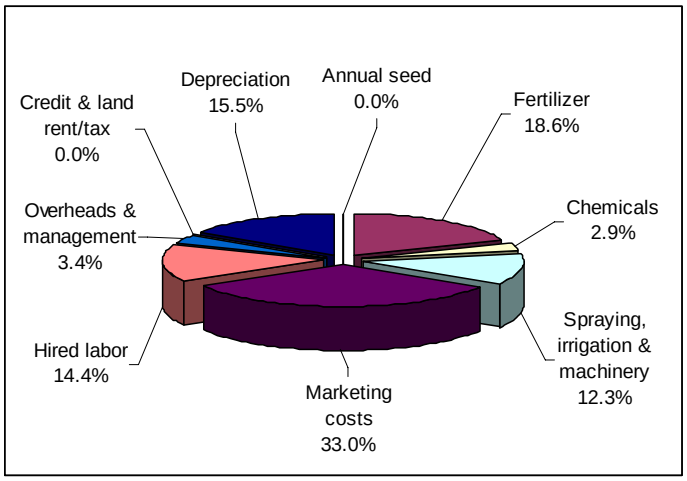


Figure 38: Sugar Cane – Build-up of Farm Level SV – Independent LCF (low)



293. The next table looks at the financial costs and profits per ton of cane growing. As shown, the data for high input LCF production are the most attractive. Each other model, however, is also highly profitable in its own right and provides excellent returns to variable and total expenditure. Sugar is, in fact, the most profitable of all farm enterprises on a per hectare basis. With a yield of 116 MT cane per hectare, for example, the LCF estate model generates ZMK 16.6 million (USD 4,156) gross revenue per hectare or about ZMK 6.1 million (USD 1,525) in net profit after depreciation costs are taken into account. This is far higher than every other enterprise analyzed for the CCAA study.

Table 83: Sugar– LCF Estate, per MT Financial Indicators for Cane

	LCF ESTATE		INDEPENDENT LCF (high)		INDEPENDENT LCF (low)	
	ZMK	USD	ZMK	USD	ZMK	USD
Gross revenue	**143,310**	**35.83**	**143,310**	**35.83**	**123,640**	**30.91**
Production costs						
Crop purchase		-		-		-
Other variable costs	79,125	19.78	61,631	15.41	66,708	16.68
Investment costs	11,585	2.90	9,981	2.50	12,198	3.05
Total costs	**90,710**	**22.68**	**71,611**	**17.90**	**78,907**	**19.73**
Final income						
Gross margin	64,185	16.05	81,679	20.42	56,932	14.23
Net profit	**52,600**	**13.15**	**71,699**	**17.92**	**44,733**	**11.18**
Rates of return						
Gross margin/total VC		0.81		1.33		0.85
Net profit/total costs		0.58		1.00		0.57

294. Equally, the data show that per hectare costs are also very high and preclude individual FAM and ECF type farmers from engaging in this activity. With a yield of 90 MT/ha, for example, the least expensive LCF low input model still costs around ZMK 7.1 million (USD 1,775) per hectare to operate. To achieve the required economies of scale for investments in irrigation equipment and planting material, most independent LCF producers farm sugar on at least 50 ha and sometimes more than 200.

295. **Parity price comparisons.** As noted, the exact fob export parity price for Zambian sugar is unknown to the CCAA study team. The average "world price" is currently around 17 to 18 cents per lb (USD 386 per MT), but actual prices for Zambia vary quite considerably in different markets with the EU paying the highest price, followed by the great lakes countries, SACU and DRC. Transport costs are one major factor, but so too are existing tariff structures and quota limitations. As described

the new EU trade regime for sugar will dramatically change Zambia's pricing structure by eliminating price protection and volume restrictions. The effects of this on Zambia's competitiveness options need to be better understood before making specific recommendations for the sugar sector.

296. With this limitation in mind, it is still important for CCAA to try and make a parity price comparison using global commodity price data. Based on the price of USD 386 per ton on the unprotected world market, a rough fob factory gate price can be worked out by subtracting USD 120/MT for containerized road freight to Durban and sea freight to northern Europe. This gives an equivalent fob factory gate price for processed sugar of USD 266/MT with international shipping equal to 45% of total value.[72]

297. Given that each ton of recoverable crystals (at the estate level) includes the value of 7.84 MT of cane and each ton of cane has an estimated shipment value of USD 22.68 before processing, the total SV of one ton of crystals (before processing) works out to USD 177.81. Past studies have reported it costs around USD 100 to process a ton of refined sugar, which finally translates to an estimated shipment value for large estate processed crystals around USD 277.81 per ton.

298. On this basis, the estimated SV of processed crystals in Mazabuka works out to be USD 11.81 higher than the estimated fob factory gate price at unprotected world levels (USD 266/MT). This would appear to suggest that Zambia should not concentrate on serving the EU market from 2009 once price protection is eliminated. The implicit loss of USD 11.81, however, is relatively small and could fairly easily be offset by with savings at the processing level and/or international distribution costs (which may well be lower than assumed because of ZSC's ability to negotiate bulk discounts). If the global price should fall from the current level, however, this competitiveness position could be difficult to sustain.[73] Rail freight would be one option to help reduce costs and increased economies of scale from ZSC's current expansion plans may also provide significant advantage.

299. The analysis also underscores the importance of focusing on regional trade as the most competitive markets outlets for Zambia. Whereas high transport costs to Europe account for an estimated 45% of Zambia's export parity on the world market, lower freight costs are likely to be available to other regional destinations especially compared to the cost global competitors face in reaching these destinations. Looking forward, ZSC correctly acknowledges that the EU will be a difficult market to serve after 2009. The company still plans to sell about 100,000 MT to Europe annually, but this will only be about 25% of total output once the company's current expansion phase is complete. Unlike most large sugar companies in Brazil, ZSC's plans for bio-energy currently focus only on molasses rather than ethanol.

[72] This price is quite different than the price that can be derived by dividing Zambia's total recorded export value in 2003 (USD 43.8 million) by the number of tons exported (at least 111,000 tons). From these figures, the per ton fob export price works out USD 398 per ton although even this is not an accurate figure since EU sales are paid on cif basis after delivery and more information is still needed on prices in Zambia's regional markets to make a full assessment of its competitiveness options.

[73] Two years ago, sugar prices were significantly lower than they are now at around USD 8 to 9 cents per pound. Recently, however, global prices have been on a fairly steady increase, due mainly to Brazil diverting more and more of its sugar production to ethanol, a trend which seems likely to continue.

VI. FINDINGS AND NEXT STEPS

300. This CCAA competitiveness report for Zambia set out to identify products that are currently competitive or stand good prospects of becoming competitive in domestic, regional, or global markets. In so doing, the analysis sought to identify weak links in the value chain that are the main obstacles to achieving competitiveness and to summarize the qualitative and quantitative factors that shape the actual and potential opportunities for trade of each commodity analyzed. To achieve these objectives, the analysis began with an overview of the current performance issues, opportunities, and constraints in Zambian agriculture. The paper then presented results of the quantitative value chain analysis prepared using a new methodology developed specifically for the CCAA study. Further background information on each of the seven commodity sectors covered by the CCAA analysis was used to interpret the quantitative data.

301. An enormous amount of data was generated by the spreadsheet models that can help to understand Zambia's opportunities for competitive agriculture development. The quantitative analysis specifically resulted in a detailed cost break down for each commodity at major steps along the value chain until the point where each product reaches its final place of international competition, either as an import substitute or export commodity. This information, together with the final measurements of shipment value at each stage of the value chain, help to determine where Zambia's greatest opportunities for agriculture development lie. With further analysis and discussion of these results, the data can be used to help identify the types of policy changes and new investments that are needed to help Zambia promote the emergence of successful commercial agriculture.

302. The discussion here has tried to draw attention to the most important aspects of the data set, but many additional conclusions, findings, and interpretations can still be read by looking at the spreadsheet models themselves. It is hoped that people with a true detailed interest in Zambia's growth opportunities will want to make use further of these data (and methodological tools) to gain even greater insight to the requirements and opportunities for competitive development. Having developed the basic set of spreadsheet models, it is relatively easy to vary individual assumptions and use the tools to model different policy and investment scenarios.

303. This concluding section begins with a brief summary of the main findings and quantitative results for all CCAA commodities. It then provides a quick interpretation of the implications for each commodity and identifies a few crosscutting conclusions that are also important to consider. Finally, the discussion draws to a close with a few comments on areas for further analysis.

A. Summary Findings

304. **General considerations.** Zambia has considerable potential for economic growth and poverty reduction through expanded agriculture trade. The country is endowed with a large natural resource base for agricultural production, land resources remain largely unexploited, and there are abundant water resources that could be used for irrigation. Because of these natural conditions, Zambia has been able to develop a successful sugar industry based on extremely low field costs. The country has also done well in other high-value crop sectors like cotton and tobacco for which natural growing conditions are well suited.

305. As a land-locked country, it is also apparent that high transportation costs have a major bearing of the opportunities for agriculture trade and investment. It is no accident that relatively high value commodities like sugar, tobacco, horticulture coffee, and paprika account for a large share of Zambia's agriculture exports. Lower value products like maize and soybeans, on the other hand, are better suited for production as import substitutes or for trade with regional neighbors where high transport costs are less of a factor and still provide some degree of protection from competition with global imports. Zambia enjoys a significant cost advantage in the production of maize as an import substitute, for example, but is much less competitive as an export producer except for opportunistic regional markets where short-term deficits exist.

306. High transport costs are also an important component of most input prices. Although this can be quite low as a share of total SV for some very high value inputs like vet medicines and certain agri-chemicals, 30% of the landed value of fertilizer at the farm gate is estimated to be accounted for by international freight. Certainly, the fact that Zambia imports nearly all of its agricultural inputs adds considerably to the costs of farm production and is a basic reality that any competitiveness strategy must account for. In the simplest of terms, these higher costs adds emphasis to the importance of focusing on import substitution to meet domestic demand while also targeting regional markets for exports when possible and high value commodities for the global market.

307. Other important considerations in developing a competitiveness strategy relate to the very real need for more volumes of product to create better economies of scale and reduce the transaction costs of sourcing raw material. This is especially true in outlying areas where production is quite dispersed and therefore involves a high cost to bring the product into a formal, commercial market. Just like Zambia enjoys a degree of natural protection from competition with regional and global imports, producers in the outlying areas also have a strong incentive to produce crops for their own consumption and have difficulties competing in other markets.

308. The opportunities for export development and import substitution also depend on Zambia's ability to meet required international standards. This is particularly noticeable in the cattle sector, where beef exports are currently not possible due to disease restrictions and other public health requirements in the EU, SACU, and most other potential market outlets except in the DRC and other regional neighbors like Malawi. Even for bulk commodities like maize, rice, and soybeans, it is clear that Zambia still has some way to go to develop (and enforce) required world standards covering things like moisture content, contamination with foreign matter, and guarantees on quality standards and availability. These needs are being addressed, in part, by ZACA through the establishment of a warehouse receipt program, but it is clear that Zambia still has a long way to go before it can be regard as anything like reliable supplier of bulk, export quality product. As production grows, investments in bulk handling facilities are also required to save costs on bagging and grain handling.

309. **Domestic transfers.** Overall the analysis finds that import duties and VAT translate into a fairly modest share of the final shipment value of most traded agriculture commodities. This is especially true for FAM and ECF products in which farmer and traders use relatively fewer taxed inputs than at the LCF level. Fuel taxes for in-field machinery operations become important at the LCF level, but still accounts for a fairly small share of total SV for the finished product after all other costs and mark-ups are taken into account.[74]

310. This is not to say that input taxes and other domestic transfers cannot be reduced or eliminated for strategic advantage. Council levies charged at the district level, in fact, represent a very substantial part of each commodity's shipment value equal to 75% of the tax on FAM maize and 43% of the tax on LCF maize. District councils certainly need adequate funding, but the decision to raise revenue through crop leview cannot be viewed in isolation form the effects on Zambia's agriculture competitiveness.

311. In other cases, Zambia has already taken steps to reduce taxes for strategic advantage. This is especially true with respect to imported irrigation equipment which, until recently, was axed at 15% duty and 17.5% VAT. The lack of irrigation development is one of the most significant constraints to agriculture growth and the elimination of these taxes is a clear step in the right direction for promoting new investment. On the other hand, chemical sprayers (which are important for cotton and as other high value commodities), are charged 5% duty compared with most other agriculture implements that do attract duty at all. Likewise, although there is no duty on fertilizer and most types of agri-chemicals, insecticides have a 15% customs rate. Although any change to fiscal policy needs to be

[74] Taking LCF maize as example (which includes fuel for land preparation, chemical application, and combine harvesting), fuel taxes account for 28% of the cost of machinery operation, but only 4% of the crop's final shipment value at the first point of sale.

considered in the full context of other macroeconomic policies and goals, efforts to minimize these and other remaining taxes on strategic agriculture inputs could be a very good and direct way for improving Zambia's agriculture competitiveness.

312. **Farm production.** After the question of input supply, agriculture competitiveness next depends on the efficiency of how different inputs are combined at the farm level. The CCAA methodology provides insight to this matter by measuring the per ton shipment value of each farm product analyzed. These benchmark values can be compared with the farm level indicators for other CCAA countries to determine whether Zambia has higher or lower costs compared with its African competitors and the world standards set by Brazil and Thailand. The main per ton SV indicators for unprocessed farm commodities at the point of first sale are summarized below.

Table 84: Summary of Farm Level per MT Shipment Values (USD)

Product	Location	FAM	ECF	LCF
Cassava (tubers)	Roadside (farm gate)	33.87	41.59	62.56*
Cattle (24-month long weaner)	Into feedlot	685.04	900.48	1,096.89
Cotton (un-ginned seed cotton)	Rural depot	181.75	234.17	408.88*
Maize (bagged grain)	Roadside (FAM) Shed (ECF and LCF)	136.27	151.58 (3mos storage)	176.48 (6mos storage)
Rice (un-milled paddy)	Rural depot	128.54	173.81	n/a
Soybeans (bagged seed)	Rural depot	90.69	119.68	206.39
Sugar (unprocessed cane)	Factory gate	19.73†	17.90‡	22.68§

* hypothetical possibility; † independent LCF low; ‡ independent LCF high; § LCF estate. LCF cotton, soybeans, and sugar include irrigation.

313. In addition to analyzing farm level per ton shipment values, it is also important to look at costs and profitability of each enterprise to understand the appeal to primary producers. Agriculture production and competitiveness begins with the decisions farmers make and the methodology also provides insight to how commodities compare from the private financial perspective.

314. The indicators of financial costs and profitability have been summarized to this point on a per ton basis since that allows for the most direct comparison of total competitiveness across sectors. It is, however, important to understand costs and profitability on a per hectare basis since this is what farmers mainly look at themselves in deciding on their cropping strategy. Previous studies of Zambian agriculture have commented on the lack of profits available from primary agriculture and it will be interesting to compare the per hectare indicators calculated for this study with those from other CCAA countries. Per hectare indicators still show nothing about whole farm profitability since that depends on cash flow and how different enterprises are combined, but analysis in per hectare terms is important for understanding Zambia's competitiveness options. Simply put, farmers want crops that are affordable to grow and still provide attractive gross and net profits.

Table 85: Summary of Farm Level Financial Indicators (USD/ha)

	Yield (MT/ha)	Gross Revenue	Total Cost	Gross Margin	Net Profit
Cassava (dry tuber)					
FAM	4.0	350	96	272	253
ECF	4.5	394	138	287	255
LCF	12.0	600	750	(5)	(150)
Cotton (seed cotton)					
FAM	0.8	240	92	167	148
ECF	1.3	390	238	184	152
LCF	3.0	1,350	1,227	347	123
Cattle (long weaner, live)					
FAM	0.013	15	9	8	6
ECF	0.019	24	17	11	7
LCF	0.025	31	27	16	4
Maize (bagged grain)					
FAM (sell immediately)	2.75	364	245*	139	119
ECF (3 months storage)	3.9	692	533	192	159
LCF (6 months storage)	5.75	1,150	1,015	281	135
Rice (bagged paddy)					
FAM	1.5	300	154	165	146
ECF	2.0	400	291	141	109
Soybean (bagged seed)					
FAM	2.0	365	145	239	220
ECF	2.5	513	241	304	272
LCF	3.5	831	722	333	109
Sugar (raw cane)					
FAM	90.0	2,782	1,775	1,281	1,007
ECF	110.0	3,941	1,969	2,246	1,972
LCF	116.0	4,156	2,631	1,861	1,525

315. The per hectare data show that all enterprises return positive financial return except LCF cassava (which was analyzed as a hypothetical possibility for illustrative purposes only). Whereas the total SV of all LCF commodities is higher compared with FAM and ECF commodities, the inverse is most often true in terms of gross and net profit. As stated, however, the scale of production also needs to be taken into account as well as each farmer's individual cash flow requirements and mix of enterprises in deciding on the optimal production strategy. This type of analysis is well beyond the scope of the CCAA value chain templates, but is certainly something that needs to be taken into account at the enterprise level for farmer recommendations.

316. **Assembly.** The next step in the value chain analysis is assembly. Although many farmers in Zambia perform the delivery function themselves, this operation was analyzed as a separate activity from farm production for most commodities. This is to help separate the costs so that the value chain process can be better understood and compared more directly with conditions in other countries. Specifically, a few simple cost modules for informal traders and larger-scale commodity transporters and brokers were prepared and applied to the analysis of each enterprise as appropriate.

317. More specifically, it was usually assumed that FAM farmers sell to an informal roadside buyer. These traders pay a low price, but usually pay cash (although bartered goods are sometimes more common in remote areas) and are often the only type of buyer a small farmer has access to. ECF and LCF farmers, on the other hand, usually sell to a larger-scale transporter or commodity broker. Details of the assembly arrangements applied for the analysis of each commodity are included with the discussion of that product.

318. The main per ton SV indicators for unprocessed farm commodities delivered at the final assembly point are summarized below. It is important to note that these assembly indicators include all accumulated value from farm production and input supply (including profit margins paid to farmers and input dealers) and do not merely show the incremental cost of assembly.

Table 86: Summary of Assembly Level per MT Shipment Values (USD)

Product	Assembly Point	FAM	ECF	LCF
Cassava (tubers)	Kasama	95.22	95.22	97.50
Cattle (24-month long weaner)	Feedlot	*Farm data covers assembly into feedlot*		
Cotton (un-ginned seed cotton)	Katete (FAM and ECF) Lusaka (LCF)	318.20	318.20	476.50
Maize (bagged grain)	Nearest mill (FAM) Lusaka mill (ECF, LCF)	141.62 (no storage)	218.98 (6 mos store)	230.00 (6 mos store)
Rice (un-milled paddy)	Kasama	205.62	205.62	n/a
Soybeans (bagged seed)	Lusaka	205.62	235.00	267.50
Sugar (unprocessed cane)	Factory gate	*Farm data covers assembly into mill*		

319. For most commodities, per MT measurements of SV at the assembly point are sufficient to measure international competitiveness against import or export parity. Maize, for example, is nearly always traded as an unprocessed commodity the total SV of Zambia's domestic production at the mill gate is the place to measure international competitiveness. Soybeans are another commodity traded in their unprocessed form and the accumulated SV at the assembly point is sufficient to measure \ competitiveness in this commodity. Products like seed cotton and paddy rice, however, still have to undergo some type of processing to become an internationally traded commodity that can be compared directly with import or export parity.[75]

320. **Processing.** At the processing stage, data limitations became a serious constraint for carrying out the template analysis. In most cases, some very rough (and old) data were available, but this information was usually not very detailed and less certain compared with the cost information for other stages. Bearing this limitation in mind, the final SV indicators for 1 ton of finished commodity are summarized below. These figures include all accumulated costs from input supply, farm production, and assembly included in amount of raw material required to produce one ton of processed commodity. In the case of FAM and ECF cotton, for example, the ginning outturn (GOT) ratio of 40.5% means that the total SV for lint include all of the costs of 2.47 MT of seed cotton.

[75] The alternative would be to subtract a rough measure of processing costs from the appropriate world price to derive an *unprocessed* parity price equivalent for that commodity at the assembly point (or even farm gate if detailed assembly information is unavailable.

Table 87: Summary of per MT Shipment Values for Processed Raw Material (USD)

Product	Outturn	FAM	ECF	LCF
Cassava (tubers)	Data not available	*Compare at assembly stage with regional parity*		
Cattle (24-month long weaner)	Data not available	*Compare at assembly stage with into feedlot costs for other countries*		
Cotton lint Katete ginnery for FAM and ECF Lusaka ginnery for LCF	40.5% GOT for FAM and ECF 43% GOT for LCF	1,047.09	1,047.89	1,433.70
Cotton seed Katete ginnery for FAM and ECF Lusaka ginnery for LCF	55% seed for FAM and ECF 53.5% seed for LCF	771.04	771.04	1,080.79
Maize	Rough data available, but not necessary	*Compare at assembly stage with regional parity for white maize (and seasonal variations)*		
Rice Packaged mixed and broken rice, delivered Lusaka	FAM = 38% whole, 31% broken; ECF = 43% whole, 26% broken	478.39	496.50	n/a
Soybeans (bagged seed)	Rough data available, but not necessary	*Compare at assembly stage with regional parity for unprocessed beans*		
Sugar (unprocessed cane)	Data not available	*More information on processing costs and fob prices at factory gate required.*		

321. From all the SV calculations above, the table on the next page can now be compiled with a summary of the most relevant domestic benchmark price for comparison of Zambia's international competitiveness. In addition to the final measure of SV, this table also describes type of parity price against which the comparison of Zambia's competitiveness should be made and together with the best available parity price information at the time of writing.

Table 88: Final Parity Price Comparisons of SV with Best Available Reference Price

Product	Final Stage for SV Comparison	Final Shipment Value per MT			Ideal Parity Comparison	Available Reference Price
		FAM	ECF	LCF		
Cassava	Assembly (bulked tubers in N. Prov)	$95	$95	$97*	Regional export parity to DRC	$50/MT cif Northern Europe
Cattle	Farm (24-mos weaner into feedlot)	$685	$900	$1,097	Import parity or regional export parity	$870/MT at Argentina feedlot
Cotton lint	Processing (fob factory gate)	$1,047	$1,047	$1,433*	Confirm local export parity with gin operators	$978/MT for FAM & ECF $1,303 for LCF (varies by staple length)
Cotton seed	Processing (fob factory gate)	$771	$771	$1,080*	Analyze value as feed ingredient	$90/MT fob factory gate
White Maize	Assembly (un-milled grain)	$141 (June)	$219 (Dec)	$230 (Dec)	Regional import (and export?) parity including seasonal price cycles	$338/MT cif Lusaka (ex Randfontein, October)
Rice	Logistics (polished rice delivered Lusaka)	$478	$496	n/a	Thai import parity and regional export parity	$460/MT cif Lusaka (ex Thailand)
Soybeans	Assembly (bagged seed)	$206	$235	$268	RSA import/export parity	M = $489/MT cif Lusaka X = $215/MT fob Lusaka (ex Randfontein)
Sugar (all LCF)	Farm (cane delivered to factory)	$19.73 (low)	$17.90 (high)	$22.68 (estate)	Various (including current and future EU price and regional prices)	$266 MT refined sugar factory gate w/o protection (+/-$33.93/MT cane equiv. ex processing)

* Hypothetical possibility. Available reference prices provided by FAO and/or own calculations from alternative sources.

B. Summary Interpretation

322. Several conclusions and can be drawn from the above information. Together with the background analysis and more detailed quantitative results for each commodity discussed in main results section, this helps to identify some basic observations about Zambia's competitiveness options.

323. **Cassava.** Cassava is mainly grown for household food security in the north and northwestern regions of Zambia. There are no large commercial producers and it appears that processing is entirely informal. There are reports of cross border trade with DRC and other regional neighbors, but the main market for cassava now is for local trade and sale to urban consumers in Lusaka and the Copperbelt. The international parity price of USD 50 per ton fob Northern Europe provided for the CCAA analysis is therefore almost meaningless since Zambia's competitiveness needs to be measured in the

context of regional market opportunities. From the financial perspective, one of the most appealing features of cassava is that it is extremely inexpensive for small farmers to produce and could offer a good opportunity for commercial development in outlying areas. As a low value, bulky commodity, however, this is likely to depend on investment in new processing facilities. There has been a surge in cassava production recently, but as a food security crop there is still an open ended question about whether traders can amass enough surplus as raw material to sustain a processing facility. LCF farmers are all a long way from the main cassava growing areas and are unlikely to participate in this value chain.

324. **Cattle.** The opportunities to trade beef are severely restricted by the size of the domestic market and demanding veterinary and public health requirements in potential export destinations. Like cassava, the DRC probably offers the best opportunity for export growth term because the international requirements regarding animal health and disease control are less of an issue (if any) in that market. Exports to the European Union or even South Africa are not possible at present (or arguably even in the foreseeable future) until international certified systems for the control of foot and mouth and corridor disease can be put in place. That said, the into feedlot SV for Zambia is reasonably competitive with the equivalent price in Argentina suggesting that Zambia could do well in this commodity if markets were opened up. Equally, however, feedlot costs are likely to be higher in Zambia than elsewhere and further analysis of this stage in the value chain is needed to get a fuller picture of development opportunities.

325. **Cotton.** Cotton is an important export commodity for Zambia and is especially well suited to production by FAM and ECF-type farmers. The commodity has done very well in recent years, especially as the two major ginning companies have apparently solved many of the problems around the risk of side selling by farmers who are looking to avoid repaying of input loans. The total estimated SV for FAM and ECF cotton is slightly higher than the estimated export parity price, but this can easily be explained by data deficiencies (especially at the processing level, but also at other stages of the value chain and even in the calculation of the estimated parity price). Until more data become available to look at this value chain in greater depth, the most reliable conclusion is to say that any reduction in world price may very quickly lead to a need for a realignment of profits between value chain participants. Continued investment in improved seed and other yield enhancing technology (both at the farm and processing levels) are also important to sustain Zambia's place in the global marketplace.

326. **Maize.** As Zambia's staple food, white maize is of enormous strategic importance to the entire economy. Far more area is given to this commodity than any other and it is very simply the basis of most rural livelihoods. As an import substitute, the SV calculations all show that Zambia has a strong incentive to produce maize and is extremely competitive with imports. Further analysis of seasonal price cycles would help to clarify some of the circumstances around this, but it absolutely clear that Zambia has an economic (and political) interest in producing its own maize crop and should continue to emphasize this activity. Export opportunities, on the other hand, are less certain but can still be a good target in years with a maize surplus. The Democratic Republic of Congo in particular usually demands large volumes of imported maize each year and Zambia could do well to explore this market where it alone has a transport advantage over all other global competitors. Maize, typically sells for 20-30% more in the DRC than in Zambia, but so far most trade takes place on an informal cross-border basis.[76] Government interference in the sector, particularly in the form of export bans and efforts to enforce pan-territorial pricing through the Food Reserve Agency have seriously constrained the potential for regional export development.

327. **Rice.** Rice is a minor commodity for Zambia, but appears to have done well in recent years. Prices are determined by competition with imports and the calculations of total SV for polished rice landed in Lusaka show that domestic crop is marginally more expensive compared with the cost of importing rice from Thailand. All rice in Zambia is grown in very remote areas and the high costs of

[76] FEWSNET, 2006.

production together with domestic transport costs combine to make it very difficult for Zambia to compete with imports. The problem of broken grains is another constraint to Zambia's competitiveness in this commodity. That said, domestic production appears to have increased recently and regional export opportunities may also exist, especially to the DRC which is closer to Zambia's rice growing areas than Lusaka where the final comparison of SV was made. Export prices in the DRC, together with logistical requirements for trade with that country need to be better understood.

328. **Soybeans.** Opportunities in the soybean sector depend largely on continued growth in domestic poultry production. Soybean oil can be sold on the local market, but this is constrained by competition from inexpensive Asian palm oil that is refined in Kenya and imported duty free as a COMESA product. Even at these highly competitive prices, soybean oil appears to be more profitable than the cake, but processors must, of course, sell the cake, which is the main product by volume to cover the costs of processing. This is why the growth of the poultry industry is critical to the success of soybeans. As an import substitute and even export product, the calculations of SV are encouraging and show unprocessed beans are competitive under both trade scenarios. Import substitution is the most likely trade scenario, but Zambian soybeans are sometimes also exported to regional markets. As with all of Zambia's commodities, however, the closer the goods travel to an international port, competition from lower costs producers worldwide becomes increasingly stiff. The main advantage of soybean exports, therefore, is Zambia ability to supply relatively small quantities compared with very large orders from Brazil and Argentina. More detailed analysis of regional parity prices is needed to assess the true potential for this type of trade. More information is also needed on growth prospects in the poultry sector, including the potential for supplying urban consumers in the DRC.

329. **Sugar.** Sugar is an important commodity for Zambia and presently accounts for around 4% of total merchandise exports. Until recently, growth in the sugar industry has been constrained by EU quotas, but new trade policy will effectively give Zambia unfettered access for about 95% of current production equal to a maximum of 250,000 MT refined sugar from 2009 until at least 2015. This change represents a significant challenge for Zambia, not least because the new policy is expected to result in a 32.5% effective price cut from current protected levels, but also because of the vast development opportunity it offers. The estimated SV of processed crystal works out to be USD 11.81 higher than the estimated fob factory gate price at unprotected world levels (USD 266/MT) which would appear to suggest that Zambia should not concentrate on serving the EU market from 2009. The implicit loss of USD 11.81, however, is relatively small and could fairly easily be offset with savings at the processing level and/or international distribution. The analysis also underscores the importance of focusing on regional trade as the most competitive markets outlets. Whereas high transport costs to Europe account for an estimated 45% of Zambia's export parity on the world market, lower freight costs are likely to be available to regional destinations, especially compared to the costs global competitors face in reaching these destinations. Zambia is regarded as the world's sixth lowest cost cane producer and the Zambia Sugar estate is currently expanding its operations by 85% from 247,000 MT total sugar production to 440,000 MT by 2009.

C. Other Conclusions

330. Several other crosscutting findings also stand out from the analysis.

331. **Regional markets are the most important.** One of the most significant conclusions is that regional markets are often the most important for Zambia, both as a source of competition and likely export destination. Because of Zambia's reliance on imported inputs and physical position as a landlocked country, transport costs mean that commodities with a relatively low value to weight ratio such as maize, soybeans, and cassava are unlikely to compete in the global export market. Closer to home, however, and Zambia does begin to enjoy a competitive advantage. Because Zambian agriculture has not developed to the stage of producing regular surpluses, and because many of its neighbors also produce the same commodities, such advantages are often short-lived, but could perhaps be developed over time particularly with respect to feed ingredients, cassava, and possibly even maize (see box).

332. **High value commodities are likely to do better in global markets.** For the same reason that Zambia does well with import substitution, higher value commodities are the most likely to cover transport costs and succeed in global export markets. This certainly applies to products like cotton and refined sugar, where Zambia's growing conditions provide another important advantage in terms of the ability to supply the world market at a competitive price. Other commodities like coffee, paprika, tobacco, and export horticulture (consisting of cut flowers and fresh vegetables) are also important high value products for Zambia that enjoy a competitive place in the global market. The possibility of expanding counter-seasonal fresh fruit production to supply markets in South Africa is another area of high value agriculture that Zambia may want to explore.

Box 3: Regional markets for stock feed.

One interesting regional development over the past year was the announcement by the Botswana Meat Commission of a 40% price increase to Botswana cattle farmers (essentially bringing the price paid by the BMC in line with Botswana's own export parity). At previous prices, feedlotting in Botswana was not viable, but this is now expected to change. Naturally, most of Botswana's feed ingredients will come from South Africa, but this new market can also be viewed as a possible opportunity for Zambia, particularly to the extent favorable prices might be available on backload freight. This possibility would certainly be interesting to look at in more detail as part of a future regional market study (related to CCAA or otherwise) and is an example of the type of regional opportunities Zambia needs to explore. Unlike Zambia, Botswana enjoys EU access for its beef products.

333. **Look north for opportunities.** Although trade with the Democratic Republic of Congo is complicated by border inefficiencies and lack of security for financial transactions, this market undoubtedly offers Zambia the best potential for rapid agriculture export development. Bulk food commodities like cassava, beef, maize, and rice are all in great demand in the DRC and typically trade for about 20-30% more compared with Zambia's own domestic prices.[77] Beef is of special interest to Zambia because the DRC is one of the few markets where veterinary and food safety standards do not prevent trade. Katanga Province is also the one geographic area where Zambia enjoys a transport advantage over all other competitors worldwide and is the natural place for Zambia to look for export opportunities. Before this potential can be realized, very serious problems relating to basic physical security, transparency and rule of law at the border, freedom from extortion at roadblocks, and even the risk of non-payment by importers all need to be addressed. This will likely require concerted effort by government, donors, and private investors alike.

334. **Customs policy is generally favorable to agriculture.** Import duties on most agriculture inputs are low and do not attract VAT. The major exceptions are insecticides (15% duty), spraying equipment (5% duty and 17.5% VAT) and, until recently, irrigation equipment (15% duty and 17.5% VAT). If a farmer is VAT registered they can reclaim VAT or apply for a deferment. Even in these cases, however, the VAT still gets passed on in the supply chain to the next level consumer. For other inputs like fertilizer and herbicides, the current tax regime (0% duty, 0% VAT) is an important advantage to agriculture competitiveness for which government should be commended.

335. **Farmers account for a large part of total agriculture value.** Although this point may seem obvious, it is perhaps worth emphasizing that primary producers account for (and receive) the greatest share of total value (by far) in each commodity chain. Often the discussion of Zambian agriculture becomes sidetracked by allegations of "unfair" trading practices by bulking agents or processors who are said to capture a disproportionate share total value added. Although it is certainly true that FAM farmers in particular face a difficult (and largely uncompetitive) trading environment at the farm gate, primary producers without doubt account for the greatest share of agriculture value added. A greater understanding between value chain participants of how the decisions at one level affect total competitiveness could therefore go a long way to improving overall sector performance. Apart from major outgrower crops like cotton, for example, farmers, assemblers, and processors largely operate in isolation (or even in competition) with each other rather than toward the same common goal of improving Zambia's agriculture competitiveness.

[77] FEWS NET, 2006.

D. Areas for Further Analysis

336. Although comprehensive in scope and detail, the CCAA value chain analysis for Zambia is constrained by many factors well beyond the data limitations that were described for some commodities. Indeed, upon reflection the data limitations were only serious to the point of looking even more specifically at the development opportunities in certain crop sectors. For the purpose of providing an overview of Zambia's main development opportunities, trade-offs between investment options, and constraints, the type of detail provided here is probably more than sufficient. The analysis has revealed several areas where renewed competitiveness might be possible and further analysis can always be carried out for Zambia (and other CCAA countries) using the analytical spreadsheet models developed for this study. While the available data didn't provide all the information needed to assess processing opportunities for cassava or feedlot costs for beef, for example, the analysis does still show whether these sectors are attractive and where certain investments or policy changes could help improve competitiveness.

337. Beyond the quantitative and qualitative features covered here, a great many other areas that were not even touched on also need to be considered in developing new strategies for agriculture. The problem of HIV/AIDS, for example is serious constraint to agriculture both at the household level and for commercial farmers through reduced productivity and loss of skilled workers.[78] Limited skills in the workforce, poor condition of rural feeder roads, and absence of landline phone networks in most parts of the country together with a myriad of other social and other human development factors, all complicate Zambia's opportunities for competitive agriculture development and need to be accounted for as part of any policy recommendation or investment strategy.

338. In terms the narrowly defined CCAA analysis, the next steps in identifying competitive growth options is to compare the measurements of total SV and other value chain and financial indicators with the data from other study countries. At what stage of the value chain is Zambia most and least competitive? Compared with recognized global leaders, are Zambia's costs at the factory, assembly point, and farm gate higher or lower than the world standards? Only by looking at the Zambia data in the context of the larger CCAA results can the full methodology be put to use through international comparison. A greater consideration of regional parity prices should probably also be included as part of this next stage analysis for the reasons described above.

339. Despite current limitations, it is hoped that the analysis at least helps to show how production decisions at one stage of the value chain affect other participants and shape Zambia's final ability to compete in the global, regional, and domestic marketplace. In the absence of a well defined methodology for assessing these processes, sector planning can easily become an exercise in guesswork based on presuppositions about which crops and trading arrangements are best. The approach followed here cannot point to all the issues that need to be considered in developing new strategies for agriculture, but does help to identify some of the major trade-offs between important investment decisions sector participants should be aware of and discuss.

[78] In the very labor intensive horticulture export sector, the Zambia Export Growers Association has been working with its members to establish a workplace care program that addresses this issue specifically to reduce the cost of worker absenteeism as a matter of export competitiveness.

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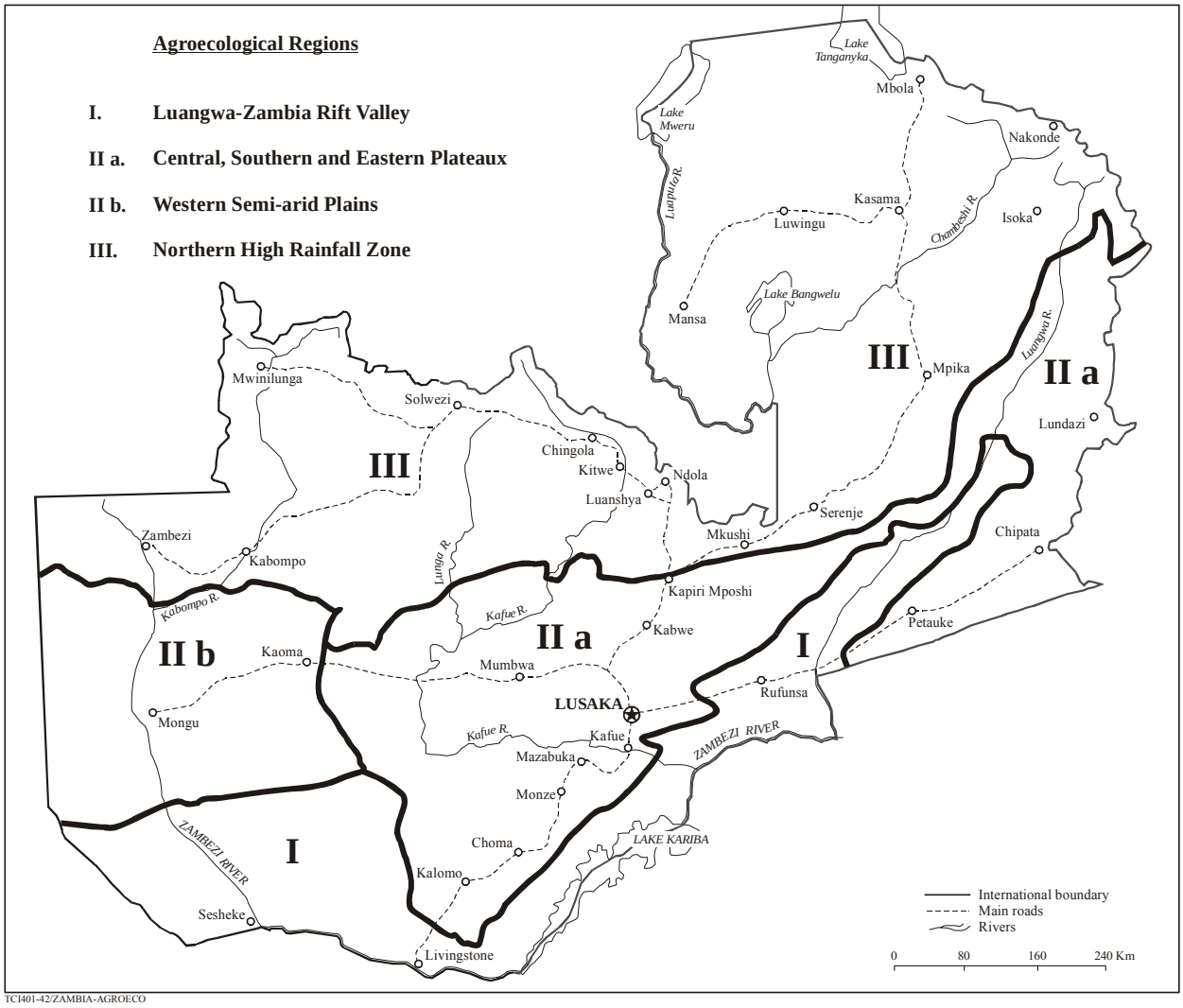
MAP 1: Republic of Zambia, Major Geographic Features

MAP 2: Agri-Ecological Zones in Zambia



Source: FAO (2005).

Area (ha) under Cultivation for Selected Major Crops, 1989/90 - 2003/04

	1989/90	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04	% Change 1989/90-1993/94	% Change 1989/90-1998/99	% Change 1998/99-2003/04
Cotton	64,036	74,020	59,614	76,492	50,067	35,200	66,217	89,879	80,254	70,629	36,947	56,939	87,026	86,431	121,593	-22	10	72
Maize	763,258	639,390	661,305	623,340	679,914	520,165	675,565	649,069	510,374	598,181	605,648	583,850	696,619	699,276	631,080	-11	-22	5
Rice (paddy)	9,627	13,450	14,369	13,802	7,177	9,746	9,888	12,412	9,065	13,346	10,532	14,321	13,050	10,305	12,379	-25	39	-7
Soybean	29,815	29,200	22,786	19,864	25,447	21,612	25,489	17,273	11,681	11,716	11,721	16,754	17,963	17,402	33,186	-15	-61	183
Sorghum	48,466	31,790	40,323	46,563	55,245	40,365	47,839	40,237	35,864	36,405	37,388	43,354	33,955	37,054	45,350	14	-25	25
Millet	58,869	45,270	66,598	52,654	82,302	73,809	76,930	78,639	90,047	77,292	61,277	69,738	61,347	56,751	59,081	40	31	-24
Groundnuts	80,443	80,470	68,724	71,415	105,737	100,431	89,488	126,573	154,682	119,945	69,532	137,108	139,562	150,460	116,978	31	49	-2
Mixed beans	26,436	28,940	38,508	38,489	48,599	41,462	43,240	41,541	35,379	30,780	39,853	51,025	40,043	44,002	45,270	84	16	47
Sunflower seed	44,289	36,490	32,302	39,450	31,079	32,433	47,621	20,745	15,692	14,280	12,983	37,666	22,600	22,521	30,689	-30	-68	115
Wheat	11,595	11,849	10,964	13,656	11,566	7,806	10,327	10,693	11,251	12,682	14,113	14,380	22,600	26,277	13,543	0	9	7
Burley tobacco	1,483	1,898	2,313	9,388	4,450	1,720	2,059	2,762	3,464	3,157	3,337	4,247	3,855	3,944	8,052	200	113	155
Virginia tobacco	3,588	1,262	2,951	3,558	1,900	1,353	1,594	3,497	5,400	4,730	4,060	3,715	3,010	3,040	5,464	-47	13	35
Total	**1,141,905**	**994,029**	**1,020,757**	**1,008,671**	**1,103,483**	**886,102**	**1,096,257**	**1,093,320**	**963,153**	**993,143**	**907,391**	**1,033,097**	**1,141,630**	**1,157,463**	**1,122,665**			

Production (MT) of Selected Major Crops, 1989/90 - 2003/04

	1989/90	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04
Cotton	36,536	48,721	25,899	47,851	33,093	16,578	40,824	75,412	66,897	58,381	58,276	49,282	65,979	64,659	144,307
Maize	1,119,670	1,095,908	483,492	633,326	679,356	520,165	675,565	649,039	510,372	818,149	1,052,806	801,877	839,783	1,207,202	1,213,601
Rice (paddy)	9,293	14,186	9,325	15,742	13,993	6,358	12,110	13,296	6,399	14,700	8,835	12,387	5,303	10,744	11,699
Soybean	26,791	25,676	8,800	26,001	24,630	21,129	40,050	29,292	12,376	26,704	27,508	28,311	35,215	42,120	54,687
Sorghum	19,591	20,939	13,007	35,448	35,068	26,523	35,640	30,756	25,399	13,914	26,898	30,245	16,801	20,301	24,467
Millet	31,531	25,573	48,029	37,394	62,644	54,501	54,858	61,129	62,236	60,413	42,863	49,606	37,615	35,331	39,784
Groundnuts	29,450	19,161	19,833	20,504	34,301	34,732	36,119	34,755	45,859	56,934	57,246	53,251	76,194	82,550	69,696
Mixed beans	14,312	14,123	20,401	23,534	23,180	23,751	23,838	13,728	13,905	13,914	16,492	21,349	16,619	24,097	18,161
Sunflower seed	29,450	16,361	10,645	1,493	15,479	9,821	13,649	26,178	74,332	5,708	7,064	19,176	7,588	4,860	13,857
Wheat	53,601	58,732	54,490	69,286	60,944	38,019	36,019	57,595	70,810	89,743	90,000	82,264	74,527	84,000	82,858
Burley tobacco	1,550	1,300	1,050	2,514	1,083	1,560	1,892	2,360	2,827	3,762	3,350	4,196	4,930	12,465	20,000
Virginia tobacco	3,489	2,655	1,258	4,138	5,015	2,240	1,950	4,399	6,848	4,838	6,183	7,420	7,941	8,462	16,000
Total	**1,375,266**	**1,343,334**	**696,229**	**917,231**	**988,786**	**755,378**	**972,515**	**997,938**	**898,260**	**1,167,160**	**1,397,521**	**1,159,364**	**1,188,495**	**1,596,791**	**1,709,117**

Source: CSO

Yields (MT) of Selected Major Crops, 1989/90 - 2003/04

	1989/90	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04
Cotton	0.6	0.7	0.4	0.6	0.7	0.5	0.6	0.8	0.8	0.8	1.6	0.9	0.8	0.7	1.2
Maize	1.5	1.7	0.7	1.0	1.0	1.0	1.0	1.0	1.0	1.4	1.7	1.4	1.2	1.7	1.9
Rice (paddy)	1.0	1.1	0.6	1.1	1.9	0.7	1.2	1.1	0.7	1.1	0.8	0.9	0.4	1.0	0.9
Soybean	0.9	0.9	0.4	1.3	1.0	1.0	1.6	1.7	1.1	2.3	2.3	1.7	2.0	2.4	1.6
Sorghum	0.4	0.7	0.3	0.8	0.6	0.7	0.7	0.8	0.7	0.4	0.7	0.7	0.5	0.5	0.5
Millet	0.5	0.6	0.7	0.7	0.8	0.7	0.7	0.8	0.7	0.8	0.7	0.7	0.6	0.6	0.7
Groundnuts	0.4	0.2	0.3	0.3	0.3	0.3	0.4	0.3	0.3	0.5	0.8	0.4	0.5	0.5	0.6
Mixed beans	0.5	0.5	0.5	0.6	0.5	0.6	0.6	0.3	0.4	0.5	0.4	0.4	0.4	0.5	0.4
Sunflower seed	0.7	0.4	0.3	0.0	0.5	0.3	0.3	1.3	4.7	0.4	0.5	0.5	0.3	0.2	0.5
Wheat	4.6	5.0	5.0	5.1	5.3	4.9	3.5	5.4	6.3	7.1	6.4	5.7	3.3	3.2	6.1
Burley tobacco	1.0	0.7	0.5	0.3	0.2	0.9	0.9	0.9	0.8	1.2	1.0	1.0	1.3	3.2	2.5
Virginia tobacco	1.0	2.1	0.4	1.2	2.6	1.7	1.2	1.3	1.3	1.0	1.5	2.0	2.6	2.8	2.9

Source: CSO

Appendix 3

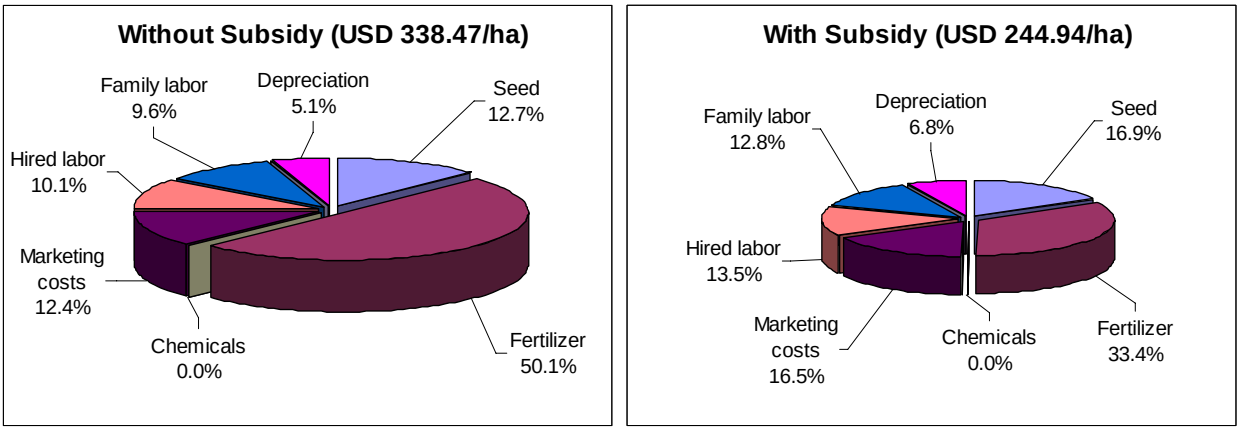
SENSITIVITY RESULTS

1. In response to reader comments, two sensitivity tests that were incremental to the main analysis were carried out. The first test looked at the effects of FAM sector fertilizer subsidy on the profitability of maize and the second test looked at the effects of increased yield assumptions on the final calculations of SV as a potential leverage point for enhanced competitiveness. The results for both sets of sensitivity tests are summarized below; the full spreadsheet models are presented in the quantitative annexes.

2. **Smallholder fertilizer subsidy.** Although it is government's policy to provide all smallholder farmers who belong to a legally registered co-op a 50% fertilizer subsidy, not all farmers have been able to access these low prices. According to MSU/FSRP, this is particularly true outside of Southern Province where the subsidy program has mainly concentrated. Because fertilizer accounts for around half of total costs for FAM maize at commercial prices, a sensitivity test using subsidized prices was carried out to understand some of the effects of this policy from a value chain perspective.

3. Tthe pie charts below look at the structure of a family farmer's costs with and without access to subsidized fertilizer. As shown, the subsidy provide a total estimated savings of USD 93.53/ha (ZMK 374,120), equal to about 28% of total costs without subsidy. These figures are based on financial prices only and do not show the additional cost to the Zambian economy of administering the subsidy program.

FAM Maize Sensitivity to Elimination of Fertilizer Subsidy: In-field Cost Structure



4. Next, the tables below compare the farmer's estimated financial costs and profits with and without subsidized fertilizer. As shown, total revenue remains the same, but variable costs are ZMK 375,200/ha (USD 93.80) lower with the subsidy. In per ton terms, the data show that it costs the farmer ZMK 136,436 (USD 34.11) less to grow maize with the subsidy, but again, this is purely a financial figure and does not show anything about the true cost of growing to the Zambian economy. Indeed, since Zambia still has to import the fertilizer at commercial prices, the economic cost of growing subsidized maize includes all commercial values plus the cost of administering the subsidy program and any resulting inefficiencies (including fewer investments in much-needed fertilizer distribution systems by private entrepreneurs).

FAM Maize Sensitivity to Elimination of Fertilizer Subsidy: Financial Indicators

FARM PRODUCTION Maize - FAM (with subsidy)	Per Hectare		Per Ton	
	ZMK	USD	ZMK	USD
Gross revenue (yield * price)	**1,457,500**	**364.38**	**530,000**	**132.50**
Production costs				
Variable costs	903,100	225.78	328,400	82.10
Investment costs	76,658	19.16	27,876	6.97
Total costs	**979,758**	**244.94**	**356,276**	**89.07**
Farmer income				
Gross margin (revenue - var costs)	**554,400**	**138.60**	**201,600**	**50.40**
Net profit (gross margin - invest costs)	**477,742**	**119.44**	**173,724**	**43.43**

FARM PRODUCTION Maize - FAM (no subsidy)	Per Hectare		Per Ton	
	ZMK	USD	ZMK	USD
Gross revenue (yield * price)	**1,457,500**	**364.38**	**530,000**	**132.50**
Production costs				
Variable costs	1,278,300	319.58	464,836	116.21
Investment costs	76,658	19.16	27,876	6.97
Total costs	**1,354,958**	**338.74**	**492,712**	**123.18**
Farmer income				
Gross margin (revenue - var costs)	**179,200**	**44.80**	**65,164**	**16.29**
Net profit (gross margin - invest costs)	**102,542**	**25.64**	**37,288**	**9.32**

5. **Sensitivity to yield.** To help identify areas for strategic intervention a sensitivity analysis of the effects of yield improvement on accumulated SV at the final stage of international competition was carried out. At the request of CCAA team leaders, hree standard levels of variation were considered including a 10%, 25%, and 50% yield improvement from the assumed base levels for each commodity and farm sector. Bagging and labor costs for harvesting were adjusted, but all other variable and fixed costs were held constant. This simplifying assumption is important because farmers may not actually be able to achieve the new yield results without using additional fertilizer, agri-chemicals, or irrigation, which all have extra costs.

6. Bearing this limitation in mind, the approach taken was to compare per hectare and per ton costs and profits for each commodity at the three levels of yield improvement. This helps to show how the yield improvement benefits the farmer in financial terms and identifies the per ton cost savings that can be carried forward in the accumulated SV to the final stage of international competition. For these final competitiveness comparisons, the best available parity price is compared with the accumulated SV at the base scenario and with the cost savings at each level of yield improvement subtracted from this figure.

7. For example, in the case of FAM cassava, the financial calculations show that a 50% yield improvement results in a per ton savings of USD 3.93 (ZMK 15,720) in total production costs. When this amount is subtracted from the original estimate of total SV at the assembly level (USD 95.22 or ZMK 380,880 per ton), the new SV after the yield improvement works out to USD 91.29 (ZMK 365.160). This new value can then be compared to the estimated parity price to determine if Zambia would enjoy a competitive advantage at the new yield level.

8. These results are summarized in the tables that follow and show that even a 50% yield improvement is unlikely to change the overall competitiveness scenario for most commodities. Although the gap between domestic SV and the international parity price does become narrower (and sometimes significantly narrower) with better yields, there are only a few cases (ECF and LCF cattle and FAM and ECF rice) where yield improvements alone are sufficient to provide Zambia a competitive advantage without changes in other areas. As discussed in the main report, savings on transport costs are likely to be a more effective intervention point, both in terms of investments that reduce current costs for long-distance routes and through development of regional markets where transport will always account for a smaller share of final SV and inherently provide an element of competitive advantage.

SUMMARY OF YIELD SENSITIVITY RESULTS (Change in Profits and Costs in USD from Base Scenario)

At per ha level, change in total costs accounted for by grain bags and additional labor only.
For per ton indicators, total cost savings = inverse of change in net profit.

	Per Ha		Per MT	
	Gross Profit	Total Cost	Gross Profit	Total Cost
Cassava - FAM				
Base +10%	27.67	7.33	0.09	(0.53)
Base + 25%	73.18	14.33	1.00	(1.96)
Base +50%	150.35	24.65	2.33	(3.93)
Cassava - ECF				
Base +10%	35.98	3.39	1.46	(2.11)
Base + 25%	90.58	7.86	3.33	(4.75)
Base +50%	181.16	15.72	5.56	(7.92)
Cassava - LCF				
Base +10%	33.95	26.05	2.61	(3.71)
Base + 25%	93.63	56.38	6.32	(8.75)
Base +50%	187.25	112.75	10.54	(14.59)

	Per Ha		Per MT	
	Gross Profit	Total Cost	Gross Profit	Total Cost
Maize - FAM				
Base +10%	24.79	11.65	3.61	(4.25)
Base + 25%	67.48	23.62	9.55	(10.94)
Base +50%	141.95	40.24	17.61	(19.94)
Maize - ECF				
Base +10%	50.30	18.93	7.26	(8.00)
Base + 25%	130.12	42.95	16.87	(18.51)
Base +50%	270.23	75.90	29.82	(32.55)
Maize - LCF				
Base +10%	99.62	15.38	11.31	(13.61)
Base + 25%	250.56	36.94	25.09	(30.16)
Base +50%	504.14	70.86	42.16	(50.61)

	Per Ha		Per MT	
	Gross Profit	Total Cost	Gross Profit	Total Cost
Sugar - Estate				
Base +10%	352.26	63.34	1.30	(1.57)
Base + 25%	880.66	158.34	2.86	(3.44)
Base +50%	1,761.32	316.68	4.77	(5.74)
Sugar - LCF (high)				
Base +10%	306.83	87.28	0.68	(0.91)
Base + 25%	767.07	218.19	1.49	(1.99)
Base +50%	1,534.13	436.38	2.49	(3.32)
Sugar - LCF (low)				
Base +10%	203.91	74.28	0.77	(1.04)
Base + 25%	509.79	185.69	1.68	(2.29)
Base +50%	960.41	430.54	2.37	(3.39)

	Per Ha		Per MT	
	Gross Profit	Total Cost	Gross Profit	Total Cost
Cattle - FAM				
Base +10%	1.44	0.09	45.16	(56.28)
Base + 25%	3.60	0.21	99.35	(123.81)
Base +50%	7.21	0.43	165.58	(206.35)
Cattle - ECF				
Base +10%	2.27	0.13	53.88	(75.86)
Base + 25%	5.68	0.32	118.54	(166.90)
Base +50%	11.37	0.63	197.56	(278.16)
Cattle - LCF				
Base +10%	2.97	0.13	50.60	(94.88)
Base + 25%	7.43	0.33	111.31	(208.74)
Base +50%	14.86	0.66	185.52	(347.90)

	Per Ha		Per MT	
	Gross Profit	Total Cost	Gross Profit	Total Cost
Rice - FAM				
Base +10%	24.97	5.04	5.11	(6.27)
Base + 25%	66.41	8.59	13.37	(15.93)
Base +50%	133.83	16.18	22.73	(26.99)
Rice - ECF				
Base +10%	33.75	6.26	8.95	(10.40)
Base + 25%	84.36	15.64	19.69	(22.88)
Base +50%	168.73	31.28	32.81	(38.14)
Rice - LCF				
Base +10%	n/a	n/a	n/a	n/a
Base + 25%	n/a	n/a	n/a	n/a
Base +50%	n/a	n/a	n/a	n/a

	Per Ha		Per MT	
	Gross Profit	Total Cost	Gross Profit	Total Cost
Cotton - FAM				
Base +10%	18.90	5.10	2.49	(4.66)
Base + 25%	48.76	11.24	6.97	(11.76)
Base +50%	96.52	23.48	10.78	(18.77)
Cotton - ECF				
Base +10%	28.84	10.16	7.28	(9.52)
Base + 25%	68.36	29.14	13.72	(18.63)
Base +50%	146.72	48.28	27.99	(36.18)
Cotton - LCF				
Base +10%	63.80	71.20	8.82	(15.59)
Base + 25%	234.34	103.16	39.35	(54.27)
Base +50%	516.34	158.66	76.18	(101.03)

	Per Ha		Per MT	
	Gross Profit	Total Cost	Gross Profit	Total Cost
Soya - FAM				
Base +10%	31.12	5.38	3.29	(4.16)
Base + 25%	77.80	13.45	7.24	(9.16)
Base +50%	140.60	41.90	7.07	(10.26)
Soya - ECF				
Base +10%	39.45	11.80	3.30	(4.46)
Base + 25%	98.62	29.50	7.26	(9.82)
Base +50%	197.25	59.00	12.10	(16.36)
Soya - LCF				
Base +10%	76.36	6.76	11.20	(17.01)
Base + 25%	190.91	16.90	24.63	(37.41)
Base +50%	381.82	33.81	41.06	(62.36)

SUMMARY OF YIELD SENSITIVITY RESULTS (Comparisons of SV)

Best available parity price and base scenario SV are original data at final stage.
Estimated change at alternate yield scenarios calculated from per ton savings at farm level only (all other costs and profits for later stages remain unchanged).
The "competitiveness gap" measures the difference between the best available parity price and estimated SV (a positive number indicates a lack of international competitiveness, the lower the number, the greater the ability to compete).

FAMILIY FARMERS (FAM)

CASSAVA

Final SV measured at: **Assembly**
Best available parity price = **50.00** USD/mt cif northern Europe
Note: Parity price provided by FAO, but should use regional export parity (to Katanga)

		Gap (USD/mt)	Gap as % of base
Final SV in USD/mt using base yield	**95.22**	**45.22**	47.5%
Estimated SV with + 10% yield	94.70	**44.70**	46.9%
Estimated SV with + 25% yield	93.27	**43.27**	45.4%
Estimated SV with + 50% yield	91.29	**41.29**	43.4%

CATTLE

Final SV measured at: **Farm (into feedlot)**
Best available parity price = **870.00** USD/mt equiv at Argentine feedlot
Price provided by FAO, should use regional import or export parity

		Gap (USD/mt)	Gap as % of base
Final SV in USD/mt using base yield	**685.00**	**(185.00)**	-27.0%
Estimated SV with + 10% yield	628.72	**(241.28)**	-35.2%
Estimated SV with + 25% yield	561.19	**(308.81)**	-45.1%
Estimated SV with + 50% yield	478.65	**(391.35)**	-57.1%

COTTON

Final SV measured at: **Processing**
Best available parity price = **978.00** USD/mt lint at gin gate
Price calculated from Cotlook data, but should verify with gin operators

		Gap (USD/mt)	Gap as % of base
Final SV in USD/mt using base yield	**1,047.00**	**69.00**	6.6%
Estimated SV with + 10% yield	1,042.34	**64.34**	6.1%
Estimated SV with + 25% yield	1,035.24	**57.24**	5.5%
Estimated SV with + 50% yield	1,028.23	**50.23**	4.8%

MAIZE

Final SV measured at: **Assembly**
Best available parity price = **338.00** USD/mt cif ex Randfontein
October 1996 price ex South Africa varies greatly by exact source and season.
FAM final SV (USD 141/mt) in June

		Gap (USD/mt)	Gap as % of base
Final SV in USD/mt using base yield	**141.00**	**(197.00)**	-139.7%
Estimated SV with + 10% yield	136.75	**(201.25)**	-142.7%
Estimated SV with + 25% yield	130.06	**(207.94)**	-147.5%
Estimated SV with + 50% yield	121.06	**(216.94)**	-153.9%

EMERGING COMMERCIAL (ECF)

CASSAVA

Final SV measured at: **Assembly**
Best available parity price = **50.00** USD/mt cif northern Europe
Note: Parity price provided by FAO, but should use regional export parity (to Katanga)

		Gap (USD/mt)	Gap as % of base
Final SV in USD/mt using base yield	**95.00**	**45.00**	47.4%
Estimated SV with + 10% yield	92.89	**42.89**	45.1%
Estimated SV with + 25% yield	90.25	**40.25**	42.4%
Estimated SV with + 50% yield	87.08	**37.08**	39.0%

CATTLE

Final SV measured at: **Farm (into feedlot)**
Best available parity price = **870.00** USD/mt equiv at Argentine feedlot
Price provided by FAO, should use regional import or export parity

		Gap (USD/mt)	Gap as % of base
Final SV in USD/mt using base yield	**900.00**	**30.00**	3.3%
Estimated SV with + 10% yield	824.14	**(45.86)**	-5.1%
Estimated SV with + 25% yield	733.10	**(136.90)**	-15.2%
Estimated SV with + 50% yield	621.84	**(248.16)**	-27.6%

COTTON

Final SV measured at: **Processing**
Best available parity price = **978.00** USD/mt lint at gin gate
Price calculated from Cotlook data, but should verify with gin operators

		Gap (USD/mt)	Gap as % of base
Final SV in USD/mt using base yield	**1,047.00**	**69.00**	6.6%
Estimated SV with + 10% yield	1,037.48	**59.48**	5.7%
Estimated SV with + 25% yield	1,028.37	**50.37**	4.8%
Estimated SV with + 50% yield	1,010.82	**32.82**	3.1%

MAIZE

Final SV measured at: **Assembly**
Best available parity price = **338.00** USD/mt cif ex Randfontein
October 1996 price ex South Africa varies greatly by exact source and season.
ECF final SV (USD 218/mt) in Dec

		Gap (USD/mt)	Gap as % of base
Final SV in USD/mt using base yield	**218.00**	**(120.00)**	-55.0%
Estimated SV with + 10% yield	210.00	**(128.00)**	-58.7%
Estimated SV with + 25% yield	199.49	**(138.51)**	-63.5%
Estimated SV with + 50% yield	185.45	**(152.55)**	-70.0%

LARGE COMMERCIAL (LCF)

CASSAVA

Final SV measured at: **Assembly**
Best available parity price = **50.00** USD/mt cif northern Europe
Note: Parity price provided by FAO, but should use regional export parity (to Katanga)

		Gap (USD/mt)	Gap as % of base
Final SV in USD/mt using base yield	**97.00**	**47.00**	48.5%
Estimated SV with + 10% yield	93.29	**43.29**	44.6%
Estimated SV with + 25% yield	88.25	**38.25**	39.4%
Estimated SV with + 50% yield	82.41	**32.41**	33.4%

CATTLE

Final SV measured at: **Farm (into feedlot)**
Best available parity price = **870.00** USD/mt equiv at Argentine feedlot
Price provided by FAO, should use regional import or export parity

		Gap (USD/mt)	Gap as % of base
Final SV in USD/mt using base yield	**1,097.00**	**227.00**	20.7%
Estimated SV with + 10% yield	1,002.12	**132.12**	12.0%
Estimated SV with + 25% yield	888.26	**18.26**	1.7%
Estimated SV with + 50% yield	749.10	**(120.90)**	-11.0%

COTTON

Final SV measured at: **Processing**
Best available parity price = **1,303.00** USD/mt lint at gin gate
Price calculated from Cotlook data, but should verify with gin operators

		Gap (USD/mt)	Gap as % of base
Final SV in USD/mt using base yield	**1,433.00**	**130.00**	9.1%
Estimated SV with + 10% yield	1,417.41	**114.41**	8.0%
Estimated SV with + 25% yield	1,378.73	**75.73**	5.3%
Estimated SV with + 50% yield	1,331.97	**28.97**	2.0%

MAIZE

Final SV measured at: **Assembly**
Best available parity price = **338.00** USD/mt cif ex Randfontein
October 1996 price ex South Africa varies greatly by exact source and season.
LCF final SV (USD 230/mt) in Dec

		Gap (USD/mt)	Gap as % of base
Final SV in USD/mt using base yield	**230.00**	**(108.00)**	-47.0%
Estimated SV with + 10% yield	216.39	**(121.61)**	-52.9%
Estimated SV with + 25% yield	199.84	**(138.16)**	-60.1%
Estimated SV with + 50% yield	179.39	**(158.61)**	-69.0%

FAMILIY FARMERS (FAM)

RICE

Final SV measured at: **Logistics (cif Lusaka)**
Best available parity price = **460.00** USD/mt cif Lusaka (ex Thailand)

		Gap (USD/mt)	Gap as % of base
Final SV in USD/mt using base yield	**478.00**	**18.00**	3.8%
Estimated SV with + 10% yield	471.73	**11.73**	2.5%
Estimated SV with + 25% yield	462.07	**2.07**	0.4%
Estimated SV with + 50% yield	451.01	**(8.99)**	-1.9%

SOYBEANS (import parity)

Final SV measured at: **Assembly**
Best available parity price = **489.00** USD/mt cif Lusaka (ex RSA)
Import parity price ex Randfontein

		Gap (USD/mt)	Gap as % of base
Final SV in USD/mt using base yield	**206.00**	**(283.00)**	-137.4%
Estimated SV with + 10% yield	201.84	**(287.16)**	-139.4%
Estimated SV with + 25% yield	196.84	**(292.16)**	-141.8%
Estimated SV with + 50% yield	195.74	**(293.26)**	-142.4%

SOYBEANS (export parity)

Final SV measured at: **Assembly**
Best available parity price = **215.00** USD/mt fob Lusaka
fob xport parity (calculated from Randfontein price)

		Gap (USD/mt)	Gap as % of base
Final SV in USD/mt using base yield	**206.00**	**(9.00)**	-4.4%
Estimated SV with + 10% yield	201.84	**(13.16)**	-6.4%
Estimated SV with + 25% yield	196.84	**(18.16)**	-8.8%
Estimated SV with + 50% yield	195.74	**(19.26)**	-9.4%

EMERGING COMMERCIAL (ECF)

RICE

Final SV measured at: **Logistics (cif Lusaka)**
Best available parity price = **460.00** USD/mt cif Lusaka (ex Thailand)

		Gap (USD/mt)	Gap as % of base
Final SV in USD/mt using base yield	**496.00**	**36.00**	7.3%
Estimated SV with + 10% yield	485.60	**25.60**	5.2%
Estimated SV with + 25% yield	473.12	**13.12**	2.6%
Estimated SV with + 50% yield	457.86	**(2.14)**	-0.4%

SOYBEANS (import parity)

Final SV measured at: **Assembly**
Best available parity price = **489.00** USD/mt cif Lusaka (ex RSA)
Import parity price ex Randfontein

		Gap (USD/mt)	Gap as % of base
Final SV in USD/mt using base yield	**235.00**	**(254.00)**	-108.1%
Estimated SV with + 10% yield	230.54	**(258.46)**	-110.0%
Estimated SV with + 25% yield	225.18	**(263.82)**	-112.3%
Estimated SV with + 50% yield	218.64	**(270.36)**	-115.0%

SOYBEANS (export parity)

Final SV measured at: **Assembly**
Best available parity price = **215.00** USD/mt fob Lusaka
fob xport parity (calculated from Randfontein price)

		Gap (USD/mt)	Gap as % of base
Final SV in USD/mt using base yield	**235.00**	**20.00**	8.5%
Estimated SV with + 10% yield	230.54	**15.54**	6.6%
Estimated SV with + 25% yield	225.18	**10.18**	4.3%
Estimated SV with + 50% yield	218.64	**3.64**	1.5%

LARGE COMMERCIAL (LCF)

SOYBEANS (import parity)

Final SV measured at: **Assembly**
Best available parity price = **489.00** USD/mt cif Lusaka (ex RSA)
Import parity price ex Randfontein

		Gap (USD/mt)	Gap as % of base
Final SV in USD/mt using base yield	**268.00**	**(221.00)**	-82.5%
Estimated SV with + 10% yield	250.99	**(238.01)**	-88.8%
Estimated SV with + 25% yield	230.59	**(258.41)**	-96.4%
Estimated SV with + 50% yield	205.64	**(283.36)**	-105.7%

SOYBEANS (export parity)

Final SV measured at: **Assembly**
Best available parity price = **215.00** USD/mt fob Lusaka
fob xport parity (calculated from Randfontein price)

		Gap (USD/mt)	Gap as % of base
Final SV in USD/mt using base yield	**268.00**	**53.00**	19.8%
Estimated SV with + 10% yield	250.99	**35.99**	13.4%
Estimated SV with + 25% yield	230.59	**15.59**	5.8%
Estimated SV with + 50% yield	205.64	**(9.36)**	-3.5%

INDEPENDENT LCF (LOW)

SUGAR

Final SV measured at: **Farm (cane at factory)**
Best available parity price = **33.93** USD/mt cane equivalent

		Gap (USD/mt)	Gap as % of base
Final SV in USD/mt using base yield	**19.73**	**(14.20)**	-72.0%
Estimated SV with + 10% yield	18.69	**(15.24)**	-77.3%
Estimated SV with + 25% yield	17.44	**(16.49)**	-83.6%
Estimated SV with + 50% yield	16.34	**(17.59)**	-89.1%

INDEPENDENT LCF (HIGH)

SUGAR

Final SV measured at: **Farm (cane at factory)**
Best available parity price = **33.93** USD/mt cane equivalent

		Gap (USD/mt)	Gap as % of base
Final SV in USD/mt using base yield	**17.90**	**(16.03)**	-89.6%
Estimated SV with + 10% yield	16.99	**(16.94)**	-94.6%
Estimated SV with + 25% yield	15.91	**(18.02)**	-100.7%
Estimated SV with + 50% yield	14.58	**(19.35)**	-108.1%

LARGE ESTATE

SUGAR

Final SV measured at: **Farm (cane at factory)**
Best available parity price = **33.93** USD/mt cane equivalent

		Gap (USD/mt)	Gap as % of base
Final SV in USD/mt using base yield	**22.68**	**(11.25)**	-49.6%
Estimated SV with + 10% yield	21.11	**(12.82)**	-56.5%
Estimated SV with + 25% yield	19.24	**(14.69)**	-64.8%
Estimated SV with + 50% yield	16.94	**(16.99)**	-74.9%