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**Post Harvest Needs Assessment in the Teso and Lango
Farming Systems of Uganda: Marketing Systems
Analysis and Farmers' Perspectives**

compiled by

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Acronyms

AKIS	Agricultural Knowledge Information System
CDO	Cotton Development Organisation
DFID	Department for International Development
HACCP	Hazard Analysis Critical Control Point
IITA	International Institute for Tropical Agriculture
KARI	Kawanda Agricultural Research Institute
MIS	Market Information System
MNS	Marketing News Service
NARO	National Agricultural Research Organisation
NGO	Non-Government Organisation
NRI	Natural Resources Institute
PCS	Primary Co-operative Society
SAARI	Serere Agricultural and Animal Production Research Organisation
WFP	World Food Programme

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SUMMARY

In November 1999, a Post Harvest Needs Assessment was conducted in the Teso and Lango farming systems of Uganda. The needs assessment consisted of a farmer questionnaire and a rapid market assessment exercise. This report documents the findings from both activities: Part A identifies proposals for future activities; Part B concerns the marketing assessment; and Part C the farmer interviews.

The objective was to identify areas that will contribute to the improved and efficiency of local produce markets and of farmers post-harvest practices. In Part A, the recommendations are detailed in the form of project proposals that embrace marketing economics, marketing services provision, institutional development, and technology development and dissemination. In all of the proposals the target beneficiaries are rural households. However, the underlying assumption is that improvements to the functioning of markets will result in benefits to farming households, even though the households may not always be the direct beneficiaries of the proposed work.

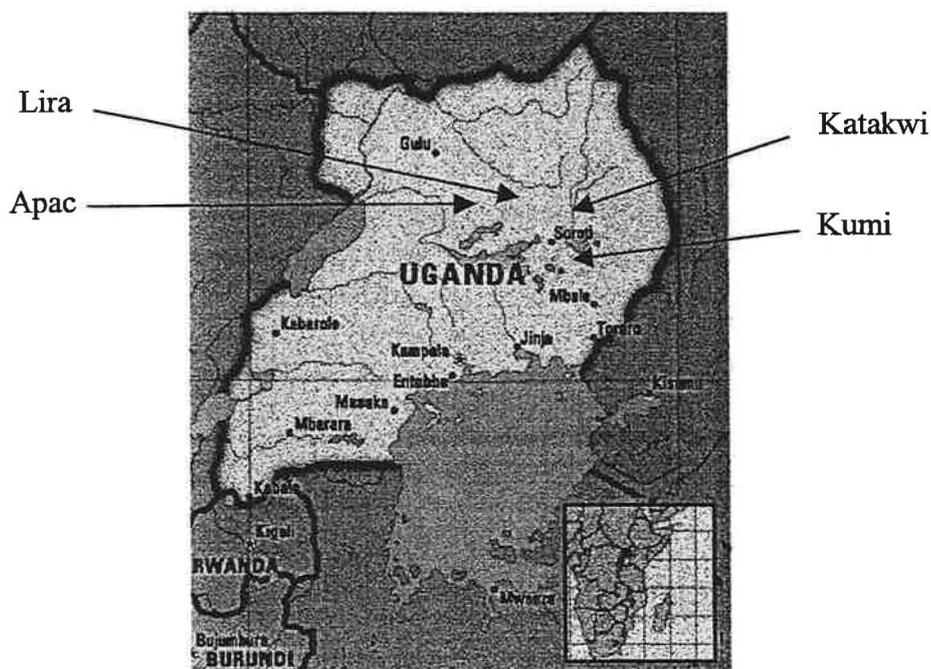
Part B sketches out the characteristics of local produce markets and identifies constraints and issues both in the marketing of specific crops and more generally in the marketing system. Sales of produce constitute a major source of income for farm households in the research area and are often the principal household cash earner. Rural households are therefore dependent upon produce markets, which have a significant bearing on livelihoods. The efficiency of produce markets, and households' access to these markets, will dictate what price and returns are received by farmers for marketed produce. Through semi-structured interviews, group discussions and review of secondary information and data, the research team investigated the characteristics and constraints of local produce markets, following marketing chains from the producer-market interface to the retailer.

Part C summarises the key findings obtained from individual interviews. It identifies what agricultural producers regard as being the key constraints at different periods before the crop is sold or consumed; once the crop has matured but is still standing in the field; between harvest and storage when crops are threshed and winnowed; during storage; after storage including processing and marketing. At each of these stages problems occur and losses are sustained. It was not the intention of the survey to accurately quantify the magnitude of the problems that occur, nor were we able during a single short visit to estimate losses. Problems were described in terms of farmers' perceptions. Clearly, severe problems do occur that need to be addressed and rectified. It is necessary to obtain a more complete and accurate estimate of these significant problems, so that the impact of corrective measures can be assessed.

INTRODUCTION

Background

This Post Harvest Needs Assessment was conducted in north-east Uganda, in the areas shown in the map below. It follows on from the Teso and Lango Farming Systems Needs Assessments conducted in 1998 by NARO and funded by DFID¹. The NARO assessments consisted of a number of community level participatory exercises to elicit the opinions and perceptions of local farmers with respect to agriculture, in order to identify priority areas for research. The assessments identified the sale of crops as the top ranking income earner of households in the two regions, often contributing more than 50 percent of the total household income. This indicates the importance of marketing and post harvest issues for resource poor rural households in the region. Although post harvest issues were raised by farmers during these exercises, no great detail was obtained on the nature of post harvest constraints. The same study, in considering marketing issues, investigated these only at the household level without looking throughout the marketing chain at system-wide issues. Given the importance of these issues, this Post Harvest Needs Assessment was designed to focus exclusively on marketing systems and farm level post harvest constraints to provide information in sufficient detail to inform the development of project concepts addressing specific constraints. The study will also complement recent research undertaken by the Agricultural Policy Secretariat in Kampala and NRI on market access in remote areas (funded by the Crop Post Harvest Research Programme of DFID).



¹ See Akwang, A.A., Obuo, J.P., Okwadi, J. and Oryokot, J. (eds) (1999) *Needs Assessment for Agricultural Research in the Lango Sub-Farming System – Summary Report*. DFID / NARO, Kampala, and Akwang, A.A., Okalebo, S. and Oryokot, J. (eds) (1998) *Needs Assessment for Agricultural Research in the Teso Farming System – Main Report*. NARO / DFID, Kampala

The Post Harvest Needs Assessment was split into:

- a rapid market assessment for crops commonly marketed in the target region (Part B); and
- delivery of a farm level questionnaire to identify and discuss farmers' post harvest needs and constraints (Part C).

Part A - Proposals for improving the efficiency of local markets and post-harvest technologies

Twelve areas are suggested for improving on-farm post-harvest technologies and the efficiency of local markets.

- A. Developing local skills for market analysis.
- B. Investigating improved mechanisms for rural market management and taxation.
- C. Identifying market information needs and uses for farmers and traders.
- D. Assessing the impact of aid/relief programmes on input and output market development.
- E. Assisting the developing contract farming schemes in the cotton sector.
- F. Developing sweet potato processing, storage technology and dissemination.
- G. Reducing transportation costs for farmers and small-scale traders.
- H. Financing agricultural marketing activities.
- I. Controlling rodent pests during crop production, through harvesting and storage.
- J. Managing insect pests of cereals and pulses.
- K. Improving drying before harvest.
- L. Developing improved methods for information dissemination and impact assessment.

Other than the first recommendation, which is aimed at improving market analysis skills, proposals B-H address issues within the marketing systems, which were identified during the fieldwork. Proposals I-L were identified as a result of the interviews with farmers. The summaries of the research findings are contained within the *Background* sections of the proposals (below) and fuller descriptions are contained in the main text of the report. The list is not exhaustive, and the recommendations in the list are not fully developed. Instead, it is hoped that the report and the recommendations can serve as an entry point for the further development of these ideas (or others). Although the work was conducted by NRI in collaboration with the National Agricultural Research Organisation, it is not intended that these organisations necessarily take the ideas forward, and it is hoped that other organisations (especially those from Uganda) will be able to take on the recommendations.

A. Developing local skills for market analysis.

Background

Marketing of agricultural produce is clearly an important component of rural livelihoods as it is a major contributor to household income. During our research, we came across a number of development initiatives (local and national level NGO projects and government programmes) which include marketing components, for example to improve market access or add value to farmer production. In addition, there are also many government and NGO initiatives which are aimed at increasing the productivity of crop cultivation and which have marketing implications. Although there was no intention during this work to discuss training needs of NGOs and government agencies involved in this work, the issue was raised by staff of the Lira Private Sector Development Centre (with a specific demand for conducting market assessments). There was a general feeling that appropriate skills were lacking in the development community. Market analysis skills can be used to improve the identification, design and implementation of development initiatives. Skills required by rural development practitioners and researchers include orthodox economic analysis of markets, together with an understanding of marketing institutions, the policy and economic environment in which markets operate, and socio-economic factors influencing individuals' market behaviour.

Objective

That development agencies involved in projects with marketing components have improved skills for understanding and analysing markets.

Activities

The first task is to determine whether there is a demand for the skills discussed above amongst development agencies in Uganda. This can be achieved through a quick survey of training needs of relevant organisations (including government agencies, NGOs and the private sector), possibly through a telephone or postal questionnaire to determine whether organisations are involved in market related work and whether they require market analysis training. If, as is believed, there is a demand for this training, appropriate training materials will need to be identified or developed, and a realistic training schedule established, to gain maximum participation of interested organisations. It is suggested that training should include a mixture of classroom and field-based work, learning and applying basic but effective analysis methods. Although much of the appropriate training materials may already exist these may need to be supplemented with additional information. Direct beneficiaries of this proposal will be those organisations receiving training. Indirectly, rural households will benefit from well-designed projects with marketing components that improve livelihoods.

B. Investigating improved mechanisms for rural market management and taxation.

Background

Rural markets in Uganda are privately managed under contracts issued by local authorities. Under these contracts, management companies pay a fee to local authorities to operate the markets, and are authorised to collect market dues from sellers as they enter the markets. The management companies retain all the funds collected through market dues over and above what they pay as their fee to local authorities. The level of market dues is far from transparent, often appearing to be arbitrary and, for certain commodities, the dues appear to be unreasonably high. There is little evidence of revenue from dues being invested into developing and maintaining market infrastructure. Indeed, it is not clear whether the responsibility for market infrastructure lies with the management company or the local authority.

Market dues dissuade farmers from entering markets to sell their produce and encourage them to sell to traders outside market boundaries, resulting in farmers receiving prices below the market level. Farmers who pay the market dues are put under pressure to sell their produce by the day's end, possibly leading to a downward pressure on prices during the course of the day. Market dues, together with a number of different taxes/levies throughout the marketing chain including roadside taxes (legal and illegal), account for a significant proportion of the final selling price of the produce. Due to the array of different charges, it is difficult to identify the full tax burden on agricultural marketing, though it can be hypothesised that these charges are high and result in lower producer prices.

Objective

Increased transparency of marketing charges and taxes with recommendations for viable alternatives to current systems made available .

Activities

The issues being addressed in this proposal are sensitive – there are a number of vested interests which may be threatened by work investigating both legal and illegal marketing charges. The first activity of the proposed project will be to get the relevant organisations 'on board' – most importantly the local authorities which have responsibility for contracting out market management, and the Ministry of Trade and Industry. The early involvement of these organisations will be vital for the implementation of research recommendations, and unless they are involved and are committed to the work, the rationale for conducting the work will need to be re-examined. If support is obtained, market survey work will be required to determine the level of market charges for different commodities in rural marketing systems, including market dues and road 'tolls'. Information should be collected through discussions with market participants. Alternative institutional arrangements for operating and managing markets should be reviewed which create conditions for broad market participation whilst ensuring adequate investment in market infrastructure.

C. Identifying market information needs and uses for traders and farmers.

Background

The absence of accurate and up-to-date information on market opportunities and prices makes marketing decisions difficult for traders and farmers alike. Our research found that access to market information is far more limited for farmers than for traders. This unequal access to information can lead to exploitation by the better-informed traders of less-informed farmers. As a result of these concerns, efforts are currently being made to improve market information services in Uganda. The defunct Marketing News Services had little credibility with the traders it was intended to benefit. In fact, we found that many traders were not even aware of the service and relied instead on informal sources of information. The improved market information services can only be effective if farmers and traders have equal access to relevant and accurate information, and are able to respond to the information they receive. Farmers, in particular, may be restricted in their ability to react to market information, as they face barriers to choosing when and where they sell their produce.

Objectives

To develop a better understanding of current market information sources and market information needs that will enable the introduction of market information systems, and identify supporting activities to better enable users to take advantage of market information.

Activities

This research proposal will support those organisations currently collecting and disseminating market information (IITA, Private Sector Development Centres, Ministry of Trade and Commerce, Agri-business Development Centre). In order to support initiatives to develop market information systems, research is required to determine what the market information needs are for different market participants, and crucially, the constraints to acting on received market information. This will involve survey work at farmer and trader level. At the farmer level, a combination of focus group discussions and individual interviews (possibly questionnaires) could be used to gather information on the sources and value of market information and on how increased access to information will impact on economic behaviour. Similar exercises will be conducted with different groups of market participants (traders, wholesalers, processors). The means of information dissemination may also require further investigations with a review of alternative (mostly informal) sources of information for farming households and traders. For example, there may be ways to use informal channels of information to reach farming households. All market participants will gain from improved market information services. Those who stand to benefit the most will be those who currently have the most restricted access, typically small-scale farmers in remoter areas.

D. Assessing the impact of aid/relief programmes on input and output market development.

Background

The World Food Programme is a major player in the dried grain market in Lira district, with large but sporadic purchases of produce which is used for food aid in neighbouring countries. There has been a recent switch from using imported grain for food aid, to purchasing from local market. The justification for this switch was the perceived support of producer prices from buying locally. However, large-scale purchases of local produce by relief programmes may destabilise produce markets, creating uncertainty in farmer (and trader) decision making, and potentially creating short-term shortages (and high consumer prices) in local markets. Although no price analysis was conducted, discussions with market participants question whether producers benefit from higher prices. Allegedly, the principal Ugandan beneficiaries of these relief programmes are those companies which win the supply contracts. This tends to be the larger national companies with the capacity to fulfil large orders. These large companies receive a high price for the produce they supply, though local wholesalers who sell to the companies complain that they do not benefit from these prices. In Lira this has prompted wholesalers to form an association to increase their negotiating strength. It appears that currently local producers do not benefit from local purchases by relief agencies, and poor households may actually suffer if local produce shortages occur as a result of local buying.

Another common policy of relief agencies is to provide subsidised or free agricultural inputs (such as fertilisers and seed) to farmers in countries neighbouring Uganda (for example, Sudan and Rwanda). There is evidence of these inputs being imported into Uganda and sold at prices below the prevailing market price. This leakage acts as a disincentive for private sector involvement in input markets, with farmers losing out in the long run due to undeveloped markets, resulting in limited access to quality inputs.

Objective

To make recommendations for mitigating potential negative impacts of aid programmes on rural input and output markets and to develop relief programmes to benefit input and output markets serving rural households.

Activities

Analysis of the impact (positive and negative) of aid/relief programmes on different participants in the marketing chain, and particularly on farmers, would be done. This would involve looking both at input and output markets with the co-operation of relief agencies and large input and output traders. On the output side, levels and patterns of relief programme purchases will be identified and, if found to be significant in local markets (possibly in Lira), estimates will be made of the impact on local markets (supply response, producer and consumer prices, institutional responses). This will be achieved through a combination of qualitative and quantitative methods. Similarly, in input markets, the perceptions of farmers, local traders and national traders of the extent of relief 'leakage', can be obtained through surveys to assess the potential impact on local input market development.

E. Assisting the developing contract farming schemes in the cotton sector.

Background

The cotton sector is showing some signs of recovery after many years of low production and there has recently been significant investment in cotton ginneries in the Soroti area. These ginneries need to secure sufficient access to seed cotton from smallholders to make capital investments in processing equipment viable. Smallholder cultivation of cotton is hampered by poor access to input markets, and by bad experiences in the past with marketing seed cotton through co-operatives (which often failed to pay farmers for their produce). Recent attempts to develop a nation-wide scheme for cotton input provision (on credit) and marketing have largely failed. This has left cotton producers with difficulties in obtaining inputs and so production is threatened and ginneries face the prospect of under-utilisation. In Soroti, there are already schemes operated by an individual ginnery to form cotton production groups, and provide credit for inputs to these groups. These schemes are still in their early days, and even though they show promise, there are potential problems with side-selling (when farmers sell their produce to a different ginnery). In other countries in sub-Saharan Africa, notably Zimbabwe, there have been some very positive experiences with individual companies operating such credit schemes. These have achieved the dual objectives of increasing access to seed cotton whilst also increasing smallholder productivity and profitability. Elements of the schemes operating in Zimbabwe and elsewhere could provide valuable assistance to cotton companies in Uganda.

Objective

To set up pilot schemes which develop business relationships between selected cotton ginneries and smallholders, to improve input and output marketing development of best practice guidelines for other ginneries in Uganda.

Activities

This proposal will entail working closely with selected ginneries in the Soroti area (and possibly elsewhere in Uganda), and the obvious initial task will be to identify potential ginneries. The Lake Kyoga Cotton Co. Ltd. in Soroti has expressed an interest in receiving assistance in developing their farmer group schemes and, therefore, is a likely candidate. Drawing from experience from other countries, assistance can be provided to develop appropriate contract arrangements between the ginnery and farmers, including farmer group organisation, the terms of credit repayment and the provision of inputs and services. This will involve working jointly with ginneries and farmers to forge close business relationships. It is envisaged that the Cotton Development Organisation will also play a vital role in developing these relationships and, potentially, the CDO is well placed to use the experiences from this pilot scheme to develop 'best practice' guidelines and extend the approach to other parts of the country. Cotton producers, the majority of whom are small-holders, will be the primary target group of beneficiaries, as they will receive improved access to inputs required for cotton production. The cotton sector in general will benefit from increased production.

F. Developing sweet potato processing, storage technology and dissemination.

Background

Analysis of secondary price information reveals that seasonal price fluctuations for fresh sweet potato are generally high and predictable, and can reasonably be expected to be higher than the costs of storage. This raises the possibility of developing storage technologies and increasing storage capability as the storage of fresh sweet potatoes, even for relatively short periods (1-2 months), potentially offers high returns. This is not a new finding, and there have been a number of research and dissemination activities in the region (for example the current NRI/CIP project and previous work on post harvest systems for sweet potato). Even though technologies for storage have been developed, these have rarely been adopted by farmers, primarily due to the high labour demands of the new technology. Processing (generally drying) sweet potato other than for household consumption is also only a minor activity and there appears to be little demand for dried sweet potato products in the main consumer market of Kampala. It is therefore debatable whether any further research is required. One area in which further work may be justified is to consider commercial approaches to storage and processing. Much of the previous work has focussed on the farmer level, with farmers as the direct beneficiaries. Switching the focus to market intermediaries would be justified by the potential indirect benefits to poor producers and consumers, who would both benefit from a 'flattening' of price fluctuations.

Objectives

Recommendations for the improved dissemination or development of sweet potato storage and processing technology are made available.

Activities

The first activity under this proposal is to carry out a thorough review of previous work in sweet potato storage, processing and marketing. A large amount of secondary information is available from a number of sources (donors, local and international research organisations, NGOs). This information needs to be pulled together coherently so that any further proposals in this sector can be put into context. This in itself would be a useful exercise and provide a valuable source of information for organisations contemplating research or other activities in the sweet potato sector. It may also highlight gaps in existing knowledge. Although it is impossible to say firmly what areas may merit further investigation prior to the completion of this first activity, a cursory review reveals that many studies of sweet potato have been at the farm level, with relatively less at the trader/commercial level. If this view is supported by the findings of a more thorough review, there may be a case for conducting a rapid marketing assessment of sweet potato (fresh and processed) with the objective of identifying interventions at the trader level for improving market efficiency. For instance, most storage technologies are aimed at the farmer rather than at the trader. In terms of poverty reduction, justifying trader level interventions would require investigation of the link between market efficiency and farmers' returns.

G. Reducing transportation costs for farmers and small-scale traders.

Background

Transportation of produce by farmers and small-scale traders to and from rural markets can be difficult. Long distances, poor infrastructure and lack of access to means of transportation result in 'head-loading' being the most prevalent form of transportation used by farmers. This increases the time required for transportation and reduces the volumes traded, resulting in increased unit marketing costs and a reduction in returns. In addition, poor transport limits the marketing options for farmers, and consequently leaves them in a weak negotiating position (pressurising farmers to accept offered prices rather than transporting their produce to markets with higher prices).

To expect substantial improvement to infrastructure (mainly roads) is unrealistic, especially for remoter communities, and so alternative cost-reducing approaches are required. These may include: reducing distances by increasing the number of periodic markets, or improving the distribution of periodic markets; developing and aiding the dissemination of appropriate (i.e. affordable and suitable for road conditions) means of transportation; and institutional developments, such as farmer marketing associations for increased bulking up of produce.

Currently, other initiatives are looking at rural transportation in Uganda, for instance the Agricultural Rural Transport Project for East Africa, though no details of their activities were collected during this review and they do not appear to be active in the areas under consideration. However, before advocating any approaches to reducing transportation costs, a better grasp of the potential impact on marketing returns is required.

Objective

To assess the impact of improved transportation options on marketing returns for small farmers.

Activities

This proposal aims to test the hypothesis that improved transportation for farmers will improve their livelihoods. Basically, improved means of transportation result in produce being moved further, in greater quantities and faster. Mainly through field-based survey work with farmers and traders, we will seek to answer the following questions: *What are the benefits of being able to transport produce greater distances?* This relates to the cost of transportation and also to the variation in prices between markets. If markets are spatially integrated, differences in prices between adjacent markets should be the same or less than the cost of transporting produce between the markets. *What are the benefits of being able to transport larger quantities of produce?* Although there are clear economies of scale to be realised from transporting greater volumes of produce, farmers may actually prefer to market smaller quantities or do not have larger quantities to market. Farmers may be discouraged from marketing larger quantities if they lack options for saving cash received from selling their produce, or if they prefer to withhold produce for household consumption or for marketing at a later date when prices are expected to be higher. Traders may be better placed to benefit from larger scale transportation, though

financial constraints may be a hindrance to purchasing large quantities of produce. *What are the benefits of being able to transport produce more quickly?* The time taken to transport produce was raised as a constraint by farmers. The benefits of faster transportation are related to the opportunity cost of labour, and for perishable produce, the benefits relate to transportation losses.

Answering these questions will provide the basis for assessing different options for improving transportation for farmers and small-scale traders, and as such will be valuable for agencies funding transportation interventions (donors, NGOs).

H. Financing for agricultural marketing activities.

Background

Finance for marketing activities is difficult to obtain for all market participants other than large scale traders and wholesalers. This would include credit for storage, processing and transportation facilities, working credit for traders to purchase produce, and consumption credit for farmers allowing them to store for longer periods. Formal financial institutions in rural Uganda tend to avoid lending to agricultural activities, fearing high risks and potential default on loan repayment. The informal financial sector (such as savings groups or moneylenders) is typically limited to providing small, short term loans at relatively high interest rates. The limited sources of credit results in both low levels of investment capital (for example in storage, processing or transportation assets) and also in working capital, which reduces storage capacity and the scale of marketing activities. Low levels of liquidity in local produce markets potentially reduces demand and forces producer prices downward. Increased access to funds would increase entrepreneurial activity in the sector. Again, such conclusions are not new and nor are the negative attitudes of banks to the agricultural sector. However, there are signs of rural banks in Uganda trying to learn more about the agricultural sector and to cautiously lend for agricultural activities (notably the Centenary Rural Development Bank). Projects may have a role in further developing this involvement in agriculture, working closely with banks and other financial institutions to identify suitable investments and clients for lending (and savings mobilisation).

Objectives

To develop a better understanding of agricultural marketing opportunities for formal financial institutions and work alongside willing FFIs to identify post harvest activities which are viable for financing.

Activities

Survey work will be conducted among interested financial institutions to identify appropriate potential investments in agricultural markets. The best candidate for this is the Centenary Rural Development Bank, which has already started pilot schemes lending to the agricultural sector using an innovative methodology for assessing investment viability. This focuses on household cash flow and tailoring the terms of loan repayment to suit individual household circumstances. This approach could be applied to post harvest investments to determine those activities and investments from which farmers and traders may benefit from credit. Potential investments can be identified through discussions and analysis with local market participants. In addition, local research organisations and NGOs may have already identified technological advances (for example storage or processing equipment) which require capital investment. A stronger link is required between organisations involved in technology development and dissemination, and financial institutions.

I. Controlling rodents pests during crop production, through harvesting and storage.

Background

Rodents were regarded as an important problem, which affected both production levels before harvest and also the quantity available during storage for sale and consumption. It is not possible to quantify the losses that occur either before or after harvest. Farmers do attempt to take action against these pests by putting down highly toxic rodenticides, by using traps or simply by allowing cats to roam. None of these methods are particularly successful because of the poor information farmers have regarding control of rodents. Pest management is further hindered because farmers are unaware of the identity, ecology or biology of the active species. Such knowledge is essential to optimise rodent control.

Any rodent control programme must be available for both the individual farmer, whose individual homestead store could harbour rats or mice, and for the village, because the gregarious nature of rodents and their ability to range allows their effects to be expressed community-wide.

Objective

To provide communities and individuals with a better understanding of the rodent pest problems so that they are able to conduct control activities which reduce rodent populations to levels that are of no economic significance.

Activities

Firstly, it will be essential to identify the species present and describe their behaviour. An assessment of the populations present and of the damage or losses caused will be undertaken in selected targeted communities. Utilising similar approaches to those developed in Mozambique (i.e. non-chemical, trapping-based methods) pilot control programmes will be initiated in the target areas, and these will be scaled up in due course to cover the remaining districts in Teso and Lango. The programmes will be conducted through community based organisations who will participate fully in developing the control strategies and evaluating the impact. The project will include a significant component of information dissemination. It will train farmers and continuously monitor impact throughout the period.

J. Managing insect pests of cereals and pulses.

Background

As in many rural, agriculturally dependent communities in sub-Saharan Africa, once the main cereal and pulse crops are harvested their quality is neglected during storage. Deterioration during storage can be considerable and although losses have not been quantified either in terms of weight or value in Uganda, it is not unreasonable to expect weight loss to exceed 10% during six months storage for many crops. Most of the loss is due to insect pest attack and it is clear from responses from farmers that problems caused by insects are extremely significant and need to be alleviated. This issue has been exacerbated with the recent introduction to the country of the Larger Grain Borer.

Many of the problems caused by storage insect pests can be solved by the introduction of technologies developed elsewhere in Africa. Solarisation techniques to disinfest grain would be particularly appropriate for pulses. Inert dusts and ethnobotanicals would represent low cost, simple-to-use solutions. Such treatments would need to be used in combination with better storage management practices, which might in turn require improvements to storage structures. Furthermore, information dissemination mechanisms would need to be enhanced to ensure that farmers were in receipt of appropriate extension messages.

Objective

Cheap, environmentally sustainable, safe methods for protecting cereals and pulses during storage introduced and used by families to maintain quality during storage.

Activities

Several villages will be selected in which conservation methods will be introduced. In each village, the constraints will be examined in detail in order to decide which methods would be most appropriate. Farmers will be offered a choice of procedures and their performance will be monitored and evaluated by the communities themselves. Base line studies of losses will be undertaken to enable quantitative comparisons to be made. Much work has already begun with grain legumes but this project will address pest control in cereals, which have different issues because of the larger quantities stored. This project will also build upon the development of Agricultural Knowledge Information Systems (AKIS), used for improving the dissemination and impact evaluation of grain legumes technologies.

K. Improving drying before harvest

Background

Durable crops remain standing in the field once they have matured. Before harvest, the crop dries down to a point at which it is safe to store, i.e. it is at equilibrium with a relative humidity of 70%, below which no fungal attack will take place. The occurrence of fungal problems will be determined not only by the moisture content of the commodity during storage but also by the rate of drying. Crops that dry slowly, e.g. husked maize, are more prone to fungal damage than those which dry down rapidly. Drying after physiological maturity is dependant on the climatic conditions existing before harvest. In many parts of East Africa the rainy season ends well before harvest and the crops dry quickly before being put into store. However, in other areas, rains may be prolonged so that drying occurs during periods of high humidity making it difficult to achieve a safe moisture content. In these latter circumstances it will be necessary to introduce artificial methods of drying in order to prevent excessive deterioration of the crop.

It is clear that farmers in parts of Teso and Lango suffer from extended rains causing losses before harvest. Once the crop goes into store it appears that it is sufficiently dry, no longer causing a problem.

Objectives

To minimise losses caused by mould invasion and bacterial rotting by improving the efficiency of crop drying after maturity.

Activities

It may well be possible to introduce simple technologies to facilitate in-field drying. However, solutions can only be devised and introduced when current drying practices are understood and described. It will be necessary to use case studies of farmers drying key crops to identify where and how interventions can be made. Methodologies will then be tested on a small scale and continuously monitored and modified to improve efficiency. This testing will be scaled up and technologies introduced on a larger scale. The methods used will be critically examined for their cost-efficiency as well as their socio-acceptability. Ergonomics will play an important role in deciding what technologies will be recommended.

L. Developing improved methods for information dissemination and impact assessment

Background

The post-harvest problems that occur in north-east Uganda are unique neither to that country nor to sub-Saharan Africa, but technologies are available to address most problems. What is lacking is the knowledge base of the farmer and of those engaged in extension, who are employed to help him/her find appropriate solutions. Transfer of information from research to the end user is poor. This is not solely because of the inadequacies of the government extension services but also because: researchers do not disseminate information efficiently; extension workers, especially in the NGO sector, do not understand or appreciate the technical complexities of the post-harvest system and so do not appreciate the need for technology; the technologies offered do not address the problems. Problem solving has been technology driven, rather than responding to the real needs of farmers. The approach to technology transfer must be more inclusive, so that these problems can be addressed.

Objectives

To understand existing information dissemination pathways targetting farmers and identify gaps that could be used to distribute post-harvest technologies; secondly to develop methods by which farmers can monitor the effectiveness of introduced technologies.

Activities

A systems approach needs to be taken, which will have two separate goals. Firstly, it will be necessary to follow a hazard analysis critical control point (HACCP) approach to examine the post-production system in order to identify specific points at which constraints or problems arise. Then technologies or methodologies will be introduced and tested to remove the constraints. The system will be tested with different groups of farmers with several key crops from the point of crop maturity to sale or consumption.

The second goal will be to devise a system, which will improve information dissemination as well as allow continuous monitoring of the effectiveness of the proposals and of their impact. This will involve improvement to the AKIS system and then its use in developing mechanisms for evaluation. Impact assessments will be undertaken by all stakeholders, including farmers, extension workers and researchers. All will work together to improve both the technologies themselves and the mechanism for information exchange. It will be a two-way process.

PART A ANALYSIS OF MARKETING SYSTEMS

Objectives

The aim of this study was to identify the characteristics and constraints of the marketing chains of commodities grown by farmers in Teso and Lango regions. Specific objectives were to:

- Identify marketing participants, institutions and marketing chains;
- Identify the marketing activities and strategies of these participants;
- Identify constraints within the marketing system; and
- Identify areas requiring further research or interventions.

Methodology

The research was carried out over the period of November 15 to November 26, 1999. The team conducting the survey work consisted of:

Andrew Goodland, Senior Scientist, Natural Resources Institute.

Patrick Kalunda, Socio-economist, Kawanda Agricultural Research Institute, Uganda.

Fred Owera, Post harvest technologist, Kawanda Agricultural Research Institute, Uganda.

This review of the marketing chain was a rapid exercise (two weeks), intended to provide a 'snap-shot' of the marketing system. The most appropriate way to gather information rapidly was through interviews with participants at different levels of the marketing chain, and with key informants with a good knowledge of the marketing system (such as Ministry of Trade and Commerce officers). Checklists were devised and used to guide semi-structured interviews with market participants. These are included in Annex 1. The majority of the interviews were conducted at local market places (rural and urban retail and wholesale markets) and at agro-processing sites. Survey areas were Soroti, Kumi, Katakwi, and Lira/Apac. In addition, visits were made to markets in Kampala, which is an important destination for several key crops grown in the Teso and Lango farming systems. Discussions were also held with key national agricultural processors and exporters based in Kampala, which source raw materials from Teso and Lango. In addition, the researchers met other organisations, which play an active role in marketing systems or have an interest in their development, for example the Agri-business Development Centre (Kampala) and AT (Uganda).

Findings

Key issues and conclusions are drawn from interviews conducted in each district, some of which are generic, affecting the whole marketing system, whilst others are crop or district specific. The findings from the exercise are organised as follows:

1. Market participants and strategies
2. Commodities and marketing chains
3. Marketing costs and margins
4. Marketing institutions and institutional arrangements
5. Market information systems
6. Price trends and fluctuations

7. Summary of constraints

1. Market participants and strategies

The entry point for the research in each of the districts was to hold discussions with local authorities, in particular the District Agricultural Officers and District Trade and Commerce Officers. These are key informants who have a system-wide view of agricultural markets and were able to identify the principal stages and participants in marketing chains for different crops. Discussions were followed up with more detailed interviews with participants in the marketing systems to gain a deeper insight into how the marketing system functions for a range of crops, and the marketing strategies of the various participants.

Producers

Farmers are dependent upon produce marketing for a large proportion of household income. The interface between farmers and 'the market' is critical for determining farmers' returns. Within the study region there are a range of market linkages which may be available to farmers depending upon location and crop. Farmers can retail produce themselves directly to consumers, either informally (for example, home sales, sales within their community or to friends and family, or from the road-side) or in formal markets. Farmers may be dissuaded from selling in markets due to taxes which must be paid on all produce entering a market for sale. Alternatively, farmers can sell to market traders who assemble produce and sell on to wholesalers. Such traders may visit farming communities, but more frequently are located at or around local rural markets. Farmers selling to traders outside market boundaries escape market taxes, though may receive lower prices. Alternative buyers are Primary Cooperative Societies (PCS), though the number of crops marketed through this channel may be limited. Finally, farmers can sell to agro-processors. This is especially the case for cash crops, for example, both cotton and sunflower are sold directly to the ginner and presser respectively, or to middlemen linking directly to processing companies.

Marketing strategies of farmers are limited by resource and information constraints. Obviously farmers will strive to obtain the highest returns for their produce, which is related both to their marketing costs and the price they receive. However, in practice, farmers face a number of constraints which limit their choice of marketing outlet, and prevent them from realising maximum returns. There are a number of factors which influence when and where farmers will sell their produce. Firstly, the most common reason for selling produce is to generate cash for other purchases. A pressing need for money may decrease negotiating power as farmers are pressurised to accept any price being offered. Even where farmers can choose when to market their produce, there may be little choice of where they can sell their crop. Especially in remoter areas, visits from middlemen directly to farms may be rare, and transportation options limited. In such circumstances, farmers may be restricted to selling at their nearest market place (irrespective of the price that they will receive there). Additionally, for certain crops (especially non-food cash crops), there may be only a limited number of buyers in the

market (for example in Soroti district, there is currently only one sunflower oil processor (i.e. one buyer)). Such lack of competition may lead to lower producer prices.

Accessing prices in other markets is restricted by transportation difficulties, due to long distances, poor infrastructure and limited means of transportation. The system of periodic rural markets has developed to reduce distances to markets, though farmers can still be several kilometres from them, farmers often have to walk to these markets with their produce 'headloaded', which is both arduous and time consuming. For small quantities, the returns to effort and time expended in transportation are low.

With these constraints, price may not be a strong determining factor in a farmer's decision of when and where to sell his or her produce. The markets visited during the research confirmed this, with large numbers of sellers (mostly farmers) and relatively few buyers. For example, at Gwetom market a lone cassava chip trader was surrounded by farmers trying to sell their produce to her. In these circumstances the individual sellers have little negotiating power and tend to be price takers.

Rural market assemblers

These small-scale traders visit periodic rural markets to purchase directly from farmers, assembling produce in sufficient quantities to sell on to wholesalers in larger towns. They may also use their knowledge of spatial price differentials to sell in other rural markets where prices are higher. Generally, their asset base is low, without access to storage facilities or a permanent market stall. Usually they will own or hire weighing scales and purchase sacks for assembling produce. They depend on public transport or hired transport (possibly joining together to hire a pick-up or truck).

Agents/sub-buyers

Agents work on behalf of wholesale traders or agro-processors, often on a commission basis and occasionally with cash advances. They buy directly from farmers (normally at the farm-gate) and then assemble in rural trading centres. Agents may own or rent storage facilities in rural trading centres where produce will be held prior to transportation to wholesalers. In accessing farmers' produce, agents depend to a large extent on their local reputation and developing close relationships with farmers. Typically, they have their own 'patch' – a rural area in which they have an informal monopsony. Often they originate from the areas in which they operate.

Brokers

The term 'broker' is used in Uganda to describe those market participants who do not actually handle the produce but play a role in identifying and negotiating with buyers and sellers. They are prevalent in perishable produce markets, in which there is a need for a rapid trading of produce. In the fresh sweet potato sector, brokers operate in the producing villages and identify farmers who are selling sweet potatoes. The broker negotiates a price with the farmer for a given quantity, and the farmer has to provide the sweet potato at a set time to be collected by a truck. These brokers tend to work on a commission basis for the urban-based sweet potato traders. Brokers are also employed at the point of sale in the sweet potato marketing chain at urban wholesale and retail

markets. Here they identify buyers, negotiate prices and arrange for the buyers to be present when the trucks carrying sweet potato arrive. Using brokers enables traders to quickly load and off-load their trucks, thereby reducing the risk of spoilage and increasing turnover.

Local wholesale traders

Generally based in rural trading centres or larger towns (Lira, Soroti), local wholesale traders own or rent permanent trading facilities – normally a storage facility. They purchase produce mainly from rural market assemblers or from their own agents. We found that the usual strategy for wholesalers is generally not to store produce for long periods, but rather to aim for small margins and high turnover of produce. Price fluctuations over a season are too unpredictable for wholesalers to be confident that there are positive returns to storage and instead they tend to sell on quickly to national or international markets. Produce is either transported to these larger markets (for instance, Kampala, Mbare or Busea) or traders from these markets travel to the wholesalers to purchase directly. Local wholesalers (especially those in Lira) also sell produce to agents employed by large purchasers such as the World Food Programme (see below).

Primary Cooperative Societies (PCSs)

PCSs used to play a major role in the marketing of produce, particularly cotton. However, shortage of funds and poor management led to a situation where farmers would frequently have to receive credit notes instead of cash for their produce. With the liberalisation of the cotton sector, which allowed private sector buyers to purchase seed cotton from farmers, many of the PCSs have drastically reduced the scale of their operations or ceased functioning altogether. Those still in operation do provide a service of crop marketing for farmers, though this accounts for only a small proportion of total farmer sales (estimates of 5-10% were given). Farmers using this marketing channel deliver direct to the local PCS which then sells on to traders. Prices offered by PCSs are no better and occasionally worse than those found in local markets, and the main reason for farmers selling to PCSs is due to proximity or loyalty. There is great variation in the performance of PCSs, with some being far more active than others – one of the most active is the Gwetom Cooperative in Soroti district, which is involved with the trade of roasted groundnuts to Europe. Although many PCSs have ceased to function, there is an on-going Dutch-funded project providing support to PCSs as a means of increasing market access for smallholders.

Transporters

A large number of transporters operate out of the larger market centres (Soroti and Lira) with vehicles and drivers available for hire. There are no large transport companies based in the research areas, rather there are small sized companies or, frequently, individuals owning one or two vehicles. Trucks vary in size between 2 and 20 tonne capacity (though in practice these are often over-filled). Companies and individuals hiring out vehicles will do so either on a per bag basis, or hire out the whole vehicle with driver.

Processors

Local cash-crop processors (cotton ginners, sunflower seed processors) tend to purchase raw material directly from the farmers, either at the plant site, or through rural agents. The processed produce enters local and national markets (in the case of sunflower oil), or national and international markets (cotton).

The majority of staple crop processors are flour millers and rice hullers. These tend to be small-sized operations, often with a single hammer mill. They generally do not purchase raw material (for example maize or rice paddy), but instead charge for processing farmers' or traders' produce, which is then used for domestic consumption or sold in local markets. This approach means that the millers are dependent on producers and traders, and during off peak seasons the mills may have to close down. In Kampala and other large urban centres, larger scale national-level processors are active. Their operations are far more sophisticated, ensuring that mill facilities have a high utilisation rate by offering tenders for supplies, for which (mostly Kampala) wholesalers bid. This, combined with a substantial storage capacity, enables mills to be active year-round.

World Food Programme (WFP)

The WFP is an important purchaser of several commodities which are used in regional food relief programmes, for example in Rwanda. This reflects the trend of relief agencies to purchase produce locally as opposed to using imported grain (often surpluses from the North) for their relief operations. Buying locally is intended to support local produce markets by increasing demand (as opposed to importing grain which may dampen demand for local produce). However, the evidence from Uganda suggests that this analysis is too simplistic.

To purchase food from local markets, the WFP invite tenders for the supply of produce. Tendering companies need to have adequate resources to quickly mobilise and handle large quantities of produce, which tends to exclude all but a few large Kampala-based companies. Once a contract to supply has been won, the company will contact local wholesalers in surplus areas such as Lira. As it is a large single buyer, the company is in a position to drive a hard bargain when purchasing produce. Wholesalers in Lira market have responded by forming an association with which the company must deal directly, theoretically increasing the negotiating strength of the wholesalers. The effect of WFP purchasing on local and national markets is likely to be significant, causing shortages and higher prices for consumers in the short run, and influencing farmers' choice of crop in the longer run. To the authors' knowledge, the extent of destabilisation caused by WFP buying has not been researched in Uganda.

2. Commodities and marketing chains

Marketed produce

A large number of crop commodities are traded in the Teso and Lango farming systems. The majority of crops are not grown exclusively for household consumption or for income generation. Instead, households will make decisions on which crops to market

based on harvest levels, stocks, risk of storage losses, market opportunities and household needs. Non-food cash crops are the exception to this, as they are grown exclusively for marketing. Cotton falls into this category, whilst sunflower is also predominantly sold to commercial oil processors. There are also distinct seasons for the marketing of different crops. The survey period coincided with the height of fresh sweet potato marketing in Kumi district, rice from Katakwi and beans from Lira. Table 1 shows the different crops which are most important in terms of trade in the different survey districts over a whole year, and the most important destination markets for those crops.

Table 1: Commodities marketed and destination markets

Katakwi		Soroti		Kumi		Lira/Apac	
<i>Product</i>	<i>Destination</i>	<i>Product</i>	<i>Destination</i>	<i>Product</i>	<i>Destination</i>	<i>Product</i>	<i>Destination</i>
Cassava (Fresh)	Karamoja Kampala	Gr'ndnuts	Mbale Busea Kampala	Sweet potatoes	Kampala	Beans	Mbale Rwanda Kampala
Cassava (Dried)	Karamoja	Sesame	Mbale	Cotton	Export	Sunflower	Lira
Rice	Mbale Kampala	Millet	Mbale Kampala	Cassava (Dried)	Tororo Pallisa Busea	Maize	Kampala Mbale Busea
		Cotton	Export			Sesame	Kampala Export
						Fruit	Kampala
						Cassava (Fresh)	Kampala

Marketing chains

Figures 1 and 2 below are an attempt to characterise the marketing chains for produce traded in Teso and Lango, based on discussions held with market participants. There is a degree of generalisation in the chains, though it is possible to categorise crops into three broad groups; dried cereals and legumes, non-food cash crops (including sunflower), and fresh produce. These three groups have distinct characteristics which determine their marketing chains.

Dried cereals and pulses

These are generally sold in small quantities by farmers, and bulked up by traders. Their durability allows for storage and extending the time between harvest and consumption, giving farmers and traders a degree of choice over when and where to market (though in practice, farmers may be restricted in this choice). All farmers will cultivate at least some cereals and legumes as household staples and market any surpluses. All farmers are therefore potential participants in these markets, generally selling at local markets or to agents/sub-buyers in the more sophisticated marketing system in Lira. Marketing systems for these commodities tend to be multi-tiered, with small-scale traders selling to local wholesalers who sell on to national and international markets. There tends to be large numbers of participants in each of the levels of the marketing chain suggesting a competitive market. The World Food Programme also participates in these markets,

generally contracting national companies which then purchase directly from local wholesalers.

Non-food cash crops (including sunflower)

Within the area under study, cotton and sunflower seeds fall into this category. Apart from a small amount of sunflower which is used for household consumption or processed at the household level, farmers cultivating these crops must market them. All this produce is handled by specialised processors which have invested in crop-specific processing equipment. The market is therefore characterised by a few specialised users. Processors will either buy directly from the producer (on the farm or at the factory), or through market intermediaries, possibly working on behalf of the processors. An interesting relationship exists between the producers of these commodities and the processors, both being dependent upon the other. In fact, processors are more 'locked in' to specific crops than are producers; farmers can choose which crop to cultivate, processors are restricted to a specific crop. This may encourage processors to develop closer relationships with producers, with a limited role for additional marketing levels between producer and processor, thus shortening the marketing chain.

Fresh produce

Fresh produce (fruits, fresh vegetables) cannot be stored for long periods (in the absence of refrigeration). The perishable nature of the produce requires that it reaches consumers quickly, and for this reason a distinct marketing system exists for these commodities. With speed to market as the priority, a relatively sophisticated marketing system has evolved which generally by-passes rural assembly markets. Participants in the marketing chain have highly specialised roles to ensure that produce is rapidly sourced, transported and sold. Brokers play a key role at both ends of the marketing chain in organising the purchase and sale of produce. Specialised packers, and organised loaders and off-loaders, are also employed by the traders to increase the speed and efficiency of the marketing operation.

Figure 1: Typical marketing chains for dried cereals and pulses (maize, beans, groundnuts, sorghum etc.)

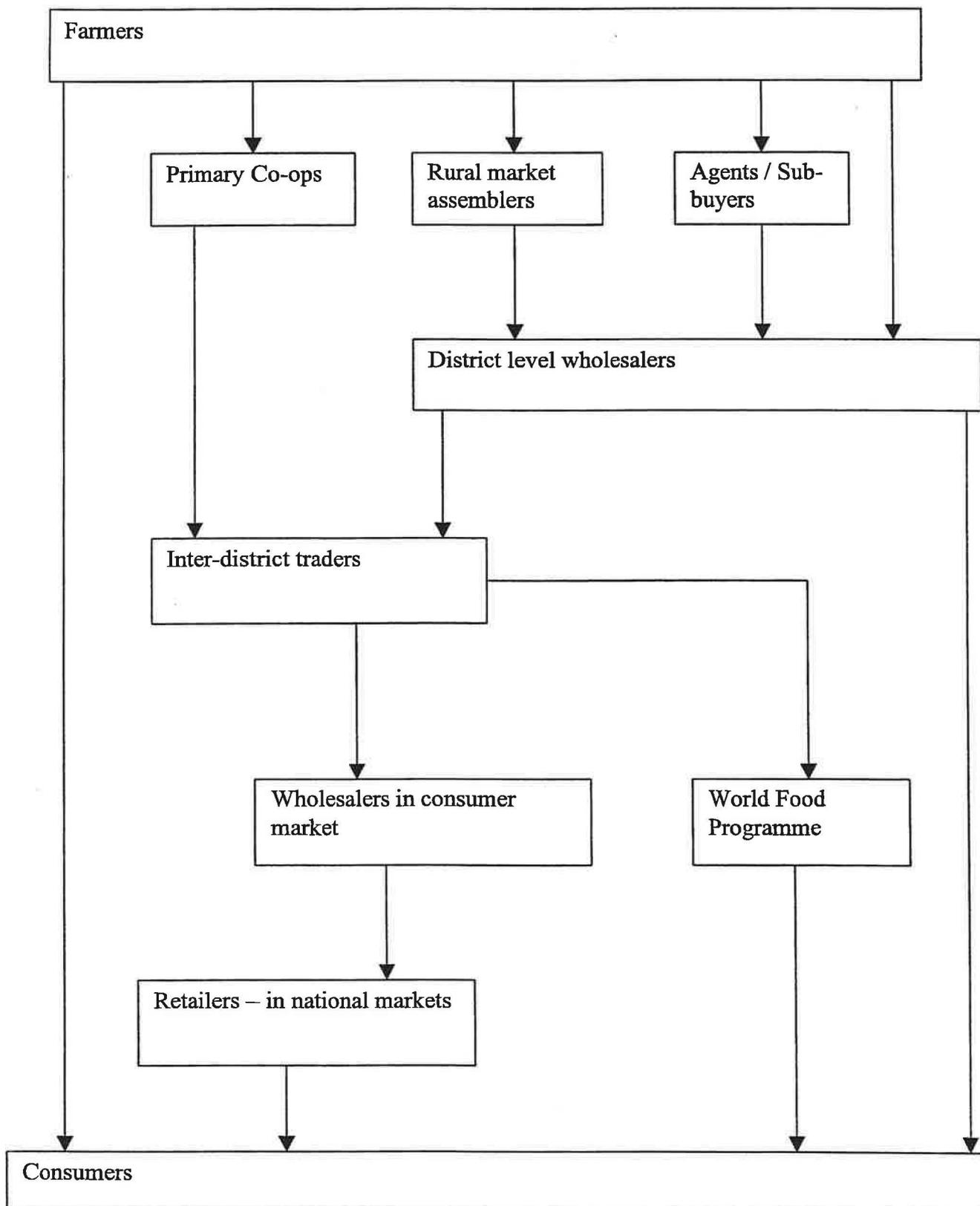


Figure 2: Typical marketing chain for non-food cash crops (cotton, sunflower)

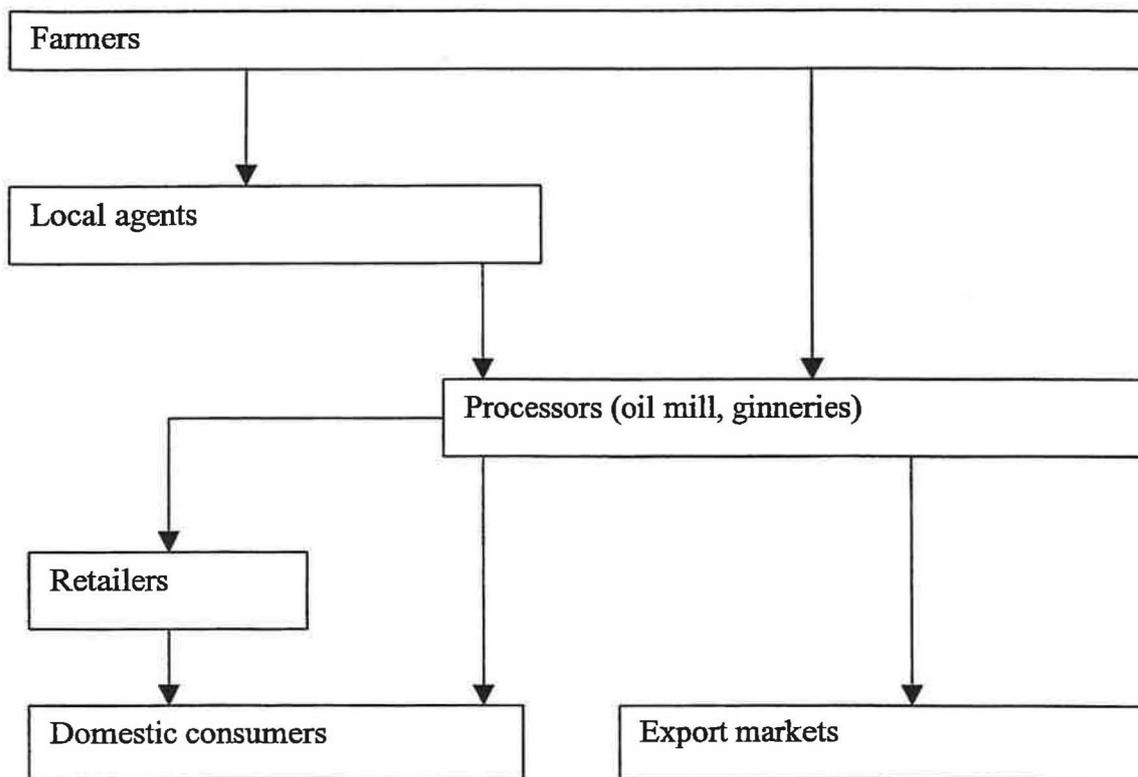
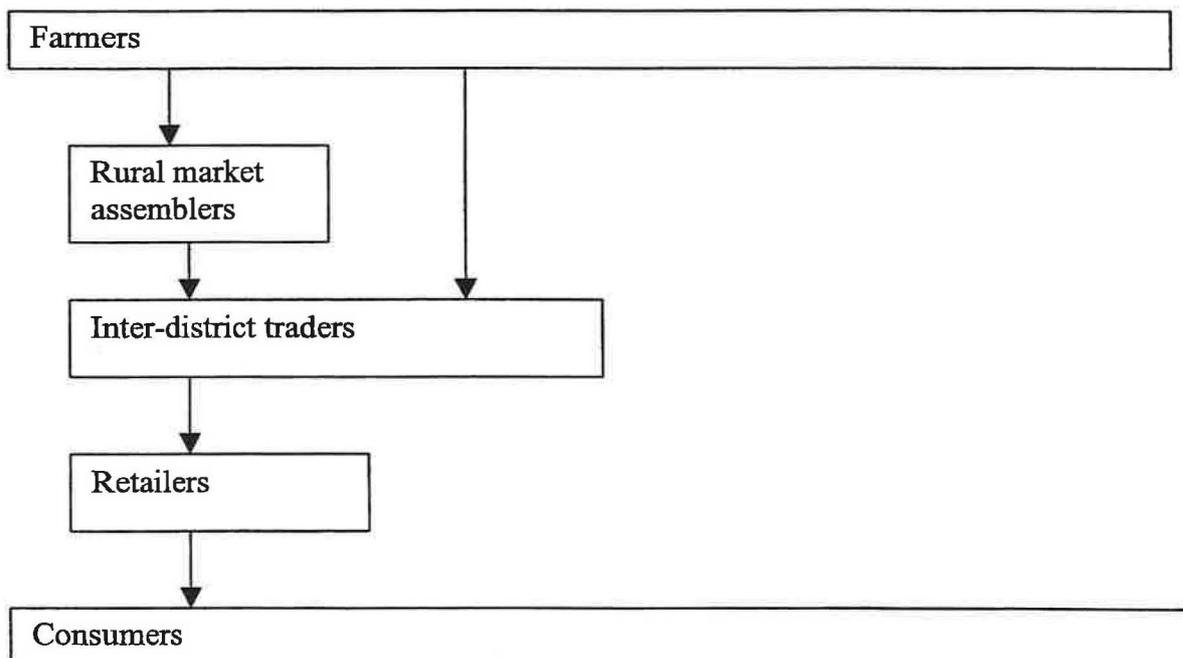


Figure 3: Typical marketing channels for fresh produce (fresh cassava, sweet potato, fruit)



3. Marketing costs and margins

Marketing margins are the differences between prices at different levels of the marketing chain for the same quantity and quality of produce, for instance, between the producer and consumer prices or the wholesale and retail prices. These margins are made up from marketing costs and profit. Marketing costs include the costs attached to transportation, storage, transformation, handling and transaction costs (including the costs involved with identifying buyers/sellers, gathering information about the product, and negotiation costs). By gathering information on prices and marketing costs throughout the marketing system, it is possible to deconstruct the final selling price of the product into marketing costs and profits.

Two examples are provided below, which illustrate the marketing costs for fresh sweet potato produced in Kumi and sold in the Kampala market, and for rice produced in Katakwi and sold in Mbare. These have been built up from talking to different market participants. The figures are drawn from a relatively small sample, and are therefore likely to only provide a rough indication of the costs and margins. Also, it was found that certain costs and prices can vary quite significantly. For fresh sweet potato, prices fluctuate significantly over the season, which would change the margins, especially for the producer, who for the same costs of inputs can receive widely different prices for their output. No attempt was made to determine the costs of production for farmers, and hence it is not possible to deduce the profitability of crop production, though it is possible to observe the share of the final price of the product that the farmer receives. Also, only an approximation of marketing costs are included, with, for instance, no attempt to value labour or assets.

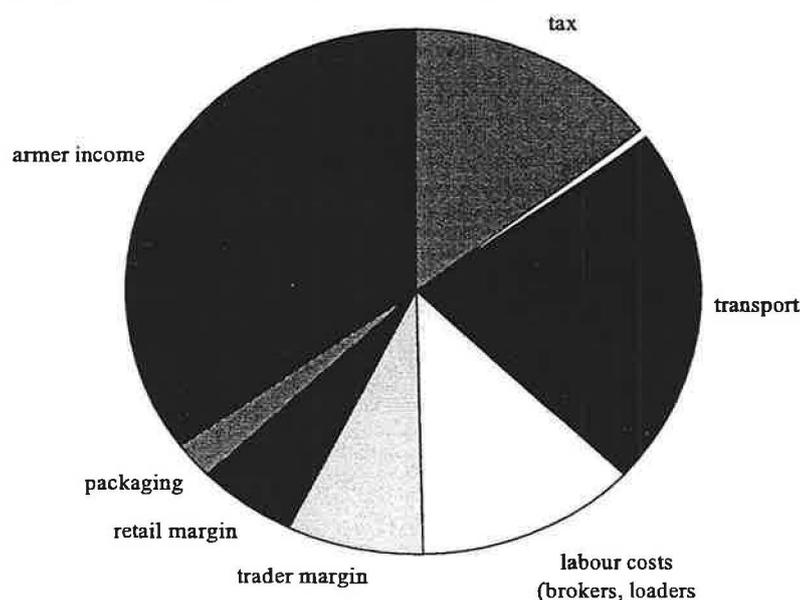
The figures suggest that the perception that middlemen and traders are making excessive profits by exploiting farmers is incorrect. In fact, although this was admittedly only a rapid assessment, it appears that margins of profit are shared through the marketing chain. The farmers' perception that they are being exploited comes from the difference in the price they receive and the final selling price of the product. This difference can be explained by the costs involved in handling, processing and transporting the produce, not by excessive profiteering. This conclusion is to be expected in competitive output markets. In the markets visited, both rural assembly markets and urban wholesale and retail markets, there were generally a large number of sellers and buyers. Unless there is collusion between either buyers or sellers, a competitive market is likely to minimise margins. The only evidence of collusion was found at the Lira wholesale market where traders had formed an association. This association blocked traders from outside the district from purchasing directly from farmers (especially buyers from Kampala fulfilling World Food Programme contracts). However, the members of the association still compete among themselves, and there was no evidence of price setting.

No attempt was made to calculate the margins being achieved by transporters, though as for the traders and wholesalers, there are also a large number of transporters in the market and it is therefore likely that their profits are not excessive.

Case study 1: fresh sweet potato - marketing costs (per bag @ 120kg)

	<i>Costs (shs)</i>	<i>Income (shs)</i>	<i>Margin (shs)</i>
<i>Farmer costs:</i>			
- hired labour for digging and transport to road	200		
Sell to trader		7000	
Farmer margin			6800
<i>Trader costs:</i>			
Purchase from farmer	7000		
Cost of bag	500		
Payment to buying broker	400		
Labour for filling and loading bag	800		
District Development Fund – Kumi	200		
Patroller – labour	200		
Transport to Kampala	4500		
Transport dues (to traffic police)	600		
Kampala City Council (parking, off-loading)	500		
Payment to selling broker	400		
Off-loading	500		
Sub-total – trader	15600		
Sell to retailer		17000	
Trader margin (after costs)			1400
<i>Retailer costs:</i>			
Purchase of sweet potato	17000		
Market dues	1000		
Selling price		19550	
Retailer margin			1550

Figure 4: Pie chart of marketing costs and margins for fresh sweet potato (Nov 24 1999)

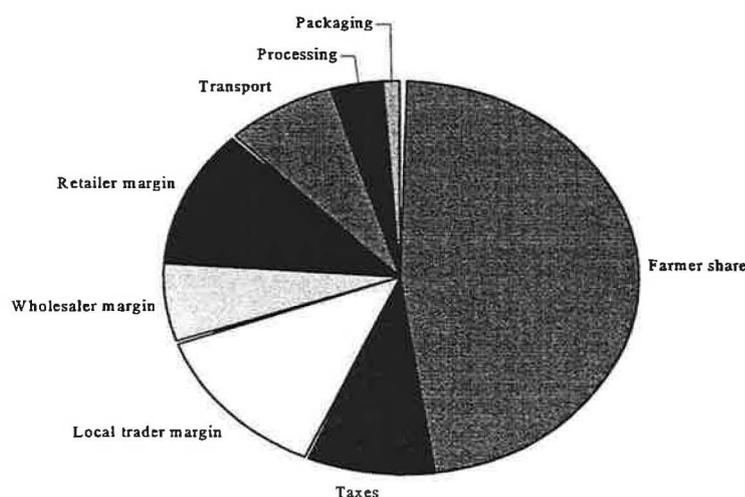


Case Study 2: Rice from Katakwi rural market (Shillings per kg of rice)

	Costs (shs)	Income (shs)	Margin (shs)
<i>Farmer costs:</i>			
Market dues at rural market	43		
Sell to local trader (shs300 per kilo of paddy)		429	
Farmer income			386
<i>Local trader costs:</i>			
Purchase from farmer	429		
Cost of bag	6		
Transport market to Soroti	30		
Hulling costs	30		
Sell to wholesaler *		600	
Local trader margin			105
<i>Wholesaler costs:</i>			
Purchase from trader	600		
Transport to Mbale	33		
District Development Fund Kumi	2		
Mbale off loading	10		
Sell to retailers		700	
Wholesalers margin			55
<i>Retailer costs:</i>			
Purchase of rice	700		
Market dues	10		
Selling price		800	
Retailer margin			90

*Assumes a paddy-rice conversion rate of 70%, i.e. 1.43 kg unhulled equals 1 kg hulled

Figure 5: Pie chart of marketing costs and margins for rice purchased in Katakwi rural markets and sold in Mbale (Nov 25 1999)



4. Marketing institutions and institutional arrangements

Market management

For all the market places (rural and urban) in the survey districts, market management is contracted out to private companies. This system has replaced the previous arrangement in which the local district authorities had full responsibility for the upkeep of markets and the collection of market dues. Low official collection rates for these dues, attributed to widespread corruption, have brought about the privatisation. Markets are now graded according to size into four categories. Each market is tendered for by private management companies, which are required to pay a fixed monthly 'operating fee' to the local district authorities. The level of the operating fee varies according to the grade of the market, and is higher for larger markets. The operating contracts are tendered and issued regularly (in Soroti district this is meant to occur every six months).

The management company is licensed to collect market dues from market participants and it keeps all dues over and above the operating fee. Market dues are paid for by all persons bringing in goods for sale at markets, and are meant to be based on the value of the produce. However, the levels of the dues that market participants pay are far from transparent. The agents of the marketing companies make a visual assessment of the goods being brought for sale and decide what dues should be paid. Deciding these fees is a very subjective exercise, especially for crop produce because, in the absence of weighing scales and grading facilities, the agent cannot make an accurate assessment of quantity or quality.

It is questionable whether the new privatised arrangements for market operation are the most efficient way of managing markets. The local authorities obviously prefer it to the old system, in which returns from market dues were low and variable. Local market management companies also benefit from the new system. However, traders and farmers at the markets may lose out from the new arrangements, and there is evidence that farmers are understandably dissuaded from marketing their produce through these markets (for example a bag of sweet potato worth US\$7000 attracted market dues of US\$1000 in Kumi).

Associations / farmer groups

Generally farmers market their produce individually and in small quantities. Farmers taking produce to markets incur relatively high marketing costs per unit of produce marketed (for example market taxes, transportation and the opportunity cost of labour). These unit marketing costs could be lowered by realising economies of scale through joint marketing of produce. At present, produce tends to pass through one or two intermediate traders before reaching the wholesale market. There is a margin of profit for these traders which could potentially be captured by farmers if they performed assembly and transport functions themselves, through associations or groups. However, although there appears to be benefits from bulking up at farmer level, experiences with group-based initiatives in the past have not been positive².

² Attempts to develop group-based savings and credit schemes in Uganda have had relatively little success, and tend to break down due to a number of factors including the general suspicion of 'imposed' group

Traders' associations also offer potential benefits to their members. As with farmer groups, small-scale traders can reduce marketing costs through joint activities. This was evident in the markets around Soroti where local traders came together in informal groups to hire transportation, and in one case to hire weighing scales which were used by all the traders when purchasing from farmers at a rural periodic market.

Traders can form groups to increase their control of the market. This is the case with the Lira Wholesalers' Association. The main incentive for forming this association was to prevent traders from Kampala and elsewhere from dealing directly with farmers, thereby cutting out the wholesalers and threatening their business. Potentially this will hamper competition in the sector, and could lead to lower prices for farmers, though there was no evidence of this. The Lira Wholesalers' Association was also interested in developing joint storage facilities and taking joint liability for bank loans, which individual wholesalers have difficulty in accessing.

Role of contractual arrangements

There is little use of contract farming in the study region. However, in Soroti District the Lake Kyoga cotton ginnery has formed women's and youth groups to channel credit for land clearing and to provide purchased inputs under contract. Even so, the history of such contractual arrangements in Uganda is not good, with farmers frequently defaulting on credit repayments and breaking contracts³. Elsewhere in Africa (notably in Zimbabwe⁴) experiences in using contract farming for cotton farmers have been positive. There may be potential for Ugandan ginneries to learn from these experiences.

5. Market information systems

Reliable and widely available information on prices can potentially play an important role in increasing market efficiency. Both buyers and sellers can make better informed decisions on crop marketing - when and where to sell or buy produce - to increase returns. Information asymmetries are also removed, reducing the possibility of exploitation (normally by better informed traders of less informed farmers). Market participants (from farmers through to wholesalers) interviewed during the assessment relied solely on informal sources of information acquired from social and business contacts.

Formal sources of information are available. Since September 1999, the International Institute of Tropical Agriculture (IITA) have launched a Market Information System (MIS), which when it is fully up and running will collect farmgate, wholesale and retail

formation (due in part to negative experiences with the state imposed co-operative movement), lack of group management skills, and mutual distrust between group members. Goodland, A. D. (1999) *Smallholder credit in Uganda: roles of farmers, government and the private sector*. Natural Resources Institute, Chatham.

³ *ibid*

⁴ Gordon and Goodland (2000) *Smallholder access to inputs*. Savings and Development (forthcoming)

prices for a range of fresh, dried and animal products from across the country. The targets for the new service are farmers and traders and the main means of dissemination will be radio. This will replace the Marketing News Service (MNS) which was previously operated by the Ministry of Trade and Industry. (Interestingly, none of the traders spoken to were even aware of the MNS.)

In addition to the new MIS, local Private Sector Promotion Centres (with offices in Soroti and Lira) also intend to provide market information for agricultural traders, though systems for the collection and dissemination of this information have yet to be developed. Developing market information systems has to be carefully planned if it is to have an impact. Market information may be largely irrelevant for farmers who have little choice in deciding both the time and place that they sell produce. Farmers can only benefit from market information if they have the means of storing produce, changing cultivation patterns, or a choice of the market they sell to. Therefore, many farmers may be limited in their ability to benefit from opportunities provided by improved market information. There are also dangers of operating a poor MIS. Poor quality information and old information cause producers and traders to make ill-informed marketing decisions, possibly increasing marketing costs and reducing returns. No MIS may be better than a bad MIS. Good MISs must invest considerably to collect regular, accurate and relevant information and disseminate this rapidly to target groups.

In addition to market price information, farmers and traders may require information on technologies to improve marketing related activities (for example storage and processing technologies). Of the traders spoken to, several were interested in receiving further information on good storage management (for instance the correct way to build grain stacks) although this was not as high a priority as improved price information.

6. Price trends and fluctuations

The economic efficiency of storage can be calculated through comparing seasonal price changes with the costs of storage incurred over the same period. Analysing seasonal price changes requires access to good quality price data. The market information systems in Uganda are currently going through some upheaval (see Marketing Information above). Gaps in the data mean that any analysis of seasonal price fluctuations is difficult and has not been attempted here. More recently, IITA have been collecting both farm-gate and retail prices of traded commodities in the survey areas. This has been collected regularly since the beginning of 1998. Although this is useful (see graphs below) it is not a long enough series to make firm conclusions about seasonal price fluctuations or returns to storage.

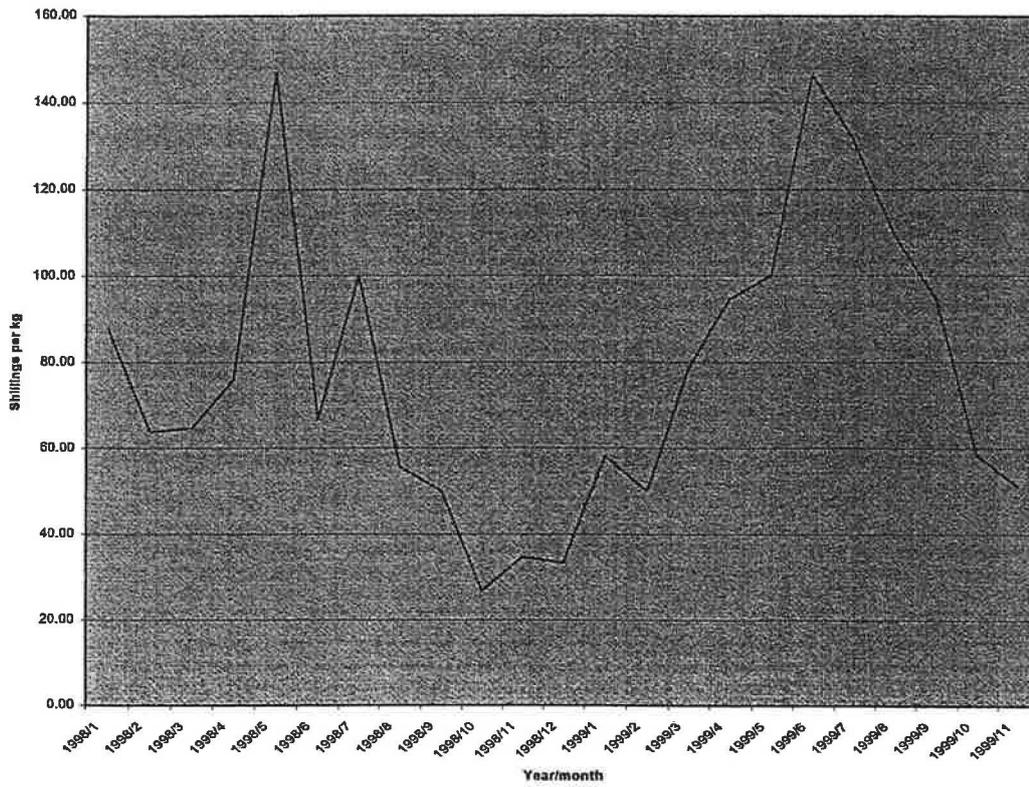
Measuring storage costs requires detailed data collection, which was not possible with the time and resources available for this rapid marketing research exercise. For an accurate analysis of storage costs, data are required on the whole range of costs associated with storage. These include: the opportunity cost of capital which is tied up in the produce being stored; losses in value due to quality deterioration and weight losses during storage;

labour costs associated with storage; rental costs or depreciation of storage facilities and packaging (for example reusable bags); and interest rates on loans, if applicable.

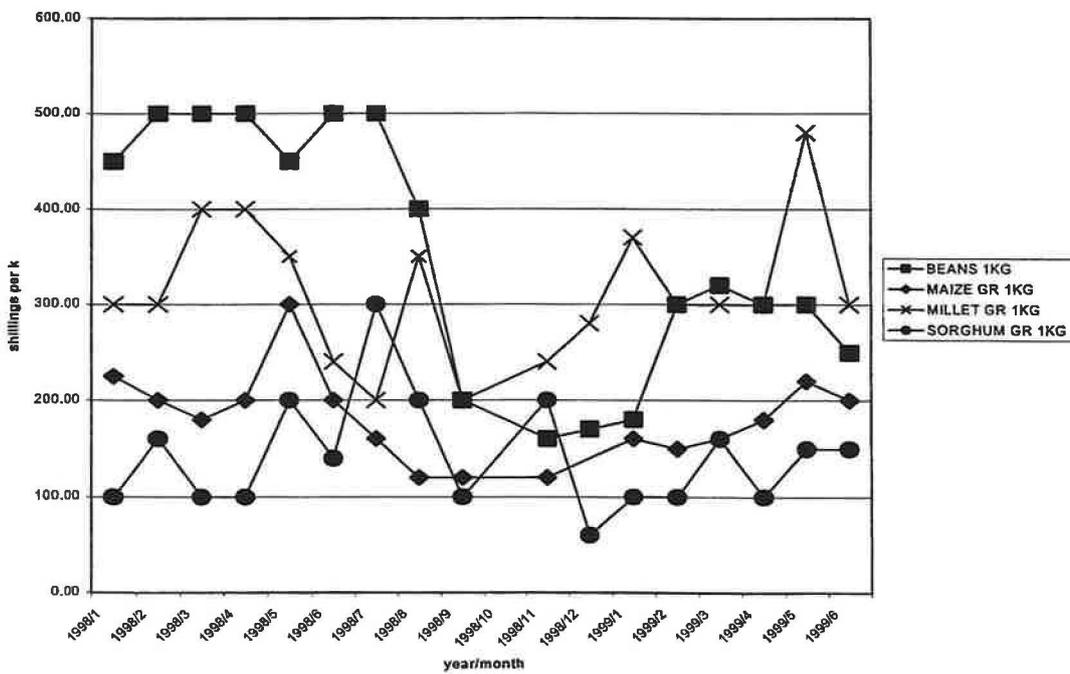
Although this investigation did not conduct a detailed analysis of potential returns to storage, the storage behaviour of different participants in the marketing chain was explored through interviews. Presumably, if traders had access to storage facilities and were able to finance storage, they would do so if the returns were greater than those that would be achieved through other trading activities. Traders tended not to speculate on seasonal price fluctuations, and instead aimed for rapid turnover with smaller margins, suggesting that the returns from storage do not exceed those returns from regular trading. One reason provided for this behaviour was the difficulty in predicting prices. The farm-gate price data from Lira (graph 2) backs this up. For small grains such as millet and sorghum, although prices do fluctuate, it is difficult to discern any pattern in price movements. A number of factors may contribute to these erratic price movements:

1. The bimodal rainfall pattern allows for two seasons of many grains which decreases the length of shortage periods/high prices.
2. Sporadic interventions by large buyers, such as the World Food Programme destabilises prices and makes the prediction of prices difficult.
3. Uganda is increasingly supplying regional markets (Kenya, Rwanda) and prices appear to be sensitive to fluctuations in supply and demand in these countries, adding further complexity to price fluctuations.
4. Many crops are substitutable – meaning, for example, that a supply shortage in one crop will mean an increase in demand for another. This is what was happening in the sweet potato market during the survey period: the matoke harvest in the west of the country was low and households were switching to fresh sweet potato as a substitute, pushing up the price. This is demonstrated graphically below (graph 1) where the dip in prices for sweet potato was lower in 1998 than in 1999.

Graph 1: Farmgate prices, fresh sweet potato, Kumi (data source: IITA)



Graph 2: Farmgate prices: various crops, Lira (data source: MNS)



7. Summary of Constraints

Holtzman⁵ (1993) lists the common constraints found in developing country agricultural marketing systems. These can be used as a checklist to summarise marketing constraints in the Teso and Lango marketing systems.

1. *Geographical Dispersion of Production*

A wide geographical dispersion of production leads to high marketing costs, due to high transportation and transaction costs. Production patterns in the research area show that households grow a large number of different crops with little specialisation. This partly reflects farmers managing risk, both in terms of production failure and marketing difficulties. Physical access to markets is a problem for small farmers, though the system of periodic markets ensures that farmers should have a relatively short distance to travel to a market at least once a week, though inevitably, at these markets they will tend to be price-takers as opposed to price-setters. On a larger scale, the district of Katakwi suffers from poor transport infrastructure (specifically the road between Soroti and Katakwi), which may dissuade traders from visiting the district.

2. *Inadequate or Excessive Specialisation by Traders*

Inadequate specialisation by traders means that they fail to capitalise on economies of scale. On the other hand, excessive specialisation increases risk and implies higher transaction costs. Traders in the research area tend to switch between many commodities, and will basically trade in any commodity in which they can make a profit. This may be classified as inadequate specialisation, the consequence of which could be the failure to capitalise on economies of scale. Alternatively, it could be considered as the necessary response to a diverse market, and reflects instead low barriers of entry into the market.

Clearly, in the cotton and sunflower oil sectors, there is asset specificity, where processors have invested in assets which are specific to a particular crop. In these circumstances, specialisation is inevitable, and processors invest in securing access to raw material through networks of commissioned agents and through maintaining good relationships with farmers.

3. *Monopsonistic Competition in Rural Markets*

Monopsonistic competition can lead to exploitation of farmers by traders in the form of lower prices for produce. In the research area, farmers certainly can face restrictions in the number of traders they can access, often being limited to traders at their local rural periodic market. Prices may be lower at these markets than in urban markets, though these may reflect increased marketing and transaction costs, rather than excessive profit seeking. Certainly, there are few barriers to entry into trade. It is possible to travel to and from markets using public transport and hire weighing scales. Working capital is necessary to purchase from farmers, and traders must buy packing materials (sacks) and pay market taxes. However, no license is required. These low barriers to entry suggest a competitive market.

⁵ Holtzman, J., Martin, J., and Abbott, R. (1993) *Operational Guidelines for Rapid Appraisal of Agricultural Marketing Systems*. USAID

4. Crude and Inefficient Handling and Storage

As noted, there is relatively little medium to long term storage of produce in the survey area. Inspections of wholesalers stores identified a number of bad storage practices (poor stacking, poor access, some pest and insect damage), though this does not appear to lead to significant losses as commodities are generally only stored for a short period. At the farm level, details of storage and handling are available from the farmer questionnaire survey.

5. Price Volatility

Price uncertainty and volatility is a problem, and partly contributes to traders' strategies to have a rapid turnover. The complex marketing system results in unpredictable price movements (see Price Trends and Fluctuations above).

6. High Marketing Costs

Marketing costs tend to be high, especially for food crops. This is partly because of high transportation costs and the small quantities marketed. For fresh produce, marketing costs are particularly high, due to the perishable nature of the produce and the consequent need to market quickly (see above).

7. Pervasive Mistrust

Fear of opportunistic behaviour leads to mistrust between parties in an exchange. This can add to transaction costs. For instance, sweet potato traders employ packers to ensure only good quality potatoes are selected, thereby adding to costs. In the absence of defined and enforced quality and quantity standards, personalised transactions may develop to reduce the need for repeat checking of produce during transactions, though no evidence of this was found.

8. Deficient and Uneven Market Information (see section above)

There is a deficiency of market information at all levels. Even though this is collected reliably by IITA, no traders spoken to ever made use of this information. Farmers appear to rely on informal market information systems to determine prices, and the information may be of limited use to farmers with restricted market access.

9. Lacking or Undeveloped Physical Infrastructure

Roads may be a problem in remoter areas and, in particular, the road between Soroti and Katakwi. Storage structures visited in urban markets seemed reasonably well maintained, as are the marketing structures (stalls, drainage etc.). The periodic rural markets on the other hand have only basic infrastructure – some stalls and canopies. However, it was not evident that this was compromising quality of produce.

10. Undeveloped Marketing Services

Very few marketing services are offered though marketing information is being addressed by the IITA project. There is no uniformity with regards to grades and standards, access to credit for marketing activities is severely limited, there is no training in business / marketing skills, and uniform weights and measures are not available.

11. Atomistic Competition

Atomistic competition refers to the situation in which there are a large number of small operators within a market, each with a small market share, and each therefore unable to generate sufficient income to invest in knowledge or technology to increase productivity. Certainly, in the markets observed, the scale of operation of traders and wholesalers is generally small. Wholesalers remarked that access to credit was a constraint to increasing the scale of their operations. No estimate was made on the potential economies of scale (and hence increased productivity) which could result from increased investment in operations.

12. Shortage of Marketing Credit

This was raised as a constraint by respondents throughout the marketing chain. At the farmers level, credit may be required for storage or processing structures/technology, or for enabling a delay in selling produce. Traders require credit for increasing the scale of their operations, either through investment in technology, or by allowing them to purchase larger amounts of produce. Although this may be the case, access to credit is often raised as a constraint when, in fact, the returns on credit have not been calculated. For example, are returns to storage sufficient to justify investment in storage technology? There are a few formal sources of credit in rural Uganda – the Centenary Bank is increasingly considering rural lending, though outreach at present is low.

13. Negative Public Attitudes Towards Marketing

There is a negative attitude from farmers towards traders, whom they perceive as making excessive profits. Though this is understandable from farmers who compare the price they receive with the price the consumer finally pays, the analysis (albeit quick and simplified) of market costs suggests that this perception is misplaced, as it ignores the high transaction costs.

14. Ineffective or Counterproductive Government Policies

There is relatively little government intervention in agricultural markets. Government plays no role in setting prices. One area for involvement of local authorities is the awarding of contracts for market management, which may merit further investigation into the impact on market participants.

15. Excessive or Inappropriate Parastatal Activities

Little direct parastatal activity now occurs in the crop sectors in Uganda. Both the Cotton Development Organisation and The Uganda Oilseeds Processors' Association provide some services to farmers, primarily seed distribution. Other government institutions are more geared towards providing production oriented services, for example the research and extension services. Post harvest issues are handled by the Post Harvest Department of the Kawanda Agricultural Research Institute. KARI's activities include the development of appropriate storage technologies for farmers and traders.

PART C FARMER PERSPECTIVES

Objectives

The post-harvest system is made up of several components, which begin once the crop in the field has reached physiological maturity. This survey was undertaken to identify the constraints that occurred from the point of crop maturity to when the commodity is processed, sold or consumed as food. The following objectives were therefore established to identify:

- problems occurring between crop maturity and storage
- on-farm storage problems
- primary processing and marketing problems
- areas requiring further development and interventions.

Methodology

For descriptive purposes, Uganda is divided into a number of geographical farming systems. Each system comprises a number of administrative counties, which are subdivided into a series of sub-counties and then parishes. The parish is the smallest grouping of households covered by a government extension field worker. The table below shows the localities from which farmers participated in the survey.

Farming system	District	County	No. of parishes
Teso	Apac	Maruji	7
	Lira	Moroto	6
		Omoro	
		Otuke	
Adwari			
Lango	Katakwi	Amuria	5
	Kumi	Bukedea	5
		Kumi	

A total of 160 farmers in 57 villages were interviewed individually, almost equal numbers of men and women (sex ratio: 0.51). One-to-one informal, but structured interviews took about two hours (an example questionnaire is illustrated in Annex 2). Respondents were selected by local extension services at random from lists provided by the parishes.

A separate team of four enumerators worked in each district. Team members were drawn from government research, district agricultural staff and NGOs (details are given in Annex 3).

Wealth ranking

Three characteristics were used to determine relative wealth: area of land cultivated; number and type of livestock; and number of dependants. The average area cultivated was 6.4 h and each farmer had 3.6 cattle, 5.2 goats or sheep, 1.2 pigs and 1.8 chicken (Annex 4).

Background information

Most farmers cultivated between 3-9 different crops, the average being six. Cassava was regarded as the most important crop by 38% of respondents and a further 19% regarded it as the second most important crop. Other main crops included groundnuts, common beans, sorghum, millet, sesame, grain legumes including green gram, cowpea and pigeon pea, other cereals, particularly maize and rice and sweet potato. Production details are given in Annex 5. Only 20% of farmers use improved varieties when cultivating their main crop, 45% use local varieties and the remainder use a mix of both. When considering the five most important crops together, 70% of the producers use local varieties. Only 8% of these crops are grown solely to sell, 55% are used for sale and for home consumption whilst most of the remainder is used for food alone. A very small amount, 1%, is retained on the farm for seed.

Findings

Farmers were asked to identify problems that occurred during four distinct phases between the point when the crop matured and the time it was consumed or sold.

- Between crop maturity and harvest, whilst the crop is drying in the field: up to two months.
- From harvest until storage begins: up to two weeks.
- Storage: usually 4-8 months depending on the crop but can be much longer for millet.
- Processing after storage, and marketing.

The following recorded responses relate to the main problems or issues that farmers mentioned. None of the tables total 160, because some farmers did not respond or the issues mentioned were of minor consequence. To some questions, for example those concerning types of storage protectants, farmers frequently gave more than one solution or method.

1. From maturity to harvest

Table 2 illustrates what farmers believe to be the two main problems they face. Quite clearly there is a variety of issues which farmers have to contend with before harvest. Of these, prolonged rainfall, which may well cause fungal invasion and spoilage and rotting is the most important. Pests are also a cause for concern.

Table 2 Pre-harvest problems

	No. of farmers	
	Main problem	Second problem
Birds	20	13
Insect pests	29 (15)	24 (15)
Rodents	9	12
Rain	30	17
Rot / mould	17	14
Seed drop /shattering / germination	18	20

Data in () are numbers of farmers who complained about termites.

2. Between harvest and storage

Lack of appropriate transport from the field to the store is one of the two major issues at this stage (table 3). Transport is either inappropriate and expensive or simply not available. Drying due to prolonged rains and inadequate methods – most drying is undertaken by exposure to ambient heat from the sun – is also of major concern.

Table 3 Pre-storage problems

	No. of farmers	
	Main problem	Second problem
Transport	53	29
Drying	42	40
Labour availability	16	7
Insect pests	16 (14)	- (14)
Threshing/winnowing	-	18

Data in () are numbers of farmers who complained about termites.

3. Coping strategies employed before harvest

Frequently, farmers have solutions for the problems they experience. Although many of these solutions alleviate the problems they do so only to a limited extent and are, therefore, not particularly effective. This is particularly well illustrated for constraints that occur before harvest takes place. Birds, which are pests after the crop matures, are chased and scared away or trapped; only one farmer clears roosting sites, a method that might be the most effective. Rapid harvesting was employed to avoid pest problems, 13 farmers used chemicals for insect pest control and three used traps to catch rats.

The time-frame for these operations, and especially for transporting the crop from the field to the homestead, is determined by the number of people employed. Many farmers try to employ casual labour as well as using family members to undertake the various harvest operations. Hiring labour can be expensive, particularly at a time of year when farmers have little cash available, and many feel that credit should be available for this purpose.

Farmers are most concerned about transport. Those that cannot hire labour usually convey the produce as head loads. The preferred methods are using ox-carts or bicycles, though less than 5% have access to these.

4. Storage

Pest attack, particularly by insects, but also by rodents is the significant factor which affect crops during storage (table 4). It would appear that by the time the crop is put into store drying is no longer significant. The extent of pest damage may be related to the type of structure used for storage. More than a third of farmers use sacks (table 4) for holding grain either as their sole means of storage or in combination with a more resilient structure such as a woven basket. When kept in sacks, produce is very susceptible to pest attack unless some means of protection is utilised, either synthetic insecticides or natural insecticides such as chilli pepper and wood ash.

Table 4 Storage problems

	No. of farmers	
	Main problem	Second problem
Insect pests	97 (5)	76 (26)
Rodents	32	51
Fungi/mould	7	13
Theft	7	3

Data in () are numbers of farmers who complained about termites. More detail is given in Annex 5.

Table 5 Type of storage structures

Type	No. of farmers
Granary (outside)	88
Mud silo	8
Sack	59
Other structures (inside house)	3

The crops mostly attacked by insects during storage were beans and maize (table 6).

Table 6 Main commodities infested by storage insect pests (total of 93 respondents)

Commodity	No. of farmers
Beans	30
Maize	20
Sorghum	17
Cowpea	16
Cassava	13
Sweet potato	9
Groundnut	5
Unspecified	29

The most common methods for preventing insect infestation is to dry the produce at intervals (table 7). Another cheap method, particularly used on stored pulses, is the application of botanicals. More expensive, but also more effective, is the use of synthetic chemicals. Ash is a useful protectant as it works well if large quantities are used, but this limits its use, as it is difficult and tedious to collect sufficient material.

Table 7 Methods used to prevent insect damage during storage

Method	No of responses	Comments	Advantages	Disadvantages
Drying	76	The frequency varies between every 2 or 3 days to intervals of months.	cheap	Tedious, not very effective
Chemicals	58	Actellic, 'safi-safi' (unknown powder)	effective	Expensive, harmful
Botanicals	41	Mostly chilli (1 respondent mentioned neem). On beans, grains, cassava chips	cheap	Not very effective, painful (chilli)
Inert materials	23	Ash mostly, also sorghum chaff	cheap	Added work

Similar methods are used against termites, although some farmers simply inspect the store and its environment regularly, clearing away termites by hand. This method is rather tedious and does not account for insects that burrow in through the internal walls of the store where they cannot be seen. One farmer built his store on raised blocks to facilitate inspection and to hinder access by termites.

There are three main methods for combating rodents: laying down rat poison, using traps and relying on cats (table 8). Farmers have very little confidence in any of the methods

for different reasons. Trapping is potentially the most user-friendly method but efficiency is reliant on how traps are used, where they are placed and the general level of store management. It is clear that the level of knowledge and skill employed is not sufficient to achieve adequate control.

Table 8 Methods used to prevent rodent damage during storage

Method	No of responses	Comments	Advantages	Disadvantages
Poison	53	Rattak, baiting with fish, maize meal, groundnut	effective	dangerous
Traps	23		easy, effective, affordable	expensive, not effective, painful
Cats	20	Very often used with poison and/or traps	effective	not much liked

Despite attempts to reduce or prevent pest damage by adopting a variety of different procedures, significant problems still remain. When questioned about the use to which damaged grain would be put, most respondents said they would use it for food if it was only lightly damaged, otherwise it would be used to feed livestock or, more commonly, discarded (table 9).

Table 9 Use of infested produce

Use*	No of responses	comments
Discard	99	Especially if too damaged (cowpea, sorghum..)
Feed livestock	67	Chicken (30), other animals (37)
Brew	62	For beer (maize, cassava, sorghum, millet, sweet potato) or gin (cassava)
Eat	30	If not too damaged
Sell	23	Mostly at a lower price, or for beer, or mixed with higher quality produce
Mill	12	To eat or sell
Process	7	To cook (especially for legumes)
Re-dry	7	
Treat (pesticide)	3	
Use as fertiliser	2	
Harvest	2	Cassava: harvest and process as chips

*Farmers were asked to say what the three main uses would be.

5. Processing

Typically, complaints regarding primary processing included lack of finance, and shortage of labour, equipment and transport. For 60 farmers, milling maize, cassava, sorghum or millet and pounding sesame and sunflower are the major processing issues caused by the lack of mills in the locality, the cost of using the mills or the cost of transporting commodity to the mills. The provision of additional mills was believed to be the answer to these problems. Only nine respondents thought shelling and threshing cereals were difficult, being cumbersome and tedious. However, cassava farmers did complain about the tedium and pain involved with grating and peeling this crop and sweet potato. More people (15 respondents) complained about the cooking times for grain legumes, especially of beans and pigeon peas to be processed into 'dhall'; this can only be overcome by long periods of soaking in water.

6. Marketing

There were two main marketing issues expressed by interviewees: transport or access to market and prices. Most producers take produce to market by bicycle when what they want is to hire cheap forms of bulk-carrying vehicles. Transport would be facilitated if the condition of the roads was improved. Transport issues would also be circumvented if more local market centres were established by farmer co-operatives, or if the farmer sold at the farm gate. It was felt that co-operatives would have advantages because these groups could work together to improve roads, which would attract buyers (table 10).

Production gluts cause low prices, which farmers try to overcome by extending storage. Some farmers travel long distances to gain better prices and many wanted the government to fix prices so that all the uncertainties are removed.

Table 10 Marketing problems

	No. of respondents		Coping strategy	Suggested solutions
	Main problem	Second problem		
Transport	64	79	Hire, sell from home	Community to improve roads
Prices	45	47	Store	Co-ops, new markets, government to fix prices, provide loans, process into beer
Lack of demand	10	12	Travel far, wait, sell cheaply or for credit	
Market tax	8	16	Borrow, sell at farm gate	Co-ops, trading centres to reduce tax
Marketing choice	7	7		Need better choice of markets, prices, how and where to sell

7. Conclusions

Very little practical advice and information is given to farmers regarding the best practices to be employed once crop production is over. Consequently, the traditional means of handling crops from the point of physiological maturity through harvest, storage and processing, to sale and consumption, does not provide adequate solutions to the problems that occur. Farmers suffer from pests and diseases, gluts are produced giving rise to low financial returns and market access is difficult.

Insect pests and rodents are problems that occur both before and during storage. There is a need to introduce cheap, locally-available pest management practices. Synthetic insecticides and rodenticides are effective but many farmers are unable to purchase them, simply because of the cost. Ethnobotanicals would provide cheaper alternatives, but very limited exploitation of plants has taken place. It is most likely that candidate plants other than those in current use (chilli pepper) would provide significantly more effective control of storage insects. Other technologies for pest management, including efficient rodent trapping and exclusion, use of solarisation and inert dusts for insect control, and more efficient use of husbandry practices, could make valuable contributions in reducing pest damage.

These pest problems, as well as other issues such as drying before harvest and primary processing methods, could be addressed, for the most part, by the introduction and adaptation of existing technologies. To overcome transport difficulties and those associated with marketing will require further investigation at a more specific level.

Annex 1: Checklists used in survey

Checklist 1: Traders

Transactions

1. Which crop commodities do you trade in?
2. What factors influence your choice of crop commodity?
3. How much of each crop commodity did you trade in the past year?
4. When are your purchasing and selling periods for these commodities?
5. Which crop commodities are most profitable to trade?
6. Where do you purchase your commodities?
7. Who do you purchase from? (for instance, farmer, trader, farmer association)
8. Do you have any special arrangements for purchasing commodities? (for example, contracts)
9. Where do you sell your commodities?
10. Who do you sell to?
11. Do you have any special arrangements for selling commodities?
12. What trading/market taxes do you have to pay, and how are these determined?

Storage

13. Which commodities do you store?
14. How do you store these (bulk, sacks etc.)
15. How long do you typically store these commodities for?
16. What structures do you use to store (and can we see them)?
17. Are these rented or owned?
18. How significant are your storage losses and what are the main causes of these?
19. What steps do you take to minimize losses? Details...
20. What additional storage problems do you face?
21. What are your storage costs? (level of rent / cost of construction / cost of maintenance / stock treatments)

Prices

22. For the commodities that you trade, what are the high and low price periods?
23. What are the typical high and low prices for different commodities?
24. Have these fluctuations increased or decreased in the past five years?
25. What factors contribute to these fluctuations?
26. How significant is quality in relation to prices for the different commodities?
27. What quality factors influence the price of different commodities?
28. How do you determine your buying and selling prices?
29. What are your sources of market information?

Transport

30. What means of transportation do you use (for different commodities)?
31. What transport problems do you face?
32. What measures do you take to overcome these problems?
33. What are your transportation costs and how are these determined?

34. How significant is spoilage in transport?

Finance

35. Do you use credit to finance your trading activities?

36. If yes, what sources of credit do you have?

37. Are there any problems with respect to credit?

Checklist 2: Market Masters

These will be persons who we can obtain general information relating to the structure, operation and problems of agricultural markets in the district. They should be able to direct us to key processors, traders and transporters in the district.

Also, specific information of that particular market place:

1. What is the size of market? (no. of traders, no. of retailers, marketing infrastructure).
2. Do you have records of commodities and quantities traded? If so, can we see?
3. What market charges do you levy and how are these determined?

Checklist 3: Processors

1. What commodities are processed?
2. What are the final products?
3. What are the supply sources? (eg, farmers, traders, agents)
4. Do any special arrangements exist with suppliers?
5. Is access to finance a constraint?
6. What is the market for your final produce?

Checklist 4: Transport companies.

1. Which commodities do you transport?
2. From where and to where?
3. What are your charges?
4. How are these charges determined?
5. What levels of spoilage occur in transportation?
6. Who are your main clients?
7. Are there any commodity specific transportation/handling problems?

Activity 2: Secondary data and policy review

Location: Kampala

Areas to be covered through interviews with key informers:

- Price data – historical trends and seasonal fluctuations
- Government involvement in marketing
- What has been happening in domestic and international markets and at the policy level that may be impacting on local markets?
- Regulatory environment – are there any rules on standards/grades, laws affecting marketing.
- Role of public marketing institutions

- **Impact of macro-economy (fiscal and monetary policy) on local crop markets (if any).**
- **Role of the financial sector (finance is likely to be a major constraint to post harvest operations... can these constraints be elaborated).**

Annex 2

**Teso and Lango Post-harvest
Needs Assessment Survey. November 1999.**

District: _____ County: _____ Parish: _____
Village: _____ Date: _____ Enumerator: _____
Respondent: _____ Gender: _____

(is the respondent the head of the household?) Yes No

Part I: General information

1. **How many acres do you own? How many acres do you cultivate in total?
(exclude those acres not cultivated)**

Owned:	Cultivated:
---------------	--------------------

2. **How many dependants (above and under 15 year of age) are in this household?**

Above 15:	Under 15:
------------------	------------------

3. **How much livestock do you have?**

Cattle:	Goats/sheep:	Pigs:
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To ask only if you see that the house has a tin roof:

4. **Does your house have a tin roof that is newer than 5 years old?**

Yes **No**

Part II: Specific information at the farm level

This category should include not only cereals, pulses, root crops but also vegetables and fruit, and beverages where relevant

5. a) What crops do you grow? (Indicate whether local (L), improved (I) or both (B))
 b) Please rank the crops in the order of their importance for the household.
 c) Why do you grow these crops?

a)Crop	b)Rank	c) Reason for growing Food/ Cash
<i>Maize (B)</i>	<i>4</i>	<i>For seeds</i>
<i>Beans (L)</i>	<i>2</i>	<i>3 varieties for food, 3 varieties for sale</i>

6. Where do you obtain seeds (own saved, market, neighbour etc). What problems do you experience in obtaining seeds or planting material?

...*Maize from my own saved seed , tomatoes from my local store.*

.....

.....

.....

.....

.....

.....

7. How do you ensure that seed or planting material is of good quality?

.....

.....

.....

.....

.....

8. The following questions are for the 5 most important crops from question 5

The period under consideration is the last two seasons, from Nov 1998 to July 1999

	Crop 1	Crop 2	Crop 3	Crop 4	Crop 5
Name of the crop:					
a. How much did you harvest over the last 2 seasons (State measure: bags, basins..)?					
b. How much did you store for food (State measure)?					
c. How much did you store for sale (State measure)?					
d. What was the maximum period the crop was in store? (State the number of months)					

9. a) Whilst the crop is still standing in the field, after it's mature but before it's harvested, what type of problems do you experience? List and rank all problems.
- b) What have you done to overcome these problems?
- c) Or what other solutions could be appropriate?

a) Problems	Rank	b) Coping strategies	c) Proposed solution(s)
<i>Mice damage the crop whilst it is drying in stooks in the field</i>	3	<i>Children chase mice</i>	<i>Speed up drying so the crop can be harvested more quickly</i>

10. a) List the problems you face between harvest time and storage (including drying, threshing, winnowing, transportation...). Rank them.
 b) What have you done to overcome these problems?
 c) Or what other solutions could be appropriate?

a) Problems	Rank	b) Coping strategies	c) Proposed solution(s)
<i>Threshing by putting maize in sack and beating with sticks causes lot of grain damage</i>	5	<i>Shell by hand but very tedious</i>	<i>Use mechanical sheller</i>

11. a) List the STORAGE problems you have. Rank them (at least the 5 most important).
 b) What have you done to overcome these problems?
 c) Or what other solutions could be appropriate?

a) Problems	Rank	b) Coping strategies	c) Proposed solution(s)
<i>Insect in stored beans</i>	2	<i>Sell all quickly</i>	<i>Use additive to kill insects</i>

12. a) What types of STORAGE STRUCTURES do you use? Use local traditional name for granaries
 b) What crop(s) do you store in them (threshed or unthreshed)?
 c) How much grain can the stores hold? (in bags, basins, kg whatever is standard description used by farmer)
 d) How much do the stores cost?
 e) Who builds the store (where appropriate), the farmer or a skilled trader etc.
 f) What is the lifespan of the stores?

a) Common name of store	b) Crop (threshed or unthreshed)	c) Volume or capacity	d) Cost	e) Who makes the structure	f) Lifespan
<i>Sacks in the house</i>	<i>Shelled maize</i>	<i>100 kg</i>	<i>Sack costs 1,000/-</i>		<i>Two seasons</i>

(WHEN USING THE TRADITIONAL NAME FOR A STORE, PLEASE DESCRIBE THE STRUCTURE ON THE BLANK SHEET OPPOSITE. INCLUDE THE MATERIALS FROM WHICH IT IS MADE. THIS CAN BE DONE DURING THE ROUND UP SESSION AT THE END OF THE DAY)

13. a) What are the limitations and problems of these storage structures?
 b) How and to what extent do you overcome the problem?
 c) Can you suggest other solutions?

Name of store	a) Problems	b) Coping strategies	c) Proposed solution(s)
Granary	Life expectancy very short because of termite damage	<i>Use termite resistant wood when available, quite effective</i>	<i>Would like to use chemicals to treat wood but too expensive</i>

Losses during storage.

14. a) What crops suffer the most in store?
 b) Describe the main factors responsible for these losses
 c) And separately for each crop rank the importance of these factors.
 d) How much do you think you lose (weight, value etc)?

a) Main crops affected	b) Factor causing loss	c) Rank	d) Quantity lost (volume or value)
<i>Maize</i>	<i>Insects</i> <i>Moulds</i> <i>Rain</i>	1 3 2	Out of 10 sacks 2 are lost 2 tins altogether 1 tin from each sack

15. a) Problem
 b) DESCRIBE THE METHODS USED TO OVERCOME THE PROBLEMS described in question 14.
 c) What are the rates of application (quantities used, duration of exposure...)?
 d) What are the advantages of the method?
 e) What are the disadvantages of the method?

a) Problem	b) Method	c) Quantites used	d) Advantages	e) Disadvantag
<i>Insects on beans</i>	<i>Mix in dried powdered chillie pepper</i>	<i>2 cups for each basin of grain</i>	<i>Very cheap as I use my own chillies</i>	<i>Not very effective only protects for months</i>

16. How do you detect infestation or damage in your store(s)?

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**17. How soon are the crops damaged during storage
(indicate the crops)?**

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**18. What do you do with infested produce? (e.g. make beer,
feed to livestock, discard..)**

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Processing (remember this category should include not only cereals, pulses, root crops but also vegetables and fruit, and beverages where relevant: do not include tobacco or cotton)

19. What processing problems do you face (secondary processes: transforming produce, adding value)?

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Ask the following question only if the answer was not provided as part of question 19
20. Describe in some details the stage(s) of the process(es) where these problems apply (please specify which process)

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21. What have you done to overcome these problems? Or what other solutions could be appropriate?

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Part III: Specific information on Marketing

This category should include not only cereals, pulses, root crops but also vegetables and fruit, and beverages where relevant: do not include tobacco or cotton)

22. When you are planning to sell your crops, what problems do you face?

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23. What have you done to overcome these problems? Or what other solutions could be appropriate?

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• **Selling**

	Crop 1	Crop 2	Crop 3	Crop 4	Crop 5
Name of the crop:					
24. What form are they sold in? (fresh, dried, processed...)					
25. Rank the most important in terms of income					
26. How much was sold in the last 2 seasons?					

	Crop 1	Crop 2	Crop 3	Crop 4	Crop 5
27. Once you start selling, how often do you sell, and what sort of quantity do you sell at any one time?					
28. Why do you sell at that time?					
29. What proportion is sold within two months of harvest (%)?					
30. Who in the family makes the decision to sell?					
31. Who sells the crop?					
32. Who is it sold to?					
33. Why do you sell to them?					
34. Where do you sell (e.g. farm gate, road side, rural market...)					
<i>What are the seasonal variations in price of the crops?</i>					
35. When was the price highest in the last 12 months (which month)?					
36. What was the price?					
37. When was the price lowest in the last 12 months (month)?					
38. What was the price?					

39. How have prices changed over the last 3 to 5 years?					
40. What factors affect market value of that commodity?					
41. Rank the most important in terms of loss of value					
42. What problems do you face when transporting to market?					
43. How can these be overcome?					
44. How do you find out about market prices?					

Market accessibility

- 45. a) What is (are) the market(s) where you sell your produce?
b) How far is it?
c) What sort of problems do you have when selling at the market?**

Market	Distance to market	Ease of access? Problems?

46. Is there any organisation that gives credit to post-harvest (pesticides, processing,...)?

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47. Do you have any problem accessing credit?

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48. What sources do you normally obtain it from (if you do)?

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49. What are your sources of Post-harvest information (NGO's, etc.)?

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50. Are there any other problems related to post-harvest issues that we have not covered?

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Annex 3 The Project Team

Firstname	Surname	job	from
Walter O	Anyanga	RO	SAARI
Deus C	Lem	Technician	SAARI
Tony	Arach	RO (I)	SAARI/NGETTA
Julius	Okwadi	Socio Economist	KARI
Fred	Okiera Odom	RO	KARI
Andrew	Goodland	Agri-economist	NRI
Patrick	Kalunda	Socio-economist	KARI
Stephen	Ecwinyu	Devt trainer	Matilong Katakwi
JEP	Obuo	RO Agronomist	SAARI
J Robert	Omadi	Technician, Breeding	SAARI
Dodah	Okwang-Auwriat	Technician Entomology	SAARI
Grace	Ebryau	Technician Animal Production	SAARI
Samuel	Opule	AAO/MSE	Apac
Patrick	Odyomo	AO	Apac
Victor	Ogwang	Animal Traction Officer & PHHS	Apac
Betty	Okori	AO	Apac
Jokeme			
Margaret	Angom-Ogwang	FO PHP	Lira
Herbert	Okurut-Akol	PL Grain legumes	SAARI
Bruno	Tran	PH Ecologist	NRI
Samuel	Ebonga	AO	Lira
Stella	Isodo	AO	Vision Terudo
Ambrose	Agona	PH Programme leader	KARI
Peter	Golob	Project Leader	NRI

Annex 4 Wealth factors

	Acres		Dependants	
	owned	cult.	Age >15	Age <15
avge	14.11	6.00	3.76	4.84
stdev	21.14	4.26	3.43	3.61
count	159	159	150	152
SEM	1.676	0.338	0.280	0.293
min	0	1	0	0
Max	180	28	25	20

	Livestock			
	Cattle	Goats/ sheep	Pigs	Poultry
avge	3.64	5.15	1.15	1.78
stdev	9.37	4.91	2.24	5.17
count	137	149	116	127
SEM	0.800	0.402	0.208	0.458
min	0	0	0	0
Max	104	40	14	30

Crops

number of crop cited:

average	6.3
stdev	2.121
SEM	0.168
count	160
min	2
Max	12

Number of crops	Number of farmers
6	39
7	23
5	20
8	20
4	17
9	15
3	11
2	5
11	5
10	4
12	1
Total	160

Annex 5 Crop production

Crop 1		Crop 2		Crop 3		Crop 4		Crop 5	
Cassava	60 38%	Cassava	31 19%	Cassava	22 14%	Sorghum	22 14%	-	33 21%
Gnut	36 23%	Gnut	21 13%	Simsim	22 14%	-	16 10%	Sorghum	17 11%
Beans	18 11%	Sorghum	18 11%	Millet	18 11%	Millet	15 9%	Simsim	16 10%
Millet	13 8%	Simsim	16 10%	Gnuts	15 9%	Green gram	12 8%	sweet potato	14 9%
Rice	10 6%	Beans	14 9%	Cowpea	13 8%	Beans	11 7%	Sunflower	12 8%
Maize	5 3%	Millet	14 9%	Sorghum	12 8%	Cassava	10 6%	Millet	11 7%
Pigeon peas	5 3%	Sweet potato	13 8%	Sweet	11 7%	Maize	10 6%	cowpea	10 6%
Simsim	4 3%	Maize	11 7%	potatoes		Gnut	9 6%	Maize	10 6%
Sorghum	3 2%	Sunflower	5 3%	Beans	9 6%	Cowpea	8 5%	Beans	6 4%
Finger millet	2 1%	Rice	4 3%	Pigeon peas	7 4%	Sweet potato	8 5%	Cassava	6 4%
Bananas	1 1%	Pigeon peas	3 2%	Green gram	6 4%	Pigeon peas	7 4%	Gnuts	6 4%
Cotton	1 1%	Cowpea	2 1%	-	5 3%	Rice	7 4%	Green Gram	5 3%
Green gram	1 1%	Green gram	2 1%	Maize	5 3%	Simsim	7 4%	Pigeon peas	5 3%
Sunflower	1 1%	Oranges	2 1%	Rice	4 3%	Sunflower	6 4%	Finger millet	3 2%
		Cotton	1 1%	Cotton	2 1%	Cotton	4 3%	Cotton	2 1%
		Soyabean	1 1%	Finger millet	2 1%	Sweet potato	4 3%	Rice	2 1%
		Upland rice	1 1%	Soya	1 1%	Bananas	1 1%	Banana	1 1%
				Sunflower	1 1%	Finger millet	1 1%		
				Upland rice	1 1%	Potatoes	1 1%		
						Sesame	1 1%		

Data represent the numbers and percentages of farmers producing each crop.

Origin of seeds for 5 main crops:

	crop 1	crop 2	crop 3	crop 4	crop 5	total 5 crops	
Local	74	101	97	93	82	447	70%
Improved	34	21	21	15	22	113	18%
Improved & local	30	16	15	11	3	75	12%
no answer	22	22	27	41	53		
Grand Count	160	160	160	160	160	635	