# INVESTMENT IN DEVELOPING EXPORT AGRICULTURE (IDEA) PROJECT

# Analysis of the Maize Supply Chain in Uganda

## Final Report

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# List of Acronyms

| | |
|---|---|
| ACE | Audit Control Expertise |
| ADF | African Development Fund |
| CERUDEB | Centenary Rural Development Bank |
| FAO | Food and Agricultural Organisation of the United Nations |
| HV | High Value |
| ICRC | International Committee of the Red Cross |
| IDEA | Investment in Developing Export Agriculture |
| LV | Low Value |
| MAAIF | Ministry of Agriculture, Animal Industry and Fisheries |
| MSGGA | Masindi Seed and Grain Growers' Association |
| MTTI | Ministry of Tourism, Trade and Industry |
| NALG | Nakisenhe Adult Literacy Group |
| NTAE | Non Traditional Agricultural Export |
| UEPB | Uganda Export Promotion Board |
| UCE | Uganda Commodity Exchange |
| UGTL | Uganda Grain Traders Limited |
| UNBS | Uganda National Bureau of Standards |
| URA | Uganda Revenue Authority |
| USP | Uganda Seed Project |
| VOCA | Voluntary Overseas Cooperative Alliance |
| WFP | World Food Program |

# EXECUTIVE SUMMARY

## 1.0 INTRODUCTION

### Background to the Study

Investment in Developing Export Agriculture (IDEA) Project was initiated in March 1995, with the main goal of increasing incomes of the rural people. This is being achieved through promoting the production and marketing of selected Non-Traditional Agricultural Exports (NTAEs). The NTAEs include Low Value food crops (primarily maize and beans) and High Value crops (such as flowers, fruits and vegetables, vanilla and cocoa). The main intermediate result is increased value of the selected NTAEs as the source of increased incomes. Therefore, IDEA is one of those projects whose activities have a direct bearing on the production, marketing and export of NTAEs in Uganda.

Maize is currently one of the most important cereal crops widely grown and consumed in Uganda. The crop occupies a strategic position in the country's food security alongside bananas, cassava and sweet potatoes. It forms a major part of the diet for both the rural and urban communities. Maize also provides farm households and traders with incomes. It is therefore an important crop from both the food security and income-generation points of view.

However, despite the significance of maize, farmers and traders respectively face high production and distribution costs that squeeze their profit margins from the farm gate and along the supply chain. Besides, the farmers and traders also operate in thin markets that are susceptible to price swings that can result in financial losses. Grain mills in Uganda operate below full capacity because local supplies of maize are inadequate.

In addition, physical bottlenecks exist in the maize supply chain, which among others include insufficient secure storage facilities, poor distribution/transport mechanisms and shortage of electric power in the rural areas. Institutional obstacles like the absence of standardized maize grading and classification standards, thin markets and limited access to crop finance and export credit pose even a greater threat to maize farmers and traders. At the centre of all these bottlenecks is uncertainty in the transaction costs (value – cost assessment), which raises the fundamental question of whether maize is a profitable enterprise or not.

To further understand the functioning of the maize supply chain, Independent Consulting Group (ICG) was contracted by IDEA Project to carry out an analysis of the maize supply chain. This report therefore provides an insight on how maize competitiveness can be improved and ways to strengthen forward (to markets) and backward (to input suppliers) linkages. It also helps to understand the maize supply chain and value addition process along the chain. The study covered the major maize growing districts of Iganga, Kapchorwa and Masindi.

### Purpose and Tasks of the Study

Overall, the study was aimed at addressing the problem of the absence of strong farmer and commercial organizations at the farm level that can enforce and fulfil contractual forward (to markets) and backward linkages (to input suppliers and suppliers of modern production/handling/storage technologies). The main

objective of the study was to ascertain costs and value through the maize supply chain as well as identifying means of increasing maize competitiveness.

Specifically, the key study objectives were to:

- Carry out a literature review of related research works done on maize over the last 5 years.

- Map out the existing maize supply chains in the study area, with a focus on:
  - Enumerating all categories of participants in the maize supply chain.
  - Defining the commercial functions performed by each category of participants
  - Documenting the different categories of participants in terms of their concentration, location and estimated full production capacity.
  - Identifying for each category of participants' production, performance and value addition characteristics through the maize supply chain.
  - Conducting a maize value chain analysis through all points of market transfer and value addition, starting from farm gate and ending with traders, grain reserves, exporters and processing companies.

- Assess the basic economics of the existing supply chains in form of costs, value addition and profitability by:
  - Ascertaining the actual unit cost and price at each level of value addition within the chain.
  - Computing the production costs and benefits by technology/task for each category of participants within the maize supply chain.

- Carry out an in-depth assessment of the competitiveness of the maize sub-sector through:
  - Identifying the problems and prospects at each value-addition level in the existing within the maize supply chain.

- Propose recommendations to enhance maize competitiveness by:
  - Compiling a set of normative suggestions and recommendations concerning the institutional and regulatory framework in which the maize supply chain currently operates.
  - Proposing ways of how to improve competitiveness in the maize supply chain.

## 2.0 THE MAIZE SUPPLY CHAIN

### Overview

The maize supply chain has been analyzed to understand how the various participants behave right from production, through marketing up to either final consumers or various market outlets. The study also analyzed the horizontal and vertical linkages as well as the participants' for value addition roles, strengths, weaknesses, opportunities and threats in improving the competitiveness of maize supply chain. Maize supply chains are commercial conduits through which information, cash and credit flows, while product ownership rights and contingent ownership claims take place. Hence when maize supply chains are well aligned, information flow becomes efficient among participants causing healthy competition in the entire chain. It is therefore necessary to understand

the role of each category of participants in the supply chain to be able to offer remedies to constraints that may be impeding the flow of maize.

**Importance of Maize to the Uganda Economy**

Maize is grown in almost all districts of Uganda except in some extremely wet, dry or infertile areas. The major growing districts include Iganga, Kapchorwa, Masindi, Mbale and Kasese, which are estimated to be producing 60%-80% of the marketable surplus in the country. Other districts that grow significant amounts of maize include Mbarara, Kabarole, Mubende, Lira Apac, Bugiri, Sironko, Hoima, Pallisa, Masaka, Kyenjojo and Kamwenge. In Uganda, maize is not only a major food crop and important for food security, but also used as a key input in animal feed industries and local brewing. The crop has become a major source of household incomes and provides employment to input dealers, traders, millers, transporters and other auxiliary services providers.

Maize is increasingly becoming an important non-traditional agricultural export commodity. The value of maize exports rose from US$15 million in 1997 to US$18.3 million in 2001, before declining to about US$7.3 million in 2002 due to a fall in production attributed to price fall at the farm gate following a bumper harvest in 2001B season. Despite the decline, maize production and export have steadily increased since then and it is estimated that under the current production and marketing systems, maize export can earn the country over US$20 million annually. The maize sub-sector is estimated to provide a living to about 3.5 million households, close to 2,000 traders and over 20 exporters.

In the input sub-sector, maize production has also led to the emergence of over 70 input stockists in the three maize growing districts studied. Besides selling improved maize seeds, the input stockists also handle pesticides, herbicides and fertilisers. The most common maize inputs include improved seeds such as Uganda hybrid, Longe varieties, Panar, Kenya hybrid. Other maize related inputs include fertilizers such as DAP, UREA, pesticide, farm implements etc. On average, a typical urban based input distributor makes a turnover of UShs 43.9 million in a season (6 months) of which 45%-75% of the sales are from improved maize seeds and the related inputs. The best selling period for maize inputs annually is March-May and August-November, which coincides with the planting period.

The maize sub-sector has also boosted the transport business both in the rural and urban areas of the major maize growing districts. A number of transporters own trucks with varying capacities ranging from 10-60 tones. The number of transporters has increasingly grown, while that of maize traders has doubled. Most often, the transporters hire services of rural agents to either procure or search for maize to be transported.

**Key Participants in the Maize Supply Chain**

In Uganda the maize supply chain involves a number of participants that include farmers, traders, agents, millers, animal feed producers, local brew makers and consumers. A detailed description of the participants is elaborated below:

- **Subsistence farmers:** Subsistence farmers make up 90%-95% of the maize farmers nationally and contribute over 80% of the total marketed volume. They cultivate maize on landholdings of less than 2 acres and use traditional

methods of farming. The subsistence farmers are usually scattered and mainly carry out maize production for home consumption with little surplus available for sale. The marketing of the maize output is done individually due to mistrust amongst farmers, lack of a central collection place and poor storage facilities. As a result, the subsistence farmers end up selling the maize surpluses at the farm gate, immediately after harvest to the rural traders and agents, who often set the prices. The subsistence farmers usually have no wide choice of buyers.

- **Commercial farmers:** These currently make up about 5%-10% of the maize farmers nationally and contribute about 20% of the marketed maize volume. The commercial farmers often devote more than 5 acres to maize production and are increasingly adopting modern farming methods and crop husbandry practices. They produce maize specifically for sale and often market it during the off peak season to urban traders both within and outside their respective districts. The commercial farmers sell in bulk and improve on maize quality to obtain better prices.

Table 1 summarizes the production and post harvest handling methods of the subsistence and commercial farmers as well as their marketing characteristics.

**Table 1: Main Category of Maize Farmers and their Key Production and Marketing Characteristics**

| Item | Subsistence Farmers | Commercial Farmers |
|---|---|---|
| % of total number of farmers | 90%-95% | 5%-10% |
| Land ownership | Small own plots | Land for maize production is most often rented and scattered in various areas |
| Maize acreage per season | Less than 2 acres | More than 5 acres |
| Labour | Mainly use family labour | Combination of family and hired labour |
| Type of maize seed | Mostly home saved with little Longe I and Longe V or Kenya Hybrid | Masindi and Iganga farmers use Uganda Hybrid with some Longe I and Longe V, while in Kapchorwa they use Kenya Hybrid and Certified Seed 614, 626, 628 |
| Fertilizer Usage | Non-existent | Close to 20% Apply DAP and Urea |
| Herbicides | Not applied | A recently introduced practice that is gradually being adopted (Round-up and Atrazine) |
| Pesticides | Not applied | Apply Bulldock and Anti-termites to some extent |
| Equipment Utilized | Traditional hand hoe & pangas | Ox-ploughs & hire tractors and hand hoes to a lesser extent |
| Yields | Less than 10 bags per acre | More than 20 bags per acre |
| Target Market | Grow without a market perspective. Sell mainly to buyers at farm gate to rural market | Grow mainly for sale with target markets being UGTL members, traders in Kampala, Busia, Mbale, Suam, Gulu, Nakasongola and other buyers like relief agencies. Tend to sell in bulk |
| Estimated % Contribution to total marketable volume | 70-85% | 15-30% |
| Post-Harvest Handling<br>• Drying<br>• Shelling | On the ground<br>Use of sticks and sacks | Use tarpaulins<br>Iganga and Masindi farmers use sticks and sacks, while in |

| Item | Subsistence Farmers | Commercial Farmers |
|---|---|---|
| • Storage | Rooms in house | Kapchorwa they use shellers cribs and stores |
| Value addition | Minimal | Cleaning, sorting and bulking |
| Marketing period | Immediately after harvest | Usually in the off-peak season |
| Marketing outlets/channels | Rural traders and agents | Urban traders both within and outside the district |
| Volumes marketed | Less than 6 bags (600kgs) | Over 100 bags (10,000kgs) |
| Prices | Usually low as the trader has the upper hand in determining it | Higher prices as the farmer gets to bargain based on volume and quality |
| Market information source | Trader, agents, fellow farmers and friends. | Radios, friends, neighbours and urban traders. |

*Source: Maize Supply Chain Analysis Study, August 2003*

- **Rural Traders and Agents:** Rural traders who operate in villages, are the primary base of maize marketing and are a major market outlet for the subsistence farmers. In the 3 districts studied, the rural traders make up between 80%-90% of the total maize traders and handle 50%-70% of the traded maize depending on the volume of tradable maize in a district. Rural traders often act as agents for urban traders and millers during the peak of the maize marketing season since they are located much nearer to the subsistence farmers. Hence, they are often the most reliable link between the rural subsistence farmers and the urban traders. They move on bicycles procuring maize at the farm gate on a cash basis, thereby assembling it from the many scattered rural subsistence farmers. They often dictate the prices although it varies from season to season and they use weighing scale and other methods such as basins, tins, mugs etc.

- **Urban Traders**: In the 3 districts studied, the urban traders who are often located in the major trading centres form about 10%-20% of the total maize traders and handle 30%-50% of the traded maize from rural traders and commercial farmers. They use pickups, lorries and trucks of about 10-25 tonnes to transport the maize. The prices offered by urban traders are dependent on the prices at which they can sell the produce and varies from season to season. The main activities of urban traders are to pre-clean the maize, assemble and bulk it in either rented or own stores and also act as sources of market information regarding prices and volumes within their respective areas of operation.

- **Brokers:** These are found at almost every point of the maize supply chain. They main role is to bring together the various maize supply chain participants. They coordinate grain buying, selling and organize transport. These brokers mainly take advantage of having information of potential buyers and sellers, providing temporary storage services and arranging transport for transferring grains from one point to another. They are paid a commission for every transaction made. They build long-term relationships with their clients especially the urban and cross border traders.

Table 2 summarises the marketing characteristics of both the rural and urban trader.

**Table 2: Marketing Characteristics of Traders by Category**

| Item | Rural Traders | Urban Traders |
|---|---|---|
| Procurement Source | Buy at farm gate from subsistence farmers | Buy from commercial farmers and rural traders |
| Weighing Scale | Approved and unapproved scales including mugs, basins and tins | Approved scales |
| Value Addition | Collecting and assembling | Collecting, assembling, bulking, pre-cleaning, re-weighing & minimal storage |
| Marketing Outlets | Urban traders, millers | Large traders in major towns, exporters, relief agencies, millers, institutions |
| Volume Marketed | Less than 3 bags on bicycles | Lorry loads of over 100 bags |
| % of traded maize handled | 60%-70% | 30%-40% |

*Source: Maize Supply Chain Analysis Study, August 2003*

- **The Millers**: Millers can be categorised as small and medium scale millers and mainly carry out contract based milling for institutions, traders and direct consumers. Some millers also involve themselves in maize grain trading, especially at peak harvest season. They mainly operate locally fabricated hammer mills that are often poorly maintained, which results into poor quality flour and outturns. For the millers who carry out trade based milling, they procure the maize grain either through rural agents or directly from urban traders. Trade-based millers mainly sell the flour to general retail traders, wholesalers and institutions. Milling operations are affected by electricity fluctuations and high tariffs as well as availability of maize grain.

**Maize Production Levels**

On average, farmers from the districts of Iganga, Kapchorwa and Masindi devote 30% of their arable land to maize production. Interviews with farmers in the districts of Iganga and Masindi districts showed that maize yields normally range between 1.0– 2.5 mt and 3.5-6.25mt per ha for subsistence and commercial farmers respectively. As for Kapchorwa, maize yields normally range between 2.0-3.0 mt and 6.25-7.5 mt per ha for subsistence and commercial farmers respectively. The leading maize growing counties in Iganga include Luuka, Bulamogi, Bugweri, Kigulu and Busiki. In Kapchorwa the leading sub counties include Kaptanya, Binyiny and Kaproron while in Masindi its Kigumba, Pakanyi, Kiryandongo, Mutumba, Miirya, Bwijanga, Biiso and Karujubu.

Farmers from the districts of Iganga and Masindi can grow 2 maize crops annually, while Kapchorwa farmers grow only one crop due to the fact that the maize variety grown in Kapchorwa takes a longer gestation period of 7-9 months yet in the other areas it is 3-4 months. The first maize planting season in Iganga and Masindi starts in March, while the second one occurs in August. This implies that peak harvest seasons in these districts occur between July – August and December – February. In the case of Kapchorwa, planting starts in March and harvesting occurs in October. This implies that the Kapchorwa maize harvest augments the first harvest season of Iganga and Masindi districts.

Data obtained from Departments of Agriculture in the three districts studied show that the area planted and volume produced have been continuously rising over time as shown in Table 3. Despite the unreliability of these data, it is generally accepted that over 170,000 mt of maize are realised annually from these districts as marketable surplus for internal consumption and for export.

**Table 3: Maize Acreage (Ha) and Production 1995-projections in 2003**

| Year | Iganga | | Kapchorwa | | Masindi | |
|---|---|---|---|---|---|---|
| | Area (Ha) | Volume (Mt) | Area (Ha) | Volume (Mt) | Area (Ha) | Volume (Mt) |
| 1995 | 40,735 | 66,607 | 22,502 | 78,705 | 31,029 | 50,753 |
| 1996 | 41,662 | 55,372 | 26,155 | 91,542 | 31,735 | 42,192 |
| 1997 | 42,661 | 53,986 | 27,000 | 94,500 | 32,496 | 41,136 |
| 1998 | 43,945 | 67,410 | 27,550 | 96,425 | 33,474 | 51,364 |
| 1999 | 43,374 | 76,821 | 22,000 | 77,000 | 33,039 | 58,535 |
| 2000 | 44,873 | 79,958 | 29,500 | 101,500 | 34,181 | 60,926 |
| 2001 | 45,770 | 81,957 | 28,500 | 99,780 | 34,864 | 62,449 |
| 2002 | 46,342 | 83,186 | 28,400 | 99,400 | 35,300 | 63,386 |
| 2003 est | 47,500 | 88,000 | 29,300 | 102,550 | 36,000 | 65,000 |
| **Average** | **44,095.8** | **72,588.6** | **26,767.4** | **93,489.1** | **33,568.7** | **55,082.3** |
| **Marketable Surplus** | | **55,003** | | **70,000** | | **45,000** |

*Source: Districts Departments of Agricultures and Iganga data includes the current districts of Bugiri and Mayuge*

## Maize Consumption and Production

The domestic demand for maize in Uganda has been growing annually and is estimated at between 400,000 and 650,000 mt leaving only about 50,000 – 120,000 Mt as surplus. This has been attributed to the increased consumption of maize meal amongst both the urban and rural communities, while consumption of green maize particularly in the urban areas is also on the increase. In addition, the rising population has increased the demand for food. Besides, there is also increasing demand for maize products mainly due to the growth of the animal feeds industry.

## Economics of Maize Production

Total costs of production (UShs/Acre) are summarised in Table 4. The total cost incurred in using improved maize farming technologies is about two times that of the traditional farming method. This is seen as a major hindrance for many subsistence farmers in adopting improved production technologies. Nonetheless, the cost-benefit analysis shows that though use of improved production technologies involves more costs, the returns are higher due to greater yields. This justifies the greater margins enjoyed by the commercial farmers as opposed to the subsistence farmers.

The unit costs of production and profitability between subsistence and commercial maize farmers by district are summarized in Table 4. From the table, it is clear that the unit cost of production can be reduced by as much as 20-35% if one adopts improved maize farming technologies.

**Table 4: Maize Costs and Returns per Acre**

| Item | Iganga | | Kapchorwa | | Masindi | |
|---|---|---|---|---|---|---|
| | Subsistence | Commercial | Subsistence | Commercial | Subsistence | Commercial |
| Total Cost of Production | 146,050 | 271,900 | 173,550 | 325,200 | 146,100 | 279,550 |
| Yield (Kg) | 900 | 2,200 | 1,500 | 3,000 | 1,000 | 2,350 |
| Unit Cost of Production (Ushs) | 162 | 124 | 116 | 108 | 146 | 119 |
| Farm Gate (Ushs/kg) | 180 | 200 | 200 | 250 | 200 | 250 |
| Returns/Gross Margins (Ushs) | 162,000 | 440,000 | 300,000 | 750,000 | 200,000 | 587,500 |
| **Net profits (Ushs)** | **15,950** | **168,100** | **126,450** | **424,800** | **53,900** | **307,950** |
| **Output:input ratio** | **1.11** | **1.61** | **1.72** | **2.31** | **1.37** | **2.10** |

*Source: Maize Supply Chain Analysis Study, August 2003*

**Maize Marketing**

The maize market in Uganda is characterised by a variety of marketing arrangements. Since the liberalisation of the marketing system, several private sector entrepreneurs have joined the various parts of the maize supply chain. These entrepreneurs include companies that are active in regional maize grain trading, informal cross border traders, produce agents, small and medium millers, transporters, wholesalers and retail stores. Virtually all the domestic transactions made by these players are 'spot market' and cash based. They sell the maize grain in 100kg bags without any "grading" and premiums prices for quality produce. However, for milled maize, there are three major grades i.e. grade 1 '*hodari*', grade 2 '*nylon*' and grade 3 '*safi*'. The flour is sold in kgs and prices differ by grade.

The maize marketing arrangements are categorised into the typical and the emerging new maize chains. While in all districts, a bigger proportion of the maize produce passes through the typical maize supply chain, there are also institutions and associations that have been set up in the same districts that market the maize. These associations differ by district and category of farmers but involve fewer participants in the chain as will be shown in the subsequent sections.

**Shortcomings**: A typical maize supply chain was noted to have the following shortcomings:

- This supply chain has too many participants with many speculative traders and agents who make the movement of maize time consuming.
- There is normally over supply of maize during the harvest season as farmers and traders have no stores.
- Participants' competition reduces as one goes up the chain.
- No clear flow of market information.
- Transactions are 'on spot' market and cash based.
- The markets are thin and volatile in terms of prices, trading volumes and liquidity.
- The marketing arrangement is not well developed leading to inadequate market outlets, high transaction costs and minimal value addition.

- Distances, poor road networks, information flow and inadequate transport means, usually hinder the access to the market.

The Emerging New Maize Marketing Arrangements, although somewhat better than the tradition mechanism, still has a number of short-comings. These revolve around the following:

- There is lack of trust between buyers and the subsistence farmers. This is compounded by lack of cash payment, which sometimes causes impatience amongst farmers thus selling their maize to other traders who procure on cash basis at a much lower price.
- The poor rural trunk road networks not only affect maize trading activities, but also increase the costs of doing business in terms of time and money.
- Lack of proper storage and quality of the produce
- Lack of group cohesion and lack of information and data reports for the association

## Market Transaction Costs

Tables 5 shows indicative transaction costs of a typical maize supply chain. The results reflect that total transaction costs for a typical maize supply chain range from 20%-32% of the farm gate prices and 16%-22% of the final landed market prices. A detailed analysis shows that transport costs constitute 41%-51% of total transaction costs in the typical maize supply chain.

**Table 5: Transaction Costs of a Typical Maize Supply Chain**

| Source | Iganga | | | Kapchorwa | | Masindi |
|---|---|---|---|---|---|---|
| **Transaction Stage/ Destination** | **Kampala** | **Mbale** | **Busia** | **Mbale** | **Busia** | **Kampala** |
| **Farm gate to rural trader** | | | | | | |
| Collection costs | 4 | 4 | 4 | 4 | 4 | 4 |
| Bagging | 3 | 3 | 3 | 3 | 3 | 3 |
| Weighing | 1 | 1 | 1 | 1 | 1 | 1 |
| **Rural trader to urban trader** | | | | | | |
| Off -Loading | 1 | 1 | 1 | 1 | 1 | 1 |
| Weighing | 1 | 1 | 1 | 1 | 1 | 1 |
| Bagging | 5.5 | 5.5 | 5.5 | 4.5 | 4.5 | 6 |
| Local government tax | 2 | 2 | 3 | 3 | 5 | 2 |
| Transport | 10 | 10 | 10 | 5 | 5 | 10 |
| Loss | 1 | 1 | 1 | 1 | 1 | 1 |
| **Urban trader to Large Scale Trader** | | | | | | |
| Re-drying | 1 | 1 | 1 | 1 | 1 | 1 |
| On-loading | 2 | 2 | 2 | 1 | 1 | 1 |
| Off-loading | 1 | 1 | 1 | 1 | 1 | 1 |
| Transport to final destination | 15 | 12 | 12 | 10 | 15 | 18 |
| Stacking | 1 | 1 | 1 | 1 | 1 | 1 |
| Overhead costs | 6 | 6 | 6 | 1 | 1 | 5 |
| Loss | 2.1 | 2.1 | 2.1 | 1 | 2 | 1 |
| **Total Transaction Costs of Grain** | **48.6** | **45.6** | **53.6** | **39.5** | **47.5** | **57.0** |
| **Farm gate price** | **180** | **180** | **180** | **200** | **200** | **180** |
| **Final price (sales point)** | **260** | **250** | **300** | **250** | **300** | **260** |
| **Net margins (per kg)** | **31.4** | **24.4** | **66.4** | **10.5** | **52.5** | **23.0** |

*Source: Maize Supply Chain Analysis Study, August 2003.*

Tables 6 shows the indicative transaction costs of the emerging new maize supply chains, with total transaction costs ranging from 20%-24% of the farm gate prices and 13%-16% of the final landed market prices. A breakdown of these costs reveals that between 43%-47% of the total transaction costs are incurred in transport. The above analyses show that the emerging supply chains are more efficient through the reduction in transaction costs.

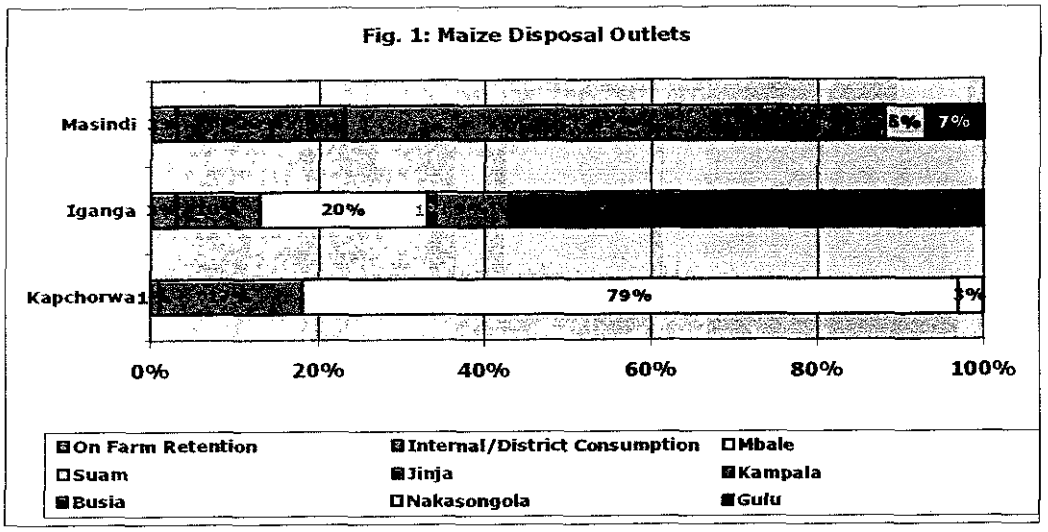
**Table 6: Transaction Costs of the Emerging New Maize Supply Chains**

| Item | Iganga | | | Masindi |
|---|---|---|---|---|
| | Nakisenhe | | | Gukwatamanzi |
| Destination | Delivered to Kampala | Delivered to Mbale | Delivered to Busia | Delivered to Kampala |
| Price to the farmer | 180 | 180 | 180 | 180 |
| Weighing | 1 | 1 | 1 | |
| On-Loading | 1 | 1 | 1 | 3 |
| Bagging Material | 2.5 | 2.5 | 2.5 | |
| Transport to central store | 5 | 5 | 5 | |
| Off-Loading | 1 | 1 | 1 | 1 |
| Drying | 1 | 1 | 1 | |
| Fumigation | 5 | 5 | 5 | |
| Cleaning | 1 | 1 | 1 | |
| Stacking | 1 | 1 | 1 | |
| Re-Clean after fumigation | 1 | 1 | 1 | |
| Re-Weighing | 1 | 1 | 1 | 2 |
| Storage | 5 | 5 | 5 | |
| Transport to Final Destination | 15 | 12 | 12 | 30 |
| Contingency fund | | | | |
| Store Manager/Facility Management | 2 | 2 | 2 | |
| Losses | | | | |
| **Total** | **222.5** | **219.5** | **219.5** | **216** |
| **Transaction Costs** | **42.5** | **39.5** | **39.5** | **36** |
| **Av. Price Received at Sales Point** | **260** | **250** | **300** | **260** |
| **Net Margins (Per Kg)** | **37.5** | **30.5** | **80.5** | **44** |

*Source: Maize Supply Chain Analysis Study, August 2003*

## Market Outlets

Figure 1 shows the maize disposal outlets and their proportions for the districts of Iganga, Kapchorwa and Masindi. While an average of 3% and 16% of the grain is respectively consumed on farm and within the district, 57% of Iganga's maize is sold to Busia cross border, 79% of Kapchorwa's to Mbale and 65% of Masindi's to Kampala.




A detailed follow-up of the final destinations for maize marketed outside the districts of Iganga, Kapchorwa and Masindi is summarised in Figure 2. It was revealed that a large portion of the maize produced in Eastern Uganda is mainly marketed through the Busia Uganda/Kenya border and to small extent through Suam border, where Iganga and Kapchorwa maize account for 60%-70% of it. Though maize is Kenya's staple food that could easily be obtained from Uganda, formal maize trading activities have been constrained by a myriad of factors that has spurred the growth of informal trade mainly through the Busia border.

The peak-purchasing season of maize by Kenya traders occurs between November and March every year. Kenyan traders usually come when contracted by companies like UNGA or other traders especially from Nairobi, Nakuru and Kisumu. The maize at the Busia border is procured through open-air markets with the maize assembled into lorry lots of 200-600 bags (100-Kg), although few transactions take place at stores that hold between 50-100 bags (100-Kgs). The maize that goes to Kenya is estimated to be 5-10 lorries of 600 bags on a bad day and 10-20 lorries on a good day. Normally, prices range from UShs 200 – 250 per kg, although in times of scarcity, they shoot up as high as UShs 450-500 per Kg. The customs officials use a direct assessment criterion without insisting on all the necessary export documentation requirements.

Factors that have boosted cross border maize trade include:

- Uganda maize is cheaper when compared to that grown in Kenya.
- Convertibility of Kenya and Uganda currencies
- Existence of traders on both sides willing to trade
- High demand for maize in Kenya as it is their staple food, but produced only once a year.

Factors that threaten cross border maize trade include:

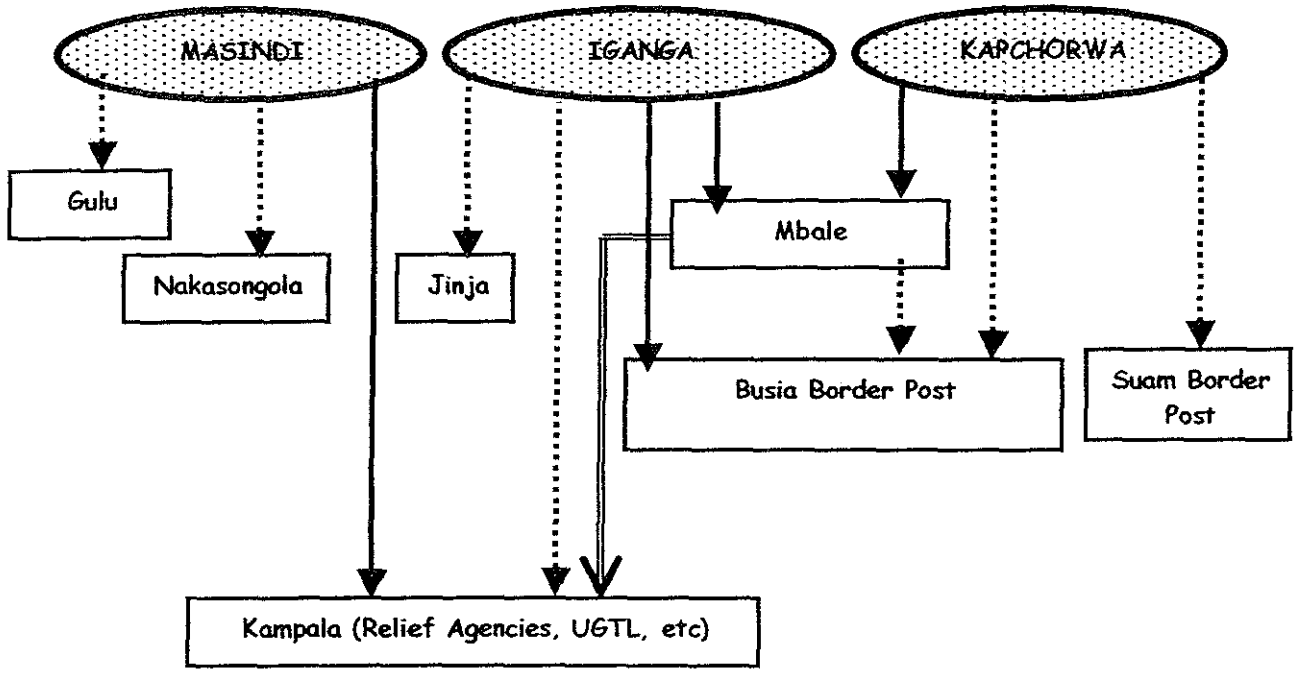
- Different quality standards, which causes confusion to cross border maize traders. Sometimes, Kenyan traders incur post harvest losses due to procurement of maize at very high moisture content between 16%-17% instead of 14%. This results into a loss of 8-15 kgs per 100kg bag of maize. Besides, sometimes Uganda's maize is very dirty and has red tips.

- Requirement to have a certificate of origin, yet they are only obtained from Kampala, which is not only time consuming, but also expensive in terms of transport costs.
- Existence of unfair policies set by the Kenyan government, stops Uganda traders from crossing the border into Kenya to sell their maize due to fear of being cheated and going through cumbersome road checks.
- Lack of adequate and proper maize storage facilities at the Busia cross border.

As for Kapchorwa district, much of the maize is channelled to Mbale, the hub of grain milling in Eastern Uganda. Farmers in Kapchorwa prefer Mbale to Suam border because of the better road. Almost 90% of the maize that reaches Mbale is milled into flour, which is later sold to relief aid agencies like WFP, ICRC and other major urban centres in the country. Maize is transported to Busia for sale only if better prices are expected and one is able to recoup the transport expenses. Though maize grain from Kapchorwa is cleaner, it usually has a high moisture content, which needs re-drying before milling or else it leads to great losses.

As for Masindi district, although a good chunk of the maize is destined for Kampala markets and largely consumed by relief agencies, Gulu and Nakasongola are increasingly becoming major maize outlets. Their choice of market outlets is driven by market size and good prices. Some of the main traders within Masindi district have established their agents especially in the major trading centres of Kigumba, Kiryandongo and Pakanyi.

**Figure 2: The Various Maize Marketing Outlets for Iganga, Kapchorwa and Masindi Districts**




Bold lines — Major grain outlets
Broken lines — Minor grain outlet
Double lines — Maize flour outlet

In summary, the flow of maize within and outside Iganga, Kapchorwa and Masindi districts is influenced by the factors enumerated below:

- Demand for the Maize
- Transaction costs to the final market destinations
- Prevailing maize market prices
- Market efficiency
- Trade relations with Kenya

**Maize Milling**

This section assesses the importance of maize milling as part of the commercialisation of maize production. It examines the milling technology and its consequential impact on production costs as well as the changing patterns of maize consumption. The majority of the maize millers in Iganga, Kapchorwa, Masindi, Mbale, Jinja and Busia districts are mainly small-medium scale millers who use either diesel engine or electric-motor driven hammer mills. The commercial millers prefer the locally manufactured mills because of their simple production system, low cost and the fine flour they produce. However, its flour is less nutritious and has a danger of being contaminated by iron filings from the hammer. It is also inefficient in the consumption of electricity.

**Maize Milling and Consumption**

Two maize milling channels were observed during the study:

**Contract-based maize milling:** This is where a client is charge a specific fee for milling his/her maize grain. It is the most dominant form of maize milling in Iganga, Kapchorwa, Masindi, Mbale, Jinja and Busia districts. These contract based maize millers normally use hammer mills that are not well maintained leading to low returns and poor quality flour. Most of the millers visited during the study reported operating at 30%-50% of the installed capacity of their mills. The quantity of maize milled is mainly determined by the availability of power and the demand for maize flour. On average, the contract millers reported milling between 1,900kgs-10,000kgs a day depending on the capacity of the mill. The competition amongst the contract-based millers is so stiff that their profits are so low. The demand for flour among the different buyers differs significantly; the traders and wholesalers prefer super grade '*hodari*', institutions prefer second grade '*nylon*', while direct consumers demand for third grade '*safi*'. Besides, the demand for animal feeds has been growing rapidly resulting into increased usage of bran.

**Trade based maize milling:** is more common in urban centres. It has built-in costs of purchasing of the maize grain, transporting, grain storage, milling, packaging, storage of maize flour and marketing.

**Maize Milling Costs and Profitability**

The study revealed that milling charges ranged from UShs 50 -100 per kg as shown in Table 7. However, in reality, field observations revealed that due to stiff competition amongst millers, the milling charge depends on the volume of maize grain to be milled, location of mill, size of the mill, energy costs and availability of maize grain. The price of a kg of maize flour at the mill also varies by grade and season, but on the whole it ranges from UShs 410- 550 per kg for grade 1, UShs 380-420 per kg for grade 2, while grade 3 is sold between UShs 290-360 per kg.

**Table 7: Indicative Milling Costs and Profit Margins**

| Item | Grade 1 *(Hordari)* | Grade II *(Nylon)* | Grade III *(Safi)* |
|---|---|---|---|
| Milling Charge | 80 | 60 | 50 |
| Cleaning grain | 1 | 1 | 1 |
| Huller labour | 2 | 2 | 2 |
| Miller labour | 2 | 2 | 2 |
| Bag | 5 | 5 | 5 |
| Repairs | 25 | 25 | 25 |
| Packaging | 2 | 2 | 2 |
| Licence + Others | 2.5 | 2.5 | 2.5 |
| **Total** | **119.5** | **99.5** | **89.5** |
| **Gross Margins** | **39.5** | **39.5** | **39.5** |

*Source: Maize Supply Chain Analysis Study, August 2003*

The conversion of maize grain to flour is estimated at 50%, 65% and 75% for grade 1, 2 and 3 respectively. The by-product of maize milling (bran) is sold at UShs 50-100 per kg. Due to the high demand for bran nowadays, millers often off set its purchase price from milling charges that traders/institutions pay. This implies that on the whole, the actual milling charges are much lower. The profitability of maize milling depends on volume of grains, charges levied, flour outturn and operational costs. The flour outturn also depends on the maize variety. Calculations based on field observations show that millers earn gross margin of about UShs 40 per kg.

### Factors Affecting Maize Supply Chain Competitiveness

The following are the key factors affecting maize supply chain competitiveness:

- **The high number of participants and transaction costs**

The maize marketing chain is long with many participants, which increases transaction costs. Besides, maize being low value and bulky crop, the existence of many participants who add minimal value to it results in a tendency of powerful participants to collude and attain better profit margins.

- **Minimal Horizontal and Vertical Linkages Nurtured**

Most participants in the maize supply chain act individually and carry out on spot cash based market transactions, which limit horizontal and vertical linkages that hinder the integrating of activities and efficiency within the maize supply chain.

- **Inaccessibility to Information by Participants**

The poor information flow between the various participants constrains development of a competitive and efficient maize supply chain. In reality, access to information by individual participants is used to one's advantage at the expense of other participants within the maize supply chain.

- ***Failure to enforce and reward quality improvements***

Maize deals and transactions are mainly based on volumes and visual quality inspection and assessment. The failure by the participants to reward quality improvements within the maize supply chain has undermined quality improvement in the maize traded.

- **Poor Quality Road networks**

The poor rural road networks not only increase the transaction costs within the maize supply chain, but also the time taken to bulk the maize. Some areas are impassable. Otherwise if the roads were good, more traders would go to the farmers, competition would increase and in so doing market information would be more easily accessed.

- **Failure to Develop Contractual Arrangements amongst the Maize Supply Chain Participants**

The reliance on-spot cash-based market transaction raises transaction costs and hinders private sector institutional development. The failure to develop contractual arrangements between participants has led to parasitic behaviour and on and off seasonal participants within the maize supply chain, which increases uncertainties.

- ***Inadequate Credit Support***

Inadequate credit support is amongst the major constraints to the development of an efficient and self-propelling maize supply chain. Notably, commercial banks normally require physical assets as collateral before availing credit to the beneficiaries rather than usage of maize stock inventories.

- ***Poor Storage Facilities***

The absence of appropriate storage facilities has resulted into high post harvest losses and untimely delivery of maize consignments from one stage to another within the maize supply chain.

**Prospects of Improving Competitiveness of the Maize Chain**

Improving Uganda's maize supply chain competitiveness will entail reducing the unit costs of producing maize, strengthening horizontal and vertical linkages between participants, quality improvement, minimisation of post-harvest losses, bulking of produce as well as reduction of transaction costs. A maize supply chain that encompasses the following best practices will certainly be more competitive:

**Promoting contractual procurements:** Adoption of procurement and payment through clearly defined contractual arrangements will attract high volumes and delivery of products within the maize supply chain. Besides, stock inventory financing through warehouse receipt mechanism gives comfort to participants and financial institutions, will be boosted.

**Establishing quality control measures:** Well laid down quality control procedures will help avoid mistrust and scepticism. A mechanism that offers a premium for quality will ensure compliance, and thus boosting competitiveness of the maize supply chain.

***Adequate and Proper Storage:*** Sizeable storage capacity will attract more serious buyers, as they would want to procure what they can see and not what they can imagine. Besides having facilities such as dryers, graders and sorters in place will enhance quality improvements and thus competitiveness of the maize supply chain.

**Increasing Information flow:** Active and functioning information flow channels will nurture vertical and horizontal as a means of enhancing competitiveness within the maize supply chain.

**Minimizing Transaction Costs:** Knowledge and appreciation of reduced transaction costs and maintaining a clear cost structure minimises costs, which makes the maize supply chain more competitive.

**Sufficient turnover:** Maize supply chains operating from areas with huge maize surpluses, will not only be able to pull product at low costs and enjoy economies of scale, but also attract bulk buyers.

## 3.0 CONCLUSION AND RECOMMENDATIONS

### Conclusions

This study has found that the main constraint to efficient functioning of the maize supply chain is the highly volatile maize prices and volumes, which limits the volume of stockholding and trade. There is also a range of other constraints to the functioning of the maize supply chain that include high transaction costs, on-spot cash based market transactions, limited use of contract in maize trading, limited appreciation of quality standards, poor information flow, limited access to credit, inadequate and poor storage facilities and minimal institutional development.

### Recommendations

The following are the recommended measures that should be considered in addressing most crucial structural problems observed in the maize supply chain:

- **Promoting Use of Maize Stocks as Collateral**: Maize stakeholders in collaboration with the government should encourage commercial banks and micro finance institutions to accept maize stocks as collateral to enhance the trading of maize within the country. This involves designing and implementing a viable stock warehouse receipt and inventory credit system that involves different stakeholders like banks, insurance companies, farmers, traders etc. This will contribute towards broadening of the market, improving quality standards, improved management of large volumes stocks of maize, reduced quantitative and qualitative grain loses, flow of market information on the volume, location, and prices of stocks, etc.

- **Providing incentives to the private sector to invest in large-scale storage and handling of sizeable maize volumes:** Government should support initiatives aimed at setting up of proper storage facilities to enhance timely delivery of quality grain by traders at all levels. Efforts geared towards promoting the provision of post-harvest equipment such as driers and shellers to farmers should be given priority. Besides, support to the Uganda Grain Traders Limited (UGT), though the Export Credit Guarantee Scheme would enable members collectively hold sufficient stock.

- **Reducing Transaction Costs Through the Following**:
    - By lobbying central and local governments to allocate more funds to road infrastructure improvements to increase rural accessibility.
    - Farmers should work together with reliable traders who engage in bulking and offer fair prices for their produce through linking them up with large scale traders and export markets.
    - Strengthening market information dissemination amongst the maize stakeholders at the different levels of the maize supply chain.

- **Streamlining Maize Quality Standards:** Government should support initiatives aimed streamlining maize quality standards to enhance traceability of the maize and quality improvements. Training of farmers in quality control methods and enforcement of quality standards should be promoted. In addition, maize traders and millers should offer premium prices for high quality maize.

- **Promoting Formation of Farmer Associations and Producer *Organizations* for Marketing**: Stakeholders working with government should encourage farmers to form strong farmer associations and producer organizations that will assist them to pool produce together for bulk marketing, strengthening linkages with traders, enforcement of quality standards, accessing extension services, credit and marketing information. This will generate economies of scale, improved quality and the resultant premium prices.

- **Setting a Floor Pre Maize Planting Price**: Maize industry stakeholder should agree upon a floor price prior to the maize planting season. Setting up a maize industry forum will enhance the setting up of such floor prices and addressing of problems facing the stakeholders.

- **Promoting Good Agronomic Practices**: Government, working with maize industry stakeholder should promote good agronomic practices among the maize producers to reduce costs of production at the farm level. Efforts should be aimed at promoting usage of fertilisers, improved seeds and adoption of modern farming technologies

- **Rural Market Infrastructure Development:** Maize industry stakeholders should work together to promote the establishment of rural marketing centres. Support rural-based commodity exchange centres with basic infrastructure and a reliable communication network should be given priority.

- **Promoting Rural Small Scale Agro Processing Industries:** Government should support the maize milling industry in order to make it more competitive through making electricity tariffs much cheaper. Promoting the development of small agro-milling industries in the rural areas should be encouraged to boost maize production. It is also essential to regularly organise training programs for millers to make them aware of new developments in maize milling, improve there business and resource management skills and provide market information and opportunities.

# 1.0 INTRODUCTION

## 1.1 Background to the Study

Investment in Developing Export Agriculture (IDEA) Project was initiated in March 1995, with the main goal of increasing incomes of the rural people. This is being achieved through promoting the production and marketing of selected Non-Traditional Agricultural Exports (NTAEs). The NTAEs include Low Value food crops (primarily maize and beans) and High Value crops (such as flowers, fruits and vegetables, vanilla and cocoa). The main intermediate result is increased value of the selected NTAEs as the source of increased incomes. Therefore, IDEA is one of those projects whose activities have a direct bearing on the production, marketing and export of NTAEs in Uganda.

Maize is currently one of the most important cereal crops widely grown and consumed in Uganda. The crop occupies a strategic position in the country's food security alongside bananas, cassava and sweet potatoes. It forms a major part of the diet for both the rural and urban communities. Maize also provides farm households and traders with incomes. It is therefore an important crop from both the food security and income-generation points of view.

However, despite the significance of maize, farmers and traders respectively face high production and distribution costs that squeeze their profit margins from the farm gate and along the supply chain. Besides, the farmers and traders also operate in thin markets that are susceptible to price swings that can result in financial losses. Grain mills in Uganda operate below full capacity because local supplies of maize are inadequate. This raises their per unit operating costs thereby compressing profit margins.

In addition, physical bottlenecks exist in the maize supply chain, which among others include insufficient secure storage facilities, poor distribution/transport mechanisms and shortage of electric power in the rural areas. Institutional obstacles like the absence of standardized maize grading and classification standards, thin markets and limited access to crop finance and export credit pose even a greater threat to maize farmers and traders. At the centre of all these bottlenecks is uncertainty in the transaction costs (value - cost assessment), which raises the fundamental question of whether maize is a profitable enterprise or not.

To further understand the functioning of the maize supply chain, Independent Consulting Group (ICG) was contracted by IDEA Project to carry out an analysis of the maize supply chain. This report therefore provides an insight on how maize competitiveness can be improved and ways to strengthen forward (to markets) and backward (to input suppliers) linkages. It also helps to understand the maize supply chain and value addition process along the chain. The study covered the major maize growing districts of Iganga, Kapchorwa and Masindi.

## 1.2 Purpose and Tasks of the Study

Overall, the study was aimed at addressing the problem of the absence of strong farmer and commercial organizations at the farm level that can enforce and fulfil contractual forward (to markets) and backward linkages (to input suppliers and suppliers of modern production/handling/storage technologies). The main objective of the study was to ascertain costs and value through the maize supply chain as well as identifying means of increasing maize competitiveness.

Specifically, the key study objectives were to:

- Carry out a literature review of related research works done on maize over the last 5 years.

- Map out the existing maize supply chains in the study area, with a focus on:
  - Enumerating all categories of participants in the maize supply chain.
  - Defining the commercial functions performed by each category of participants
  - Documenting the different categories of participants in terms of their concentration, location and estimated full production capacity.
  - Identifying for each category of participants' production, performance and value addition characteristics through the maize supply chain.
  - Conducting a maize value chain analysis through all points of market transfer and value addition, starting from farm gate and ending with traders, grain reserves, exporters and processing companies.

- Assess the basic economics of the existing supply chains in form of costs, value addition and profitability by:
  - Ascertaining the actual unit cost and price at each level of value addition within the chain.
  - Computing the production costs and benefits by technology/task for each category of participants within the maize supply chain.

- Carry out an in-depth assessment of the competitiveness of the maize sub-sector through:
  - Identifying the problems and prospects at each value-addition level in the existing within the maize supply chain.

- Propose recommendations to enhance maize competitiveness by:
  - Compiling a set of normative suggestions and recommendations concerning the institutional and regulatory framework in which the maize supply chain currently operates.
  - Proposing ways of how to improve competitiveness in the maize supply chain.

## 1.3 Study Methodological Approach

**Study Approach**: The study methodology was designed to achieve the set objectives outlined in the scope of work (Annex 1). In summary, the approach involved reviewing of relevant literature, conducting informative interviews with key stakeholders in Kampala and study area. This enhanced capturing of the maize flow, transaction costs involved, value addition as well as the horizontal and vertical linkages within the maize supply chain.

The study approach ensured taking on bottom-up direction, starting with farmers, followed by traders and processors to exporter level as shown in Figure 1.

**Stage I: Preliminary Interviews and Literature Review**
The study team designed checklists and questionnaires that guided the collection of information from the key respondents at the different levels of the maize supply chain (Annex 2). The key informative interviews were held with staff from IDEA project, Uganda Grain Traders Limited, World Food Program, Uganda National Bureau of Standards, Ministry of Agriculture, Ministry of Trade, Uganda Revenue Authority, Uganda Export Promotion Board, Audit Control Expertise, Uganda Commodity Exchange amongst others.

In order to get an insight into the performance of the maize sub-sector, the study team also carried out a review of relevant documents. This enabled the study team not only to generate key issues that guided the stakeholder consultative meetings but also fine tuning the study design and instruments prior to the execution of field activity, which enhanced the quality of data collected. The documentary sources included:

- World Food Program (WFP)
- Uganda Export Promotion Board (UEPB)
- Relevant Ministries like Ministry of Agriculture, Animal Industry and Fisheries (MAAIF), Ministry of Tourism, Trade and Industry (MTTI)
- Uganda Grain Traders Limited (UGTL)
- Food and Agricultural Organisation (FAO)

The study team also collected relevant information from the Internet websites to supplement the documentary reviews.

**Stage II: Interviews with Primary Participants in the Maize Supply Chain (i.e. Organised Maize Farmer Groups and Commercial Farmers)**
With the information obtained from Stage 1 and the initial interviews held with key stakeholders within the major maize growing districts, a list of organised maize farmer groups and commercial farmers was compiled for further in-depth interviews (Annex 3). The respondents were randomly selected, taking into account their gender, geographical location and sizes of their farms. Subsistence maize farmers were also randomly selected and interviewed but gender representation was taken into account.

Information captured at this stage included the aspects on maize acreage, agronomic practices used, extent of input utilization, the cost of maize production at the farm level, input prices, sources of inputs, market outlets,

maize quality, volume of maize consumed and marketed. This stage laid a foundation for tracing the flow of maize from the farm level to the next marketing stage either within or outside the major maize growing districts. In addition, a list of stakeholders that included input stockists, traders, millers, and consumers within and outside the major maize growing districts was generated.

**Stage III: Interviews with Secondary Participants in the Maize Supply Chain**

At this stage, the respondent was selected depending on the frequency one was mentioned by the farmers, gender, volume of maize handled and geographical location (i.e. whether operating within or outside the major maize growing districts).

These interviews at stage helped in capturing the types and sources of inputs, transaction costs, value addition, enterprise performance, volume of maize handled and market outlets for each category of participants within the maize supply chain. The information generated was later crosschecked for consistency and reliability.

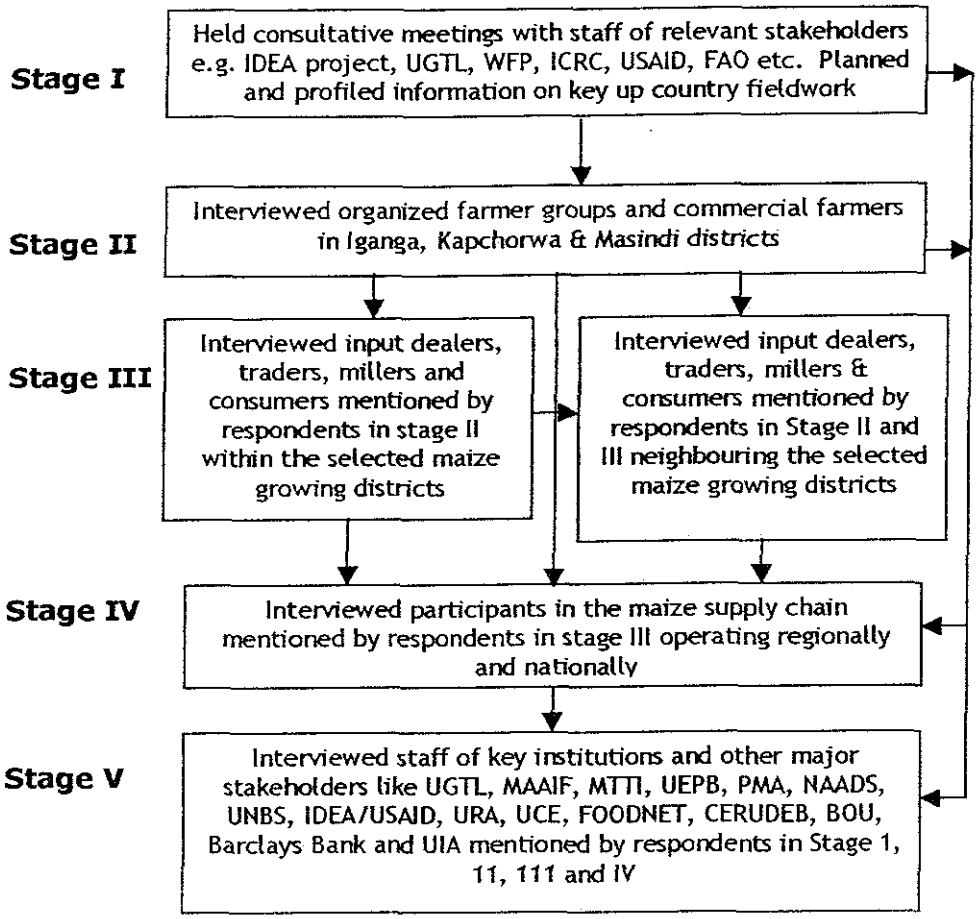
**Stage IV: Interviews with Tertiary Participants with Regional and National Spheres of Operation in the Maize Supply Chain**

Stage III triggered a list of tertiary traders, millers and consumers located within and outside the maize growing districts. However, the respondents interviewed by study team were only those operating regionally and nationally. The selection of respondents depended on the frequency one was mentioned by participants in Stage III, gender, volume of maize handled and his/her proximity to the major maize growing districts. Information captured at this stage was aimed at establishing the sources of maize, volumes handled each season, volumes exported, destination of the exports, market prospects, costs, constraints and efficiency parameters and linkages with farmers and urban traders. The information collected at this stage was also crosschecked for consistency and reliability and a list of key institutions and other stakeholders in the upper segment of maize chain was generated.

**Stage V: Interviews with Staff of Key Institutions and Other Major Stakeholders in the Maize Sub Sector**

The stakeholders interviewed at this stage included, institutions, projects and government agencies. The interviews focused on policy initiatives, maize promotional activities, the stakeholders' experiences in supporting the maize sub-sector and their suggestions towards enhancement of maize competitiveness.

**Figure 1: Study Approach Adopted for the Maize Chain Cost Value Analysis**




**Data Management:** Data quality was maintained throughout the assignment. To achieve this, the study team ensured that the data collected was reliable and consistent, prior to its capture. A computer-based program employing Microsoft Office was designed for the data entry exercise.

**Data Analysis:** This mainly focused on univariate data analysis methods that involved the use of frequency tables and descriptive statistics (mean, minimum, maximum and standard) that were applied to examine the variables for outliers. The data from secondary sources was mainly used to generate the main study parameters, which were compared with international standards.

## 1.4 Report Outline

This draft report presents findings from the maize supply chain analysis study that covered the major maize growing districts of Iganga, Kapchorwa and Masindi. The report is divided into 3 chapters. The current chapter is the introduction and the rest of this report is organized as follows:
Chapter 2 evaluates the maize supply chain, and
Chapter 3 gives a summary of the study findings and recommendations.

# 2.0 THE MAIZE SUPPLY CHAIN

## 2.1 Overview

The maize supply chain has been analyzed to understand how the various participants behave right from production, through marketing up to either final consumers or various market outlets. The study also analyzed the horizontal and vertical linkages as well as the participants' for value addition roles, strengths, weaknesses, opportunities and threats in improving the competitiveness of maize supply chain. Maize supply chains are commercial conduits through which information, cash and credit flows, while product ownership rights and contingent ownership claims take place. Hence when maize supply chains are well aligned, information flow becomes efficient among participants causing healthy competition in the entire chain. It is therefore necessary to understand the role of each category of participants in the supply chain to be able to offer remedies to constraints that may be impeding the flow of maize.

### 2.1.1 Importance of Maize to the Uganda Economy

Maize is grown in almost all districts of Uganda except in some extremely wet, dry or infertile areas. The major growing districts include Iganga, Kapchorwa, Masindi, Mbale and Kasese, which are estimated to be producing 60%-80% of the marketable surplus in the country. Other districts that grow significant amounts of maize include Mbarara, Kabarole, Mubende, Lira Apac, Bugiri, Sironko, Hoima, Pallisa, Masaka, Kyenjojo and Kamwenge. In Uganda, maize is not only a major food crop and important for food security, but also used as a key input in animal feed industries and local brewing. The crop has become a major source of household incomes and provides employment to input dealers, traders, millers, transporters and other auxiliary services providers.

Maize is increasingly becoming an important non-traditional agricultural export commodity. The value of maize exports rose from US$15 million in 1997 to US$ 18.3 million in 2001, before declining to about US$7.3 million in 2002 due to a fall in production attributed to price fall at the farm gate following a bumper harvest in 2001B season. Despite the decline, maize production and export have steadily increased since then and it is estimated that under the current production and marketing systems, maize export can earn the country over US$20 million annually. The maize sub-sector is estimated to provide a living to about 3.5 million households, close to 2,000 traders and over 20 exporters.

In the input sub-sector, maize production has also led to the emergence of over 70 input stockists in the three maize growing districts studied. Besides selling improved maize seeds, the input stockists also handle pesticides, herbicides and fertilisers. The most common maize inputs include improved seeds such as Uganda hybrid, Longe varieties, Panar, Kenya hybrid. Other maize related inputs include fertilizers such as DAP, UREA, pesticide, farm implements etc. On average, a typical urban based input distributor makes a turnover of UShs 43.9 million in a season (6 months) of which 45%-75% of the sales are from improved maize seeds and the related inputs. The best selling period for maize inputs annually is March-May and August-November, which coincides with the planting period.

The maize sub-sector has also boosted the transport business both in the rural and urban areas of the major maize growing districts. A number of transporters own trucks with varying capacities ranging from 10-60 tones. The number of transporters has increasingly grown, while that of maize traders has doubled. Most often, the transporters hire services of rural agents to either procure or search for maize to be transported.

## 2.2 Key Participants in the Maize Supply Chain

In Uganda the maize supply chain involves a number of participants that include farmers, traders, agents, millers, animal feed producers, local brew makers and consumers. A detailed description of the participants is elaborated below:

***Subsistence farmers:*** Subsistence farmers make up 90%-95% of the maize farmers nationally and contribute over 80% of the total marketed volume. They cultivate maize on landholdings of less than 2 acres and use traditional methods of farming. The subsistence farmers are usually scattered and mainly carry out maize production for home consumption with little surplus available for sale. The marketing of the maize output is done individually due to mistrust amongst farmers, lack of a central collection place and poor storage facilities. As a result, the subsistence farmers end up selling the maize surpluses at the farm gate, immediately after harvest to the rural traders and agents, who often set the prices. The subsistence farmers usually have no wide choice of buyers.

*A trader in Iganga town re-drying maize outside his store.*

**Commercial farmers:** These currently make up about 5%-10% of the maize farmers nationally and contribute about 20% of the marketed maize volume. The commercial farmers often devote more than 5 acres to maize production and are increasingly adopting modern farming methods and crop husbandry practices. They produce maize specifically for sale and often market it during the off peak season to urban traders both within and outside their respective districts. The commercial farmers sell in bulk and improve on maize quality to obtain better prices.

Table 1 summarizes the production and post harvest handling methods of the subsistence and commercial farmers as well as their marketing characteristics.

**Table 1: Main Category of Maize Farmers and their Key Production and Marketing Characteristics**

| Item | Subsistence Farmers | Commercial Farmers |
|---|---|---|
| % of total number of farmers | 90%-95% | 5%-10% |
| Land ownership | Small own plots | Land for maize production is most often rented and scattered in various areas |
| Maize acreage per season | Less than 2 acres | More than 5 acres |
| Labour | Mainly use family labour | Combination of family and hired labour |
| Type of maize seed | Mostly home saved with little Longe I and Longe V or Kenya Hybrid | Masindi and Iganga farmers use *Uganda Hybrid with some* Longe I and Longe V, while in Kapchorwa they use Kenya Hybrid and Certified Seed 614, 626, 628 |
| Fertilizer Usage | Non-existent | Close to 20% Apply DAP and Urea |
| Herbicides | Not applied | A recently introduced practice that is gradually being adopted (Round-up and Atrazine) |
| Pesticides | Not applied | Apply Bulldock and Anti-termites to some extent |
| Equipment Utilized | Traditional hand hoe & *pangas* | Ox-ploughs & hire tractors and hand hoes to a lesser extent |
| Yields | Less than 10 bags per acre | More than 20 bags per acre |
| Target Market | Grow without a market perspective. Sell mainly to buyers at farm gate to rural market | Grow mainly for sale with target markets being UGTL members, traders in Kampala, Busia, Mbale, Suam, Gulu, Nakasongola and *other buyers like relief* agencies. Tend to sell in bulk |
| Estimated % Contribution to total marketable volume | 70-85% | 15-30% |
| Post-Harvest Handling<br>• Drying<br>• Shelling<br><br>• Storage | <br>On the ground<br>Use of sticks and sacks<br><br>Rooms in house | <br>Use tarpaulins<br>Iganga and Masindi farmers use sticks and sacks, while in Kapchorwa they use shellers<br>cribs and stores |
| Value addition | Minimal | Cleaning, sorting and bulking |
| *Marketing period* | Immediately after harvest | Usually in the off-peak season |
| Marketing outlets/channels | Rural traders and agents | Urban traders both within and outside the district |
| Volumes marketed | Less than 6 bags (600kgs) | Over 100 bags (10,000kgs) |
| Prices | Usually low as the trader has the upper hand in determining it | Higher prices as the farmer gets to bargain based on volume and *quality* |
| Market information source | Trader, agents, fellow farmers and friends. | Radios, friends, neighbours and urban traders. |

*Source: Maize Supply Chain Analysis Study, August 2003*

***Rural Traders and Agents:*** *Rural traders who* operate in villages, are the primary base of maize marketing and are a major market outlet for the subsistence farmers. In the 3 districts studied, the rural traders make up between 80%-90% of the total maize traders and handle 50%-70% of the traded maize depending on the volume of tradable maize in a district. Rural

traders often act as agents for urban traders and millers during the peak of the maize marketing season since they are located much nearer to the subsistence farmers. Hence, they are often the most reliable link between the rural subsistence farmers and the urban traders. They move on bicycles procuring maize at the farm gate on a cash basis, thereby assembling it from the many scattered rural subsistence farmers. They often dictate the prices although it varies from season to season and they use weighing scale and other methods such as basins, tins, mugs etc.

**Urban Traders**: In the 3 districts studied, the urban traders who are often located in the major trading centres, form about 10%-20% of the total maize traders and handle 30%-50% of the traded maize from rural traders and commercial farmers. They use pickups, lorries and trucks of about 10-25 tonnes to transport the maize. The prices offered by urban traders are dependent on the prices at which they can sell the produce and varies from season to season. The main activities of urban traders are to pre-clean the maize, assemble and bulk it in either rented or own stores and also act as sources of market information regarding prices and volumes within their respective areas of operation.

**Brokers:** These are found at almost every point of the maize supply chain. They main role is to bring together the various maize supply chain participants. They coordinate grain buying, selling and organize transport. These brokers mainly take advantage of having information of potential buyers and sellers, providing temporary storage services and arranging transport for transferring grains from one point to another. They are paid a commission for every transaction made. They build long-term relationships with their clients especially the urban and cross border traders.

Table 2 summarises the marketing characteristics of both the rural and urban trader.

**Table 2: Marketing Characteristics of Traders by Category**

| Item | Rural Traders | Urban Traders |
|---|---|---|
| Procurement Source | Buy at farm gate from subsistence farmers | Buy from commercial farmers and rural traders |
| Weighing Scale | Approved and unapproved scales including mugs, basins and tins | Approved scales |
| Value Addition | Collecting and assembling | Collecting, assembling, bulking, pre-cleaning, re-weighing & minimal storage |
| Marketing Outlets | Urban traders, millers | Large traders in major towns, exporters, relief agencies, millers, institutions |
| Volume Marketed | Less than 3 bags on bicycles | Lorry loads of over 100 bags |
| % of traded maize handled | 60%-70% | 30%-40% |

*Source: Maize Supply Chain Analysis Study, August 2003*

**The Millers**: Millers can be categorised as small and medium scale millers and mainly carry out contract based milling for institutions, traders and direct consumers. Some millers also involve themselves in maize grain trading, especially at peak harvest season. They mainly operate locally fabricated hammer mills that are often poorly maintained, which results into poor quality flour and outturns. For the millers who carry out trade based milling, they

procure the maize grain either through rural agents or directly from urban traders. Trade-based millers mainly sell the flour to general retail traders, wholesalers and institutions. Milling operations are affected by electricity fluctuations and high tariffs as well as availability of maize grain.

### 2.2.1 SWOT Analysis of the Key Maize Participants

Table 3 illustrates a SWOT analysis of the main three categories of participants namely, farmers, traders and millers.

**Table 3: SWOT Analysis of the 3 Categories of Participants**

| **Farmers** | |
|---|---|
| **Strengths** | **Weaknesses** |
| • Land with fairly good soils.<br>• Good rainfall, which allows growing of two crops annually.<br>• Cash based transactions<br>• Maize is both a staple food crop and source of income.<br>• Emerging source of input stockists and other auxiliary services | • Lack of commercial orientated production.<br>• Inadequate storage facilities.<br>• High levels of post-harvest losses.<br>• Limited knowledge on quality standards.<br>• Limited enterprise diversification.<br>• Inadequate working capital. |
| **Opportunities** | **Threats** |
| • Increasing demand for maize.<br>• Change in attitudes towards commercial farming.<br>• Emergence of farmer groups and associations.<br>• Increased linkages with private sector service providers and international development partners.<br>• Adoption of improved technologies and efficient labour utilisation reduces unit costs of production. | • Fluctuations in prices.<br>• Dependence on prices as a stimulant for production expansion.<br>• Scattered and low marketable surpluses, which raises transaction costs.<br>• Limited bargaining power.<br>• Over usage of land leading to depletion of soil nutrients.<br>• Lack of rewards for quality improvements.<br>• Erratic weather conditions.<br>• Competition from other better paying enterprises.<br>• Pest infections<br>• Exploitation by traders |
| **Traders** | |
| **Strengths** | **Weaknesses** |
| • Fairly knowledgeable about market outlets.<br>• Increased networking and collaboration.<br>• Source of market information.<br>• Proximity to product source. | • Transactions are cash based.<br>• Inadequate working capital.<br>• Quality standards are not promoted.<br>• Limited storage facilities.<br>• Limited business exposure.<br>• Poor post harvest handling retards timely deliveries. |
| **Opportunities** | **Threats** |
| • Traders have formed associations.<br>• Increased demand for maize.<br>• Increased linkages with government.<br>• Increased linkages with private sector service providers and international development partners.<br>• Relief agencies give priority to local traders. | • Volatile prices and volumes.<br>• Poor road networks.<br>• Unfavourable regional trade policies.<br>• Competition with other maize producing countries.<br>• Bulkiness of maize undermines reduction in transaction costs. |

| Millers | |
|---|---|
| **Strengths** | **Weaknesses** |
| • Existence of value addition through milling.<br>• Primarily carry out contract-based milling.<br>• They are widespread and located near the farmers. | • Inadequate working capital.<br>• Poor quality maize flour.<br>• Have poor milling machines.<br>• Limited knowledge on value addition.<br>• Inadequate storage facilities that undermine bulking and stocking.<br>• Unpredictable electricity supplies |
| **Opportunities** | **Threats** |
| • Increasing demand for flour.<br>• Maize can be processed into various products and by-products. | • Unreliable and seasonality maize supplies affects capacity utilisation.<br>• Stiff competition.<br>• High energy costs.<br>• Limited integration with other participants. |

## 2.3 Maize Production Levels

### 2.3.1 Overview

On average, farmers from the districts of Iganga, Kapchorwa and Masindi devote 30% of their arable land to maize production. Interviews with farmers in the districts of Iganga and Masindi districts showed that maize yields normally range between 1.0- 2.5 mt and 3.5-6.25mt per ha for subsistence and commercial farmers respectively. As for Kapchorwa, maize yields normally range between 2.0-3.0 mt and 6.25-7.5 mt per ha for subsistence and commercial farmers respectively. The leading maize growing counties in Iganga include Luuka, Bulamogi, Bugweri, Kigulu and Busiki. In Kapchorwa the leading sub counties include Kaptanya, Binyiny and Kaproron while in Masindi its Kigumba, Pakanyi, Kiryandongo, Mutumba, Miirya, Bwijanga, Biiso and Karujubu.

Farmers from the districts of Iganga and Masindi can grow 2 maize crops annually, while Kapchorwa farmers grow only one crop due to the fact that the maize variety grown in Kapchorwa takes a longer gestation period of 7-9 months yet in the other areas it is 3-4 months. The first maize planting season in Iganga and Masindi starts in March, while the second one occurs in August. This implies that peak harvest seasons in these districts occur between July – August and December – February. In the case of Kapchorwa, planting starts in March and harvesting occurs in October. This implies that the Kapchorwa maize harvest augment the first harvest season of Iganga and Masindi districts as shown in Table 4.

**Table 4: The Typical Maize Availability Calendar**

| District | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sept | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1st Rains | | | | | 2nd Rains | | | | |
| Iganga | 2nd Harvest | | 1st Planting | | | | 1st Harvest<br>2nd Planting | | | | | |
| Kapchorwa | | | Planting | | | | | | | Harvesting | | |
| Masindi | 2nd Harvest | | 1st Planting | | | | 1st Harvest<br>2nd Planting | | | | | |

*Source: Maize Supply Chain Analysis Study, August 2003*

It should be pointed out that the total acreage for maize production in Iganga and Masindi districts is relatively higher in the first season compared to the second season. This is mainly attributed to the more reliable rainfall in the first season compared to the second season. Besides, competition for land between food crops and cash crops usually occurs in the second season. However, the commercial farmers tend to target the much better prices due to less marketable maize volumes that occur during the second season by increasing maize acreage.

Data obtained from Departments of Agriculture in these districts show that the area planted and volume produced has been continuously rising over time as shown in Table 5. Despite the unreliability of these data, it is generally accepted that over 170,000 mt of maize is realised annually from these districts as marketable surplus for internal consumption and for export

**Table 5: Maize Acreage (Ha) and Production 1995-projections in 2003**

| Year | Iganga | | Kapchorwa | | Masindi | |
|---|---|---|---|---|---|---|
| | Area (Ha) | Volume (Mt) | Area (Ha) | Volume (Mt) | Area (Ha) | Volume (Mt) |
| 1995 | 40,735 | 66,607 | 22,502 | 78,705 | 31,029 | 50,753 |
| 1996 | 41,662 | 55,372 | 26,155 | 91,542 | 31,735 | 42,192 |
| 1997 | 42,661 | 53,986 | 27,000 | 94,500 | 32,496 | 41,136 |
| 1998 | 43,945 | 67,410 | 27,550 | 96,425 | 33,474 | 51,364 |
| 1999 | 43,374 | 76,821 | 22,000 | 77,000 | 33,039 | 58,535 |
| 2000 | 44,873 | 79,958 | 29,500 | 101,500 | 34,181 | 60,926 |
| 2001 | 45,770 | 81,957 | 28,500 | 99,780 | 34,864 | 62,449 |
| 2002 | 46,342 | 83,186 | 28,400 | 99,400 | 35,300 | 63,386 |
| 2003 est | 47,500 | 88,000 | 29,300 | 102,550 | 36,000 | 65,000 |
| **Average** | **44,095.8** | **72,588.6** | **26,767.4** | **93,489.1** | **33,568.7** | **55,082.3** |
| **Marketable Surplus** | | **55,003** | | **70,000** | | **45,000** |

*Source: Districts Departments of Agricultures and Iganga data includes the current districts of Bugiri and Mayuge*

### Maize Consumption and Production

The domestic demand for maize in Uganda has been growing annually and is estimated at between 400,000 and 650,000 mt leaving only about 50,000 – 120,000 Mt as surplus. This has been attributed to the increased consumption of maize meal amongst both the urban and rural communities, while consumption of green maize particularly in the urban areas is also on the increase. In addition, the rising population has increased the demand for food. Besides, there is also increasing demand for maize products mainly due to the growth of the animal feeds industry.

## 2.2.2 Economics of Maize Production

Total costs of production (UShs/Acre) are summarised in Table 6 and detailed in Annex 4. It is evident from Annex 4 that costs of production increase with adoption of improved maize farming technologies. The total cost incurred in using improved maize farming technologies is about two and a half times that of the traditional farming method. Thus, this is a major hindrance for many subsistence farmers to adopting improved production technologies. Nonetheless, the cost-benefit analysis shows that though use of improved production

technologies involves more costs, the returns are higher due to greater yields. This justifies the greater margins enjoyed by the commercial farmers as opposed to the subsistence farmers.

The unit costs of production and profitability between subsistence and commercial maize farmers by district are summarized in Table 6. From the table, it is clear that the unit cost of production can be reduced by as much as 20-35% if one adopts improved maize farming technologies.

**Table 6: Maize Costs and Returns per Acre**

| Item | Iganga | | Kapchorwa | | Masindi | |
|---|---|---|---|---|---|---|
| | **Subsistence** | **Commercial** | **Subsistence** | **Commercial** | **Subsistence** | **Commercial** |
| Total Cost of Production | 146,050 | 271,900 | 173,550 | 325,200 | 146,100 | 279,550 |
| Yield (Kg) | 900 | 2,200 | 1,500 | 3,000 | 1,000 | 2,350 |
| Unit Cost of Production (Ushs) | 162 | 124 | 116 | 108 | 146 | 119 |
| Farm Gate (Ushs/kg) | 180 | 200 | 200 | 250 | 200 | 250 |
| Returns/Gross Margins (Ushs) | 162,000 | 440,000 | 300,000 | 750,000 | 200,000 | 587,500 |
| **Net profits (Ushs)** | **15,950** | **168,100** | **126,450** | **424,800** | **53,900** | **307,950** |
| **Output:input ratio** | **1.11** | **1.61** | **1.72** | **2.31** | **1.37** | **2.10** |

*Source: Maize Supply Chain Analysis Study, August 2003*

Though a farmer is usually excited about the cash income accruing from sales of the crop, it is important to analyse maize profitability from two points; viz output: input ratio and net profits. The output: input ratio shows the relationship between the unit price received and the unit cost of production incurred by the farmer. A ratio of more than 1.00 shows that an enterprise is profitable and the reverse reflects un-profitability of an enterprise. The net profits on the other hand refer to the difference between the gross income (including valuation of crop consumed by the household) and the total cost involved in producing the crop (including valuation of family labour). If the difference is positive, an enterprise is said to be profitable.

A detailed analysis (*See Annex 4*) of the cost of maize production reveals the following:

- The labour input costs varied from 50% to 95% of the total cost of production depending on technology used. Wherever the hand hoe was employed the labour cost constituted 85- 95% of the total cost of production. Further, the use of herbicides reduces the share of labour cost to about 50%.

- Material input costs constituted between 6 to 50% of the total costs, depending on technology used. The relative share of purchased inputs was lowest for subsistence producers (6%) and highest for farmers using improved technologies (49%).

- The adoption of improved maize farming technologies greatly enhances returns and profitability. Yields can increase by over 100% through adoption of improved inputs and technologies and by as high as 200-250% through the adoption of improved maize farming practices.

From the above findings, it is evident that farmers who produce at subsistence level are more prone to the effects of price changes, as they require a high price in order to enjoy profits. A low price in a given season would therefore discourage subsistence farmers from growing enough maize in the subsequent season. Consequently output would decrease and price of maize would substantially increase. Farmers would then react by planting more maize in the next season and as a result, the price would fall. This cycle (i.e "farmers chasing prices") is one of the major reasons why Uganda as a country has for a long time been considered an unreliable supplier of maize.

**Towards Maize Commercialisation In Kapchorwa by Kapchorwa Commercial Maize Farmers Association**

The association started in 2000 with 27 members and currently has 429 members with 80% of the commercial farmers in Kapchorwa district registered with it. The overall objective of the association is to help farmers raise their maize output volumes and quality in order to attain higher prices. The association has a 7-man executive that comprises the chairman, vice chairman, treasurer, secretary and a taskforce with 3 members. Benefits from the association include training in improved agricultural production methods, farm record keeping, fertilizer application, business and financial management and input usage. Besides, the farmers are also able to access credit and crop finance through the association. Under the association, IDEA project linked farmers to CERUDEB and were able to access loans for buying inputs. Depending on individual farmer requirements, each of them got between Ushs 500,000 – 6,000,000. They also benefited through study trips to Iganga, Hoima, and Nakasongola and agricultural shows in Nairobi and Jinja. Demonstration farms have been set up to the farmers' benefit and the association also provides market information to its members.

### 2.2.3 Factors Affecting Maize Production and Commercialisation

- **Cost of Renting Land**

The cost of renting land currently ranges between UShs 40,000-60,000 per acre each season. Besides, some of the scattered pieces of land are not easily accessible which increases the cost of maize production. As a result, the commercialisation of maize growing is not only being curtailed by the unavailability of sizeable landholdings in these districts, but also the rising cost of renting the land.

- **Labour Costs and Availability**

Labour costs accounts for about 50%-60% of the total maize production costs at the farm level. The subsistence farmers mainly depend on family labour, while commercial farmers use hired labour. Besides the subsistence farmers cannot fully commit all their time to maize production due to the diverse nature of household chores. In addition, given the small acreage of their maize farms, it

would not be prudent for them to hire labour as it is not cost effective. The scarce labour explains the rising costs of hiring manpower, whose costs range between UShs 10,000-35,000 per acre depending on the type of production activity. Even then, most often the labour that is available is not skilled, which hinders the commercialization of maize production.

- **Availability and Cost of Improved Maize Seeds**

While in the past, subsistence farmers depended on home saved seeds that were unreliable in germination, nowadays they have resorted to using improved seeds. The subsistence farmers in Iganga and Masindi districts prefer Longe I and V due to its lower prices, while commercial farmers mainly use Uganda hybrid, which is relatively expensive, but gives higher and better yields. On the other hand, Kapchorwa farmers prefer Kenya hybrid because it is pest resistant and gives rise to better yields than Uganda hybrid.

Besides, the input stockists are located in urban centres, which forces farmers to obtain improved seeds from rural open markets, where seeds are often of poor quality. In addition, the input stockists usually have little knowledge on the maize seeds that they cannot advice farmers appropriately. The input stockists also have low working capital, which limits the stocking of adequate maize inputs. This results in demand exceeding the supply of inputs leading to increased prices.

- **Availability and Cost of Fertilizers, Herbicides and Pesticides**

Though some national input suppliers often deliver the inputs purchased directly to the input stockists on credit arrangements, other items are not supplied. This prompts the input stockists to purchase the undelivered items from other suppliers in Kampala or Mbale for the case of Kapchorwa. Besides, few input stockists regularly stock fertilizers, herbicides and pesticides due to their high purchase prices, seasonal demand and limited usage within Iganga, Kapchorwa and Masindi districts. This also hinders commercial farmers' farming activities since they cannot easily access the required amounts of inputs on time.

- **Seasonal Fluctuations in Maize Prices**

The price paid to farmers for their maize produce goes along way in determining the profitability and thus greatly impacts on the acreage of the next production season. Consequently, frequent fluctuations in the prices of maize distort farmers planning for the next season. Therefore, the prices payable in a particular season are determined by the output produced.

- **Market Information Flow and Dissemination Channels**

While the main sources of market information include friends, fellow farmers, local leaders and radios, there is limited flow especially on the prevailing prices, expected volumes, specifications and opportunities. This directly affects farmers maize marketing and has resulted into their being cheated by unscrupulous middlemen.

- **Termites**

Termites particularly in Iganga are a menace to the maize farmers as they destroy the maize plants throughout the production period. This menace is even worse for subsistence farmers who do not apply pesticides during maize production.

- **Limited availability of Credit**

The farmers are faced by a shortage of credit that is also coupled with high interest rates, which hinders them from expanding on their maize production and increases the cost of production.

- **Inadequate knowledge on maize quality and standards**

Farmers lack adequate knowledge on quality standards of maize required in the market. This has in turn resulted in farmers earning very low prices for their maize output and failure to attract buyers.

- **Poor Post Harvest Handling Methods**

The post harvest handling methods of most maize farmers are still poor due to lack of modern drying facilities, shelling equipment and storage facilities especially at the farm level, which negatively affects the quality of maize grain. Heavy rains especially at the time of harvest affect maize drying, which makes it rot. Besides, the poorly dried maize is often broken during shelling and lost to bran during milling. In some instances due to high moisture levels, it rots or gets infected with pests and weevils. The lack of post harvesting facilities prompts subsistence farmers to sell their maize produce immediately after harvest. Even at the secondary level, proper storage facilities are stilling lacking, as the stores are not well plastered and the roofs leak, which increases the moisture. The poor post handling methods lead to grain losses of about 20% - 35% of the total maize output at both primary and secondary levels of maize supply chain.

*A maize growing household in Iganga using sticks to shell the maize grain.*

- **Weak Farmers' Institutions and Organizations**

There are no strong farmers' associations to disseminate market information, provide extension services, credit as well as inputs so as to improve on their production levels. This has resulted into subsistence farmers operating individually which undermines bulking, increases collection costs and farmers' getting low prices, as they cannot effectively bargain for the small volumes being sold. Nonetheless, with the support from IDEA project, Kapchorwa commercial farmers group is steadily becoming a strong farmer group.

## 2.3 Maize Marketing

### 2.3.1 Market Arrangements

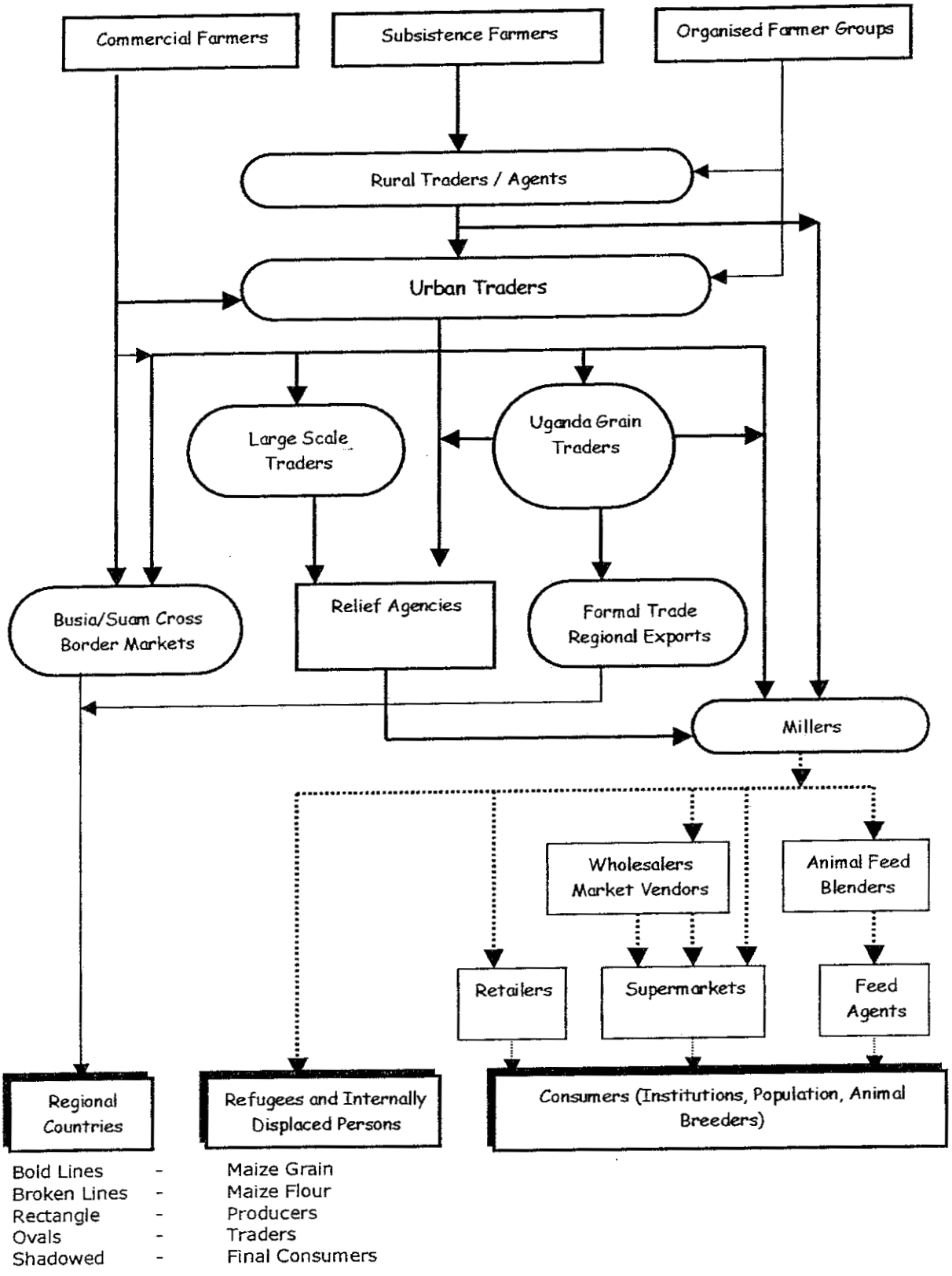
The maize market in Uganda is characterised by a variety of marketing arrangements. Since the liberalisation of the marketing system, several private sector entrepreneurs have joined the various parts of the maize supply chain. These entrepreneurs include companies that are active in regional maize grain trading, informal cross border traders, produce agents, small and medium millers, transporters, wholesalers and retail stores. Virtually all the domestic transactions made by these players are 'spot market' and cash based. They sell the maize grain in 100kg bags without any "grading" and premiums prices for quality produce. However, for milled maize, there are three major grades i.e. grade 1 '*hordari*', grade 2 '*nylon*' and grade 3 '*safi*'. The flour is sold in kg and prices differ by grade.

The maize marketing arrangements are categorised into the typical and the emerging new maize chains. While in all districts, a bigger proportion of the maize produce passes through the typical maize supply chain, there are also institutions and associations that have been set up in the same districts that market the maize. These associations differ by district and category of farmers but involve fewer participants in the chain as will be shown in the subsequent sections.

### 2.3.2 The Typical Maize Supply Chain

**Marketing Arrangements**: A typical maize supply chain in Iganga, Kapchorwa and Masindi districts is shown in Figure 2. The participants include farmers, rural traders/agents, urban traders, millers, local brewers, wholesalers, retailers, institutions, relief food aid agencies and direct consumers. It should also be pointed out that the higher the marketable maize volume in any area, the longer the supply chain. Field observations reflect that urban traders often commission the rural traders and agents to procure maize from the farmers. Besides, the urban traders also procure maize directly from commercial farmers, as they often have huge volumes of maize to sell. The urban traders sell the maize to millers, relief agencies, wholesalers and exporters. Value addition by the urban traders is minimal, though it is appreciated as maize moves up the chain. Approximately 50%-70% of the maize is sold as grain. Maize being a low value crop, its profitability depends on volume of grain sold and quality. Further up the chain 30%-50% of the grain is milled into flour and various grades are sold branded or unbranded. The by-products of milled maize like bran are used in the making of animal feed.

**Figure 2: A Typical Maize Marketing Chain**



**Shortcomings**: A typical maize supply chain was noted to have the following shortcomings:

- This supply chain has too many participants with many speculative traders and agents who make the movement of maize time consuming.
- There is normally over supply of maize during the harvest season as farmers and traders have no stores.
- Participants' competition reduces as one goes up the chain.
- No clear flow of market information.
- Transactions are 'on spot' market and cash based.
- The markets are thin and volatile in terms of prices, trading volumes and liquidity.
- The marketing arrangement is not well developed leading to inadequate market outlets, high transaction costs and minimal value addition.
- Distances, poor road networks, information flow and inadequate transport means, usually hinder the access to the market.

### 2.3.4 The Emerging New Maize Marketing Arrangements

#### Nakisenhe Adult Literacy Group (NALG) Marketing Arrangement -Iganga

**Overview:** NALG, a maize brokerage Non Government Organization has been operating in Iganga district for the last 3½ years. NALG's marketing chain involves the movement of maize from the commercial farmers to the different market destinations that include millers, Uganda Commodity Exchange, Uganda Grain Traders and cross border traders. NALG also provides inputs, carries out adult literacy as well as farmer training in business management and improved agricultural production practices. NALG avails farmers with a platform through which they share ideas and experiences on maize production that increases on their knowledge, market and bargaining power. NALG also provides farmers with agricultural inputs on credit terms against which payment can be done after the selling of the output. On the whole, the NALG kind of maize market arrangement was found to be promising especially for future market arrangements.

**Marketing Arrangement:** NALG mainly deals with commercial farmers and organized subsistence farmers' groups. NALG encourages the farmers to collect, clean and bulk their produce in their homesteads to ease the procurement process. If a farmer is selling maize grain exceeding 10 mt, NALG will incur the cost of collecting and transporting it to its store. NALG rents 10 of the former Busoga Growers' Cooperative Union stores for purposes of bulking maize, with 7 of them located in Iganga district of which 3 are in Kigulu county, 2 in Busiki and 2 Luuka, while 2 and 1 are found in Bugiri and Mayuge districts respectively. Each store has a capacity of about 500mt of grain (50ft x 100ft). NALG procures about 80% of the commercial farmers' maize grain and 25-40% of the total maize produced in Iganga district. NALG searches for maize markets and negotiates the selling price on behalf of the farmers. NALG negotiates transport and loading charges with the maize buyers before the transactions are finalized, although in most instances the buyer is responsible for the transport costs, while NALG caters for the loading charges. NALG mainly targets maize buyers who offer prices that are above those predicted by farmers at the time of delivery to

NALG stores. Table 7 shows the performance of NALG over the past year and estimates for 2003.

**Table 7: Maize Handled by NALG (Tonnes)**

| Season | Tonnes |
|---|---|
| 1st Season 2002 | 916 |
| 2nd Season 2002 | 485 |
| 2003 Estimate – 1st Season | 585 |
| 2003 Estimate – 2nd Season | 415 |

*Source: Maize Supply Chain Analysis Study, August 2003*

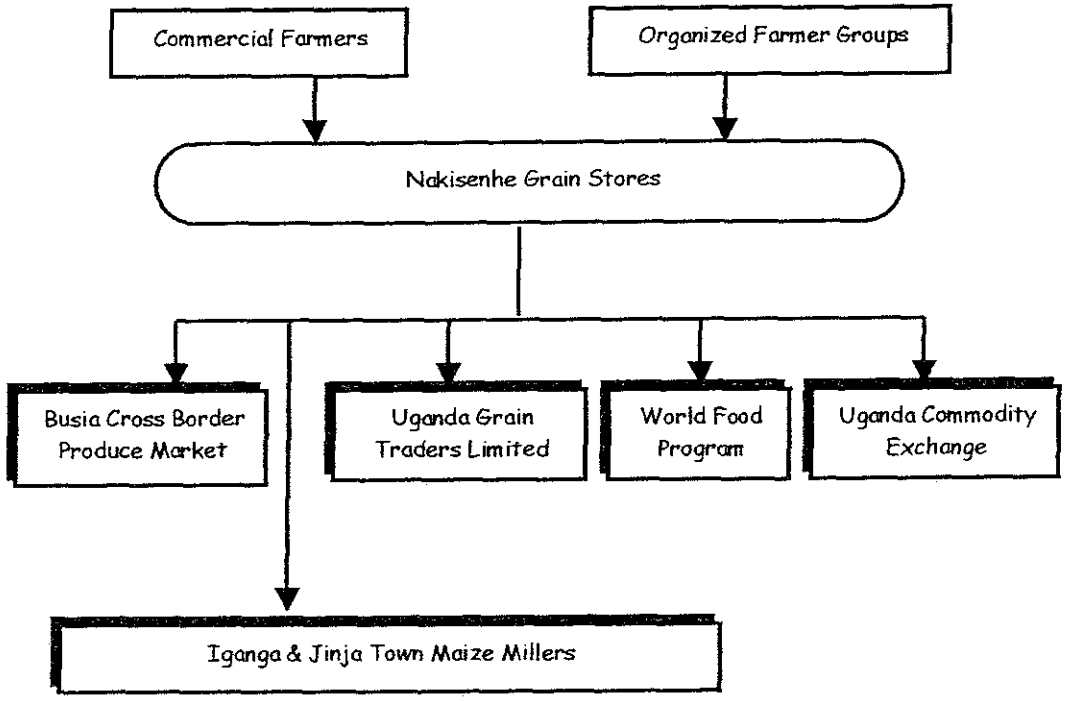
A 5%-10% commission is charged by NALG to cater for storage, re-cleaning, re-weighing, re-bagging and fumigation of the farmers' produce at the NALG stores. This commission depends on the premium that is obtained by NALG above the price that was being targeted by the farmer on delivery of his/her produce and actual price NALG sells. If NALG obtains a price above UShs 30 of the farmers target prices, NALG charges a 10% commission, if the premium is below UShs 30 NALG will charge 5% commission. If the transaction has been completed, NALG takes its commission and all that remains goes to the farmer. NALG would be charging a much higher commission of 20%-30% if its activities were not being partially subsidized by USAID/PL-480 project by providing weighing scales and topping-up their expenses on fuel and employees' salaries. NALG gives farmers the opportunity to search for better markets and prices even after receipt of their maize. In case the farmer gets the market, NALG will only require the farmer to pay for storage, re-cleaning, re-weighing, re-bagging and fumigation costs.

NALG has been getting much better prices above what is agreed with the farmers due to better maize marketing, good handling, networking with commercial farmers and market intelligence. NALG markets about three quarters of the maize through the cross border produce market in Busia, while the rest is sold to WFP, UGTL members like Afro Kai, Magric Uganda, Value Enterprises, Uganda Commodity Exchange and sometimes to millers both within and outside Iganga district.

**Shortcomings of the NALG Maize Marketing Arrangement**:

- There is lack of trust especially between NALG and the subsistence farmers who do not want to sell their produce on credit.
- NALG does not pay for the farmers' produce on cash basis. This causes impatience amongst some farmers who then end up selling their maize to other traders who procure on cash basis, though at a much lower price.
- NALG failed to work with un-organized subsistence farmers who are scattered and have low outputs of maize.
- The poor rural trunk road networks not only affect maize trading activities, but also increase the costs of doing business in terms of time and money.

**Figure 3: Nakisenhe Maize Marketing Arrangement**



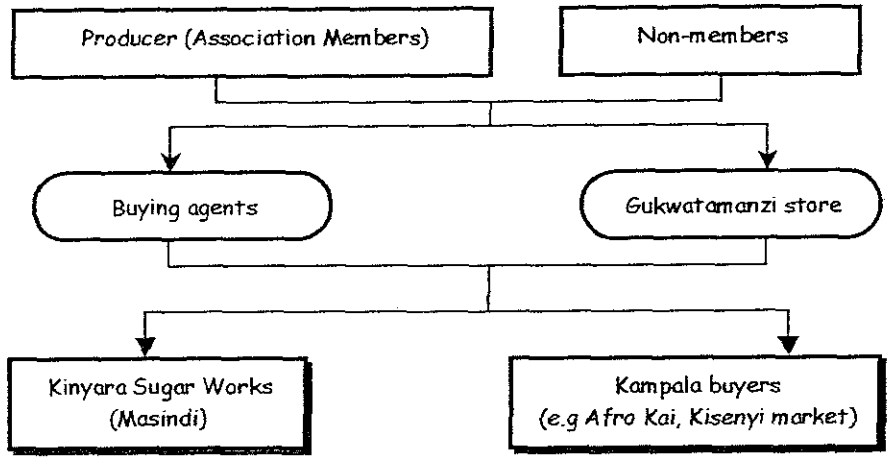

**Gukwatamanzi Farmers' Association Market Arrangements - Masindi**

**Performance:** The overall objective of this association is to collect large maize volumes in order to obtain a better price. Each of its 40 members is expected to plant at least 5 acres of maize, resulting in a minimum of 200 acres. At an average yield of 20 bags per acre, the 200 acres would generate a total output of 4,000 bags of maize (i.e 400 mt per season). Given this output, plus that bought from other farmers within the community, an overall output of at least 600 mt per season would be realised. Records show that in 2002, Gukwatamanzi marketed 1,400 mt of maize assembled from 117 producers, which was valued at about US$103,000.

**Marketing System:** The procurement of the maize is mainly conducted through agents who have small stores within the farmers' vicinity. Farmers also at times sell their maize output directly to the association stores. The payment for the farmers' maize output is usually cash on delivery or within two weeks time depending on the marketing arrangement between the buyer and Gukwatamanzi Farmers' Association. The association most often sells the maize to Kinyara Sugar Works and Kampala buyers. The farmers are regularly kept abreast with the market developments through monthly meetings.

The marketing system for Gukwatamanzi Farmers' Association is shown below.

**Figure 4: Gukwatamanzi Farmers' Association Marketing System**




**Shortcomings:** Issues of proper storage and quality of the produce are major concern both to agents and the association. However, the association envisages constructing a proper storage facility that can store the produce for a long period. The association incurs high transport costs because it does not have its own transport means. Furthermore, group cohesion is weak, as farmers prefer to receive cash for the produce delivered at the store.

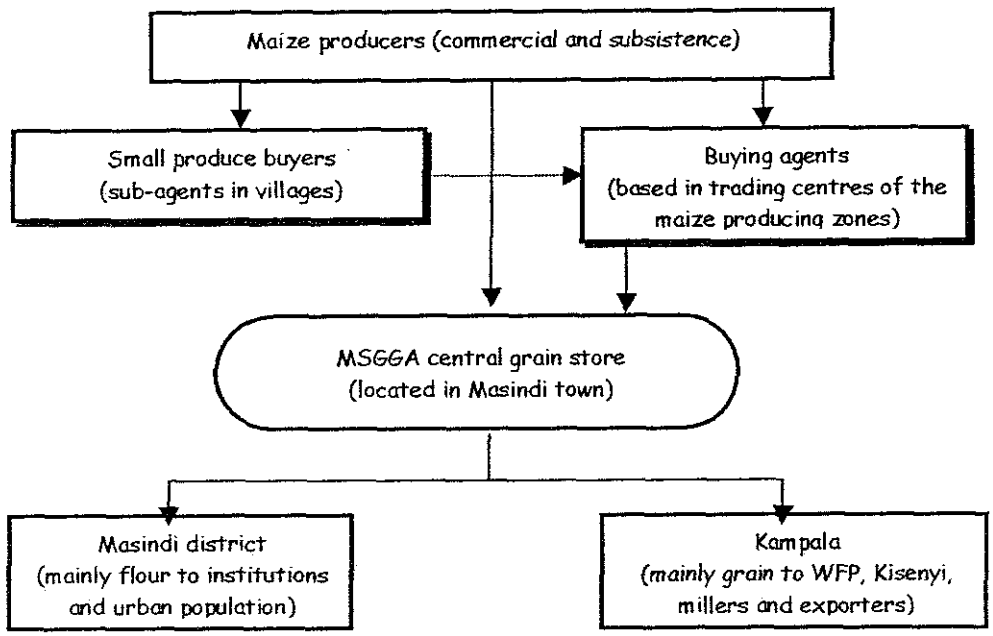
**Masindi Seed and Grain Growers Association (MSGGA) - Masindi**

**Overview:** Seventeen (17) farmers focused mainly on seed production for Uganda Seeds Project (USP) formed MSGGA in 1984 and by 1987 the membership had risen to 200. In 1994, MSGGA in collaboration with VOCA changed its constitution to include grain buying to cater for maize grain that had not been taken up by USP. Hence, MSGGA was formed purposely for marketing the surplus and rejected maize produce by USP. Another reason for MSGGA's formation was that some farmers had been dropped from the list of USP suppliers but had continued to grow maize, yet they needed to find market their produce.

**The Set Up of MSGGA**: An executive committee that comprises of the Chairperson, Vice Chairperson, Secretary, Vice Secretary, Treasurer and 4 zonal leaders, runs MSGGA. It has 4 working committees with 5 members on each namely: Finance and Credit, Production and Marketing, Transport and Construction, Marketing and Evaluation. The day-to-day management of MSGGA is vested in an appointed Secretary Manager, who has overall executive powers, a Treasurer who is the financial controller, and a foreman who heads the milling section. To become a member, a farmer pays UShs 5,000 for registration, UShs 10,000 as annual subscription fee and is also obliged to have a minimum of 40 shares each of UShs 10,000.

**Marketing Operations**: In 1995 MSGGA secured an equivalent of UShs 280 million from the African Development Fund (ADF) as an investment fund for increasing its maize procurement, processing and marketing. MSGGA on its part contributed 15% of the total investment requirements by purchasing land (where buildings were constructed), procuring building materials and paying for unskilled labour during the construction. Five rural maize procurement centers, one in each zone were established. Three (3) workers (1 in-charge of the store, 1 quality controller and 1 support staff in charge of weighing) were recruited at each procurement center.

**Figure 5: MSGGA's Marketing Structure**




As part of MSGGA's quality control measures, the maize bags are sampled, physical appearance checked, moisture content measured, prior to certifying it as good quality maize. Fumigation of the maize grain is done regularly (at least once a month) and a premium price is paid for high quality produce. The main buyers of MSGGA's maize grain are WFP, CEI, schools and traders from Kisenyi and Maganjo in Kampala. Since 1997, MSGGA has procured close to 1,500 mt of maize worth over UShs 3.0 billion

**Shortcomings:** The following were cited as the major shortcomings of MSGGA's marketing system:

- There is general lack of managerial capacity at MSGGA. Most of the decisions are made by the Secretary Manager, without much support from other members of the executive.

- MSGGA procures its maize produce from a wide range of producers, including farmers' groups, cooperative societies, individual subsistence and commercial farmers as well as agents. However, no clearly laid down modus operandi is reached with any of these producers.

- To enhance prompt payment to farmers, MSGGA advances funds to maize buyers especially agents at the stores. However, MSGGA faces a problem of poor accountability as most of the agents including commercial farmers who have shares in MSGGA bring less produce compared to the cash advanced. No measures have been taken to recover the money shortfalls since the association lacks by-laws to enforce recovery of the funds.

- The price offered for the maize produce is persistently declining because the quality of produce has been deteriorating as agents nowadays mix the good and bad quality maize together.

- Due to impromptus payments by MSGGA, some members of the association have resorted to selling their maize to other traders who offer cash on delivery.

- MSGGA lacks committed members, which complicates their marketing operations, as they cannot easily raise sizeable volumes of produce to negotiate for better prices.

Given the above and other related problems, MSGGA is in the process of restructuring its operations. The approach being proposed is to centralize the marketing of maize with a focus on farmers' representatives and commercial farmers that is aimed at eliminating agents whose quality standards are difficult to control.

**Future Marketing Arrangements in Kapchorwa District**

Plans are underway to start marketing maize produce under Kapchorwa Commercial Farmers Association. It is hoped that by the start of the next season (Oct/Dec 2003), an average of 8,500kgs of maize will be collected from each member. Each of the 429 members has an average of 10 acres (each farmer owns between 5-50 acres) and is therefore expected to devote at least half of that acreage (about 5 acres) to maize production, which will give a minimum of 2,000 maize acres. At an average yield of 17 bags per acre, the 2,000 acres will produce a total output of 34,000 bags of maize per season. The association is also devising ways of working with the small-scale farmers. They have secured the former central cooperative stores in town that have a capacity of over 500mt and will be collecting, cleaning and bulking their produce at the stores to ease the procurement process. They also envisage establishing at least 1 store in each of the major maize growing sub counties.

The other half of the produce that is left with the farmers is to give them a chance to market it somewhere else. And the fact that farmers will not be paid on cash basis, the produce they keep will help them market through the usual channels so that they can get some money to plan for the next planting season. The association will act as a link between farmers and buyers by searching for maize markets and negotiating for better prices on behalf of the farmers. A commission to cater for storage, cleaning, weighing, bagging and fumigation of the farmers' produce at the store is under review.

**Shortcomings:**

- Poor rural trunk road networks increase transaction costs.
- Poor storage facilities
- Poor quality maize
- Lack of information and data reports for the association

### 2.3.5 Market Transaction Costs

This section analyses the transaction costs for the different maize supply chains and identifies impediments to reducing those costs. A typical chain between farmers and the final maize destination is usually long and varies from district to district, although the main activities carried out by the participants are evidently bulking and cleaning. Districts with sizeable marketable maize surpluses have relatively longer marketing chains as compared to those with very little surplus. Tables 8 shows indicative transaction costs of a typical maize supply chain. The results reflect that total transaction costs for a typical maize supply chain range from 20%-32% of the farm gate prices and 16%-22% of the final landed market prices. A detailed analysis shows that transport costs constitute 41%-51% of total transaction costs in the typical maize supply chain.

**Table 8: Transaction Costs of a Typical Maize Supply Chain**

| Source | Iganga | | | Kapchorwa | | Masindi |
|---|---|---|---|---|---|---|
| **Transaction Stage/ Destination** | **Kampala** | **Mbale** | **Busia** | **Mbale** | **Busia** | **Kampala** |
| **Farm gate to rural trader** | | | | | | |
| Collection costs | 4 | 4 | 4 | 4 | 4 | 4 |
| Bagging | 3 | 3 | 3 | 3 | 3 | 3 |
| Weighing | 1 | 1 | 1 | 1 | 1 | 1 |
| **Rural trader to urban trader** | | | | | | |
| Off -Loading | 1 | 1 | 1 | 1 | 1 | 1 |
| Weighing | 1 | 1 | 1 | 1 | 1 | 1 |
| Bagging | 5.5 | 5.5 | 5.5 | 4.5 | 4.5 | 6 |
| Local government tax | 2 | 2 | 3 | 3 | 5 | 2 |
| Transport | 10 | 10 | 10 | 5 | 5 | 10 |
| Loss | 1 | 1 | 1 | 1 | 1 | 1 |
| **Urban trader to Large Scale Trader** | | | | | | |
| Re-drying | 1 | 1 | 1 | 1 | 1 | 1 |
| On-loading | 2 | 2 | 2 | 1 | 1 | 1 |
| Off-loading | 1 | 1 | 1 | 1 | 1 | 1 |
| Transport to final destination | 15 | 12 | 12 | 10 | 15 | 18 |
| Stacking | 1 | 1 | 1 | 1 | 1 | 1 |
| Overhead costs | 6 | 6 | 6 | 1 | 1 | 5 |
| Loss | 2.1 | 2.1 | 2.1 | 1 | 2 | 1 |
| **Total Transaction Costs of Grain** | **48.6** | **45.6** | **53.6** | **39.5** | **47.5** | **57.0** |
| **Farm gate price** | **180** | **180** | **180** | **200** | **200** | **180** |
| **Final price (sales point)** | **260** | **250** | **300** | **250** | **300** | **260** |
| **Net margins (per kg)** | **31.4** | **24.4** | **66.4** | **10.5** | **52.5** | **23.0** |

*Source: Maize Supply Chain Analysis Study, August 2003.*

Tables 9 shows the indicative transaction costs of the emerging new maize supply chains, with total transaction costs ranging from 20%-24% of the farm gate prices and 13%-16% of the final landed market prices. A breakdown of these costs reveals that between 43%-47% of the total transaction costs are incurred in transport. The above analyses show that the emerging supply chains are more efficient through the reduction in transaction costs.

***Table 9: Transaction Costs of the Emerging New Maize Supply Chains***

| Item | Iganga | | | Masindi |
|---|---|---|---|---|
| | Nakisenhe | | | Gukwatamanzi |
| Destination | Delivered to Kampala | Delivered to Mbale | Delivered to Busia | Delivered to Kampala |
| Price to the farmer | 180 | 180 | 180 | 180 |
| Weighing | 1 | 1 | 1 | |
| On-Loading | 1 | 1 | 1 | 3 |
| Bagging Material | 2.5 | 2.5 | 2.5 | |
| Transport to central store | 5 | 5 | 5 | |
| Off-Loading | 1 | 1 | 1 | 1 |
| Drying | 1 | 1 | 1 | |
| Fumigation | 5 | 5 | 5 | |
| Cleaning | 1 | 1 | 1 | |
| Stacking | 1 | 1 | 1 | |
| Re-Clean after fumigation | 1 | 1 | 1 | |
| Re-Weighing | 1 | 1 | 1 | 2 |
| Storage | 5 | 5 | 5 | |
| Transport to Final Destination | 15 | 12 | 12 | 30 |
| Contingency fund | | | | |
| Store Manager/Facility Management | 2 | 2 | 2 | |
| Losses | | | | |
| **Total** | **222.5** | **219.5** | **219.5** | **216** |
| **Transaction Costs** | **42.5** | **39.5** | **39.5** | **36** |
| **Av. Price Received at Sales Point** | **260** | **250** | **300** | **260** |
| **Net Margins (Per Kg)** | **37.5** | **30.5** | **80.5** | **44** |

*Source: Maize Supply Chain Analysis Study, August 2003*

It should be pointed out that total transaction costs are higher during the maize off-harvest periods as compared to harvest periods. This arises from scarcity of the grain that sets in diseconomies of scale. Besides, it observed that total transaction costs are much lower in the emerging new maize supply chain compared to typical maize supply chain. This is attributed to the fact that emerging new maize supply chain has fewer intermediary participants, hence lower transaction costs. Thus, in order to reduce transaction costs, it is imperative that the number of intermediary participants is minimised, which could lead to farmers enjoying much higher prices.

## 2.3.6 Market Efficiency, Profitability and Market Margins

The level of efficiency of a maize supply chain depends on the number, behaviour and conduct of the various participants and influences the pricing and net returns for each of the participants at each stage. At each stage of the chain, margins should reflect a 'normal' profit above costs to each intermediary stage.

Table 10 shows the percentage shares of the final consumer price obtained by various participants in the maize supply chain. From the table, it is evident that farmers, urban traders and retailers in that order took the largest share of the consumer prices.

**Table 10: Margins for the Various Participants by Season (Margins in Shs/Kg)**

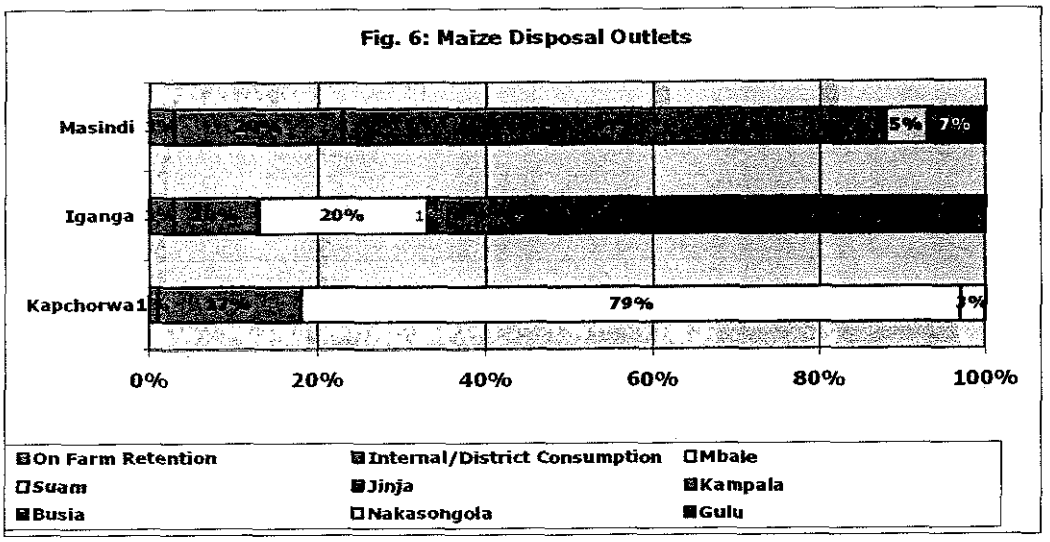
| Participant | Iganga | | Kapchorwa | | Masindi | |
|---|---|---|---|---|---|---|
| | Margins | %age | Margins | %age | Margins | %age |
| Farmer | 60 | 22.2% | 100 | 32.3% | 90 | 30.0% |
| Rural Trader | 40 | 14.8% | 40 | 12.9% | 40 | 13.3% |
| Urban Trader | 50 | 18.5% | 50 | 16.1% | 50 | 16.7% |
| Miller | 40 | 14.8% | 40 | 12.9% | 40 | 13.3% |
| Wholesaler | 30 | 11.1% | 30 | 9.7% | 30 | 10.0% |
| Retailer | 50 | 18.5% | 50 | 16.1% | 50 | 16.7% |

*Source: Maize Supply Chain Analysis Study, August 2003*

## 2.3.7 Market Outlets

Figure 6 shows the maize disposal outlets and their proportions for the districts of Iganga, Kapchorwa and Masindi. While an average of 3% and 16% of the grain is respectively consumed on farm and within the district, 57% of Iganga's maize is sold to Busia cross border, 79% of Kapchorwa's to Mbale and 65% of Masindi's to Kampala.

**Fig. 6: Maize Disposal Outlets**




A detailed follow-up of the final destinations for maize marketed outside the districts of Iganga, Kapchorwa and Masindi is summarised in Figure 7. It was revealed that a large portion of the maize produced in Eastern Uganda is mainly marketed through the Busia Uganda/Kenya border and to small extent through Suam border, where Iganga and Kapchorwa maize account for 60%-70% of it. Though maize is Kenya's staple food that could easily be obtained from Uganda, formal maize trading activities have been constrained by a myriad of factors that has spurred the growth of informal trade mainly through the Busia border.

The peak-purchasing season of maize by Kenya traders occurs between November and March every year. Kenyan traders usually come when contracted by companies like UNGA or other traders especially from Nairobi, Nakuru and Kisumu. The maize at the Busia border is procured through open-air markets with the maize assembled into lorry lots of 200-600 bags (100-Kg), although few transactions take place at stores that hold between 50-100 bags (100-Kgs). The maize that goes to Kenya is estimated to be 5-10 lorries of 600 bags on a bad day and 10-20 lorries on a good day. Normally, prices range from UShs 200 – 250 per kg, although in times of scarcity, they shoot up as high as UShs 450-500 per Kg. The customs officials use a direct assessment criterion without insisting on all the necessary export documentation requirements.

Factors that have boosted cross border maize trade include:

- Uganda maize is cheaper when compared to that grown in Kenya.
- Convertibility of Kenya and Uganda currencies
- Existence of traders on both sides willing to trade
- High demand for maize in Kenya as it is their staple food, but produced only once a year.

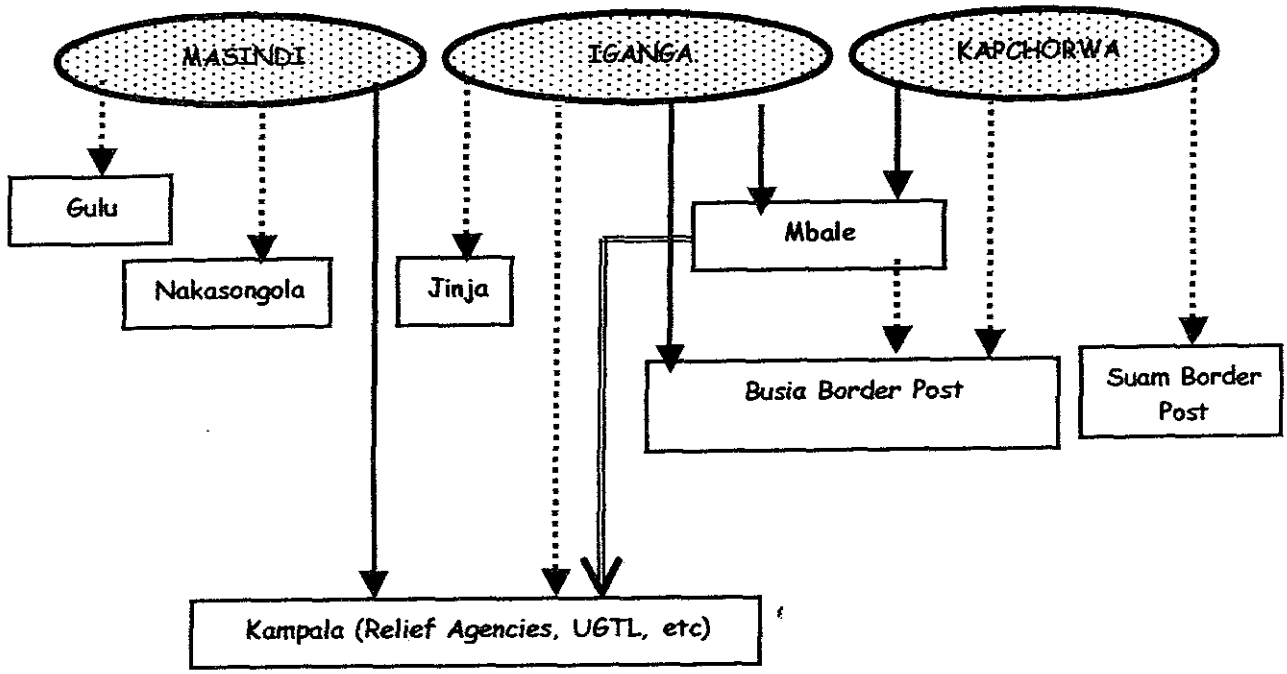
Factors that threaten cross border maize trade include:

- Different quality standards, which causes confusion to cross border maize traders. Sometimes, Kenyan traders incur post harvest losses due to procurement of maize at very high moisture content between 16%-17% instead of 14%. This results into a loss of 8-15 kg per 100kg bag of maize. Besides, sometimes Uganda's maize is very dirty and has red tips.
- Requirement to have a certificate of origin, yet they are only obtained from Kampala, which is not only time consuming, but also expensive in terms of transport costs.
- Existence of unfair policies set by the Kenyan government, stops Uganda traders from crossing the border into Kenya to sell their maize due to fear of being cheated and going through cumbersome road checks.
- Lack of adequate and proper maize storage facilities at the Busia cross border.

As for Kapchorwa district, much of the maize is channelled to Mbale, the hub of grain milling in Eastern Uganda. Farmers in Kapchorwa prefer Mbale to Suam border because of the better road. Almost 90% of the maize that reaches Mbale is milled into flour, which is later sold to relief aid agencies like WFP, ICRC and other major urban centres in the country. Maize is transported to Busia for sale only if better prices are expected and one is able to recoup the transport expenses. Though maize grain from Kapchorwa is cleaner, it usually has a high moisture content, which needs re-drying before milling or else it leads to great losses.

As for Masindi district, although a good chunk of the maize is destined for Kampala markets and largely consumed by relief agencies, Gulu and Nakasongola are increasingly becoming major maize outlets. Their choice of market outlets is driven by market size and good prices. Some of the main traders within Masindi district have established their agents especially in the major trading centres of Kigumba, Kiryandongo and Pakanyi.

**Figure 7: The Various Maize Marketing Outlets for Iganga, Kapchorwa and Masindi Districts**




| | |
|---|---|
| Bold lines | Major grain outlets |
| Broken lines | Minor grain outlet |
| Double lines | Maize flour outlet |

In summary, the flow of maize within and outside Iganga, Kapchorwa and Masindi districts is influenced by the factors enumerated below:

- Demand for the Maize
- Transaction costs to the final market destinations
- Prevailing maize market prices
- Market efficiency
- Trade relations with Kenya

## 2.4 Maize Milling

### 2.4.1 Overview

This section assesses the importance of maize milling as part of the commercialisation of maize production. It examines the milling technology and its consequential impact on production costs as well as the changing patterns of maize consumption. The majority of the maize millers in Iganga, Kapchorwa, Masindi, Mbale, Jinja and Busia districts are mainly small-medium scale millers who use either diesel engine or electric-motor driven hammer mills. The commercial millers prefer the locally manufactured mills because of their simple production system, low cost and the fine flour they produce. However, its flour is less nutritious and has a danger of being contaminated by iron filings from the hammer. It is also inefficient in the consumption of electricity.

### 2.4.2 Maize Milling and Consumption

Two maize milling channels were observed during the study:

**Contract-based maize milling:** This is where a client is charge a specific fee for milling his/her maize grain. It is the most dominant form of maize milling in Iganga, Kapchorwa, Masindi, Mbale, Jinja and Busia districts. These contract based maize millers normally use hammer mills that are not well maintained leading to low returns and poor quality flour. Most of the millers visited during the study reported operating at 30%-50% of the installed capacity of their mills. The quantity of maize milled is mainly determined by the availability of power and the demand for maize flour. On average, the contract millers reported milling between 1,900kgs-10,000kgs a day depending on the capacity of the mill. The competition amongst the contract-based millers is so stiff that their profits are so low. The demand for flour among the different buyers differs significantly; the traders and wholesalers prefer super grade *'hordari'*, institutions prefer second grade *'nylon'*, while direct consumers demand for third grade *'safi'*. Besides, the demand for animal feeds has been growing rapidly resulting into increased usage of bran.

**Trade based maize milling:** is more common in urban centres. It has built-in costs of purchasing of the maize grain, transporting, grain storage, milling, packaging, storage of maize flour and marketing.

### 2.4.3 Maize Milling Costs and Profitability

The study revealed that milling charges ranged from UShs 50 -100 per kg as shown in Table 11. However, in reality, field observations revealed that due to stiff competition amongst millers, the milling charge depends on the volume of maize grain to be milled, location of mill, size of the mill, energy costs and availability of maize grain. The price of a kg of maize flour at the mill also varies by grade and season, but on the whole it ranges from UShs 410- 550 per kg for grade 1, UShs 380-420 per kg for grade 2, while grade 3 is sold between UShs 290-360 per kg.

**Table 11: Indicative Milling Costs and Profit Margins**

| Item | Grade 1 *(Hordari)* | Grade II *(Nylon)* | Grade III *(Safi)* |
|---|---|---|---|
| Milling Charge | 80 | 60 | 50 |
| Cleaning grain | 1 | 1 | 1 |
| Huller labour | 2 | 2 | 2 |
| Miller labour | 2 | 2 | 2 |
| Bag | 5 | 5 | 5 |
| Repairs | 25 | 25 | 25 |
| Packaging | 2 | 2 | 2 |
| Licence + Others | 2.5 | 2.5 | 2.5 |
| **Total** | **119.5** | **99.5** | **89.5** |
| **Gross Margins** | **39.5** | **39.5** | **39.5** |

*Source: Maize Supply Chain Analysis Study, August 2003*

The conversion of maize grain to flour is estimated at 50%, 65% and 75% for grade 1, 2 and 3 respectively. The by-product of maize milling (bran) is sold at UShs 50-100 per kg. Due to the high demand for bran nowadays, millers often off set its purchase price from milling charges that traders/institutions pay. This implies that on the whole, the actual milling charges are much lower. The profitability of maize milling depends on volume of grains, charges levied, flour outturn and operational costs. The flour outturn also depends on the maize variety. Calculations based on field observations show that millers earn gross margin of about UShs 40 per kg.

### 2.4.4 Factors Affecting Maize Milling

- **Availability and Cost of Electricity**

Power shortages being rampant, it affects the quantity of maize flour milled in a day. In addition, electricity tariffs are high, which leads to high milling charges. However, for the millers to remain in business, they have to cut back on other operational costs. This problem is further exacerbated by the fact that the millers cannot afford to run the mills on generators.

- **Type of Technology Used**

The machines used in milling of maize grain are locally manufactured, poorly maintained and not efficient in energy utilisation. These machines not only make the cost of milling high, but also give rise to poor quality flour and outturns. In addition, millers operate their mills below the installed capacity, which raises operational costs. The situation has been worsened by the lack of capital to procure better mills.

- **Lack of Knowledge and Resources to Invest into Other Maize Value Products**

Maize and its by-products can be processed into many other value products. However, the lack of knowledge and resources has hindered investments in products.

- **Stiff Competition**

A maize mill is small investment that requires little capital. This accounts for the ever-increasing number of millers and stiff competition in the milling sector.

## 2.5 Analysis of the Maize Supply Chain

### 2.5.1 SWOT Analysis of the Various Maize Supply Chains

This section analyses the strength, weaknesses, opportunities and threats of the typical and the emerging new maize supply chains as summarised in Table 12.

**Table 12: SWOT Analysis of the Various Maize Supply Chains**

| **The Typical Maize Supply Chain** | |
|---|---|
| **Strengths** | **Weaknesses** |
| • Deeply rooted in the rural maize production systems.<br>• Provides avenues for farmers to earn income from sale of surplus maize | • High collection and transport costs.<br>• The chain is very long with many intermediaries.<br>• No linkages between participants.<br>• Limited market entry at the higher level of the chain.<br>• Collusion amongst participants.<br>• Poor post harvest-handling methods.<br>• Cash based on spot market transactions.<br>• Minimal value addition<br>• Quality improvements are not rewarded<br>• No trust between producers and traders. |
| **Opportunities** | **Threats** |
| • Creates more employment opportunities.<br>• Has wider market base. | • Maize is a low value and bulky produce<br>• Transport costs are major cost of total transaction costs.<br>• Frequent fluctuation in maize prices<br>• Unreliable marketable volumes<br>• Competition reduces as one moves up the chain |
| ***The Emerging New Maize Supply Chains*** | |
| **Strengths** | **Weaknesses** |
| • Chain is shorter with fewer participants.<br>• Has some form of contract based transactions, which nurtures linkages between participants.<br>• Bulking is faster as commercial farmers who have huge volumes with central pooling centres dominate it.<br>• The participants appreciate quality improvements. | • Only works efficiently with commercial farmers and organised farmers' groups.<br>• Inadequate storage facilities. |
| **Opportunities** | ***Threats*** |
| • Market information moves faster through this chain.<br>• Promotes production and handling of sizeable volumes and economies of scale<br>• Promotes commercialization of maize production<br>• Enhances collective bargaining amongst the participants<br>• | • Low value and bulky product<br>• Fluctuation of prices and marketable volumes<br>• Transport costs are a major cost of total transaction costs.<br>• Inadequate credit facilities jeopardise loyalty in case of cash needs.<br>• Institutional development hinges on a few committed participants. |

## 2.5.2 Factors Affecting Maize Supply Chain Competitiveness

The following are the key factors affecting maize supply chain competitiveness:

- **The high number of participants and transaction costs**

The maize marketing chain is long with many participants, which increases transaction costs. Besides, maize being low value and bulky crop, the existence of many participants who add minimal value to it results in a tendency of powerful participants to collude and attain better profit margins.

- **Minimal Horizontal and Vertical Linkages Nurtured**

Most participants in the maize supply chain act individually and carry out on spot cash based market transactions, which limit horizontal and vertical linkages that hinder the integrating of activities and efficiency within the maize supply chain.

- **Inaccessibility to Information by Participants**

The poor information flow between the various participants constrains development of a competitive and efficient maize supply chain. In reality, access to information by individual participants is used to one's advantage at the expense of other participants within the maize supply chain.

- **Failure to enforce and reward quality improvements**

Maize deals and transactions are mainly based on volumes and visual quality inspection and assessment. The failure by the participants to reward quality improvements within the maize supply chain has undermined quality improvement in the maize traded.

- **Poor Quality Road networks**

The poor rural road networks not only increase the transaction costs within the maize supply chain, but also the time taken to bulk the maize. Some areas are impassable. Otherwise if the roads were good, more traders would go to the farmers, competition would increase and in so doing market information would be more easily accessed.

- **Failure to Develop Contractual Arrangements amongst the Maize Supply Chain Participants**

The reliance on-spot cash-based market transaction raises transaction costs and hinders private sector institutional development. The failure to develop contractual arrangements between participants has led to parasitic behaviour and on and off seasonal participants within the maize supply chain, which increases uncertainties.

- **Inadequate Credit Support**

Inadequate credit support is amongst the major constraints to the development of an efficient and self-propelling maize supply chain. Notably, commercial banks normally require physical assets as collateral before availing credit to the beneficiaries rather than usage of maize stock inventories.

- **Poor Storage Facilities**

The absence of appropriate storage facilities has resulted into high post harvest losses and untimely delivery of maize consignments from one stage to another within the maize supply chain.

### 2.5.3 Prospects of Improving Competitiveness of the Maize Chain

Improving Uganda's maize supply chain competitiveness will entail reducing the unit costs of producing maize, strengthening horizontal and vertical linkages between participants, quality improvement, minimisation of post-harvest losses, bulking of produce as well as reduction of transaction costs. A maize supply chain that encompasses the following best practices will certainly be more competitive:

**Promoting contractual procurements:** Adoption of procurement and payment through clearly defined contractual arrangements will attract high volumes and delivery of products within the maize supply chain. Besides, stock inventory financing through warehouse receipt mechanism gives comfort to participants and financial institutions, will be boosted.

**Establishing quality control measures:** Well laid down quality control procedures will help avoid mistrust and scepticism. A mechanism that offers a premium for quality will ensure compliance, and thus boosting competitiveness of the maize supply chain.

**Adequate and Proper Storage:** Sizeable storage capacity will attract more serious buyers, as they would want to procure what they can see and not what they can imagine. Besides having facilities such as dryers, graders and sorters in place will enhance quality improvements and thus competitiveness of the maize supply chain.

**Increasing Information flow:** Active and functioning information flow channels will nurture vertical and horizontal as a means of enhancing competitiveness within the maize supply chain.

**Minimizing Transaction Costs:** Knowledge and appreciation of reduced transaction costs and maintaining a clear cost structure minimises costs, which makes the maize supply chain more competitive.

**Sufficient turnover:** Maize supply chains operating from areas with huge maize surpluses, will not only be able to pull product at low costs and enjoy economies of scale, but also attract bulk buyers.

# 3.0 CONCLUSION AND RECOMMENDATIONS

## 3.1 Conclusions

This study has found that the main constraint to efficient functioning of the maize supply chain is the highly volatile maize prices and volumes, which limits the volume of stockholding and trade. There is also a range of other constraints to the functioning of the maize supply chain that include high transaction costs, on-spot cash based market transactions, limited use of contract in maize trading, limited appreciation of quality standards, poor information flow, limited access to credit, inadequate and poor storage facilities and minimal institutional development.

## 3.2 Recommendations

The following are the recommended measures that should be considered in addressing most crucial structural problems observed in the maize supply chain:

- **Promoting Use of Maize Stocks as Collateral**: Maize stakeholders in collaboration with the government should encourage commercial banks and micro finance institutions to accept maize stocks as collateral to enhance the trading of maize within the country. This involves designing and implementing a viable stock warehouse receipt and inventory credit system that involves different stakeholders like banks, insurance companies, farmers, traders etc. This will contribute towards broadening of the market, improving quality standards, improved management of large volumes stocks of maize, reduced quantitative and qualitative grain loses, flow of market information on the volume, location, and prices of stocks, etc.

- **Providing incentives to the private sector to invest in large-scale storage and handling of sizeable maize volumes:** Government should support initiatives aimed at setting up of proper storage facilities to enhance timely delivery of quality grain by traders at all levels. Efforts geared towards promoting the provision of post-harvest equipment such as driers and shellers to farmers should be given priority. Besides, support to the Uganda Grain Traders Limited (UGT), though the Export Credit Guarantee Scheme would enable members collectively hold sufficient stock.

- **Reducing Transaction Costs Through the Following**:
    - By lobbying central and local governments to allocate more funds to road infrastructure improvements to increase rural accessibility.
    - Farmers should work together with reliable traders who engage in bulking and offer fair prices for their produce through linking them up with large scale traders and export markets.
    - Strengthening market information dissemination amongst the maize stakeholders at the different levels of the maize supply chain.

- **Streamlining Maize Quality Standards:** Government should support initiatives aimed streamlining maize quality standards to enhance traceability of the maize and quality improvements. Training of farmers in quality control methods and enforcement of quality standards should be promoted. In addition, maize traders and millers should offer premium prices for high quality maize.

- **Promoting Formation of Farmer Associations and Producer Organizations for Marketing**: Stakeholders working with government should encourage farmers to form strong farmer associations and producer organizations that will assist them to pool produce together for bulk marketing, strengthening linkages with traders, enforcement of quality standards, accessing extension services, credit and marketing information. This will generate economies of scale, improved quality and the resultant premium prices.

- **Setting a Floor Pre Maize Planting Price**: Maize industry stakeholder should agree upon a floor price prior to the maize planting season. Setting up a maize industry forum will enhance the setting up of such floor prices and addressing of problems facing the stakeholders.

- **Promoting Good Agronomic Practices**: Government, working with maize industry stakeholder should promote good agronomic practices among the maize producers to reduce costs of production at the farm level. Efforts should be aimed at promoting usage of fertilisers, improved seeds and adoption of modern farming technologies

- **Rural Market Infrastructure Development:** Maize industry stakeholders should work together to promote the establishment of rural marketing centres. Support rural-based commodity exchange centres with basic infrastructure and a reliable communication network should be given priority.

- **Promoting Rural Small Scale Agro Processing Industries:** Government should support the maize milling industry in order to make it more competitive through making electricity tariffs much cheaper. Promoting the development of small agro-milling industries in the rural areas should be encouraged to boost maize production. It is also essential to regularly organise training programs for millers to make them aware of new developments in maize milling, improve there business and resource management skills and provide market information and opportunities.

# ANNEXES

**Annex 1:**
**Scope of Work**

**Annex 2:**
**Checklist of the Key Respondents**

**Annex 3:**
**List of Respondents**

**Annex 4:**
**Major Inputs and Costs of Production**

# Annex 1:
# Scope of Work

# MAIZE SUPPLY CHAIN ANALYSIS STUDY

## SCOPE OF WORK

### I Background:

The USAID-funded Investment in Developing Export Agriculture (IDEA) Project, which was initiated in March 1995, has the goal of increasing rural men's and women's incomes. This is to be achieved through promoting production and marketing of selected non-traditional agricultural exports (NTAEs). IDEA works to expand LV food crop exports (primarily maize and beans); and increase production and exports of HV crops (such as flowers, fresh produce, vanilla, cocoa and papain). The main intermediate result (IR) under IDEA is increased value of selected non-traditional agricultural exports (NTAEs) as the source of increased incomes. By its very nature therefore, IDEA is one of those projects whose activity has a direct bearing on the production, marketing and exports of NTAEs from Uganda.

Maize is currently one of the most important cereal crops widely grown and consumed in Uganda. The crop occupies a strategic position in the country's food security alongside banana, cassava and sweet potatoes. It is a major part of the diet of both rural and urban communities and institutions. Maize also provides farm households and traders with income generated from internal and external sales. It is therefore an important crop from both the food security and income-generation points of view.

Despite this, maize producers and traders are faced with high production/distribution costs that compress their margins at the farm gate and along the supply chains. At the same time grain mills within Uganda operate below full capacity because they cannot purchase adequate local supplies of maize. This circumstance drives up their unit operating costs and compresses their margins. The markets in which all these participants operate are thin and susceptible to large price swings that can result in financial losses.

It is certainly true that physical bottlenecks exist to the operation of efficient supply chains. Some of these include a deficiency of secure storage facilities, an absence of distribution/transport mechanisms, and a shortage of rural electric power. However, institutional obstacles pose an even greater obstacle. These include the lack of standardized maize grading and classification standards, limited market depth, limited access to export credit and undeveloped credit markets for farm inputs. The recent experience of depressed markets due to strong production did complicate matters even further. Ugandan maize farmers are now asking themselves fundamental questions about whether maize is a 'money-maker' and whether maize production as a cash cropping alternative in competition with others is viable in the long term.

One fundamental problem that needs to be addressed therefore, is the absence of strong commercial/producer organisations at the farm level that can enforce and fulfil contractual forward linkages (to markets) and backward linkages (to input suppliers and to suppliers of modern production/handling/storage technologies). Alongside this is the need to analyse the competitiveness of the maize sub-sector in view of the transaction costs for the different marketing chains. This will provide a useful guide to areas where competitiveness can be improved.

In order to understand the supply chains and the value addition processes along the chains, IDEA is commissioning a study that will cover key maize production districts of Kapchorwa, Iganga and Masindi. The study, to be conducted by a Consultant, is expected to provide a comprehensive and in-depth platform from which stakeholders will be able both to identify and test alternatives for increased competitiveness of the sub-sector and for strengthening forward and backward linkages.

## II Scope of work:

**A: Objectives:** The main objective of the study will be to ascertain costs and value in the maize supply chains and identify areas for increasing competitiveness. Specific assignments will include, but not be limited to the following:

- Undertaking a literature review of similar research work done in the maize sub-sector over the last 3-5 years.

- Mapping the existing maize supply chains in the area of study. This mapping exercise will involve enumerating all of the discrete categories of participants in the chain, defining the commercial functions performed by each category of participant, profiling participants in each category in terms of their concentration and location and estimated full production/merchandising capacity.

- Assessing the basic economics of the existing supply chains, in the form of a cost and value chain assessment. For each category of value addition step within the chain, the Consultant will assess the actual unit cost and price, together with the elapsed time required to complete each step.

- Carrying out an in depth assessment of the competitiveness of the maize sub-sector, identifying the problems and prospects within each value adding step in the existing commercial chains.

- Compiling a set of normative suggestions and recommendations concerning the institutional and regulatory context in which the maize supply chains currently operate, including recommendations concerning how risks and responsibilities should be distributed and/or assumed.

**B: Data sources:** In executing this assignment, the Consultant shall be expected to liaise with a number of stakeholders, including among others; WFP, UGT, private exporter firms, producer groups, farmers, processors, projects, PMA, NAADS, Banks (CERUDEB, Stan-Chart, Barclays), NARO and input suppliers.

## III Deliverables:

The following deliverables will be required:

- **Study design/proposal**, spelling out study methodology, work plan, budget and terms of payment. These will be discussed and agreed upon between the successful firms/individuals and the IDEA Monitoring and Evaluation Specialist.

- **Draft report**, bringing out an analysis of all variables. The report should be as comprehensive as possible and should clearly spell out findings, analysis and recommendations.

- **Final report**, which incorporates all IDEA comments and fully addresses the terms of reference. The report would spell out clearly, ways through which the existing supply chains can be made more competitive. The final report is expected to:
  - Comprehensively bring out analyses, findings and recommendations that emerge from the consultative process.
  - Assess the supply chain competitiveness and outline the problems and prospects of the Ugandan maize sub-sector.

## IV Award of study:

The study will be awarded to the most competent Consultant based on past track record, availability for study period, extent of creativity and knowledge of the subject matter. Considering the actions required under this assignment, it is expected that the Consultant shall posses the following qualities:

- Expert knowledge of Uganda maize sub-sector including knowledge concerning production, processing, transportation and marketing sub-systems.
- Knowledge of farm-level organisation and organisational development.
- Familiarity with Government planning processes and cycles.

The study, which is expected to commence by mid July 2003, is to last two months.

## V Terms of contract and logistics:

The Consultant will be fully responsible for all transport, telephone contacts, and other costs associated with the assignment. He/she will be expected to work in an independent manner and exhibit a high degree of professionalism. The proposed budget is therefore expected to incorporate all the above cost items.

## VI Reporting:

The contractor will report to:

Mr. Peter Wathum,
ADC/IDEA Project Monitoring and Evaluation Specialist
Plot 18 Prince Charles Drive, Kololo, Kampala
Tel: 255482/3 Fax: 250360.
E-mail: peter-adc@starcom.co.ug

Proposal should reach the M&E Specialist by 5.00 p.m on Friday 4th July 2003. The M&E Specialist will closely monitor progress during the study period, including verification of data collection.

# Annex 2:
# Checklist of the Key Respondents

# IDEA Project: Maize Supply Chain Analysis
# Maize Traders' Questionnaire

1. Name of Trader _____

2. Location: (Nearest Trading Center) _____

3. District _____

4. Distance to District Headquarters (Kms) _____

5. Please indicate (Tick) the category of your business
   - (i) Company _____
   - (ii) Cooperative _____
   - (iii) Sole Proprietor _____
   - (iv) Group _____

6. Please indicate the quantity of maize (100- Kg bags) you bought during the last 4 years

| Year | Quantity | Mode of Payment | | Producer Price (Ushs) | |
|---|---|---|---|---|---|
| | | Farm-Gate | At Store | Farm-Gate | At Store |
| 2000 | | | | | |
| 2001 | | | | | |
| 2002 | | | | | |
| 2003 (Projection) | | | | | |

7. What is the current maize price? (Ushs/kg) _____

8. If the procurement is at farm – gate, please indicate average estimated distance from collection center to maize farmers (Kms) _____

9. What is the average number of farmers who deliver maize to your store per season? _____

10. Considering seasonal fluctuations what is the quantity of maize delivered to your store by farmers (100 kg bags):

| | In- Season | Off-Season |
|---|---|---|
| Daily | | |
| Monthly | | |
| Annually | | |

11. Estimated average transport cost per 100 kg bag of maize (off farm to store). _____. What is the average distance associated with this cost (km) _____

12. *What is the %age loss of maize at store* _____
13. Do you have competitors in the maize trade (Yes / No) _____

14. If Yes, what is their estimated number in your sub-county or within a radius of 30 kms of your store? _____

15. Taking into account other competitors, what is your estimated market share in the trade in your command area (%) _____

16. Facilities deployed in the Business:
    (a) Storage:
    - Capacity of store (100 kg bags of maize) _____
    - Nature of Building (Permanent/semi-permanent) _____
    - *If rented, Ushs per month* _____
    - If owned, estimated replacement cost of building (Ushs in M) _____

    (b) Weights and Measures (Nos)
    - 100 Kg. Scale _____
    - More than 100 Kg. Scale _____

17. Employment Cost:
    - Permanent Workers:
        - Number _____
        - Average monthly salary per employee (Ushs) _____
    - Casual/ contract please indicate
        - Number per day _____
        - Average pay per day _____

18. Other operational costs

| **Operation** | **Cost per operation (Shs)** |
|---|---|
| Offloading 100 Kg bag of Maize | _____ |
| Weighing 100 Kg bag of Maize | _____ |
| Loading 100 Kg bag of Maize | _____ |
| Other (specify) _____ | _____ |
| _____ | _____ |

19. Other Operating Costs (Overheads) per annum:

    - Storage _____
    - Fumigation _____
    - Stationery _____
    - Accounts and Audit _____

- Licenses _____
- Defectives/direct losses (% of Turnover) _____
- Cleaning material _____
- Security _____
- Other (specify) _____
_____
_____

20. Apart from the licenses in no. 19 above, do you pay any taxes (Yes / No ) _____

21. If taxes are paid, indicate the types (tick) and the corresponding rates:

- Withholding tax (%) _____
- Income tax (%) _____
- Others (Specify) _____
_____

22. Taxes: In case local taxes are enforced by the Local Authorities , Please indicate basis applicable:

| | Shs |
|---|---|
| • Charge per 3 ton truck of maize | _____ |
| • Charge per 7 ton Truck of maize | _____ |
| • Charge per 10 ton truck of maize | _____ |
| • Charge per 100 kg bag | _____ |

23. Do you consider the above taxes fair and appropriate? (Yes / No) _____

24. If not give reasons _____

23. Please indicate the nature / type of the buyers of your maize (tick)

- Rural Traders _____
- Urban Traders within the district _____
- Urban Traders outside the district _____
- Local Processors within district _____
- Local Processors outside the district _____
- Local Institutions within the District _____
- Local Consumers _____
- Other (Please Specify) _____

24. Please indicate (tick) whether you sell your maize ex-own store or ex-store of the buyers:

- Ex-own store _____
- Ex-Store of the Buyer _____

25. If the maize sale is effected after delivery to the buyers, please indicate below the type of buyer, estimated distances and current sales price:

| Location / Type of Buyer | Average Distance (Kms) | Average Price per kg (Ushs) |
|---|---|---|
| Rural Traders | | |
| Urban Traders within the district | | |
| Urban Traders outside the district | | |
| Local Processors within district | | |
| Local Processors outside the district | | |
| Local Institutions within the District | | |
| Local Consumers | | |
| Other (Please Specify) | | |

26. What constraints do you face in your business (tick);

- Unfair competition _____
- Lack of credit _____
- Expensive credit _____
- Poor rural roads _____
- Non availability of transport _____
- Cumbersome Road checks _____
- Other (specify): _____
_____
_____

27. For the key constraints affecting your business, please indicate the nature of the problems:

_____
_____
_____
_____
_____

28. For some 3 transactions you were involved in, please list down the costs incurred in moving maize grain from the source (farmer) to the end user. Include **costs** (purchase price, on-loading, off-loading, bags, bagging, weighing, transport charges, commissions, losses, storage, etc) and **values** (price received and other margins, etc).

## IDEA Project: Maize Supply Chain Analysis

# Checklist for Large Scale Traders & Exporters

1. Name of Trader _____
2. Location: _____
3. District _____
4. Who are your major suppliers of maize grain?

(*Emphasis should be placed on the suppliers from Iganga, Kapchorwa and Masindi*).

| Name of Supplier | District | Physical Address | Tel. No. / Fax |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

5. Are farmer groups among your suppliers of maize grain?

| Name of Supplier | District | Physical Address | Tel. No. / Fax |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

6. Do you also have commercial farmers supplying maize to your company?

| Name of Supplier | District | Physical Address | Tel. No. / Fax |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

7. Are these suppliers districts very significant in terms of volume (tons) in the last year?

| Name of Supplier | Total Quantity of Maize from All Your Suppliers | Quantity from Named Supplier |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

8. From the list of suppliers in Qn. 1 could you name at least 3 of your suppliers who can give us information and with reliable records on specific consignments where you are involved to enhance the capturing of transaction costs and any other information like loss in weight, quality and documentation process in between the supply chain and create a case study profile

| Name of Supplier | Quantity delivered (Lorry-lots/tons) | Actual quantity paid for (Lorry-lots/tons) | Price per kg/ton | Other charges suffered by the supplier per kg/ton |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

9. What problems do you face with your suppliers?

| Name of Supplier | Problem Faced |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |

10. What are the destinations of your maize?

| Destination | Volume in tons | Quantity actually paid for | Price per kg/ton |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

Any additional information that you think will be useful will be greatly appreciated.

7. Basic Parameters on the milling Facility:

- Year of installation _____
- If hired / leased, since when _____
- How much do pay per month _____
- Estimated Achievable production per 8 hour shift (Tons)_____
- Estimated Replacement cost of the facility ( including machinery, civil works and storage) shs in M _____
- Normally, how many months in a year is the plant in reasonable business _____

8. Operating Cost:

(a) Labour:

- Average no. of permanent labour / staff _____
- Average monthly salary per each of the staff _____
- Average no. of casual labour per shift _____
- Average pay for each casual worker per Shift (Shs) _____

(b) Power / Electricity:

- Average UEB cost per month of business (Shs) _____
- In case of generator use, average cost per shift (Shs) _____
- AV. Maintenance Cost of generator per month _____
- How often is the generator used per month of Business compared to UEB (%) _____

(c) Packaging / Bagging:

- Estimated cost of packaging 100 kg bag (UShs) _____
- No. of times a Polythene bag is re – used _____
- And price per new bag (UShs) _____

(d) Crop Financing:

- Of the amount that is used in the procurement of the crop and for working capital funds, how much is borrowed (Shs in millions) _____
- What is the estimated period (days) between the time the maize is purchased to the time it is processed and sold _____
- What is the bank interest rate applicable to the borrowed funds (%) _____

# IDEA Project: Maize Supply Chain Analysis
# Millers Questionnaire

1. Name of Miller _____

2. Location:
   - District _____
   - Country _____
   - Sub – County _____
   - Nearest Trading Center _____
   - Distance to District Headquarters (Kms) _____

3. Annual Turnover: (100 kg bags)

| Year | Raw Maize | | Processed Outupt | | Losses | |
|---|---|---|---|---|---|---|
| | Contract | Trade Based | Contract | Trade Based | Contract | Trade Based |
| 2000 | | | | | | |
| 2001 | | | | | | |
| 2002 | | | | | | |
| 2003 (Projection) | | | | | | |

4. In case of contract processing, please indicate the charge per Unit (shs/ Kg) _____

5. Procurement Network of Raw Maize:
   - Do you buy maize directly from farmers (Yes/No) _____
   - Do you operate own villages stores (Yes / No) _____
   - In case you have village stores, how many? _____
   - Do you rely on marketing agent (Yes / No) _____
   - If you do, how many? _____
   - Do you advance the agents with crop finance (Yes / No)_____

6. Based on the answers in (5) above, please provide estimate of your procurement through the various modes and corresponding procurement prices:

| | % | Procurement price |
|---|---|---|
| • Directly from farmers | _____ | _____ |
| • Own village stores | _____ | _____ |
| • Marketing agents | _____ | _____ |
| • Other (specify) | | |
| _____ | _____ | _____ |

(f) General Overhead per Annum

- Stationery _____
- Accounts and Audit _____
- Licenses _____
- Travel (general) _____
- Entertainment _____
- Others (if possible specify) _____

_____

_____

9. Please indicate, as applicable, the average outturn for maize you handle (%)

_____

10. Please indicate the by – products (if any) and their associated outturns:

| By – Product | Outturn % |
|---|---|
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |

11. Please indicate below the common buyers of your processed maize and the prices (Current) they offer:

(a) Main Product (Tick):

| | Price |
|---|---|
| Exporters | _____ |
| Other more established processors | _____ |
| Middlemen | _____ |
| Retailers | _____ |
| District wholesalers | _____ |
| Wholesalers from Kampala | _____ |
| Other (Specify) | _____ |

(b)List the buyers of the By- Product (s) and corresponding prices:

| | |
|---|---|
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |

# IDEA Project: Maize Supply Chain Analysis
# Inputs Dealer Questionnaire

1. Name of Dealer _____

2. Location (nearest Trading Center) _____

3. Distance from District Headquarters (kms) _____

4. Taking into accounts the peak and off-season sales, please provide average monthly sales by category and associated profit margins:

| Inputs Gross Category | Monthly Sales Turnover (UShs) | % Mark –up | Estimated Margin |
|---|---|---|---|
| Tools & Equipment | _____ | _____ | _____ |
| *Fertilizers* | _____ | _____ | _____ |
| Pesticides | _____ | _____ | _____ |
| Herbicides | _____ | _____ | _____ |
| Others | _____ | _____ | _____ |
| Total | _____ | _____ | _____ |

5. Do you deal in maize inputs as the only key item of your business?
   (Yes/ No.) _____

6. If not, what other goods do you handle at your shop (Tick)
   - General merchandise
   - Produce buying
   - Other (specify)

7. What % of turnover do the maize inputs *contribute to you business*
   (%)_____

8. Which do you consider to be the more profitable component of your business
   (inputs or other)_____

9. Procurement / Stocking by Dealer:
   - *Average distance dealer from suppliers* (Km) _____
   - Average value of goods each time of stocking (Shs)_____
   - Frequency of stocking per month (days) _____
   - Average transportation cost per stocking, *including incidentals* (Shs) _____

10. Nature of your inputs suppliers (Tick):
   - Agents of Foreign Manufactures
   - Independent Stockiest
   - Other (Specify)_____

11. What service do you receive from your inputs suppliers (Tick)
   - *Free / Subsidized Transport*_____
   - Training / Instructions on handling / use of various inputs_____
   - Manuals _____
   - Other (Specify)_____

12. Do you use bank financing in stocking your business (Yes /No)_____
13. If bank financing is used, what is the average loan amount (Shs)_____ and interest rate applicable (%) _____

14. Type of Financial Institution (Tick):

| | |
|---|---|
| Commercial Bank | _____ |
| Micro Finance Inst. | _____ |
| Entandikwa | _____ |
| NGO | _____ |
| *Local Lender* | _____ |
| Other (Specify) | _____ |

15. What Type of security is demanded ? (Tick)

| | |
|---|---|
| Land Title | _____ |
| Moveable Asset (Specify) | _____ |
| Group Lending | _____ |
| None | _____ |
| Other (Specify) | _____ |

16. For the previous latest loan:

| | |
|---|---|
| *What was the repayment period?* | _____ |
| What period would you prefer? | _____ |

17. Have you retired the previous loan? (Yes / No) _____

18. If not, and if it is due , give reasons (Tick):

Poor business _____
Money too expensive _____
The loan was directed to other urgent uses than was intended _____
Lack of follow up by lender _____
Other (specify) _____

19. Sales / Competition:

(a) In your estimation, how many other agricultural inputs dealers are in your:

- Trading Center _____
- Sub – county _____
- County _____

(b) What is the average weighted distance (estimate) of the bulk of your clients (Kms)_____

(c) In case you use the weekly markets as a channel for your sales, how many different weekly markets do you got to_____

(d) What % of your sales are through the weekly markets compared to your shop premises (%) _____

(e) Which are the best periods of the year to realize good sales (rank 1,2,3,4)

- December – February (Dry Season)_____
- March – May ( 1st Rain Season) _____
- June – August ( Second Dry Season _____
- August – November (Second Rains)_____

20. What are the main constraints affecting your business (tick & rank)

- Lack of knowledge about use of inputs by farmers
- Lack of effective field agricultural staff workers
- High prices of inputs
- Lack of credit
- Other (specify)

# IDEA Project: Maize Supply Chain Analysis
# Maize Farmer Questionnaire

1. Name of the respondent---------- Sex---M/F.

2. Location (District, County, Sub County, Parish, Village) ----------

3. How many people are in the H/H ----------

4. How many adults ----------M/F---------- and how many children----------M/F-----

## A. FARM PARTICULARS

1. Where do you carry out your farming

| Farm | Size | How much is cultivated |
|---|---|---|
| Own land | | |
| Borrowed | | |
| Hired land | | |
| Others- specify | | |

2. What is the acreage of Maize you grow on your farm? (Acres)

| Year | Area used | Quantity Produced |
|---|---|---|
| 2000 | | |
| 2001 | | |
| 2002 | | |
| 2003 | | |

3. What type of input do you use?

| Input type | Source | Quantity | Price |
|---|---|---|---|
| | | | |
| | | | |

4. How do you carry out your maize farming activities?

| **Activity** | **Hired labour** | | | **Family labour** | | **Social group** | |
|---|---|---|---|---|---|---|---|
| | No. | Days | Rates | No | Days | No | Days |
| **Land clearing** | | | | | | | |
| First | | | | | | | |
| Second | | | | | | | |
| Third | | | | | | | |
| Planting | | | | | | | |
| Fertiliser | | | | | | | |
| Spraying | | | | | | | |
| **Weeding** | | | | | | | |
| First | | | | | | | |
| Second | | | | | | | |
| Third | | | | | | | |
| Harvesting | | | | | | | |
| Transporting | | | | | | | |
| Drying | | | | | | | |
| Storage | | | | | | | |

**Cost of production**

## B. MAIZE MARKETING

1. How much quantity of maize is consumed at home? (100 kg bags)

2. Quantity of Maize Marketed

| **Quantity sold** | | **Where marketed** | | **Unit price** | **Distance to the market** | **Cost of transport per bag** |
|---|---|---|---|---|---|---|
| Peak harvest | Off-peak harvest | On-farm | Off-farm | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

3. If off –farm where do you market your maize?

| **Agent** | **Rural Trader** | **Millers** | **Others-specify** | **Specify the place of sale** |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

4. Which market do you prefer and why?

5. Who determines the price?

| **Person** | **On -farm** | **Off-farm** |
|---|---|---|
| Myself | | |
| Husband in case married | | |
| Farmer Group | | |
| Local Council | | |
| Agent | | |
| Rural traders | | |
| Millers | | |
| Urban Traders | | |
| Others (specify) | | |

6. Do you feel the prices are fair?

7. Who controls the income obtained from the sale of maize
a) Husband
b) Wife
c) Husband and wife

8. How do you transport your Maize?

| **Type of transport** | **On-farm** | **Off-farm** |
|---|---|---|
| Head | | |
| Bicycle | | |
| Hiring Vehicle | | |
| Hiring People | | |
| Others-specify | | |

9. Do you sell your Maize after harvest, Yes or No?

10. If no when do you do it and why?

11. Do you improve on the quality of your maize before you market it?

12. Yes or No, If yes how?

13. Do you normally have a choice of buyers?

14. If yes, how many? Specify them,

15. How are you paid?
a) Cash
b) Credit
c) Both
d) Others

16. What kind of scales or measures and weight do the buyers use to buy your maize?

17. Do you feel this is appropriate?

18. Source of information?

| **Type of Information** | **Sources** |
|---|---|
| Market | |
| Buyers | |
| Price | |
| Others-specify | |

19. Are you willing to market your maize collectively?

20. What advantages do you perceive to benefit from collective marketing?

21. Are there any institutions supporting you in marketing? Yes or No?

22. If yes specify

23. If your maize is not bought what do you do?

## C. CONSTRAINTS AND SUGGESTIONS

24. What are the problems in the market?

25. Can you suggest solutions to the above problems?

# Annex 3:
# List of Respondents

| Respondent's Name | Designation | Organisation |
|---|---|---|
| **IGANGA** | | |
| Godfrey Byandala | NAADS Coordinator | Iganga District |
| Dan Mudaladani | Produce Trader | |
| Moses Baiikoowa | Trader/Coordinator | NALG |
| Moses Dhikusoka | Trader | NALG |
| Moses Migereko | Trade | NALG |
| Moses magumba | Trader | Magumba produce dealers |
| Musobya Isabirye | Trader | Ngobi road |
| Yasini Kirunda | Commercial farmer | Bulubandi, Nakigo |
| Mumbya Muhammad | Farmer | Makandwa Makuutu |
| Jesica Nabuiumba | Farmer | Nakisene Savings and Credit Association |
| Wambuzi Gransoni | Commercial farmer | Kiboyo Bunyama |
| Nabuto Bazilio | Commercial farmer | Nakigo Youth Dev't Association |
| Magumba Amiri | Commercial farmer | Nakiseane Wairama |
| Tibesomerwa George | Commercial farmer | Makandwa Makuutu |
| Aida Magemeso | Subsistance farmer | Nakiseane Nakigo |
| Difasi Kasadha | Subsistance farmer | Kisega Ibulanku |
| Muhammed Kakaire | Miller | Waisonsole Mill |
| Katuntu | Miller | Katuntu maize mill |
| Godfrey K. | Input stockiest | Sukura Agro Supplies Ldt |
| Batambuze Amisi | Miller | Bulubandi maize mill |
| Yenusu Bamwagaie | Miiler | Yenusu Bamwagaie and Sons |
| Peter Sentamu | Wholesaler | Sentamu & Sons |
| **KAPCHORWA** | | |
| Akisoferi Karenget | Commercial farmer Trader | Kirwoko, Ngucho |
| Soyekwo Benefred | Input stockiest dealer | Sukura Agro Supplies |
| Robert Okiror | Input Stockist | El Shaddai |
| David Tweituk | Commercial Farmer Secretary | Kapchorwa Maize Grain Commercial Farmers |
| Sulaiman Onyeuka | Miller | Kapchorwa millers |
| Apili Nelson | District Agricuiturai Officer | Kapchorwa District Agriculturai Offices |
| Sikuku Erisa | Miller | Kamukesi Millers |
| **MASINDI** | | |
| Elly Kyaligonza | IDEA Coordinator | Masindi Farmers Association |
| Godfrey Kagoro | Secretary Manager | MSGGA |
| Fredrick Kyenkya | Trader | Kajuma Traders |
| Fred Kasozi | Marketing Officer | Department of Trade |
| Kenneth Ojoro | Farmer | Bweyale |
| Edward Mugisa | Manager | Gukwatamanzi Farmers Association |
| Wilbert Okello | Accounts Clerk | Gukwatamanzi Farmers Association |
| James Musinguzi | Extension Agents | Gukwatamanzi Farmers Association |
| **MBALE** | | |
| Waziri Wamboga | Miller/Trader | Combined General Store |
| Nabende Patrick | Trader/Miller | |
| Martin Wagogo | Manager | Medi and Sons Millers |
| Mugasa Issa | Miller | Medi and Sons Millers |
| **BUSIA** | | |

| Respondent's Name | Designation | Organisation |
|---|---|---|
| Maina Samuel | Trader | Kenya |
| Aziz Sharif | Trader | Kenya |
| Masembe Ahamadha Affan | Trader | Busia Produce Dealers |
| Wabwire A. | Trader | Busia Produce Dealers |
| Erima Joseph | Broker/Store Owner | Busia Produce Dealers |
| Karim | Broker | |
| Muteesi J | Store Owner | |
| **KAMPALA** | | |
| Chris Balya | Manager Produce Operations | Afro-Kai Limited |
| Charles Kintu Balikowa | Director | KNB Millers and Commodity Cleaners |
| Ware Aaron Lomude | Managing Director | Roka Ale Trading Co. Ltd. |
| Amina Male | | Magric (U) Ltd. |
| Badru Kaweesa | Chairperson | Kisenyi Millers Association |
| Rogers Ssempijja | Marketing Dept. | Maganjo Grain Millers |
| Debora Mwesigye | Manager | Uganda Commodity Traders |
| John Magnay | Chairman | UGTL |
| Peter Wathum | Monitoring and Evaluation | IDEA Project |
| Dominique Leclercy | Procurement Manager | WFP |
| Willy Musinguzi | Head of Inspectorate | UNBS |
| Kamujusi R. | Senior Revenue Officer | Customs Department |
| Carol Mukakazi | Phytosanitary Inspector | MAAIF |
| Benson Katungi | | Aponye (U) Ltd. |
| **JINJA** | | |
| Kasadha Ali | Miller | Mutengu and Company |
| Damali Nanggendo | Retailer | Jinja town |
| Dhikusoka Ali | Trader/Miller | Muyende store |

# Annex 4:
# Major Inputs and Costs of Production

## Annex 4: Cost of Maize Production Per Acre

| | | Iganga | | | | | | Kapchorwa | | | | | | Masindi | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Subsistence Farmers | | | Commercial Farmers | | | Subsistence Farmers | | | Commercial Farmers | | | Subsistence Farmers | | | Commercial Farmers | | |
| | | Qty | Unit Cost (UShs) | Value (UShs) | Qty | Unit Cost (UShs) | Value (UShs) | Qty | Unit Cost (UShs) | Value (UShs) | Qty | Unit Cost (UShs) | Value (UShs) | Qty | Unit Cost (UShs) | Value (UShs) | Qty | Unit Cost (UShs) | Value (UShs) |
| A | **Inputs** | | | | | | | | | | | | | | | | | | |
| | Seeds (Kg) | 10 | 1,200 | 12,000 | 8 | 2,200 | 17,600 | 10 | 2,800 | 28,000 | 10 | 2,800 | 28,000 | 10 | 250 | 2,500 | 7 | 2,200 | 15,400 |
| | Fertilisers DAP (Kg) | | | 0 | 50 | 760 | 38,000 | | | 0 | 50 | 700 | 35,000 | | | 0 | 50 | 750 | 37,500 |
| | Fertilisers UREA (Kg) | | | 0 | 50 | 700 | 35,000 | | | 0 | 50 | 620 | 31,000 | | | 0 | 50 | 700 | 35,000 |
| | Herbicides (Lt) | | | 0 | 2 | 15,000 | 30,000 | | | 0 | 2 | 15,000 | 30,000 | | | 0 | 0 | 15,000 | 0 |
| | Pesticides (Lt) | | | 0 | 1 | 2,500 | 2,500 | | | 0 | 2 | 3,000 | 6,000 | | | 0 | 1 | 3,000 | 3,000 |
| | Anti-Termite | | | | 2 | 6,500 | 13,000 | | | 0 | 2 | 6,000 | 12,000 | | | 0 | 0 | 6,000 | 0 |
| | Bagging | 9 | 550 | 4,950 | 22 | 550 | 12,100 | 15 | 550 | 8,250 | 30 | 550 | 16,500 | 10 | 550 | 5,500 | 23 | 550 | 12,650 |
| | Hoes | 2 | 3,500 | 1,400 | 4 | 3,500 | 2,800 | 3 | 3,500 | 2,100 | 4 | 3,500 | 2,800 | 2 | 3,500 | 1,400 | 3 | 3,500 | 2,100 |
| | Pangas | 1 | 3,500 | 700 | 2 | 3,500 | 1,400 | 1 | 3,500 | 700 | 2 | 3,500 | 1,400 | 1 | 3,500 | 700 | 2 | 3,500 | 1,400 |
| | **Total (A)** | | | **19,050** | | | **152,400** | | | **39,050** | | | **162,700** | | | **10,100** | | | **107,050** |
| B | **Labour** | | | | | | | | | | | | | | | | | | |
| | 1st Ploughing | 1 | 30,000 | 30,000 | 1 | 30,000 | 30,000 | 1 | 25,000 | 25,000 | 1 | 25,000 | 25,000 | 1 | 40,000 | 40,000 | 1 | 40,000 | 40,000 |
| | 2nd Ploughing | 1 | 25,000 | 25,000 | | | 0 | 1 | 20,000 | 20,000 | | | 0 | 1 | 30,000 | 30,000 | 1 | 30,000 | 30,000 |
| | Herbicide Application | | | 0 | 1 | 3,000 | 3,000 | | | 0 | 1 | 2,500 | 2,500 | | | 0 | 0 | 2,500 | 0 |
| | Planting | 7 | 1,500 | 10,500 | 10 | 1,500 | 15,000 | 6 | 1,500 | 9,000 | 8 | 1,500 | 12,000 | 6 | 1,500 | 9,000 | 8 | 1,500 | 12,000 |
| | DAP Application | | | 0 | 2 | 2,500 | 5,000 | | | 0 | 4 | 2,500 | 10,000 | 0 | | 0 | 3 | 2,000 | 6,000 |
| | UREA Application | | | 0 | 2 | 3,000 | 6,000 | | | 0 | 2 | 3,000 | 6,000 | | | 0 | 2 | 3,000 | 6,000 |
| | 1st Weeding | 12 | 2,000 | 24,000 | 10 | 2,000 | 20,000 | 10 | 2,000 | 20,000 | 10 | 2,000 | 20,000 | 12 | 1,500 | 18,000 | 10 | 1,500 | 15,000 |
| | 2nd Weeding | 9 | 2,000 | 18,000 | | | 0 | 10 | 2,000 | 20,000 | 10 | 2,000 | 20,000 | 10 | 1,500 | 15,000 | 10 | 1,500 | 15,000 |
| | Pesticide Application | | | 0 | 2 | 2,000 | 4,000 | | | 0 | 2 | 2,500 | 5,000 | | | 0 | 2 | 2,500 | 5,000 |
| | Harvesting | 2 | 2,000 | 4,000 | 5 | 2,000 | 10,000 | 5 | 3,000 | 15,000 | 7 | 3,000 | 21,000 | 2 | 2,000 | 4,000 | 5 | 2,000 | 10,000 |
| | Transport from Farm | 1 | 5,000 | 5,000 | 2 | 5,000 | 10,000 | 1 | 6,000 | 6,000 | 2 | 6,000 | 12,000 | 1 | 5,000 | 5,000 | 2 | 5,000 | 10,000 |
| | Drying | 1 | 2,000 | 2,000 | 2 | 2,000 | 3,000 | 1 | 2,500 | 2,500 | 2 | 2,500 | 5,000 | 1 | 2,500 | 2,500 | 2 | 2,500 | 5,000 |
| | Shelling | 6 | 750 | 4,500 | 10 | 750 | 7,500 | 8 | 1,000 | 8,000 | 12 | 1,000 | 12,000 | 5 | 1,000 | 5,000 | 8 | 1,000 | 8,000 |
| | Storage | 4 | 1,000 | 4,000 | 6 | 1,000 | 6,000 | 6 | 1,500 | 9,000 | 8 | 1,500 | 12,000 | 5 | 1,500 | 7,500 | 7 | 1,500 | 10,500 |
| | **Total (B)** | | | **127,000** | | | **119,500** | | | **134,500** | | | **162,500** | | | **136,000** | | | **172,500** |
| C | **Returns** | | | | | | | | | | | | | | | | | | |
| | Total (A+B) | | | 146,050 | | | 271,900 | | | 173,550 | | | 325,200 | | | 146,100 | | | 279,550 |
| | Yield (Kg) | | | 900 | | | 2,200 | | | 1,500 | | | 3,000 | | | 1,000 | | | 2,350 |
| | Unit Cost of Prodn (UShs/Kg) | | | 162 | | | 124 | | | 116 | | | 108 | | | 146 | | | 119 |
| | Farm Gate (UShs/Kg) | | | 180 | | | 200 | | | 200 | | | 250 | | | 200 | | | 250 |
| | Returns (UShs) | | | 162,000 | | | 440,000 | | | 300,000 | | | 750,000 | | | 200,000 | | | 587,500 |
| | **Gross Margins (UShs)** | | | **15,950** | | | **168,100** | | | **126,450** | | | **424,800** | | | **53,900** | | | **307,950** |