Cassava marketing in Uganda: constraints and opportunities for growth and development

Cassava Marketing in Uganda:
Constraints and Opportunities for Growth and Development

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March 2000

Summary

This report presents research into constraints and opportunities within traditional fresh and dried cassava marketing in Uganda. DFID's Crop Post Harvest Programme, DFID's bi-lateral aid section in Kampala and the East African Research Network funded the research.

Key findings

- Dried cassava flour is an important food staple for particular groups of poor consumers within Kampala. Real cassava flour prices in Kampala are volatile and increasing in the long term, suggesting that food-security among sections of the urban poor may be threatened.

- Improving the flow of market information would increase dried cassava marketing efficiency. This would lead to better spatial integration between urban markets (thereby reducing the absolute levels and volatility of consumer prices, and increasing marketing opportunities for farmers), and to a reduction of transaction costs throughout the marketing chain, particularly to the benefit of farmers.

- Efficiency could also be improved by increasing liquidity within the dried cassava trading chain. Greater capital availability would allow wholesalers and retailers to expand the scale of their businesses and spread their overhead costs over a greater volume of trade. Food retailing in general has poor cost efficiency, and consequently consumer food prices are much higher than is necessary. In the case of cassava flour, retailers add approximately 36% to the price of flour in between buying and selling, yet the greatest part of this margin is accounted for by overhead costs. Retailing is a simple service and should not cost consumers so highly.

- Product quality is not a problem during the dry season, when optimal drying conditions permit sufficient dried cassava production that is of adequate quality and affordable to urban consumers. However, during the wet season, good quality flour becomes expensive, not only because of low levels of inter-seasonal storage but also because farmers are unable to dry cassava roots effectively. Appropriate drying technologies might improve the situation, but they would have to be both non-labour and non-capital intensive to find favour within prevailing farming systems.

- Current market facilities constrain wholesaling efficiency. Competition with alternative land uses limits business expansion, maintains high rents, and creates congestion and pollution.

- There is no evidence that any group within the dried cassava trading chain makes unjustifiably large profits. On the contrary, excessive competition at the retail level appears to squeeze profits to the extent that individual retail outlets operate at an inefficiently small scale.

- Fresh cassava trading is driven by the high perishability of the roots and by the price premia that consumers are willing to pay for freshness.

- Large marketing cost savings could be realised if current methods for reducing the perishability of cassava roots can be adapted to meet the requirements of Uganda's fresh cassava trade.

- Recent cassava breeding research has neglected widespread consumer preferences for medium sized, sweet varieties.

- Transport charges between farms and assembly points are more than ten times more expensive than inter-urban transport charges. Although this finding was made in the context of dried cassava trading, it probably applies to most domestically marketed farm produce, and may indicate the importance of public investment in reducing the costs of community level transport.

- Lending to the food marketing sector is not only constrained by high transaction costs and poor loan security but also by conservative attitudes among potential borrowers.

Recommendations

Many of the constraints that apply to fresh and dried cassava trading are common to other types of food marketing in Uganda. Examining cassava marketing in isolation can therefore lead to less than optimal research impact. The following are suggested as avenues of general food marketing research and technical assistance.

- Formal lending to the food marketing sector: This research should concentrate on finding innovative lending practices that will reduce costs and risks to both lenders and borrowers. Ideally, it should involve traders, commercial lenders, government policy personnel, and legal experts.

- Capturing economies of scale within food wholesaling and retailing: Building on the work into improved lending, this research should be broad-ranging and include investigation into capital, business skill, entrepreneurial, cultural, and infrastructural constraints. An understanding of the relevant constraints will allow policy makers to develop strategies to encourage larger scale wholesaling and retailing.

- Improved market facility planning: If Kampala's urban authority is willing to co-operate, we recommend assistance aimed at improving the planning of Kampala's markets, with the ultimate aim of reducing marketing costs, improving sanitation and reducing congestion in the city centre. The work should engage urban planners and traders in a collaborative approach.

The final two recommendations apply specifically to technical innovation within cassava marketing systems.

- Drying technology: We do not recommend spending research funds on developing ways for drying cassava roots at the farm level. New drying techniques would only find relevance during the three months of the wet season. Furthermore, in order to find favour among farmers, drying innovations would have to satisfy the impossible combination of being non-labour and non-capital intensive. We do however recommend further research on the financial viability of drying innovations at the village assembler level of the marketing chain, where capital constraints are lower. Village assemblers handle greater volumes of chips and may therefore be able to exploit economies of scale in the drying process.

- Fresh cassava storage: We recommend research into the feasibility of adapting CIAT/NRI fresh cassava storage technology for use by Ugandan traders. Costs and benefits to the traders should form the central theme of the research.

1. Introduction

One of the numerous difficulties we encountered during this research was reconciling the diverse objectives of the participating funding agencies and research organisations. DFID, represented both by its Ugandan bilateral aid section and by the Crop Post Harvest Programme, wished to know where to invest future cassava research and technical co-operation funds. By contrast, the International Institute of Tropical Agriculture (IITA) and the East African Research Network (EARNET) wished to use the research as a model for food marketing research throughout the region. Finally, Uganda's national research establishment wished to find markets for the excess cassava production caused as a side effect of the successful dissemination of new disease resistant cassava varieties.

Meeting for the first time as the research team, we reflected that over-production is in reality a short-term imbalance that will be corrected by appropriate farmer supply responses. We therefore preferred to focus the research on ways in which the various cassava commodity systems can contribute to greater growth and development within Uganda. DFID's and IITA's objectives would be served in the process.

Such a large area of research prompted early prioritisation of the work. We decided to split the research into two parts, one that would examine constraints and opportunities within traditional cassava marketing chains, and another that would investigate the potential for increasing the use of cassava based raw materials in Ugandan manufacturing industries.

This report presents findings from our research into traditional cassava marketing.

We opted to focus our efforts on types of cassava trade that enjoy the greatest concentration of marketing services. Inevitably, this meant looking most closely at rural to urban flows. We do not mean to dismiss the importance of rural to rural flows, but merely wish to point out that flows to urban areas are more complicated and dynamic, and therefore provide the opportunity for higher impact innovations.

The choice of which cassava products to research was simple. By far the most valuable trade is in dried cassava and fresh cassava. Our research methodology combined a series of interviews of key marketing chain participants[1] with analysis of secondary information, mostly price and consumption data. The research was conducted intermittently between November 1999 and February 2000.

[1] Fieldwork for this research was conducted in Hoima, Iganga, Kampala, Kamuli, Lira, Masindi, Soroti, Kulu, Jinja, and Kaliro. In total, 16 travelling traders, 31 wholesalers and retailers, and 8 millers were interviewed.

2. The Marketing Environment

This section provides background information on the policy, demographic and economic environments in which cassava trading operates.

Demography
Uganda's current estimated population is 22 million and is growing at approximately 2.5% per annum. 16% of the population currently lives in urban areas. By 2010, this proportion is forecasted to rise to 22%. These figures underline the growing importance that food production and marketing have in feeding Uganda's population.

Consumer Incomes
Over the last ten years, per capita GDP measured in constant prices has risen by an average of 3.2 % per annum, suggesting that food demand has risen not only because of population increases but also through an income effect. Although we could find no information on changes in income distribution, anecdotal evidence suggests that there is a growing middle-class population in major cities such as Kampala. Though currently small, this group will become increasingly important as consumers of higher quality, higher value added food produce.

Government policy
In the first draft of the proposed government "Plan for the Modernisation of Agriculture" (PMA), the authors write: *"Government is committed to ensuring that all commercial activities in agriculture such as production, processing, trading, supply of inputs, exports and imports are carried out entirely by the private sector. The government's role in these sub-sectors will continue to be mainly limited to setting policies, rules and regulations"*. The document also describes current and proposed schemes for improving public and private services to the agri-business sector, including investments in rural transport infrastructure, a rationalisation of rural lending and better contract enforcement legislation. The PMA clearly reflects the government's belief in the private sector's important role in liberalised marketing structures.

Manufacturing industry
In 1997, manufacturing industry contributed 9% to total GDP. Nine years previously it contributed just 5.4%. This small but growing manufacturing base will demand increasingly large quantities of raw materials. Most of this demand is currently satisfied by imports, which by comparison with local supplies, are cheap and reliably available. Nevertheless, the future may hold some promise for locally sourced raw materials, including those derived from cassava.

Financial markets
Farmers and small businesses are poorly served by formal lending institutions. Poor branch coverage in rural areas contributes to high lending costs and poor loan recovery rates. Even for larger businesses, borrowing is not a particularly attractive option. Real rates of interest are as high as 18%, while nominal rates are approximately 17% above the government's base lending rate. Government observers believe that these high rates are the result of inefficiency within the commercial banking sector and the high risk of loan default.

3. Cassava Flour

3.1 Consumption and Prices

Cassava flour is milled from sun-dried pieces of cassava root, usually referred to as chips. While fresh cassava perishes within five days, its flour can be stored for several months. It is usually consumed by mixing it in high proportions with millet flour (a relatively expensive product) to produce a more nutritious and tasty food staple.

Table 1 and 2 give estimates of cassava flour consumption in 1997. The figures were derived from data collected during the 1996/97 Uganda Household Monitoring Survey.

Table 1. Regional Estimates of Cassava Flour Consumption in 1997

	Quantity purchased (tonnes)	Per-capita quantity purchased (kg)	Quantity consumed from own production (tonnes)	Per-capita consumption from own production (kg)
Central Region	14,700	2.55	7,500	1.31
Eastern Region	34,000	6.61	45,900	8.93
Western Region	17,500	3.09	26,900	4.77
Northern region	21,900	5.64	11,200	2.88
TOTAL	**88,100**	**4.31**	**91,500**	**4.48**

Source: Author's estimates using data from 1996/97 Uganda National Household Survey.

Table 2. Rural/Urban Estimates of Cassava Flour Consumption 1997

	Quantity purchased in 1997 (tonnes)	Per-capita quantity purchased in 1997 (kg)	Consumption from own production in 1997 (tonnes)	Per-capita consumption from own production in 1997 (kg)
Rural	75,200	4.38	90,600	5.28
Urban	12,900	3.94	900	0.28

Source: Author's estimates using data from 1996/97 Uganda National Household Survey.

A warning must be attached to these estimates. The Ugandan Household Surveys use a recall period of seven days and interview each household just once. Furthermore, all interviews tend to occur within the same month. Estimating annual figures from such data therefore runs the risk of introducing bias due to seasonal variations in consumption. A second problem occurs because not all the units used in the surveys are standardised. This is more of a problem with fresh cassava data, for which consumption is usually recorded in heaps of unspecified weight. Heap weights vary between both regions and seasons.

However, while the absolute values of estimates should be treated with a degree of caution, their relative sizes should still represent an accurate picture of comparative levels of consumption between regions and between rural and urban areas.

Clearly, consumers in Central Region are on average the least fond of cassava flour, a finding easily explained by the region's traditional preference for matoke (a food staple prepared from bananas). However, urban areas within the region have seen significant immigration from the war-affected Northern Region, where cassava

consumption is more common. Consequently, consumption in Central Region has almost certainly increased over the last decade and may still be rising.

Eastern Region's preference for cassava is evident. While cassava is often seen as a food-security crop in Central and Western Regions, it is an important part of Eastern consumers' regular diet. The same is true of Northern diets, although the Region's figure for "per-capita consumption from own production" gives the impression that this may not be true, particularly in view of cassava's ability to thrive in the generally less fertile soils of the north. An explanation may be the riskiness of producing one's own food in an area where rebel raids on villages often target food. If this explanation is valid, it highlights the important role that food trade has played in maintaining a degree of food security in the Region (note the high level of per capita cassava flour purchases).

Table 2 reveals that per capita consumption of cassava flour is more important in rural than in urban areas, a reflection, no doubt, of the greater choice of foods available in most towns. This does not indicate that cassava flour plays an insignificant role in urban diets. When measured on a calorific basis, it is among the cheapest carbohydrate sources, and therefore helps poor urban residents to eke out their food budgets. As a consequence, wealthier urban consumers often regard cassava flour as a poor person's food, and prefer more expensive staples such as maize flour and rice.

Cassava flour consumers generally prefer a white, non-odorous product that is produced from well-dried cassava pieces. Some preference exists for yellow-brown flour produced from fermented cassava pieces, although both this type of flour and off-white flour milled from mouldy cassava pieces trade at a 20 to 25% discount compared with the white variety.

Figure 1 shows selected real (adjusted for inflation) retail food prices for Kampala between September 1989 and January 2000 (data source: Bureau of Statistics). The middle price series is for cassava flour. Two comparisons are worth drawing with the other series for matoke and millet flour. Firstly, cassava flour prices have been more susceptible to price shocks. The two obvious price spikes, the first in 92/93 and the second in 97/98, were both caused by a combination of the cassava mosaic virus and abnormal weather conditions. The second notable comparison is that while matoke and millet flour prices (and indeed most other major food staple prices) showed no significant real long term trend over the ten year period, cassava flour prices have increased (the trend is statistically significant at the 5% level: $t = 4.48$). A plausible explanation for this positive trend is the effect that refugees from the north have had on food demand in Kampala. As impoverished northerners have arrived in the capital, demand for cassava flour has almost certainly increased. If supply has not kept pace, prices would have inevitably risen.

Whatever the cause of the trend, there must be considerable concern over food-security in Kampala. Given that cassava flour prices are not only increasing in the long term but are also volatile, Kampala's poor consumers are in a particularly vulnerable position.

Figure 1. Real Retail Food Staple Prices (Kampala 9/89 to 1/00). All prices in constant January 2000 Ush/kg

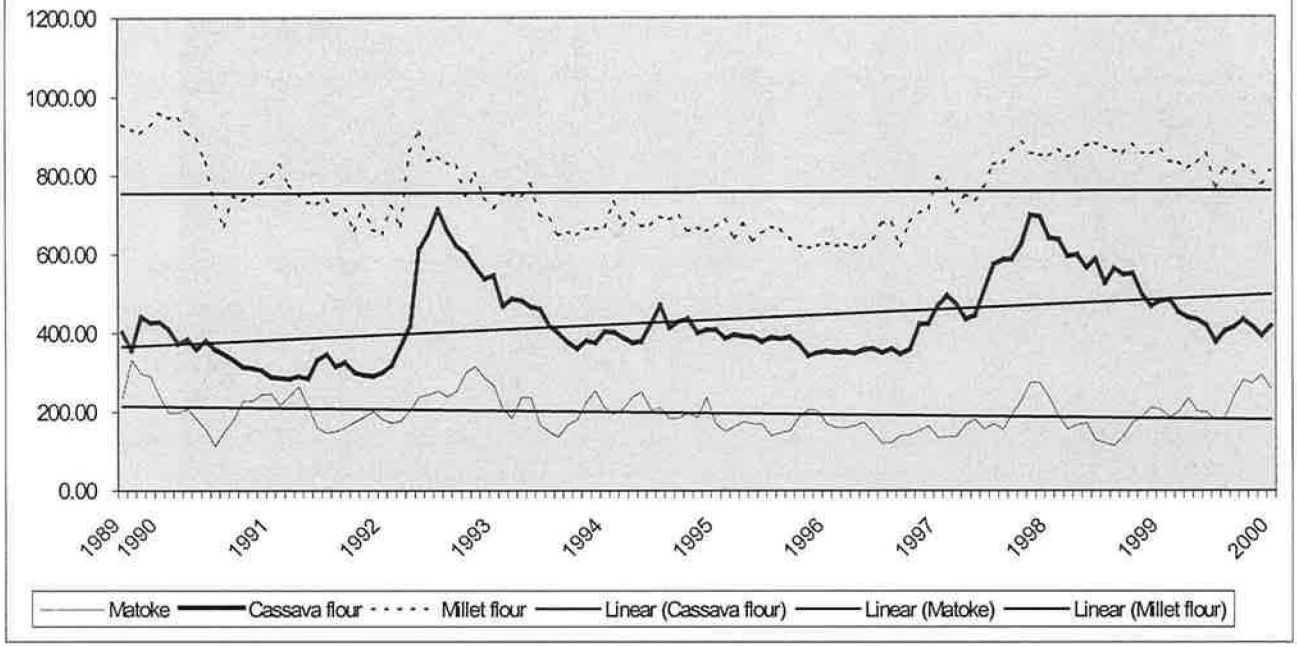


Figure 2. GSI from Kampala Retail Prices

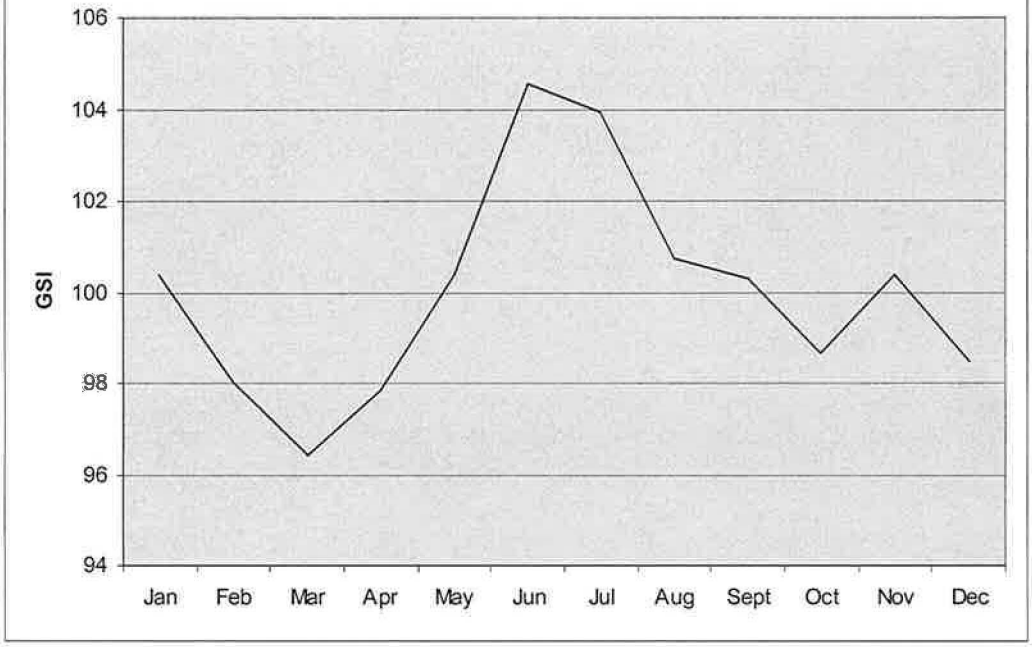


Figure 2 shows seasonal retail price movements for cassava flour in Kampala. The grand seasonal index (GSI) displayed on the graph was computed from data gathered by the Ugandan Bureau of Statistics. GSIs show seasonal patterns that remain once random, cyclical and trend elements have been removed from price series (details of the calculation appear in appendix A). Unfortunately for our purposes, the Bureau of Statistics only collects cassava flour retail price data for Kampala, Mbarara and Gulu. Of these, only Kampala is a major consumer market. The applicability of the results to other parts of Uganda is therefore in question.

The GSI methodology permits statistical testing of the existence of seasonal price movements. In our case, the tests failed to prove that the GSI for cassava flour in Kampala varies significantly from its mean value. However, given that statistical testing is notoriously conservative, and that the pattern in Figure 2 lends itself to plausible explanation, the following observations are worth making:

1. Prices decline between January and March. This periods corresponds with the dry season, when sun-drying conditions are optimal. Volumes of good quality dried cassava chips reaching the market are correspondingly high, leading to decreasing prices.
2. Between March and June, prices rise. Rains in many parts of the country start in March and continue until May/June. Not only is effective sun-drying particularly difficult and labour intensive during this period, but farmers, the principal dryers of cassava, exploit the rains for planting, thereby creating a labour scarcity for non-agricultural activities. The combination of these factors causes a market shortage of good quality cassava flour and drives prices upwards.
3. Prices decline again between June until October. The return of better sun-drying conditions in June co-incides with the major harvest periods for maize and millet. Unlike cassava, which can be harvested throughout the year, maize and millet are seasonal crops, and, in the absence of widespread inter-seasonal storage, their prices during and soon after harvest are considerably lower than at other times of the year. As preferred food staples for many consumers, maize and millet are substituted into diets at the expense of cassava flour.

The issue of substitutability is worth further consideration. As already noted, matoke is the preferred food staple in the Western and Central Regions, whose combined populations constitute well over half of Uganda's total population. Considerable concern exists over declining banana yields caused by soil degradation in these regions. Although evidence from Figure 1 does not support the notion that matoke prices have subsequently increased, there is an expectation that they might in the future. Putting aside the possibility that higher banana prices would trigger greater fertiliser usage (from near-zero current levels), there remains the prospect that cassava flour might substitute matoke in many peoples' diets. However, consumer perceptions usually have very strong momenta, and cassava flour's low status as a food-security staple is therefore unlikely to change quickly. In the near future, any substitution that arises through declining banana yields in Central and Eastern Regions is likely to favour higher status food staples such as sweet potato.

Long term cassava flour consumption trends are difficult to predict. The return of peace and therefore of some degree of prosperity in the north and other war affected parts of the country would no doubt increase demand. Population increases will also

have a positive effect. However, as real consumer incomes rise, expenditure on inferior goods, of which cassava flour is almost certainly one, will decline. The long term future of cassava flour consumption is therefore unclear. In the medium term however, cassava flour will remain an important food staple.

3.2 Description of Trading.

The main dried cassava supply areas to Kampala are Apac in the north, and Kumi, Soroti and Pallisa in the east. Although Hoima in the west supplies lower volumes, quality is generally higher, thereby giving traders who source their cassava from Hoima an instant advantage in price negotiations with their buyers. Other supply areas become important in the wet season. Chips from Paidha in north west Uganda, although too distant from Kampala to be competitive during the dry season, start to arrive during the wet season due to the general scarcity of dried cassava. Imports from the Democratic Republic of Congo and Tanzania also reach the Kampala markets during this period.

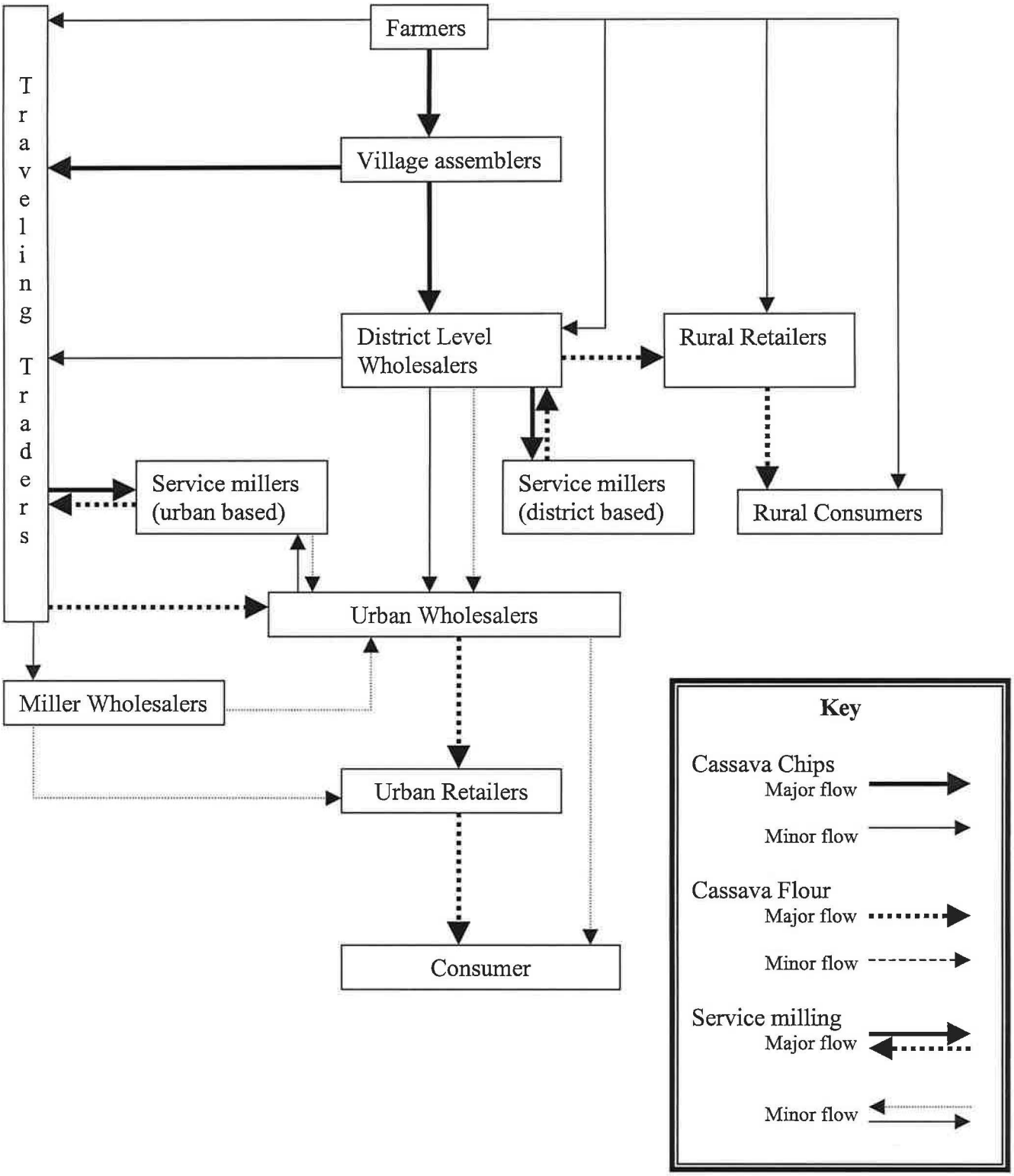
Figure 3 reveals the complexity of dried cassava marketing[2]. The number of links in the chain reflects the many services that are required to deliver cassava flour to consumers. From harvest to purchase at the local store, cassava must be, dried, bulked (in other words, assembled into tradable quantities), transported, stored, milled and finally retailed at convenient locations for consumers. The roles of each marketing chain participant, and a description of their relationships and transactions with other participants is given below.

Farmers
Farmers harvest, peel and dry cassava roots. They have several marketing options. Using their own transport they can sell directly to rural retailers, rural consumers or, if they are near major district level towns, to wholesalers. Alternatively they can sell to travelling traders (who provide links with major consumer markets) or village assemblers. Farmers rarely extend credit to their customers, and will only do so for traders with whom they have built a long-standing trading relationship.

Village assemblers
These individuals typically have access to more capital than their village neighbours. They use these financial resources and their local knowledge to bulk cassava chips from the surrounding area. Customers are willing to pay for this service because they would otherwise have to spend time and money assembling sufficient quantities of cassava chips to justify the cost of transport to the next stage in the marketing chain. The village assemblers also relieve their customers of the burden of quality controlling the small quantities of chips typically offered by farmers. To some extent, the assemblers also sort chips into a high quality white, well dried grade chips and a lower quality discoloured grade, sifting for extraneous matter in the process. Buyers often place orders with trusted village assemblers. Once the required quantities have been gathered, the assemblers contact the buyers, who invariably arrange their own transport. The assemblers often receive cash advances to

[2] The information used to construct the diagram was gathered through fieldwork in 10 districts

Figure 3. The Dried Cassava Trading Chain



fund their activities. Their customers are usually wholesalers from local towns or travelling traders.

District level wholesalers

These traders, who operate in district level towns, serve retailers in their local area and to a limited extent also supply chips and flour to wholesalers in major consumer markets in cities such as Kampala and Jinja. Their primary roles are to arrange the transformation of chips into flour (usually using the services of specialised millers), and to store the flour in volumes sufficient to enable their customers to purchase their requirements in a timely fashion. In a lesser role, district level wholesalers provide another level of bulking between the farmer and the major consumer markets. Speculative storage to benefit from inter-seasonal price movements is rarely practised because of poor liquidity and high riskiness (these constraints are examined in more detail in section 3.5).

Few district level wholesalers are specialised in dried cassava. Typically they deal in at least two other food products, commonly maize and millet. The more progressive wholesalers concentrate on cassava chips and flour in the wet season, when sourcing quality chips is a problem yet profits are highest. The less ambitious traders sell more cassava flour during the dry season, when supplies are abundant.

Few wholesalers secure credit from their sellers, yet many feel compelled to offer credit to their buyers in order to maintain regular custom.

When selling to wholesalers in larger towns, the district level wholesalers rely on customers to arrange collection of the flour. Travelling traders also provide a link between small and large towns.

Travelling traders

These traders supply the majority of cassava flour to large urban consumer markets. They turn over their capital rapidly by minimising the length of time between purchase and sale. By avoiding storage, they both limit the risk that prices will move against them and avoid significant overhead costs. Most commonly, such traders buy from several village assemblers in one trip, and hire vehicles to transport the chips to the urban centres, where they pay for milling and sell flour to wholesalers. Travelling traders tend to specialise in just one food product.

Urban wholesalers

Urban wholesalers share most of the characteristics of their district level counterparts. The major differences are location and scale. The former distinction is obvious, yet it is the urban wholesalers' location within major markets that allow them to operate on a larger scale. Whereas district level wholesalers may trade between five and fifteen 100kg sacks of cassava flour in one week, urban wholesalers commonly sell between fifty and one hundred sacks.

Miller/Wholesalers

A number of specialist businesses in major towns like Jinja, Lira and Kampala combine cassava flour milling with wholesaling. These efficiently run operations purchase either directly from village assemblers via agents or from travelling traders. Their average weekly turnover is usually in the range of 10 to 15 tonnes and milling losses reportedly amount to no more than 2%.

Service millers

Such businesses do not engage in trade but merely provide milling services. In rural areas and the smaller district towns, millers often use small petrol or diesel powered mills, and do not specialise in milling any one commodity. In large towns, millers are often specialised and run electrically powered mills.

Urban Retailers

The majority of food retailing in urban areas is characterised by a large number of small, non-specialised stores, which sell small quantities of numerous products, often trading food alongside manufactured goods such as pens and razor blades.

3.3. Dried Cassava Marketing Efficiency

In a recent concept paper published as part of FAO's "Food into Cities" Collection, Gideon Onumah and Michael Hubbard sensibly point out that:

"[In developing countries,] Food marketing chains to cities do not perform efficiently the basic marketing functions of collection (i.e., bulking of produce from farmers), handling, transporting, storage, processing, wholesaling and retailing. The result is:

- Wider seasonal variation in supplies and prices than is necessary;
- Urban consumers pay relatively more for food while producer prices remain low, thus discouraging farmers from increasing output;
- Health and environmental risks due to food product contamination, traffic and market waste." (Onumah and Hubbard 1999)

To this list, we could usefully add two more points. Firstly, poor marketing efficiency worsens food insecurity in times of food shortage. This is true both in urban and rural areas. Secondly, improved marketing efficiency allows trading networks to extend into remote and therefore marginalised production areas.

Marketing efficiency can be measured in several ways. For the purposes of this report, we have concentrated on the following:

- Spatial Integration. Do prices in different towns move in sympathy with each other? A well integrated national food marketing system leads to efficient distribution which responds to demand. Good spatial integration relies both on good physical communications between markets and good information flows on prices and market conditions

- Information flow. Is sufficient and appropriate market information available to all participants in the marketing chain? Are participants able to make appropriate use of the information?

- Innovation. Do participants innovate in order to minimise costs (including those associated with risk), increase productivity, improve quality and supply new or under-exploited markets?

- Scale of operation. Do participants operate on a scale that allows them to minimise costs? In other words, do farmers, traders and processors exploit economies of scale?

- Competitiveness. Does the appropriate level of competition exist in order to promote cost minimisation and innovation? Too much competition (usually termed "atomistic competition") can be just as inefficient as too little competition.

- Costs and margins. Properly interpreted, costs and margins reveal information on marketing inefficiency, excess profits and constraints within the marketing chain.

This section of the report examines the efficiency of Uganda's dried cassava marketing chain using these indicators as sub-headings.

Spatial Integration

Correlation coefficients provide a simple measure of how two variables move in sympathy with each other. Table 3 provides correlation coefficients for cassava flour prices in nine Ugandan towns[3]. Each town's price movements are compared with movements in the eight other towns (values close to 1 indicate high correlation, while those close to 0 indicate no correlation). Following the somewhat arbitrary conventional practice, coefficients of over 0.8 (bold in Table 3) are regarded as exhibiting high correlation, while coefficients between 0.6 and 0.8 (italics in Table 3) are said to show moderate levels of correlation.

Table 3. Correlation Coefficients for Cassava Flour Prices in Nine Towns

	Kampala	Kumi	Lira	Soroti	Masindi	Kamuli	Jinja	Apach	Luwero
Kampala	1.00	*0.69*	0.57	0.57	0.53	*0.74*	0.58	*0.75*	*0.66*
Kumi		1.00	*0.73*	*0.79*	*0.76*	**0.81**	**0.81**	*0.72*	*0.77*
Lira			1.00	*0.69*	0.48	*0.75*	*0.63*	*0.60*	*0.71*
Soroti				1.00	*0.68*	*0.76*	*0.66*	*0.74*	0.58
Masindi					1.00	0.49	0.56	0.52	0.58
Kamuli						1.00	**0.82**	**0.84**	0.58
Jinja							1.00	0.59	0.59
Apach								1.00	0.52
Luwero									1.00

[3] Although criticism has been levelled at the use of correlation coefficients for measuring the extent to which two markets are integrated, none of the criticism is so serious that careful interpretation is incapable of avoiding the pitfalls (Trotter 1992). The most significant criticism is that a high correlation coefficient may give the impression that two markets are well integrated, when in fact there is no physical flow of produce between them. In this case, the interpretation is that the two markets respond to prices in a third location, usually a major consumer market.

The coefficients were calculated using monthly cassava flour retail prices gathered by IITA and the Ugandan Bureau of Statistics between January 1998 and September 1999. The prices were deflated using the national CPI.

Kampala's correlation coefficients with other towns are disappointingly low. This is probably caused by data deficiencies. During its data gathering exercise, IITA did not collect prices in Kampala. To compensate for this, we included Kampala price data gathered by the Bureau of Statistics (the Bureau has consistently collected cassava flour data in just two towns, Kampala and Mbarara). The methodologies that the two organisations use for gathering price data are quite different and consequently the price series are not directly comparable. Despite this, the Bureau's Kampala prices show moderate correlation with IITA prices in Kumi, Kamuli, Luwero and Apach, towns located in areas that supply large quantities of dried cassava to Kampala.

Kumi is either moderately or highly correlated with all other towns, a finding that underlines Kumi District's importance as a major dried cassava supplier. While its trade in dried cassava may not be physically integrated with trade in all of the other towns, the high degrees of correlation in such cases are probably the result of response to prices in third towns, most likely Kampala and Jinja, which both have large consumer demand.

In summary, although our analysis reveals moderate to strong market integration between many towns, there is clearly room for improvement. Greater integration will help to reduce both the absolute level of consumer prices and their volatility. Farmers would gain through increased marketing opportunities.

Information Flow

Given that there is currently little formal dissemination of market information in Uganda, we were unsurprised to find that farmers and traders receive information either first hand or by talking to other participants in the marketing chain. As expected, those traders who provide links between towns have access to the best information. A worrying consequence of the generally poor flow of information is distrust. Price negotiations, particularly between individuals who have not built long-standing trading relationships, can take up to one hour to conclude. This is almost always because the seller, in the absence of up-to-date information, fears being cheated by the buyer. The consequence is that transaction costs are higher than they need to be. Farmers generally have the poorest access to information.

Innovation

There is very little innovation within the dried cassava marketing chain. Few participants seek technical and market information that would allow them to reduce costs, increase profitability and exploit new market opportunities (such as those potentially offered in neighbouring countries). If entrepreneurship does exist within the chain, it is almost certainly stifled by low levels of liquidity, expensive transport and poor information flows.

Scale of operation

Of the participants interviewed for this research, only the larger wholesalers, travelling traders, and miller/wholesalers could be said to exploit economies of scale. All other groups, particularly farmers and retailers, operate on such a small scale and with such a lack of specialisation, that costs are much higher than necessary. However, scale and specialisation are subject to constraints, of which low liquidity and high risk are the most significant. Low levels of managerial and business skill may also be relevant.

Competitiveness

Too little competition within dried cassava marketing is certainly not a problem; many people compete with each other at every stage of the chain. However, observation during fieldwork suggested that there may be too much competition, particularly at the retail level, where net incomes are so severely squeezed that no funds are available for expanding the scale of business and thereby improving cost efficiency and profitability. More evidence on this is revealed in the next section.

3.4 Costs and Margins

Table 4 gives an example of costs and margins in dried cassava trading between rural and urban areas. It summarises a chain that starts with a farmer selling cassava chips to a village assembler. A travelling trader collects the chips from the assembler, arranges transport to the urban market, contracts a miller to transform the chips into flour, and sells the flour to an urban wholesaler, who stores it for an average of two weeks. Retailers then buy from the wholesaler and sell to the public. While this chain is not the only way dried cassava is traded, it describes what we believe is common practice for rural to urban trade. Variations on this chain still encounter the same costs, although to whom they fall and what margins such people enjoy, depends very much on the exact trading arrangement.

The cost and price information used to construct Table 4 were gathered during fieldwork conducted in February 2000. Consequently, Table 4 provides a snap-shot of trading during the dry season. The situation during the wet season is somewhat different because, as mentioned before, a general scarcity of chips drives prices upwards. Evidence from the GSI calculations suggests that retail prices in Kampala rise by an average of 8.4% between March and June. By contrast, most traders interviewed for this research claimed that prices rise by between ten and fifteen percent. Whichever is correct[4], it appears that prices in the wet season do not rise uniformly throughout the chain. Most traders claim that flour is more profitable per kilogram during the wet season, suggesting that gross margins increase during this high price period.

[4] The difference is probably connected with quality. During the wet season, flour quality generally deteriorates. Consequently the quality of the flour sampled by Bureau of Statistics personnel during the dry season is higher than that of the flour sampled in the wet season. In effect, Bureau staff measure the prices of different grades of product in the two seasons (giving rise to an understated rise in the GSI). By contrast, traders almost certainly measure the rise in prices using consistent grades of flour.

Table 4. Dried Cassava Trading Costs and Margins

	Ush/100kg	% of selling price
Farmer		
Selling price	10000	
Village assembler		
Purchase price	10000	
Selling price	12000	
Gross margin	2000	16.7%
Costs		
Transport	1176	
Net margin	824	6.9%
Travelling trader		
Purchase price*	12245	
Selling price*	20000	
Gross margin	7755	38.8%
Costs		
Miscellaneous labour	700	
Transport	3529	
Milling	1000	
Packaging	500	
District levy ("loading fee")	200	
Market levy	500	
TOTAL COSTS	6429	
Net margin**	1326	6.6%
Urban Wholesaler		
Purchase price*	20000	
Selling price*	22000	
Gross margin	2000	9.1%
Costs		
Overheads	250	
Capital	150	
TOTAL COSTS	400	
Net margin**	1600	8.0%
Urban Retailer		
Purchase price*	22000	
Selling price*	30000	
Gross margin	8000	26.7%
Costs		
Overhead	4875	
Variable	300	
TOTAL COSTS	5175	
Net margin**	2825	9.4%

* Equivalent flour price after adjusting for 2% milling losses

** Before income tax and payment of trading licence

Seasons aside, there are a few points worth making about Table 4. All traders in the chain appear to earn similar net margins. However overall net incomes vary significantly between different types of trader. Travelling traders' and urban wholesalers' turnovers are much higher than those of either village assemblers or retailers. For example, a travelling trader may trade 100 bags a week, needing one trip to source this quantity. His weekly net income would be approximately 130,000 USh. By contrast, a retailer may sell only one bag a week, making less than 3,000 USh. Naturally, the retailer will profit on limited sales of many other items, but the size of the difference in respective net incomes is clear.

Turning the focus to gross margins (the difference between purchase and selling price), travelling traders and retailers appear to benefit the most. However, their high margins are matched by high costs. In the case of the travelling trader, all costs are variable (i.e. they are proportional to the amount of flour traded). While some of the costs appear high, an increase in scale of trade is unlikely to reduce costs per kilogram significantly[5]. By contrast, the largest proportion of retailers' costs are overheads (mostly store rental), with the consequence that an increase in retailers' volume of trade will bring down the retail cost of trading flour. Given that retailers add approximately 36% to the price of flour in between buying and selling it, a reduction in this margin through increased cost efficiency will benefit consumers considerably.

Retailers are of course constrained by lack of capital and probably also by poor business skills and risk averseness. Innovative solutions to these constraints will have to be found if consumers and entrepreneurial retailers are to benefit from retail economies of scale.

Similar arguments can be made for wholesaling, although the scope for exploiting economies of scale is more limited. Larger warehouses would however bring down overhead costs of storage.

In conclusion, the figures in Table 4 reveal a situation where no one is making excessive profits from trading dried cassava but where significant cost efficiencies could be realised.

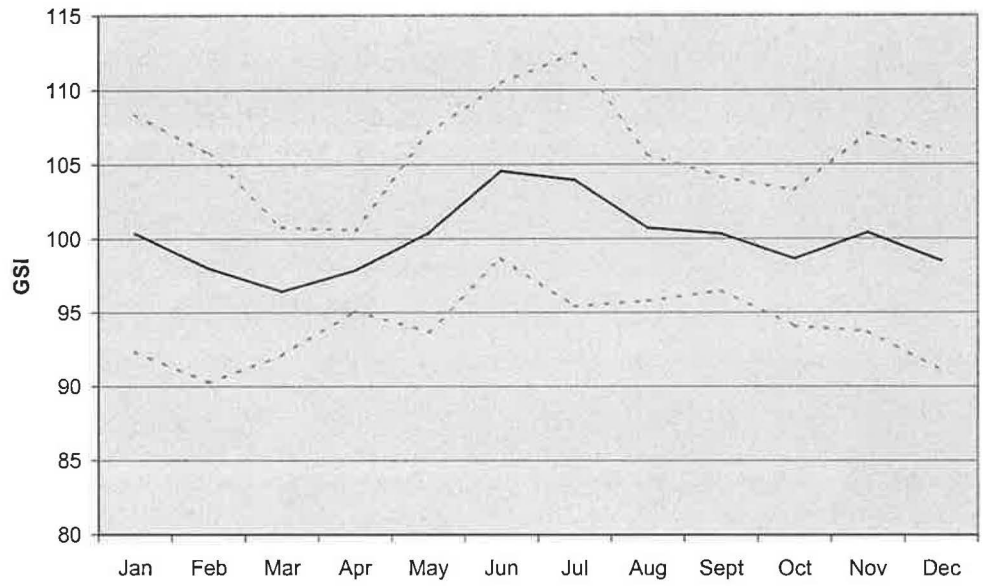
3.5 Inter-Seasonal Storage

During our fieldwork, several wholesalers claimed that they deliberately hold stocks in order to take advantage of inter-seasonal price movements. Others claimed that they would engage in this kind of storage if they had sufficient capital.

Figure 4 is basically the same graph as Figure 2, except that the GSI of Kampala retail prices is joined by 95% confidence intervals (the upper and lower lines). Strictly speaking, the intervals should be interpreted as meaning that we are 95% confident that the actual value of each month's GSI lies between the upper and lower limits set by the interval. Another interpretation is that the intervals, widely spaced as they are, give an indication of the unpredictable nature of seasonal dried cassava prices

[5] Economies of scale could probably be realised through the use of larger capacity vehicles, although the scope for this must surely be limited.

Figure 4. GSI from Kampala Cassava Flour Retail Prices



movements. This uncertainty leads to risk for any trader who is holding speculative stocks.

Setting aside the problems of risk and insufficient capital, on average, would storing between seasons be profitable? The answer, from the ballpark figures that we have gathered, appears to be an emphatic no.

The maximum seasonal price increase according to our GSI calculations is 8.4% for the period between March and June[6]. As indicated in footnote 3, this is probably an understatement of the true seasonal price increase. By contrast to our GSI figure, traders reported seasonal increases in the order of 10 to 15%. Given the unpredictability of seasonal price movements, a 10% rise over three months is probably a reasonably safe figure.

If a wholesaler purchases a 100kg bag of flour for 20,000 USh in March, he could reasonably expect to sell it three months later for 22,000 USh. His costs are related to working capital and physical storage. The real cost of capital in Uganda is estimated at approximately 1.5% per month, which compounded over three months is approximately 4.6%. The cost of tying up the trader's capital for the storage period is therefore 4.6% of 20,000 = 920 USh. The physical cost of storing a bag for three months is approximately another 3,000 USh, making a total carry cost of 3,920 USh. The trader could therefore expect to lose 1,920 USh. In fact, on the basis of these rough figures, the trader would not profit unless the three month price rise reached 20%.

[6] In the absence of a sufficiently long wholesale price series, we have had to make the assumption that retail price movements, as displayed in figure X, mirror wholesale price movements. This is probably a realistic assumption, given that correlation coefficients of retail and wholesale prices in the short period for which we have data, lie between 0.76 and 0.94 for several different locations.

3.6 Market Facilities

A common feature of Ugandan cassava flour wholesale markets is that they are in the centre of towns and often compete for space with other activities such as food retailing. Limited space leads to high rents and few opportunities for individuals to expand their wholesale businesses. Sanitary conditions are far from optimal due to the inadequate provision of public utilities. Furthermore, the regular flow of delivery trucks creates additional congestion and pollution. These conditions apply not only to the cassava flour trade but equally to wholesale markets for all types of domestically produced food crops.

There is a clear need for better planned wholesale markets, placed in areas where conflicting land uses are minimal. The new markets should provide affordable facilities that will optimise the efficiency of food delivery and storage, while maintaining good sanitary conditions and easy access for retailers. The development of such markets can only be achieved by close consultation between urban authorities and traders (Onumah and Hubbard 1999).

3.7 Cassava Flour Quality

As a general rule, poor flour quality is not a problem during the dry season. Sun-drying conditions are optimal for producing a grade of white, dry flour that consumers can afford. Urban manufacturers of pancakes often require a premium grade of flour, which has no discolouration or odour. Such demand is supplied on special order by urban wholesalers, who employ labour to scrub cassava chips and then sun-dry them. The flour milled from these chips commands a premium of up to 100 USh per kg over standard flour, although overall demand is limited.

Flour quality declines significantly during the wet season, which, in combination with a general scarcity of chips of all grades, leads to the higher wet season prices discussed previously in this report. In theory, significant benefits could be derived from a technology that could dry cassava effectively during the wet. Farmers (the principal dryers of cassava) would gain more income, urban consumer prices would be lower in the wet season and national food security would improve. In practice however, an appropriate technology may prove elusive. Drying would have to be non-capital intensive because farmers have little cash, and would also have to be non-labour intensive because farmers are busy in the wet season with other activities, principally planting. These constraints would provide a major challenge to technologists.

An alternative approach may be to encourage drying innovation among village assemblers. Capital is less of a constraint at this level of the trading chain and the higher volumes of chips that assemblers handle would help to bring down drying costs. The profitability of this activity should of course be assessed before any moves towards technology adaptation and promotion are made.

4. Fresh Cassava

4.1 Consumption and Prices

This section of the report concentrates on the flow of fresh cassava between rural supply areas and major consumption markets, principally in Kampala. This flow is particularly dynamic and involves a heavy concentration of marketing services. Rural to rural flows are, by comparison, much more diffuse.

Unfortunately for our purposes, the data source that yielded consumption data for dried cassava can not be used to provide a similar insight to fresh cassava consumption. While the source (the 96/87 Ugandan Household Survey) records fresh cassava purchases and consumption from own production, it uses heaps of unspecified weight as the most common unit of measurement. Heaps vary in size between urban and rural areas, and also according to region and season. We could find no credible conversion factors to transform heaps into weights[7], and therefore are unable to provide fresh cassava consumption figures.

Our fieldwork among fresh cassava traders revealed that urban consumers tend to prefer sweet flavoured, medium sized cassava roots. Many of the new mosaic disease resistant varieties are reportedly unpopular due to their bitter taste. From the traders point of view, roots that perish least quickly are preferable. Several traders expressed preference for roots with an outer bark-like skin that peels away easily to reveal a thick, often reddish, inner skin.

We could find no evidence of retail price seasonality. Figure 5 shows the GSI of fresh cassava retail prices in Kampala. The upper and lower lines give the 95% confidence interval. Under testing, seasonality is rejected for all months. The same result is returned for Jinja, Mbale and Massaka. Supporting evidence for these findings came from interviews with several fresh cassava retailers in Kampala, who note no seasonality in demand from their customers.

By contrast, supply does vary seasonally. Harvesting during the dry season is particularly labour intensive and often results in broken roots. No such problems exist in the wet season, and consequently supply tends to be higher.

Figure 6 shows real fresh prices between September 1989 and January 2000. There is clearly a positive long term price trend (statistically significant at the 5% level: $t = 4.66$). We can not provide a definitive reason for this, although increased demand caused by urbanisation is almost certainly a factor. Perhaps more importantly, anecdotal evidence gathered from traders suggests that reserves of fresh cassava cultivated nearest to Kampala have been over-exploited. Supplies are now

[7] We rejected data from Kayiso (1993) as implausible.

Figure 5. Fresh Cassava Retail Price GSI for Kampala

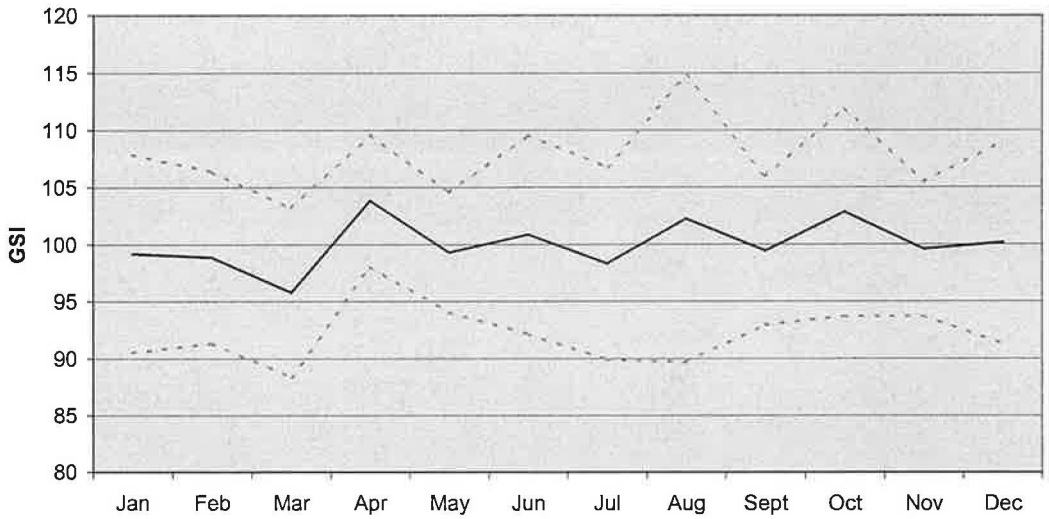
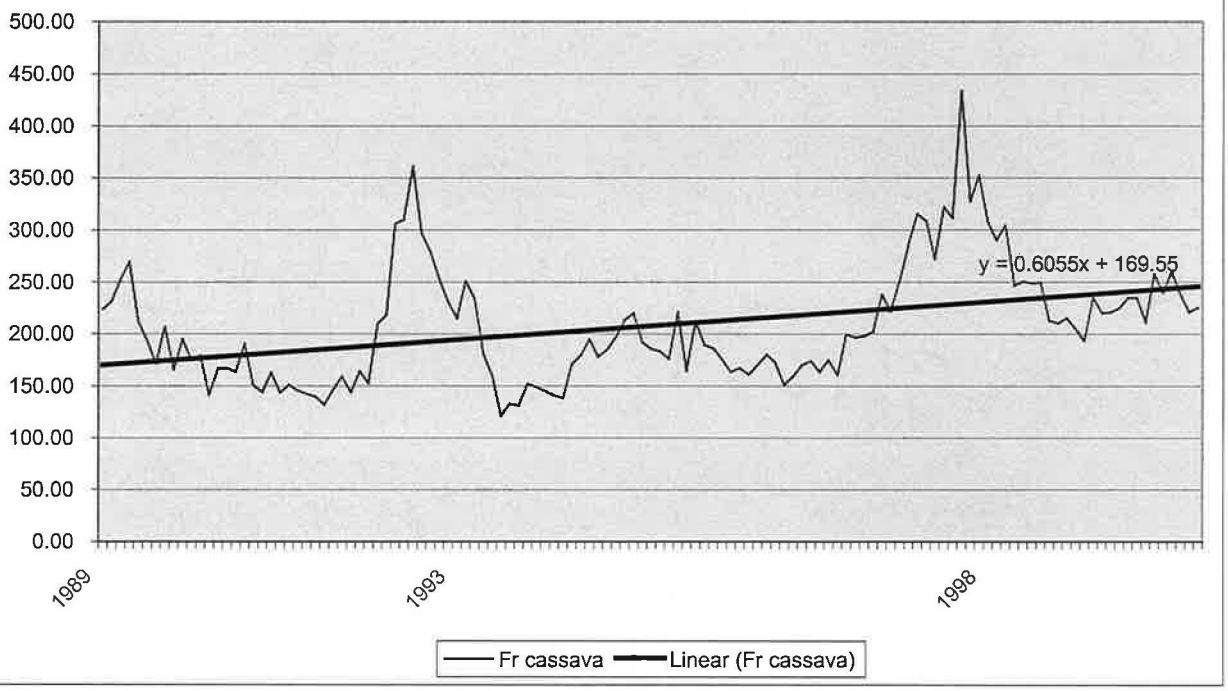


Figure 6. Real Retail Fresh Cassava Prices (Kampala 9/89 to 1/00)



sourced from further afield, thereby adding to transport costs and hence the retail price of fresh cassava.

4.2 Description of Trading

Fresh cassava trading is dynamic and highly streamlined by comparison with dried cassava trading. It is driven by the perishability of cassava roots, which necessitates swift movement from the farm to the consumer, with a minimal number of transactions. Traders are forced to discount their prices heavily if the cassava reaches the market two to three days after harvest. After five days, the roots are unsaleable.

Figure 7 indicates the simplicity of the trading chain. The role of farmers is restricted to growing the cassava and negotiating a price either with travelling traders or their agents. If travelling traders use local agents, they contact them before arriving and give instructions to find suitable supplies of cassava. Local agents merely provide a service and at no point do they take possession of the cassava. Once contacted with news that their agents have complied with their instructions, the travelling traders hire transport, often from Kampala or the other major consumer towns, and travel to the farms. Once there, the traders hire labour to harvest and load the cassava on to the hired truck. Many traders follow traditional practices by negotiating to buy whole gardens before the cassava has been up-rooted. Despite sampling for yield, traders clearly take a considerable risk that the number and size of harvested tubers will be smaller than expected when the original price was struck. More progressive traders have adopted the practice of agreeing a price once the roots have been harvested.

Roots are either loaded loosely onto the trucks, or in some cases, medium sized roots (the most marketable size) are bagged before loading. After payment of a local levy, the traders travel with the cassava to the urban market, usually preferring to travel at night to avoid police road-blocks. Police routinely stop trucks on the reasonable excuse that they are over-loaded. While this is invariably true, payment of a bribe is usually sufficient to convince policemen to allow the truck to pass.

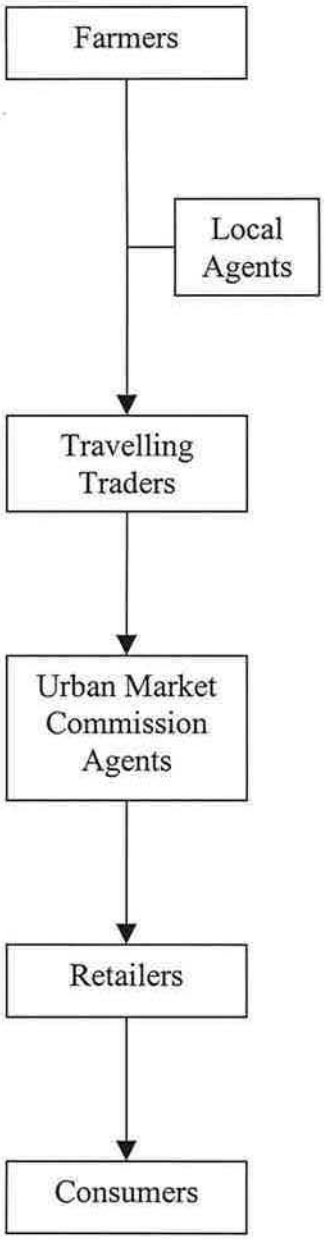
Traders arrive at the Kampala markets as early as 2am, at which time a crowd of retailers has already gathered. (The fact that traders and retailers are willing to keep such inconvenient hours is perhaps an indication of the profitability of fresh cassava trading). Travelling traders usually hand responsibility for selling the cassava to commission agents, who, in return for a fee, use their knowledge of local market conditions to negotiate sales to retailers. The latter sell to the public either within the confines of the market in which the cassava has arrived, or transport the roots to outlets scattered throughout the city.

Fresh cassava prices vary on a daily basis. While demand is usually constant, the arrival of a large number of travelling traders in a particular Kampala market can drive down prices. Conversely, a lower than average number of travelling traders will cause prices to rise. This daily variation creates price risk for traders, who can not predict market prices when they negotiate purchase prices with farmers. Another problem that unpredictable market conditions create for travelling traders is uncertainty over the ability to sell before the cassava spoils. If many traders arrive at a market, several will be obliged to find alternative markets within Kampala. This

increases both the cost of transport and the possibility that the trader will be forced to discount his sales due to root deterioration.

The areas that supply the majority of Kampala's fresh cassava are Hoima in the west, Lira and Apac in the north, and Soroti and Pallisa in the east.

Figure 7. The Fresh Cassava Trading Chain



4.3 Fresh Cassava Marketing Efficiency

Spatial Integration

Table 5 gives correlation coefficients between real fresh cassava retail price series in Kampala, Jinja, Mbale and Masaka. All but two of the coefficients show moderate integration between the towns. However, given the perishability of cassava roots, in reality we would not expect these markets (or any others) to be physically integrated. Instead, the moderate degrees of correlation shown in Table 5 are more likely to indicate that towns experience similar supply and demand patterns.

Table 5. Correlation Coefficients between Real Retail Fresh Cassava Prices in Four Ugandan Towns

	Kampala	Jinja	Mbale	Masaka
Kampala	1	0.78	0.65	0.72
Jinja		1	0.68	0.57
Mbale			1	0.50
Masaka				1

Source: Author's calculations using CPI data

Information Flows

Of all the fresh cassava marketing chain participants, farmers possess the least up-to-date market information. Thus disadvantaged, farmers often prolong price negotiations with traders in an attempt to avoid being cheated.

Travelling traders lack sufficient information on daily market conditions and therefore rely on commission agents to transact deals for them. Given the prevailing volatility of daily prices and the swiftness of the trade, delivering relevant and timely information to traders would be virtually impossible.

Innovation

During our fieldwork, we unearthed evidence that travelling traders who regularly supply Kampala's Kasubi market co-operate to regulate the supply of fresh cassava. This is not to say that they artificially restrict supply[8], but merely agree to space their arrivals in the market evenly throughout the week, thereby avoiding volatile daily prices. The co-operation also extends to the creation of an informal revolving credit fund, which traders contribute to and then utilise on a rotating basis. These examples of innovation within the fresh cassava marketing underline the dynamism of the system. Similar innovation is conspicuous by its absence in the dried cassava marketing chain.

Scale of Operation

As well as being limited by poor liquidity, the scale on which fresh cassava is marketed is also limited by perishability. Traders have a severely restricted period in

[8] If they did, buyers would simply go to other markets within Kampala.

which to assemble fresh cassava and transport it to market before their investment starts to lose value.

Competitiveness

The fresh cassava trade appears to be sufficiently lucrative that it attracts a large number of participants. In fact, it appears to be in a happy state where there is neither too much nor too little competition. More evidence is presented on this in the section below on costs and margins.

4.4 Costs and Margins

Table 6. Costs and Margins within the Fresh Cassava Trading Chain

	USh/Bag	% of selling price
Farmer		
Selling price	6000	
Travelling trader		
Purchase price*	6000	
Selling price*	20000	
Gross margin	14000	70.0%
Costs		
Miscellaneous labour	2500	
Transport	7500	
Packaging material	500	
District levy ("loading fee")	250	
Police roadblocks	300	
Market levy	500	
Commission agent fee	700	
TOTAL COSTS	12250	
Net margin**	1750	8.8%
Urban Retailer		
Purchase price*	20000	
Selling price*	24000	
Gross margin	4000	16.7%

** Before income tax and payment of trading licence

Table 6 was constructed using data collected during fieldwork and assumptions that appear in appendix 2. It is designed to be representative of fresh cassava trading between rural areas and Kampala throughout the year. The only variables that change according to season are the farmgate buying price and the cost of harvesting, both of which are higher in the dry season. We have included average annual values in the table.

Table 6 reveals no evidence that excessive profits are being earned by participants in the trading chain. Although travelling traders enjoy a large gross margin, once their

costs have been deducted, profitability is quite modest. Furthermore, their net returns should be seen in the context of the risk such they take, both in terms of uncertain market prices (which on a daily basis can vary by as much as the trader's net margin) and perishability. On average though, assuming that the traders sell between thirty and sixty bags per week, their net incomes are reasonably high by Ugandan standards.

We did not have an opportunity to measure retailing costs during our fieldwork. However, given the unsophisticated nature of fresh cassava retailing, the single largest costs are likely to be transport from the market to the retail outlet, and the rent on the outlet itself. While this means that net margins are probably relatively large, the very small volumes that retailers sell severely limit overall net income. As with cassava flour retailing, lack of scale appears to be a major cause of inefficiency at the fresh cassava retailing level.

4.5 Market Facilities

The small trucks and pick-ups that bring fresh cassava to Kampala's markets arrive and park in open spaces within the market boundaries. Selling is conducted in a confused and crowded environment. Traders often complain of theft and of being cheated by the commission agents. Conditions at Kasubi market are somewhat better and it has become popular among many travelling traders. It is located on the outskirts of Kampala, and therefore attracts fewer "hangers-on". Theft is reportedly much less common, and long-standing relationships between travelling traders and their commission agents have helped to build an atmosphere of trust. The example of Kasubi points the way for future development of fresh cassava markets.

4.6 Tackling the Perishability Problem

If the perishability of fresh cassava could be reduced, the fresh cassava trading chain could become considerably more efficient. The following would occur:

- The risk of spoilage would be decreased. Traders would be willing to accept lower net margins.
- Transport costs would decrease. Lower perishability would open up the possibility of bulking greater quantities of fresh roots, making possible the use of more cost-effective large scale transport.
- Price discovery would improve. The less frenetic pace at which the trade could be conducted would allow traders to access better price information and possibly avoid having to use commission agents.
- Daily price volatility would decrease. Supply from rural areas would become steadier and there would be a greater degree of integration between markets in nearby towns.
- Cassava farmers in remote areas would gain greater market access, and the burden on increasingly over-exploited production areas nearer to Kampala would be reduced.

In the nineteen eighties, the Centro Internacionale Agricultura Tropicale (CIAT) developed storage technology that increased fresh cassava shelf life from three days to

between two and three weeks. It relies on the selection of good quality roots, which are bagged in polythene as soon after harvest as possible. The high humidity that develops in the bags significantly reduces perishability but also promotes fungal growth. The latter is controlled by dipping the roots in fungicide before bagging. The commercial application of this technology to supply Colombian supermarkets with fresh roots failed. The reasons why are not entirely clear, although high costs of using the technology have been suggested. A more intriguing alternative explanation is that individuals who had vested interests in maintaining the status quo of the fresh cassava trade, applied pressure on the technology adherents to cease their activities.

NRI subsequently adapted the technology for use in Ghana and Tanzania. Storage costs were reduced by avoiding the use of fungicides and by simplifying packaging requirements. Although uptake has been patchy, NRI staff involved in the project have confidence in the technique's efficacy and believe that insufficient resources were spent on promoting it to the intended beneficiaries.

If simple fresh storage techniques prove effective in the Ugandan fresh cassava trading context, then at least some of the efficiencies outlined above could be realised. Ultimately, reducing the cost of fresh cassava marketing would benefit farmers, traders and consumers.

5. Marketing Constraints

While previous sections of this report have identified constraints specific to fresh and dried cassava trading, this section examines a few general constraints that we believe are relevant to the majority of food marketing in Uganda. However, rather than repeat what a growing literature on the subject has already concluded[9], we intend merely to present the new insights that our fieldwork provided.

5.1 Liquidity

As previously noted, liquidity problems limit the scale of individual trading businesses, leading to significant cost inefficiencies at the retail and wholesale levels. Very few traders interviewed during our surveys reported access to formal credit, although most claimed to borrow informally at no rate of interest from friends and family. Even if more formal credit was available, cautiousness among traders might well limit its uptake. Several traders regarded formal loans as risky because they entail regular interest and principal payments. This attitude may reveal that business performance is patchy, leading to periods when formal loans could not be serviced, but may also indicate that periodic demand for money to pay domestic bills would compete with loan repayments.

Ultimately, increasing the amount of capital available to traders can only be achieved through an increase in affordable (low interest rate) lending, which in turn relies upon low transaction costs and good loan security. These ideal conditions for lending to small businesses are far from being achieved in Uganda. One approach is being followed by USAID, which acts as a loan guarantor for traders who borrow from commercial banks. Perhaps a more sustainable solution would be to provide both the encouragement and the correct legal environment for the formation of trader associations. Formal lenders could reduce their transaction costs by lending to the association rather than to a number of small traders. Loan security could be improved if the association possesses physical assets (such as a warehouse) or if association members' stock can be collateralised by holding it in secure warehouses (inventory credit). Both approaches would require tightening of legislation to allow lenders to seize the collateralised assets of defaulting borrowers.

5.2 Transport

Of the marketing costs identified within our cost and margin estimates, transport charges are among the highest. Our fieldwork revealed three relevant factors. Firstly, transport shortages are more severe in some areas than in others. For instance, fresh cassava traders find little difficulty hiring trucks in Kampala, yet are often unable to hire trucks elsewhere. Secondly, there are type-specific as well as general shortages: Finding the appropriate size of vehicle is not always possible. Thirdly, transport costs between farms and the assembly point are disproportionately large. For dried cassava, this initial part of the journey costs between 1.2 and 2.4 USh per kilogram kilometre, whereas transport between the assembly point and the market costs approximately 0.1 to 0.14 USh per kilogram kilometre. Local transport will always be more expensive

[9] Notably, Kleih et al (1999) and Ferris and Robbins (1999).

than long-distance transport but in this case, the large discrepancy in costs suggests that public investments in "community access" routes and intermediate forms of transport should be appraised alongside investment in feeder and trunk roads. It may be that the benefit cost ratios of the former types of investment are higher.

6. Key Findings

6.1 Dried Cassava

- Cassava flour is an important food staple for particular consumer groups within Kampala's poor population. Real cassava flour prices in Kampala are volatile and increasing in the long term, suggesting that food-security among these groups may be threatened.

- Dried cassava marketing efficiency could be increased by improving the flow of market information. This would lead to better spatial integration between urban markets (thereby reducing the absolute levels and volatility of consumer prices, and increasing marketing opportunities for farmers), and to a reduction of transaction costs throughout the marketing chain, particularly to the benefit of farmers.

- Efficiency could also be improved by increasing liquidity within the dried cassava trading chain. Greater capital availability would allow wholesalers and retailers to expand the scale of their businesses and spread their overhead costs over a greater volume of trade. Food retailing in general has poor cost efficiency, and consequently consumer food prices are much higher than is necessary. In the case of cassava flour, retailers add approximately 36% to the price of flour in between buying and selling, yet the greatest part of this margin is accounted for by overhead costs. Retailing is a simple service and should not cost consumers so highly.

- Product quality is not a problem during the dry season, when optimal drying conditions allow sufficient production of dried cassava that is of adequate quality and affordable to urban consumers. However, during the wet season, good quality flour becomes expensive, not only because of low levels of inter-seasonal storage but also because farmers are unable to dry cassava roots effectively. Appropriate drying technologies might improve the situation, but they would have to be both non-labour and non-capital intensive to find favour within prevailing farming systems. Promoting efficient methods of drying at the village assembler level of the trading chain may provide a solution.

- Current market facilities constrain wholesaling efficiency. Competition with alternative land uses limits business expansion, maintains high rents, and creates congestion and pollution.

- There is no evidence that any group within the trading chain makes unjustifiably large profits. On the contrary, excessive competition at the retail level appears to squeeze profits to the extent that individual retail outlets operate at an inefficiently small scale.

6.2 Fresh Cassava

- Fresh cassava trading is driven by the high perishability of the roots and by the price premia that consumers are willing to pay for freshness.

- Large marketing cost savings could be realised if current methods for reducing the perishability of cassava roots can be adapted to the meet requirements of Uganda's fresh cassava trade.

- Recent cassava breeding research has neglected widespread consumer preferences for medium sized, sweet varieties.

6.3 General Findings

- Transport charges between farms and assembly points are more than ten times more expensive than inter-urban transport charges. Although this finding was made in the context of dried cassava trading, it probably applies to all domestically marketed farm produce, and emphasises the importance of public investment in reducing the costs of community level transport.

- Lending to the food marketing sector is not only constrained by high transaction costs and poor loan security but also by conservative attitudes among potential borrowers.

7. Recommendations

Many of the constraints that apply to fresh and dried cassava trading are common to other types of food marketing in Uganda. Examining cassava marketing in isolation can therefore lead to less than optimal research impact. The following are suggested as avenues of general food marketing research and technical assistance.

- Formal lending to the food marketing sector: This research should concentrate on finding innovative lending practices that will reduce costs and risks to both lenders and borrowers. Ideally, it should involve traders, commercial lenders, government policy personnel, and legal experts. Suggestions for improving the legal lending environment should form a central part of the research.

- Capturing economies of scale within food wholesaling and retailing: Building on the work into improved lending, this research should be broad-ranging and include investigation into capital, business skill, entrepreneurial, cultural, and infrastructural constraints. An understanding of the relevant constraints will allow policy makers to develop strategies to encourage larger scale wholesaling and retailing.

- Improved market facility planning: If Kampala's urban authority is willing to co-operate, we recommend development assistance aimed at improving the planning of Kampala's markets, with the ultimate aim of reducing marketing costs, improving sanitation and reducing congestion in the city centre. The work should engage urban planners and traders in a collaborative approach.

The final two recommendations apply specifically to technical innovation within cassava marketing systems.

- Drying technology: We do not recommend spending research funds on developing ways for drying cassava roots at the farm level. New drying techniques would only find relevance during the three months of the wet season. Furthermore, in order to find favour among farmers, drying innovations would have to satisfy the impossible combination of being non-labour and non-capital intensive. We do however recommend further research on the financial viability of drying innovations at the village assembler level of the marketing chain, where capital constraints are lower. Village assemblers handle greater volumes of chips and may therefore be able to exploit economies of scale in the drying process.

- Fresh cassava storage: We recommend research into the feasibility of adapting CIAT/NRI fresh cassava storage technology for use by Ugandan traders. Costs and benefits to the traders should form the central theme of the research.

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Appendix 1. Grand Seasonal Index Calculations for Kampala Cassava Flour Retail Prices

Monthly index of moving averages

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
1989						106.9	107.08	98.154	103.2	92.303	112.94	109.08
1990	117.09	110.9	100.33	102.95	94.458	100.43	95.664	97.406	98.477	98.962	99.036	96.77
1991	94.968	93.042	93.145	96.576	93.739	108.14	112.19	101.02	100.94	88.27	79.534	70.946
1992	68.203	67.974	77.637	89.994	128.01	130.15	137.35	120.7	110.52	106.98	101.23	97.129
1993	100.98	88.913	95.307	99.443	100.67	102.46	97.84	93.318	91.063	88.999	95.642	95.583
1994	103.2	101.7	97.583	95.908	97.313	107.29	114.57	97.848	100.65	103.2	96.214	99.532
1995	100.54	97.959	100.7	101	101.51	99.242	99.746	100.12	103.25	100.93	95.661	98.592
1996	98.708	98.824	98.941	98.824	100.18	97.936	92.757	92.347	89.385	91.696	104.31	100.95
1997	106.56	105.55	98.652	90.197	89.233	94.916	102.4	100.88	99.718	105.42	118.26	116.82
1998	107.99	105.78	97.548	98.506	94.656	101.18	91.435	100.49	101.03	104.94	96.342	94.739
1999	100.59	104.54	99.903	100.2	99.215	95.872	86.863					
N	10	10	10	10	10	11	11	10	10	10	10	10
Mean	99.882	97.518	95.975	97.36	99.899	104.05	103.45	100.23	99.825	98.171	99.916	98.013
s.d.	12.687	12.236	6.8513	4.3291	10.591	9.7541	14.155	7.8038	6.042	7.2117	10.573	11.732
s.e.(mean)	4.0118	3.8693	2.1666	1.369	3.3492	2.941	4.2678	2.4678	1.9107	2.2805	3.3434	3.7101
t (null mean =100)	-0.029	-0.641	-1.858	-1.928	-0.03	1.3762	0.8074	0.0922	-0.092	-0.802	-0.025	-0.535

Appendix 2. Dried cassava trading costs and margins

Assumptions	
Weight of bag of chips (kg)	85
Weight of bag of flour (kg)	100
Milling losses	0.02
Transport (farm to village assembler Ush/bag of chips)	1000
Transport (village to wholesaler Ush/bag of chips)	3000
Loading fee/bag of chips	200
Real cost of capital per month	0.015
Average wholesale storage period (months)	0.5
Monthly rent on wholesale store (Ush)	100000
Average wholesale store utilisation (bags)	100
Cassava flour share of wholesale overheads	0.5
Monthly rent on retail store (Ush)	100000
Retail turnover (100kg bags/month)	4
Other overhead costs (Ush per month)	30000
Cassava flour share of retail overheads	0.15

Costs and Margins within the Dried Cassava Trading Chain

	Ush/100kg	% of selling price
Farmer		
Selling price	10000	
Village assembler		
Purchase price	10000	
Selling price	12000	
Gross margin	2000	16.7%
Costs		
Transport	1176	
Net margin	824	6.9%
Travelling trader		
Purchase price*	12245	
Selling price*	20000	
Gross margin	7755	38.8%
Costs		
Miscellaneous labour	700	
Transport	3529	
Milling	1000	
Packaging	500	
District levy ("loading fee")	200	
Market levy	500	
TOTAL COSTS	6429	
Net margin**	1326	6.6%
Urban Wholesaler		
Purchase price*	20000	
Selling price*	22000	
Gross margin	2000	9.1%
Costs		
Overheads	250	
Capital	150	
TOTAL COSTS	400	
Net margin**	1600	8.0%
Urban Retailer		
Purchase price*	22000	
Selling price*	30000	
Gross margin	8000	26.7%
Costs		
Overhead	4875	
Variable	300	
TOTAL COSTS	5175	
Net margin**	2825	9.4%

* Equivalent flour price after adjusting for 2% milling losses
** Before income tax and payment of trading licence