

Business case “Sorghum milling”, a proposition co-created with Magos Farm Enterprises, Kenya

June 2021

- This business case is part of the co-creation track of the NWO-CCAFS research project “Climate-Smart Financial Diaries for Scaling in the Nyando Basin, Kenya”, led by the Amsterdam Centre for World Food Studies, in consortium with Wageningen Economic Research, University of Nairobi and CCAFS East Africa, 2018-2021 (<https://www.nwo.nl/projecten/w-08260310-0>).
- The goal of the co-creation track is to develop business models that can help the scaling of Climate-Smart Agricultural (CSA) practices.
- From a longlist of business ideas of farmers and commercial parties, a shortlist of most promising business ideas was selected. See [CCAFS Info Note - Nov 2019](#). This business case is one of them.
- Sorghum is by nature a drought-resistant crop. More resistant varieties have been developed, as one of the possible CSA practices in Nyando. Sorghum is currently produced as food crop, with surpluses being sold on the local market. The flour mills in the region are importing sorghum from Uganda, because there is a shortage on the local market. This represents a unique opportunity for Nyando farmers.
- The business case consist of two tracks: 1. could Nyando farmers produce sorghum as a cash crop? Possibly combined with aggregating sorghum through CBO storage. And 2. is it feasible to establish a flour mill to process and market sorghum from Nyando and other production regions?

Two tracks

- Track 1 (pages 3-7): could Nyando farmers produce sorghum as a cash crop? And could the CBOs organize aggregation?
- Key partners:
 - Magos enterprises (input supplier);
 - CBOs in sub-counties of Nyakach, Kisumu (Foko, Nocodep) and Soin-Sigowet, Kericho (Kapsokale);
 - Agricultural officers of the sub-counties.

- Track 2 (pages 8-10): could a flour mill be established to process and market sorghum from Nyando and other production regions, and to provide a more stable market for the farmers? And participate in aggregation?
- Key partner:
 - Magos enterprises (input supplier)

Process:

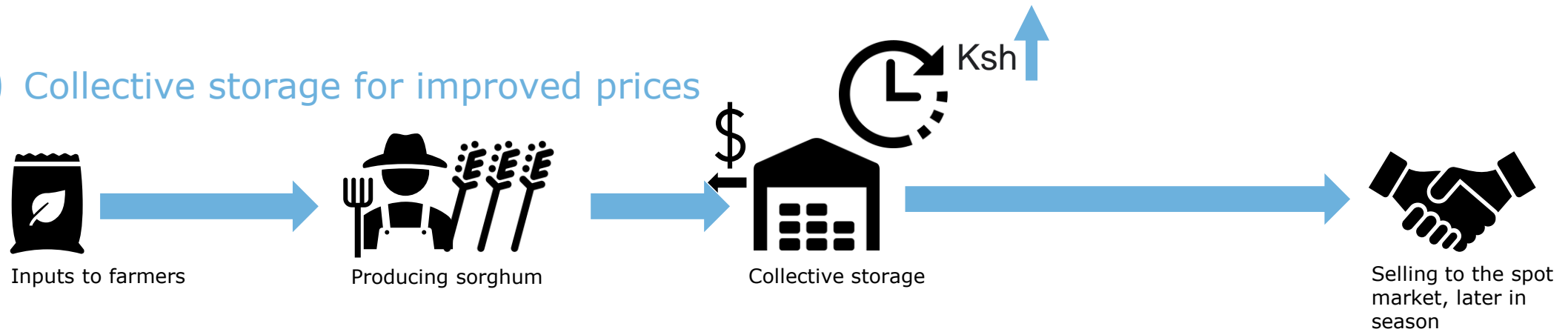
- Step 1: Interactive elaboration of track 2, through weekly meetings with Magos Enterprises (Nov 2020-Jan 2021)
- Step 2: Consultative meeting with the 3 CBOs, about track 1 and 2 (Jan 2021)
- Step 3: Exchange visit with 12 delegate farmers from the CBOs, to Magos' demonstration field in Kolenyo, and to the flour mill of Kamichi-Kapondo CBO in Ahero (Jan 2021)
- Step 4: Elaboration of the business case, in an annotated Infographic (*this presentation*)
- Step 5: Validation of the business case with the stakeholders (*pending because of Covid19*)

Track 1: Model options for farmers - Commercial sorghum farming

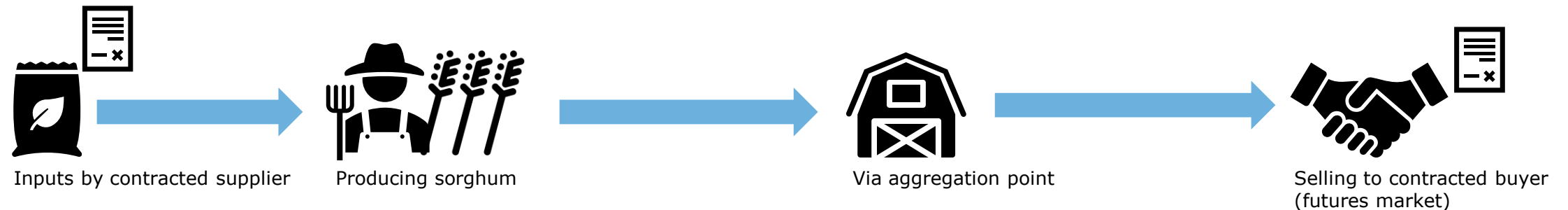
1 Simple and direct



2 Collective storage for improved prices



3 Contract farming, for inputs and off-take



1

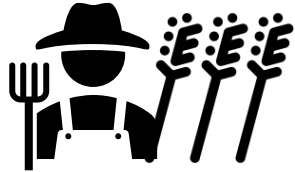
Simple and direct

Farmers buy inputs, produce a surplus of sorghum and sell directly to the market



Inputs to farmers

Mainly improved seeds and fertilizer for sorghum. This can be accompanied with a demo plot/ innovation centre, or other types of training and advice for farmers.



Producing sorghum

Farmers who produce a surplus of sorghum. They consume part of the produced sorghum, the rest is sold.



Selling to the spot market

Farmers sell as soon the production is ready. Any buyer that pays a market price is a possible client.



Positive

This business model is easiest to set up. It requires:

- Farmers that want to switch to commercial sorghum farming
- Farmers that can finance the needed inputs
- Enough buyers for the raw sorghum.



Negative / risk

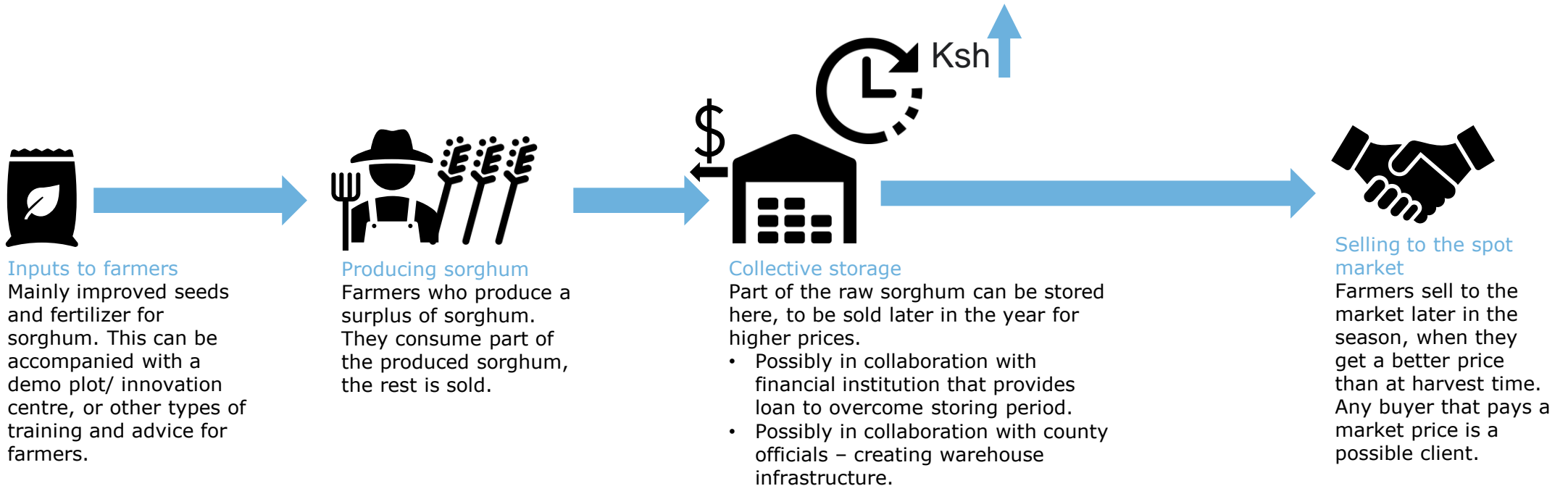
When there is no storage facility, all the raw products will hit the market at once, when prices are low.

Possible food safety issues if farmers store the product using pesticides. If farmers use traditional storage method (mixing ashes), storage losses can be a problem.

2

Collective storage for improved prices

Farmers buy inputs, produce a surplus of sorghum, store at a collective facility, may receive temporary loan, sell for higher prices



Positive

Farmers will arrange collective storage for the raw sorghum. This way the products can be sold during the year, when the market pays higher prices. Profits are therefore likely to increase



Negative / risk

- Storage infrastructure (warehouse) needs to be in place
- The storage needs to be collectively organised and paid
- Delaying sales also delays farmer payment
- Delaying sales is no guarantee for higher prices
- Delaying sales may increase storage losses

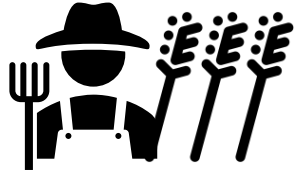
3

Contract farming, for inputs and off-take

Farmers buy inputs with contract, produce a surplus of sorghum, picked up and brought to aggregation point, sold to a contracted buyer



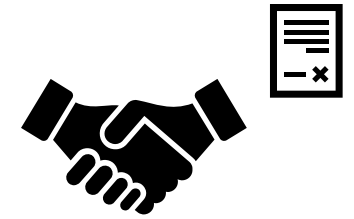
Inputs by contracted supplier
Mainly improved seeds and fertilizer for sorghum. This can be accompanied with a demo plot/ innovation centre, or other types of training and advice for farmers.



Producing sorghum
Farmers who produce a surplus of sorghum. They consume part of the produced sorghum, the rest is sold.



Aggregation point (buyer- or farmer-owned)
At the aggregation point the raw products are collected and stored, before the sorghum is sold.



Selling to contracted buyer
Farmers sell as agreed on before the season to a buyer.



Positive

Contract farming will give the farmers more security. It can also give financial security to finance the investment needed for commercial farming



Negative / risk

It requires a network of buyers and input suppliers to make this business model work. Or one party that combines input supply and off-take. Prices farmers receive can be lower than market prices. Farmers could side-sell if spot prices become higher than contract price, or if they are cash-constrained; this compromises reliability of deliveries. Contract farming can create dependency of farmers.

Business model - Commercial sorghum farming

1. Simple and direct

Farmer will invest more per acre: KSh 33000 instead of KSh 24000. This is mainly because of higher costs of improved seeds and fertilizer (KSh 9800). Labour cost of KSh 24000 is similar, mostly family labour calculated at a daily wage of KSh 500. In return the farmer expects to get a higher yield: 12-16 bags of 90 kg per acre, compared with 6-8 bags in traditional sorghum.

Commercial sorghum is profitable with a minimum yield of 7.51-9.39 bags/acre, depending on the sales price (KSh 50 or 40/kg). So it is profitable if yields meet expectations.

Farmers do need to pre-finance the input costs (KSh 9800) and maybe part of the labour.

Conditions for success:

- Many farmers growing sorghum in same locality (collective bird control measures, visibility for attracting services and support).
- Farmers agree to actually use improved varieties and fertilizer appropriately and apply healthy CSA practices.

2. Collective storage for improved prices

This model can be profitable:

- If the price fluctuations during the season are predictable; in Nyando the prices at harvest time are usually 40-50/kg and can increase to 60-70 at peak times.
- If the margin from higher prices is larger than the warehouse fee and the warehouse losses; manual drying every 2 weeks makes storage costs quite high. Yields should be higher than 12 bags/acre) and/or the price differential larger than KSh 10/kg, to make storage profitable.

Conditions for success:

- Support from county government to build community warehouses
- Strong farmer organisation for trustworthy warehouse management
- Training of farmer organisation, in warehouse management and in relations with MFI/bank
- Partnership with MFI/bank, for warehouse receipt financing.

3. Contract farming, for inputs and off-take

This model can be profitable:

- If contract prices are more attractive for the farmers than the spot prices at harvest time
- If stable deliveries are more attractive for the mill than the cheapest price
- If an MFI/bank can finance the inputs, based on the delivery contract with the mill

Conditions for success:

- Reliable volume of production and delivery
- Side-selling risk should be under control
- Aggregation point logistics (storage, transport)
- Strong farmer organisation for trustworthy supply to mills, trustworthy service to farmers and strong bargaining position of farmers
- Trustworthy contract compliance by mills
- Partnership with MFI/bank

Farm costs

Labour costs

8 persons x 6 days = 48 person-days per acre
@ KSh 500 per day
= KSh 24000 per acre
Same for traditional and commercial farming.

Input costs

- Improved seeds: KSh 800
 - Fertilizer: 1.5 bags x KSh 6000
- Zero inputs in traditional farming.

Threshing

Optional: machine threshing

Yields

Traditional sorghum

6-8 bags per acre
(bags of 90 kg)

Commercial sorghum

12-16 bags per acre

Storage costs

Storage per acre per month

Storage: 2 persons x 1 day
Drying: 2 persons x 1 day for each drying round
@ KSh 500 per day
Materials: KSh 2000 for polythene paper

For 3 months of storage, and biweekly drying rounds, this would be KSh 9000 per acre of product.

Prices

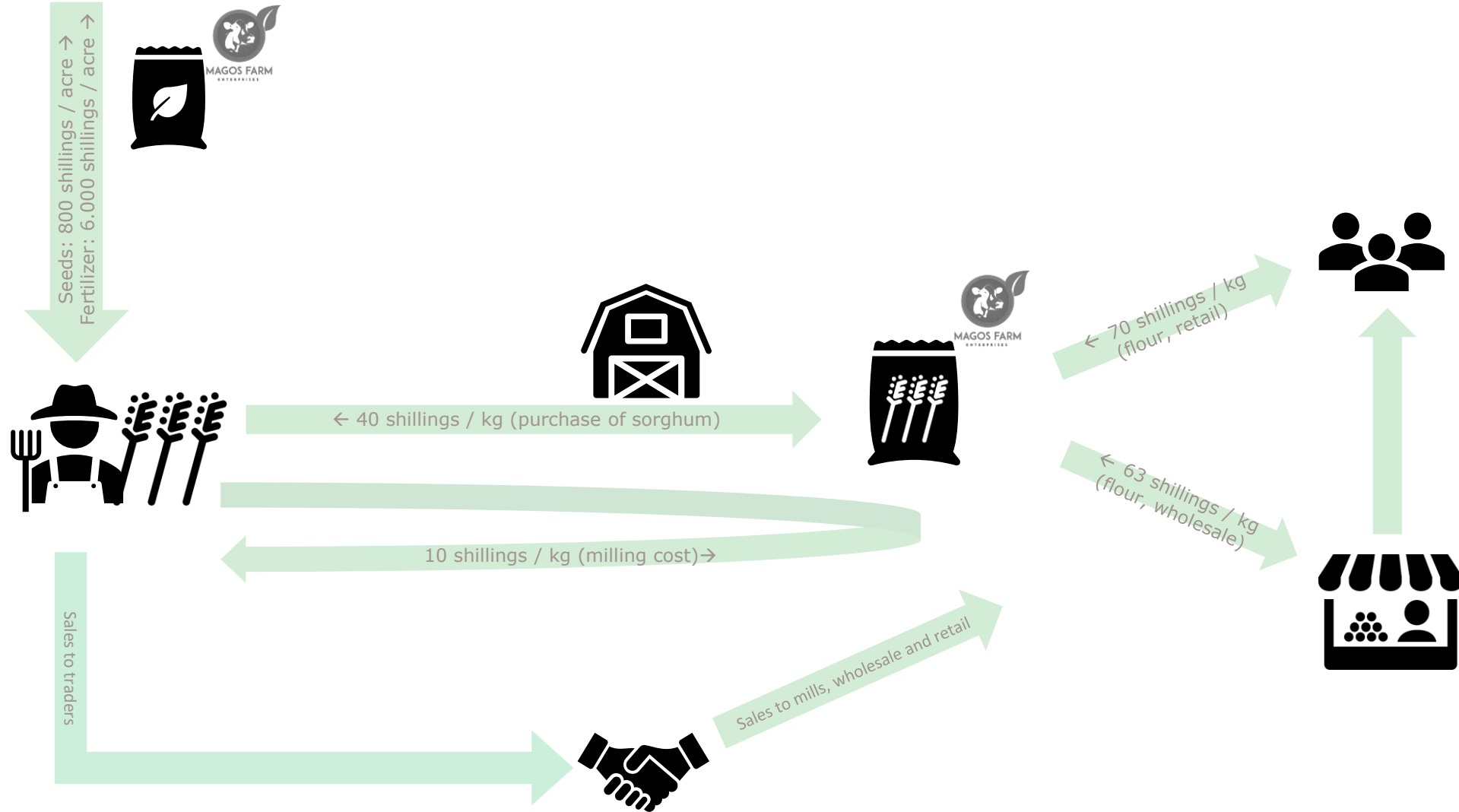
Prices at harvest moment

KSh 40-50 per kg

Prices at peak of season

KSh 60 per kg
(up to KSh 70 exceptionally)

Track 2: Product flow – Magos end-to-end Sorghum



Overview – Magos end-to-end Sorghum case

Production stream



Selling inputs to farmers

Mainly improved seeds and fertilizer for sorghum. This can be accompanied with a demo plot/ innovation centre, or other types of training and advice for farmers.



The sorghum farmers

Farmers who, with the right input, produce a surplus of sorghum. They sell their surplus via an aggregation point to the mill of Magos. Farmers in Kisumu, Siaya and potentially Nyando.



The aggregation point

At the aggregation point the raw products are collected and stored, before the sorghum goes to the mill.

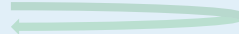


Processing of the sorghum

At the processing joint the raw sorghum is

1. Milled
2. Mixed with other flour types
3. Packaged
4. Stored before being sold

Marketing stream



Selling the milling service to farmers

Farmers can bring their own raw products to the mill. Having it processed and take it home. This can be used by farmers for own consumption or local marketing.



Selling to retailers & hotels

For a 10% discount on the consumer price retailer and hotels can buy the packaged flour.



Selling to consumers directly

This is mostly the farmer population.

Other buyers



Farmers selling to other buyers

A large and stable market is key for farmers to transition to commercial sorghum farming. Therefore, we include also other buyers in the business model overview. Other buyers are most likely other mills that can also absorb large quantities of raw sorghum.



Do farmers want to switch to commercial farming?

- Possibility to hire machines from local CBOs
- Families have to be willing to switch their farming business model
- Minimizing risks by resistant inputs and knowing enough buyers.



How much security can Magos provide to farmers?

- Guaranteed minimum price
- Contract farming



How much supply security can the farmers provide to Magos?

- Sufficient volume?
- Aggregation and transport
- Risk of side selling



How can more expensive inputs be financed?

- Self-financing
- Loans from saving group
- End-to-end finance system such as agri-wallet.
- End-to-end finance system with input supplier and buyer.
- Saving group at bank
- Individual loan bank



Besides Magos, would there be enough buyers for farmers?

- Other mills
- Other buyers for raw sorghum
- Buyers of milled flour, after use milling service

Is it lucrative enough for Magos to source from Nyando?

- Assurance minimum quantity of raw products
- Other competitive advantages?

Business case – Magos milling

The business case is profitable, but active search for market is needed

The calculated break-even point for the milling case of Magos is selling 2.886 kg per month to the market. This is higher than the conservative figure of selling 960 kg per month, but well within the expected growth possibility of 4.800 kg per month. Hence, there needs to be an active search for enough off-take, as well as sufficient volume of product supply from farmers.

Within this calculation it is expected that farmers make use of the milling service that Magos is going to offer, for at least 4.000 kg per month. Hence, there is a need to ensure this use of the services by farmers.

Overcapacity in current calculation gives more room to grow

The machines in the mill can produce in two days already more flour than is needed for a month. This overcapacity can increase the relative costs of the product, due to higher investment. Finding additional market points for selling the product can therefore increase overall profit, but also the profit per unit. Competition with other existing mills should be factored in.

Enough raw material at current sorghum farmers

The farmers Magos Farm is currently working with in terms of input supply for sorghum, produce more than enough to produce flour reaching the break-even point. It would however be more profitable to also include farmers that are not currently working with Magos, as this may also increase the profit from the input side of the model.

Fixed costs

One time investment for machine

300.000 Ksh
15% interest
1 year repayment time

Spread accounting investment time

5 years

Monthly costs in Ksh

Labour to operate machines	- 42.000
Other labour	- 12.000
Rent	- 10.000
Electricity	- 4.500
Security	- 3.000
Transport	- 6.000

Unforeseen costs

10%

Product varieties and variable costs

Mix 1 – Ugali flour

60% of the production

- Maize
- Cassava
- Sorghum

Mix 2 – Porridge flour

20% of the production

- Maize
- Cassava
- Sorghum
- Millet

Mix 3 – Pure sorghum flour

20% of the production

Variable costs per kg flour

Including loss and packaging
49,58 Ksh

Prices

Average prices per kg in Ksh

Consumer price	- 71,00
Retailer & hotel price	- 63,90
Average (50/50 share)	- 67,45

Price milling service per kg in Ksh

10 shillings

Quantities

Production capacity in kg

Per day	- 5.000
Per month (22 days)	- 110.000

Expected production for market per month in kg

Conservative figure	- 960
Growth possibility	- 4.800

Expected production for milling service per month in kg

Quite certain	- 4.000
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Needed raw products for break-even point, per year in kg

Maize	- 25.947
Cassava	- 15.086
Millet	- 1.920
Sorghum	- 18.377

Next steps

a) Unfinished business

The business models are just examples elaborated by the researchers. They can inspire, but other steps are needed to make them a reality.

Who should take the initiative?

- Magos Farm Enterprises
- The CBOs
- The county officials

Best is probably to do it together, to learn from each other and to make the best decisions possible.

If nobody takes the initiative, nothing happens.

You can seek support from others to realize your ideas: the researchers, investors, the county government, NGOs, projects.

b) Next steps by Magos for the sorghum case

1. Deciding on the investment, from Magos' perspective.
2. Seeking financiers for the investments (if needed)
3. Making preparations in for the project in the production regions (Siaya, Ahero) and off-takers markets.
4. Visiting the Nyando communities to present Magos' service offer for the Nyando farmers, in terms of commercial sorghum production and potentially in terms of sorghum milling.
5. Then: decide how to proceed further.

c) Cassava case?

1. Reflect on the cassava case, along the same lines as the sorghum case?

Thank you for the fruitful collaboration,

Wishing you well, and good luck!

The research team.