ADC Commercialisation Bulletin #15

Maize

Marketing

1
Markets and Volumes

The market for maize grain and maize meal is entirely regional. This is due to the uncompetitive price of Ugandan grain compared with world market prices. Ugandan producers do however, have the East African consumers as a significant market. The Kenyan market is traditionally undersupplied by approximately 500,000 mt. This shortfall is usually made up with imports from Southern Africa namely Zimbabwe and South Africa. The landed price of grain in Mombassa - the chief import route plus transport makes Ugandan origin maize competitive through to Nairobi but not much further east.

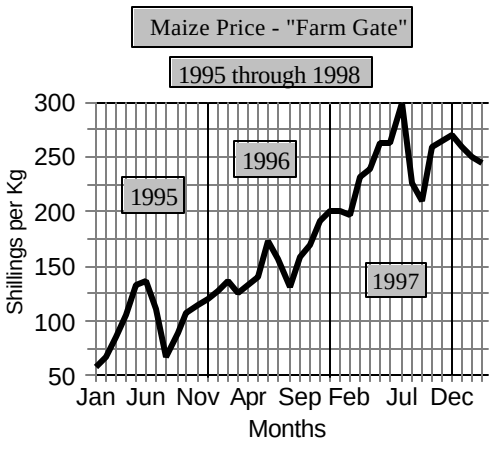
The Ugandan market for maize grain is increasing annually. Consumption habits are changing, and demand for maize meal is increasing significantly amongst both the urban and rural communities. Recent surveys have shown that in the east particularly, where maize meal is readily consumed, up to 50% of district production ends up being consumed locally.

In addition to the commercial regional markets, there currently exists a significant relief market in the central and East African region. Depending on circumstances of instability, this market consumes between 200,000 - 400,000 mt of food grain annually. This market is unlikely to disappear in the medium term.

Given the above, it can be seen that the market for maize grain is substantial and growing.

2
Prices

The market prices for grain fluctuate within a wide band, being determined by seasonal harvest and consumption pattern. Traditionally, prices fall to the annual low around week 34 of the year (mid August) following the larger first season grain harvest. For the past 2 years, this seasonal low has not fallen below 120/= per kg, and that only for a very short time. Maize production budgets assume a price band of between 140 and 200/= per kg.


Maize Price - "Farm Gate"
1995 through 1998
300
250
200
150
100
50
Shillings per Kg
1995
1996
1997
Jan Jun Nov Apr Sep Feb Jul Dec
Months

3
Competition

Competition for the large markets outlined in 1) above come mainly from Southern Africa - namely Zimbabwe and South Africa. Their costs of production are low but they face a considerable transport burden for imports into the country. The general ruling import parity price FOT Kampala is traditionally US $270 - $290 per mt. Depending on the delivery pipeline and logistic delays through the ports and rail systems, this price has the effect of setting a ceiling on local price fluctuations. Should there be significant delays in either local ordering or logistics or supply is limiting, then regional prices can exceed US $350 per mt.

Production

4
Method

Land Preparation

Proper seed bed preparation will ensure that maize has the best chance of performing well. Deep ploughing allows for stronger root development and provides better control of insects - especially cutworm, where this is a problem, and reduces the carry over affect of stalk borer and fungal pathogens. Ideally, the land should be ploughed to a depth of 20 - 30 cm. Advantage should be taken of early rain when cultivating the soil, followed by harrowing to form a fine seedbed, especially if the crop is to be machine planted.

Occasionally, bush or fallow soil, will be cleared for planting. To reduce weed problems, land should be cleared and cultivated or shallow ploughed before the end of the previous rains. A deeper ploughing or cultivation should be done before planting.

Crop Rotation

It is important that similar crops such as maize, sorghum, and millet do not follow each other. These crops have similar pests and diseases. Thus, continual maize cropping encourages a multiplication of these pests. The result being more crop damage and greater difficultly with pest control. Therefore, try not to plant the same crop in the same field as you planted in the first season. Leguminous crops such as beans , groundnuts and soyabean would be suitable crops for rotation with maize.

The traditional approach in Uganda is to crop one season and leave one season fallow - utilising only 50% of the available arable land ensuring that each season**?**s land clearance is very expensive since the field will have reverted to dense grass cover.

Planting

The seed rate for Longe 1 and Kenya hybrids is 25 kg/ha hand planting and 16 kg/ha machine planting. As the new Uganda hybrids have a smaller seed size, seed rates of 20kg/ha hand planting and 14kg/ha by machine are sufficient. The current recommendation is to plant in rows 75cm apart and 30cm [1 seed/station] or by hand at 75cm by 60cm [2 seeds per station] for a target population of 44,000 plants/ha. If more seed is planted to ensure a uniform stand, the maize must be thinned to two plants per station when the crop is about 2 weeks old. Machine planted crops, should likewise be thinned. For fully mechanised cropping programs, it is important to tie the row spacing with combine header settings. This is traditionally 90cm for maize. In row spacing needs to be adjusted to maintain target per hectare populations.

Planting should commence as soon as 3 good rains [about 50 cm] have fallen. It is important that there be no delay in planting as this will decrease yields. Planting can be done into dry soil but planting depth should be increased from the usual 4-5cm to 7.5cm. This prevents early light rains reaching the seed causing premature germination. Dry planting enables the maize crop take off as soon as sufficient rains are received. This practice, although carrying additional risk is essential in larger scale operations.

Weeding

Maize is very susceptible to weed competition during the first month of its life. Failure to keep the crop weed free during this time results in dramatically lower yields. Ensure that the weeds are removed from between the rows and between the plants.

Chemical Weed Control

Broadleaf weeds and many grass weeds may be controlled by application LASSO-ATRAZINE at a rate of 4-5 liters per hectare using 300- 500 liters of water with a tractor mounted sprayer [250-330ml per 5 liter knapsack]. This must be applied after planting to a moist soil surface but before emergence. If grass alone is a problem, then an application of STOMP 500SE after planting and before emergence will give good control. Apply this at a rate of 3 liters per hectare[180 ml/15 liter knapsack]

[There are many herbicides on the market and this list is not exhaustive - nor does it imply that alternative chemicals are in any way inferior.]

With all chemical applications, ensure that the application equipment is well calibrated. Overdosing can cause crop damage in some cases and certainly risk of carry over into the following crop.

5

Varieties

Longe 1 - is a composite release by the National Maize Program and matures in about 120 days [dry harvest]. The material is streak tolerant and has a good measure of drought tolerance. This variety is suited for all areas of Uganda except the highlands.

New Hybrid releases. Uganda Seed Project [USP] has four hybrids scheduled for official release during

1998. They are commercially available, currently designated hybrid B and C. They are single cross hybrids which are tolerant to the three major diseases in Uganda - Maize Streak Virus, Grey Leaf Spot and Leaf Rust. They mature in about 135 days [dry harvest]. Single cross seed is small, but the resulting crop has full size cobs and grains. These hybrids have been bred for low to mid altitude areas [1000 - 1700m] of Uganda.

Home Kept Seed - from a composite variety (not a hybrid) should also not be re-used as seed material for more than two seasons after the first crop. Yield potential decreases dramatically if kept longer. New seed should be purchased. A maize crop obtained from planting of hybrid seed in the previous season should never be re-used as seed for planting. Planting such seed will result in lower yield during successive seasons.

Other Hybrids - available locally are some older Kenyan Hybrids H614, H626 and H625 for high altitude areas [1500 - 2100m], H622, H511 and H512, suitable to mid altitude [1000 - 1700m] production. These are however, susceptible to the Maize Streak Virus in the mid altitude areas. New materials are being tested through the national programs from both Kenya Seed Company and others.

6
Yield

Yield of a maize crop is dependant on yield potential of the variety, rainfall conditions, level of crop husbandry, soil conditions and the level of nutrients applied particularly that of nitrogen.

The yield potential of Longe 1 is 5000-7000kg per hectare while that of the hybrids is 7000-10000kg per hectare.

7
Time to First Harvest/Seasonality/Storage

In various areas of Uganda where a minimum of 700 mm of rain a season are received, the maize crop is grown. Some areas can support two crops a year while others can only support one because of insufficient rains or extended length of the growing season.

Longe 1 has a maturity period of 120 days [dry harvest] while the Uganda hybrids have dry harvest maturity period of about 135 days. The Kenya hybrids on account of being grown in the highlands take longer, varying from 5-7 months depending on altitude.

Timely Harvesting

Harvesting should take place when the crop is mature as noted by: colour of leaves; drying and papery husk; glossy surface to the grain; grain too hard when roasted; cobs hang down, and kernels have a black layer.

Harvesting at this stage reduces the risk of field losses due to disease and pests, and frees the land for timely preparation for the next crop, and assumes a suitable off field drying and storage unit.

Field Drying Late Harvesting

The crop is left on the plant for up to 8 weeks to dry down. This method has the disadvantage of increasing infestation by insects and fungi as well as damage by birds. Field losses can easily be greater than 20%. Up to 80% of storage problems come from late field harvesting. This method doesn?t allow for a turn round for the next season.

Drying and Storage

The preferred low cost method of drying sizeable quantities of grain is by use of cribs constructed in such a way as to allow free movement of air through. They should be raised at least 1meter off the ground and not more than 1.5 meters in width. The height including clearance off the ground should not exceed 3.1 meters, with a roof overhang on either side [made preferably of mabati] of 0.5-0.75 meters. The crib length can then be adjusted to quantity of grain for drying and temporary storage.

A quicker but more costly method of drying is by use of an artificial drier which enables a farmer to dry down his crop rapidly to take advantage of generally high grain prices at the beginning of each harvest. The high costs are associated with installation but running costs can be quite low, particularly when maize cobs are used as a source of heating fuel. These artificial drying systems are available in small scale (600 kg batch) using charcoal or cobs as a heat source, to larger (2 - 15 mt batch) using charcoal/cob or diesel heat sources. The larger systems require a power source to drive a fan.

Shelled dry grain stored for a length of time should be placed on pallets, raising the grain off the ground, protected from rodents and insect pests. Proper treatment of the grain by a fumigant such as PHOSPHINE kills off any insects in the grain but does not protect it from subsequent infestation. Treatment of the grain by an insecticide such as ACTELLIC or MALATHION provides a chemical barrier to reinfestation for about 2-3 months.

8
Pests and Disease Prevention

Soil Pests - are largely controlled by seed treament applied on certified seed. In some areas false wire worm and white grub can be troublesome. These pests are difficult to control. In areas known to be affected by such pests, overplant to allow for projected stand loss. In addition, termites can be a serious problem in some areas. Control measures are expensive and impractical on a large scale. Removal of termite mounds will reduce the incidence of all except the harvester types.

Stalk Borer - can be controlled by using SEVIN D or BULLDOCK 0.05 GR applied to funnels of the plants when the crop is knee high. Application rates are usually 4-6 kg per Ha. Only a few granules per plant are required.

Diseases- Streak Virus causes yellow stripes in the plant and badly affects yield. Longe 1 and the new Uganda hybrids are fairly resistant, but some Kenya hybrids are sensitive to this disease in the low-mid altitude areas. The pressure of this disease is much lower in the highlands because the leafhopper that spreads the disease is much less active.

In general, use of improved seed, good crop rotation use and application of hygiene measures such as burying or burning old crop residue can be effective in checking a host of other maize diseases.

9
Fertilizer Requirements

Soil fertility varies throughout the country. By continually producing crops and failing to return adequate organic matter to the soil, Uganda?s good soils are becoming less and less productive. Fertility levels vary even in farmers fields. Localised poor growth may be due to shallow soil or low spots with poor drainage. Various mineral deficiencies can cause poor growth and need to be identified by soil analysis. Yield response to fertiliser is normally excellent when followinng good management practices.

The following are genneral recommendations pending specific site nutritional tests:
DAP [Diammonium Phosphate] 100 - 125kg/ha and CAN [Calcium Ammonium Nitrate] or Urea 125 - 350kg/ha. Apply approximately 3 - 5 grams [about one heaped soda bottle top] of DAP in the bottom of each planting station. Cover DAP with a little soil before planting the seed. Machine placement of DAP is possible by using a planter/fertiliser combination. Ensure that the fertiliser is placed BELOW the seed. Fertiliser can burn seed if placed in direct contact with the fertiliser.

Apply CAN or UREA by sprinkling between rows when the maize is 4 - 6 weeks old. Ensure that the maize has been throughly weeded before applying the fertiliser, otherwise the weed will use up all nitrogen before the maize gets it. After appliction of UREA, this needs to be covered with some soil to avoid volatisation [loss into the atmosphere as gas]. This can be done by hand hoe or cultivator. If rain is imminent, then this will take the product into the soil. Even though CAN is cheaper and does not require incorporation, application of UREA almost doubles the amount of nitrogen available to the crop. This is particularly advantageous, as there is a direct relationship between the amount of nitrogen applied and yield. In other words, the more nitrogen the more yield - given good management and a variety which can respond.

As the fertiliser industry grows in response to the demand from the commercial sector, it is likely that better compounds or mixes will become available. These will likely have a slightly different N:P ratio, and include potassium in required amounts.

10
Product Specifications

International standards vary slightly, but local WFP standards give an example of the requirements:

Moisture Content	14.0%
Insect Damaged	3.0%

Broken	2.0%
Shriveled, diseased and discoloured	5.0%
Other coloured grains	4.0%
foreign matter	0.5%
Live weevils	fumigated free

11
Packaging

Packaging varies by end user - traditionally 90 kg polypropylene or 100 kg jute. Some consumers demand 50 kg packing.

12
Investment

Investment requirements in this report are divided into two main categories - initial capital requirement (in field) and in field operating costs. Investment in such things as roads, drainage, storage and housing is additional, and not considered as part of this profile.

Investment is also dependant on the scale of operation - small scale
Labour intensive traditional rural producer
Partially mechanised producer supplimenting with hired equipment and labour
Fully mechanised producer

Basic budgets are presented for each of these categories below:

a) In field Production Costs

Fully Mechanised Production @6.5 mt per Ha

ACTIVITY	Production Costs/Ha
MECANICAL OPERATIONS	
PLOUGH	43,200
DISC	21,600
FERTILISE	8,640

ACTIVITY	Production Costs/Ha
PLANT	5,760
TOP DRESS	2,880
HERBICIDE	4,320
CULTIVATE	11,520
HARVEST	43,200
DRYING	63,000
INPUTS	
USP HYB	47,800
DAP @ 100 KG/HA	79,800
UREA @ 250 KG/HA	121,250
LASSO/ATRAZINE	24,000
SEVIN G	15,000
GUNNY BAGS	62, 920
TRANSPORT - 250KM	21,052
LABOUR	
MECHANICAL	5,000
CULTIVATION	8,000
HARVESTING	1,000
PROCESSING	2,000
CHEMICAL APPLICATION	6,000
MISCELLANEOUS @ 10%	**59,794**
TOTAL COSTS	**657,736**

*** These costs include fuel/lubs and maintenance**

A partially mechanised option adds approximately 60,000/= in labour to the above budget.

b) Capital Investment Requirements

Machinery Capital Investment Profile

Per Hectare - assuming a plan for double cropping

All costs based on Maize production assumptions - 4 row regime

Partially Mechanised

All costs CIF including duties and taxes with 2 years spares included

60 day turnaround on tillage

CAPITAL ITEM	IMPLIMENT	UNIT PRICE	US$	
		INCL TAXES	MECHANISATION	
		US$	PARTIAL	FULL
			75 Ha	>> 75 Ha
Tractors (0.74 Hp per Ha)	86 Hp 4 wd	37600.00	500.00	295.00
	86 Hp 2 wd	31400.00		
Machinery - primary tillage	4F Disc Plough	3545.00	47.00	26.00
Secondary Tillage	2.3 M Disc harrow	4909.00	65.00	46.00
Planter/Sprayer/Cultivator/Trailers etc			280.00	84.00
	4 row planter	6957.00		
	400 l Sprayer	4227.00		
	Tiller	2180.00		
	5 mt trailer	8076.00		
Combine harvester		150000.00	0.00	320.00
Universal Sheller		3000.00	40.00	
Diesel fired dryer plus 2000 mt silo unit		170000.00		210.00
AT dryer/storage units - 150 mt capacity		1700.00	56.00	
Total Machinery budget /Ha			**988.00**	**981.00**

In addition - land clearing from virgin or reverted can cost up to $250/Ha depending on bush density.

13
Profitability

Profitability is shown as gross margin per hectare and percentage return on in field investment in the following tables. In addition, a small farm, labour intensive budget is presented, highlighting the investment required and the returns at various levels of investment.

COMMERCIAL MAIZE PRODUCTION - FULLY AND PARTIALLY MECHANISED

PRICE/YIELD GROSS MARGIN MATRIX

'GROSS MARGIN PER Ha ('000 USH)

PRICE '000 USh/MT

		200		180		160		140	
		MECHANISATION		MECHANISATION		MECHANISATION		MECHANISATION	
		FULL	PARTIAL	FULL	PARTIAL	FULL	PARTIAL	FULL	PARTIAL
YIELD (MT/HA)	8	975	931	815	771	655	611	495	451
	7	785	742	645	602	506	462	365	322
	6	596	553	476	433	356	313	236	193
	5	407	364	307	264	207	164	107	65
	4	217	177	137	96	57	16		
	3	28							
	2								

PRICE/YIELD RETURN TO VARIABLE INPUT

'PERCENTAGE ON IN-FIELD INVESTEMENT

		200		180		160		140	
		MECHANISATION		MECHANISATION		MECHANISATION		MECHANISATION	
		FULL	PARTIAL	FULL	PARTIAL	FULL	PARTIAL	FULL	PARTIAL
YIELD (MT/HA)	8	256	239	230	215	205	191	179	167
	7	228	213	205	192	182	170	160	149
	6	199	186	179	167	159	148	139	130
	5	169	157	152	142	135	126	118	110
	4	137	128	124	115	110	103		
	3								
	2								

More Information

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