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**Sorghum and finger millet flour
processing in Tanzania, Kenya, and
Uganda**

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Abstract

We investigated the processing of sorghum and finger millet flour in Tanzania, Kenya, and Uganda. Fifty-three companies processing these crops were interviewed in 2011-2012. Except for Kenya, the processing sector was dominated by small- and medium-scale companies with 8-10 employees and an annual demand of below 50 t per year. Annual demand was highest for finger millet in Kenya (600+ t). Most firms operated below capacity because of demand constraints, inconsistent supply of raw material, and fluctuating prices for grain. Procurement of grain was primarily through traders operating without formal contracts. Two-thirds of processors in Kenya and one-third of processors in Tanzania and Uganda had experience of sourcing directly from farmers; however, because of problems enforcing contracts and with transport, they preferred to buy from traders. The main buyers of flour from these processors were urban supermarkets and small retail shops. Most processors did not have formal contracts with buyers except in Uganda. Although 62 % of processors in Tanzania claimed they were satisfied with the quality of grain they purchased, only a minority of firms in Kenya (42 %) and Uganda (31%) were satisfied with grain quality. The most important quality requirements were cleanliness and grain colour (red or white). Over 70 % of processors were willing to pay a price premium for higher quality grain. Seasonal price fluctuations ranged from 30-48 % in Tanzania and Kenya but averaged only 18 % for finger millet in Uganda. Buying prices for grain in the high season ranged from 0.30 to 0.65 USD/kg for finger millet and from 0.30 to 0.42 USD/kg for sorghum. Wholesale prices for pure flour ranged from 1-1.13 USD/kg for both sorghum and millets, with slightly higher prices for lishe flour (1.30 USD/kg) and uji flour (1.31 USD/kg). The majority of companies reported increased demand for sorghum and millet flour in the past five years, and expected demand to grow in the future, particularly for finger millet flour.

Keywords: Sorghum, millets, agri-business

JEL classification: Q1, Q13

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Acronyms

BMGF	Bill and Melinda Gates Foundation
EAGC	East African Grain Council
HOPE	Harnessing Opportunities for Productivity Enhancement
KARI	Kenyan Agricultural Research Institute
KEBS	Kenyan Bureau of Standards
KBS	Kenyan Bureau of Statistics
KSh	Kenyan Shilling
NARS	National Agricultural Research Systems
TBS	Tanzanian Bureau of Statistics
SIDO	Small Industries Development Organization (Tanzania)
TSh	Tanzanian Shilling
USh	Ugandan Shilling

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1 Introduction

Sorghum and millets are important cereal crops for farmers in semi-arid areas of Eastern Africa. They are usually grown where maize cultivation is risky because of high temperatures and low rainfall. Although traditionally cultivated for home consumption, market demand is growing. Urbanization has created higher demand for pre-processed traditional cereals in urban centres, consumers show an increasing awareness of the health benefits of traditional crops, and the flour processing industry wants to diversify their range of products. Consequently, smallholders have new opportunities to commercialize the production of sorghum and millets.

ICRISAT and its local partners surveyed flour processors in the three East African countries (Kenya, Uganda and Tanzania) with an active processing sector. The general objective of the study was to obtain an overview of the sorghum and millet in the flour processing value chain. The specific objectives were to:

1. Measure flour processors' current demand for sorghum and millets;
2. Identify their procurement, quality needs and marketing arrangements; and
3. Identify the challenges faced by processors of sorghum and millet flour.

The study was conducted as part of the HOPE (Harnessing Opportunities for Productivity Enhancement) project funded by the Bill & Melinda Gates Foundation (BMGF) which covered 11 countries in South Asia, West Africa, and East Africa.

2 Data and methods

Flour is currently the most important value-added product from sorghum and millets. There is a large informal processing sector that consists mainly of traders who buy sorghum and finger millet grain, take it to a mill and sell it at open air markets as flour. This market channel does not offer any additional benefits for farmers, however. We therefore focused on small- to large-scale processors that operate in the formal sector. The scope of the study was limited to three countries – Kenya, Tanzania, and Uganda – that have large formal processing sectors.

Because lists of registered processors dealing with these crops did not exist in all countries, we applied the following sampling procedure. First, we identified urban consumption hotspots where pre-packed finger millet and sorghum flour from small- to large scale companies is sold in supermarkets, retail shops and open-air markets. In Tanzania, these were Moshi and Arusha in Northern Tanzania, Dar es Salaam in the Coastal Area and Dodoma and Singida in Central Tanzania. In Kenya, we assumed that almost all processors sold flour in Nairobi and selected this as the only urban centre. The same holds true for Uganda, where Kampala was the major urban market. In all three countries, supermarkets, open air markets and small retail shops were visited to identify companies that produce finger millet and sorghum flour. Additionally, key

informants¹ were used to identify missing companies. Although this approach did not produce a complete list of all available processors, it helped to identify the most prominent. Unfortunately, not all companies agreed to be interviewed. Table 1 shows the sample processors interviewed for this study. Annex 1 provides a list of the companies that were interviewed and their location.

Table 1: Sample processors

Tanzania		Kenya		Uganda	
Moshi	6	Nairobi	7	Kampala	12
Arusha	6	Kisumu	3	Wasiko district ¹	3
Dar Es Salaam	13	Nakuru	2		
		Eldoret	1		
Total	25		13		15

¹ Wasiko district borders Kampala district

To obtain detailed information on processing, a standardized questionnaire was developed with sections on procurement and marketing systems, quality requirements, processing activities, opportunities and challenges, as well as market information and support needs (Annex 2). Local enumerators were trained and the questionnaire was pre-tested in all three countries. The survey was successfully completed in all three countries between May 2011 and January 2012. However, some companies refused to answer some of the questions, as information was regarded as sensitive. This resulted in some missing data. The data was analyzed using simple descriptive statistics.

3. Regional overview

3.1 Sector profile

The flour processing sector in Tanzania and Uganda is dominated by small- and medium-scale processors, with < 20 employees, while in Kenya processing is dominated by large companies with 50 + employees (Table 2). Although more developed than in Tanzania, processing in Uganda remains largely semi-industrial and dominated by medium-scale companies. Processors in Tanzania and Uganda were relatively new companies, some of which had been established specifically to process sorghum and millets, while flour processors in Kenya were established businesses that primarily processed maize but had recently added sorghum and millets to broaden their product portfolio. Annual demand for sorghum and millets in Tanzania and Uganda averaged < 50 t, while in Kenya demand averaged 600+ t for finger millet but <100t for sorghum. The major products are pure flour (100 % sorghum or millet) and *lishe* or *uji* flours that are primarily weaning foods. Most companies reported spare capacity, but smaller

¹ In Kenya, KARI and EAGC served as key informants while in Uganda and Tanzania, NARS helped to identify missing companies.

companies in Tanzania and Uganda lacked capital for investment and further expansion. Both Kenya and Uganda reported challenges with unreliable supply, suggesting that this acted as a brake on further development of the sector.

Table 2. Company profiles, demand and major products

Structure	Tanzania (n=25)	Kenya (n=13)	Uganda (n=15)
Average employees (no.).	9	56	16
Yeas in business (no.)	8	21	14
Years processing sorghum or millets (no.)	6	10	9
Finger millet demand (mt/year)	32	663	30 (processors) 273 (millers)
Sorghum demand (mt/year)	36	95	32
Major products (% sorghum or millets in product)	Pure flour (100%) <i>Lishe</i> (30%) Other blended flours (20%)	Pure flour (100%) <i>Uji</i> flour (30%) Other blended flours (40-50%)	Pure flour (100%) Millet-soya flour (80%)
Companies with spare capacity (%)	80	80	90
Main business challenge	Lack of capital (56%) Unreliable demand (20%) Lack of machines (20%)	Unreliable demand (40%) Insufficient supply (30%)	Unreliable demand (54%) Lack of capital (31%) Unreliable supply (31%)

3.2 Procurement

Private traders were the main suppliers to processors in all three countries (Table 3). Few processors in Tanzania or Kenya, and none in Uganda, reported being supplied directly by farmers. One-third of companies in Tanzania and Uganda had experience with contracting farmers directly, while in Kenya this rose to over 60 %. However, companies reported that direct contracting was time-consuming, expensive because of the distance between farmers and processors, and often unreliable, since they could not enforce contracts. Processors explained that farmers had to be continuously monitored to ensure successful production. Consequently, processors preferred to deal with private traders. Most companies did not have formal contracts

with traders but bought informally at the factory gate when supply was required, or on the spot market. Informal arrangements reduced transaction costs and ensured a more reliable supply of raw material. The major challenges in procurement were the poor quality of the grain obtained from suppliers, and supply fluctuations which prevented regular processing. In Uganda, high transport costs were also a problem since most companies were located in Kampala far from the centre of production for finger millet.

Table 3. Procurement systems

	Tanzania (n=25)	Kenya (n=13)	Uganda (n=15)
<i>Suppliers (%)</i>			
Trader	78	71	87
Farmer	22	8	-
Market	11	4	13
Agent	9	25	27
<i>Institutional arrangement (%)</i>			
Contract	-	15	20
Informal	48	62	80
Spot market	52	23	10
<i>Experience contracting farmers (%)</i>			
Yes	36	62	30
<i>Procurement challenges (%)</i>			
Low quality of raw material	47	54	80
Seasonal supply fluctuations	44	58	20
Price increases and fluctuations	47	25	-
Transportation costs	22	-	60

3.3 Marketing

Supermarkets were the main marketing channel in all three countries (Table 4). However, in Tanzania and Uganda, where processing companies were smaller and retailing less developed, small retail shops and individuals were also important. Despite the health benefits of sorghum and millet flour, hospitals and schools were only a minor marketing channel in Tanzania and Kenya, though in Uganda half the processors supplied them. Few processors had formal contracts with buyers but supplied them on an informal basis. Supermarkets and small retail shops fixed prices in advance and suppliers were paid only two weeks after delivery or after the products had been sold. This was challenging for processors because they could not adjust prices to changes in the price of raw materials and because they could not buy raw material on credit.

Table 4. Marketing

	Tanzania (n=25)	Kenya (n=13)	Uganda (n=15)
<i>Customers (%)</i>			
Supermarkets	87	83	90
Individuals	78	17	40
Small retail shops	76	29	70
Schools	20	17	50
Hospitals	18	8	50
Wholesalers	13	21	30
Others	13	17	-
<i>Institutional arrangements (%)</i>			
Contract	12	33	70
Informal	100	83	40
Spot market	56	33	40

3.4 Quality, grades and prices

In Tanzania the majority of processors (62%) were satisfied with the quality of grain obtained from their suppliers, whereas in Kenya only 42 % and in Uganda only 31 % were satisfied (Table 5). This meant that processors incurred additional costs cleaning grain. Cleanliness was the single most important quality required by over 80 % of processors in all three countries, followed by grain colour (white or red), and freedom from damage by pests (20-30%). Over 70% of processors in all three countries were willing to pay a price premium for grain quality. Few processors in Kenya (22 %) or in Uganda (20 %) graded the grain they bought from suppliers, implying that they paid the same price irrespective of grade, whereas 64 % of processors in Tanzania claimed to use grades, paying different prices for the first and second grades. For consumers, attractive packaging was as important as flour quality, which caused problems for processors since high quality packing was expensive. Grain prices for millets were higher than for sorghum in Kenya and Uganda, though not in Tanzania. Price fluctuations for grain between high and low seasons varied from 30 – 48 % in Tanzania and Kenya but only by 18 % for millet in Uganda. By contrast, the price of sorghum and millet flour was usually the same, with higher prices charged for blends rather than pure flour.

Table 5. Quality, grades and prices

	Tanzania (n=25)		Kenya (n=13)		Uganda (n=15)
<i>Satisfied with grain quality (%)</i>					
Yes	62		42		31
<i>Quality requirements (%)</i>					
Cleanliness	98		79		85
Colour	26		46		46
Free from pest damage	34		25		-
Maturity	14		-		15
Moisture	9		79		-
Size of grains	-		-		23
<i>Willing to pay price premium? (%)</i>					
Yes	72		75		90
Premium (%)	25		Na.		Na.
<i>Applying grades (%)</i>					
Yes	64		22		20
<i>Mean grain prices (USD/kg)</i>					
	Sorghum	Finger millet	Sorghum	Finger millet	Finger millet
Low season	0.60	0.50	0.58	0.66	0.79
High season	0.42	0.30	0.30	0.43	0.65
Difference (%)	30	40	48	35	18
<i>Mean flour prices(USD/kg)</i>					
Pure flour	1.12	1.12	1.13	1.06	1.0
Lishe flour	1.30	1.30	0.98	-	-
Uji flour	-	-	-	1.31	-
Millet-soya flour	-	-	-	-	1.1

3.5 Challenges

Besides availability of raw materials, processors reported challenges on both the supply and demand side (Table 6). On the demand side consumers were reported to lack knowledge about sorghum and millets, and consequently preferred maize to sorghum and millets. Others cited lack of government support in promoting sorghum and millets and education was required to stress the health benefits. On the supply side, processors in Uganda faced high costs because of high electricity prices and frequent power cuts that disrupted processing, and lacked access to credit to invest in machinery. Technical equipment was particularly important as raw material is often dirty and needs to be cleaned by processors. Thus, access to credit was a key bottleneck in the expansion of the small-scale processing sector. Many processors stated that they did not know where to apply for credit.

Table 6. Challenges facing processors (% reporting)

<i>Major challenges (%)</i>	Tanzania (n=25)	Kenya (n=13)	Uganda (n=15)
Lack of knowledge by producers and consumers	52	-	-
Consumer preferences	28	-	-
Lack of government support	24	78	-
Access to credit/lack of capital	-	22	21
High tariffs for electricity and power cuts	-	-	64

3.6 Future growth

Most processors reported that demand for finger millet and sorghum increased in the last five years. In Tanzania, 95 % of sample processors reported increasing demand, while in Kenya 69% of processors reported increased demand for finger millet and 64 % for sorghum. In Uganda, all finger millet processors stated that demand had increased over the past five years. Looking to the future, all the sample processors in Tanzania and Uganda expected demand for their products to increase, while in Kenya 92 % of finger millet processors and 82 % of sorghum processors also expected growth in demand. The processors we interviewed were primarily targeting retail shops and supermarkets. Urbanization and increasing health consciousness among consumers are expected to increase demand for finger millet and sorghum flour in these market outlets.

4. Country results: Tanzania

4.1 Sector profile

Even though large-scale flour processors exist in Tanzania, those processors handling sorghum and finger millet were mostly small- to medium- scale companies. Some had recently added sorghum and finger millet to their portfolio while others were established solely for the production of sorghum and finger millet flour. The latter were usually self-help groups or women's associations that had started the business to support their own livelihood and had no previous experience of flour processing. Nevertheless, their production was professional and they sold attractively packed flour to various retail outlets. Most of these companies were trained by the Small Industry Development Organization (SIDO), a parastatal organization under the Ministry of Trade, Industry and Marketing which aims to develop small-scale industry in Tanzania.

Table 7 gives an overview of the interviewed companies and their products. All the companies were flour processors. All dealt with finger millet and 20 (80%) with sorghum, so 20 companies handled both crops. A company had on average nine employees, with a range of 1-30. However, one medium-size company refused to provide this information. The companies

averaged 8 years in the processing business and had six years of experience with finger millet and sorghum processing. The small difference between years in the business and years of experience with sorghum and finger millet confirms that many companies were established to process sorghum and finger millet flour.

Table 7. Company profiles Tanzania (n=25)

	No.	Percent		
Flour processors	25	100		
Mean employees (no)	9	-		
Mean years business (no)	8	-		
	<i>Finger millet</i>		<i>Sorghum</i>	
	No.	Percent	No.	Percent
Companies dealing with	25	100	20	80
Mean years processing (no)	6	-	6	-
<i>Main products¹</i>				
Pure flour (%)	12	100	11	100
Lishe ² (%)	23	30	13	35
Other blended flours ³ (%)	-	-	4	20-30

¹ Percentage here refers to the share of finger millet and sorghum that the respective flour contains.

² Additional to sorghum/ finger millet, *lishe* flour contains cereals such as maize, wheat and rice as well as crops like soybeans, carrots and groundnuts.

³ Other flour blends include maize-sorghum flour; cassava-sorghum flour; soybean-sorghum flour; and rice-sorghum flour.

The most important products were *lishe* and pure flour. *Lishe* is nutritious flour that contains a mix of cereals and other crops. There was no standard recipe and the crops added as well as the share of each crop in the mix differed between processors. However, *lishe* flour always contained finger millet (on average 30%) and often sorghum (on average 35%).

Table 8 shows the yearly turnover of the crops handled by the sample processors. Wheat and maize had the highest turnover, even though only four and five companies dealt with these crops, respectively. These were large-scale companies that had been processing flour for a long time; sorghum and finger millet were minor crops added to supplement their core business. In total, finger millet and sorghum ranked third and fourth with far lower quantities being processed annually. Comparing the mean turnover of wheat and maize with finger millet and sorghum shows that finger millet and sorghum processors were small-scale businesses. Other crops mentioned by processors had low turnovers because they were mostly used to blend flours made from the other four cereals. However, the mean turnover per company was relatively high for cassava, suggesting that cassava was also sold as pure flour.

Table 8: Turnover of different crops, Tanzania (n=24)

	Mt/year (total)	Mt/year (mean)	No. of companies
Wheat	8,009	2,002	4
Maize	4,760	925	5
Finger millet	771	32	24
Sorghum	678	36	19
Rice	278	21	13
Cassava	182	91	2
Groundnut	143	11	13
Soybean	36	3	14

Table 9 shows that 5 companies (20%) reported working at full capacity, while the remaining 20 companies (80%) still had spare capacity or could increase capacity. The most important limitation was lack of capital to increase production (14 companies). Capital was needed to buy more raw materials or invest in equipment and facilities. However, appropriate machinery also needed to be available. Other limitations were power fluctuations, transport costs and availability. Only five companies (20 %) stated unreliable demand as a reason for low capacity utilisation, indicating strong demand for packaged flour.

Table 9: Reasons for not working at full capacity, Tanzania (n=20)

	No.	Percent
Lack of capital	14	56
Unreliable demand	5	20
Lack of machines	5	20
Power fluctuations	4	16
Transport costs and availability	2	8
Other	3	12

4.2 Procurement

There are four different types of suppliers, and processors often source from more than one type. The most important suppliers for both sorghum (75%) and finger millet (80%) were traders (Table 10). There were few direct linkages between farmers and processors: sorghum was supplied directly by farmers in 30% of cases and finger millet in 16% of cases. Other sources were markets and agents. Suppliers were usually based in the same urban centres as processors. They acted as middlemen between traders in production areas and centres of demand. However, some suppliers also came directly from production areas (Central and Southern Tanzania), particularly in the case of sorghum, because sorghum was more likely to be sourced directly from farmers. The regional sources of supply are in line with the main

production areas, Central and Southern Tanzania and to a lesser extent Northern Tanzania. In some cases, sorghum came from Zambia, because Zambia has large-scale sorghum producers that can supply large volumes. Trade took place directly between production and consumption hotspots as intermediate markets were not mentioned. However, no conclusions could be drawn about the number of traders involved.

Table 10: Finger millet and sorghum suppliers, Tanzania

	Finger millet		Sorghum	
	No.	Percent	No.	Percent
<i>Supplier</i>	N=25		N=20	
Trader	20	80	15	75
Farmer	4	16	6	30
Market	3	12	2	10
Agent	2	8	2	10
<i>Location of supplier</i>	N = 25		N=20	
Dar Es Salaam	15	60	11	55
Moshi/Arusha	12	50	9	45
Central	5	20	5	25
Southern Tanzania/Zambia	2	8	4	20
<i>Regional sources of suppliers</i>	N = 24		N = 19	
Central	24	100	19	100
Southern Tanzania/Zambia	12	50	12	63
Northern	6	25	1	5

Table 11 shows that business models between suppliers and processors were either informal (48%) or spot market transactions (52%). Informal arrangements were organized as follows. The processor had a supplier whom they contacted when they needed raw material. The supplier then deposited the raw material until the processor needed it. In some cases, the processor bought the raw material on credit and paid back in installments; in other cases the processor had to pay immediately. Prices were agreed when the order was made. In one case, the processor checked the quality of the raw material before accepting it and rejected it if the quality was below requirements. Other processors stated that their suppliers knew their quality requirements and that there was no mechanism to reject the order if this was not met. In the case of spot market transactions, processors visited traders at their usual locations and paid cash for the amount of raw material they needed. Nine processors reported that they had experience of sourcing directly from farmers, and seven were still being supplied by farmers. However, two processors reported that this arrangement was too time-consuming and expensive. The biggest barrier in sourcing directly from farmers was reported to be the physical distance between farmers and processors, which increased transaction costs.

Table 11: Business models between suppliers and processors, Tanzania (n=25)

Institutional arrangement	No.	Percent	Experiences in contracting farmers	No.	Percent
Informal	12	48	No	16	64
Spot market	13	52	Yes	9	36

Processors faced other challenges with procurement (Table 12). Low grain quality was a problem for both crops, but particularly for finger millet (52% compared to 40%). The same held true for seasonal fluctuations in supply (48% and 40%, respectively) and price increases and fluctuations (48% and 45%, respectively). The slightly higher turnover of finger millet (Table 8) might result in greater shortfalls in the supply of finger millet. Moreover, large-scale farmers in Zambia existed only for sorghum. Although the brewing industry also sourced large quantities of sorghum, it did not necessarily compete directly with flour processors because they looked for different sorghum varieties. Other procurement problems were transportation facilities and transport costs. Lack of capital to buy enough produce at harvest time, when prices were low, was another common problem (24% and 20%, respectively). For sorghum, 20% of the processors also complained about storage pests.

Solutions suggested for these challenges included 'training farmers in post-harvest handling' (36% and 40%, respectively); acquiring own transport (24% and 30%, respectively), buying enough at harvest time (20% and 25%, respectively), acquiring loans (24% and 15%, respectively) as well as buying directly from farmers (24% and 15%, respectively). Despite these challenges, nearly all processors (92% of finger millet and 95% of sorghum processors) reported that their demand for finger millet and sorghum had increased in the last five years. They also planned to expand their production because they expected increased market demand for finger millet and sorghum products, although they could not provide precise figures.

Table 12: Procurement challenges and solutions, Tanzania

	Finger millet		Sorghum	
	No.	Percent	No.	Percent
<i>Challenges</i>	<i>N=25</i>		<i>N=20</i>	
Low quality of raw material	13	52	8	40
Seasonal fluctuations of supply	12	48	8	40
Price increases and fluctuations	12	48	9	45
Transportation facilities and costs	6	24	7	35
Lack of capital (to buy produce at Once at harvest time)	6	24	4	20
Lack of storage facilities	2	8	2	10
Storage pests	0	0	4	20
<i>Solutions</i>	<i>N=25</i>		<i>N=25</i>	
Train farmers on post-harvest handling	9	36	8	40
Own vehicle	6	24	6	30
Buy enough at harvest time	5	20	5	25
Loans	6	24	3	15
Buy directly from farmers	5	20	3	15
Government to support production	2	8	2	10
Immediate turnover	1	4	2	10
Strategic grain reserve facilities	1	4	1	5
Other	2	8	1	5

4.3 Processing

Table 7 showed that processors in Tanzania produced pure and blended finger millet and sorghum flours. These flours are mostly used to prepare thin porridge consumed for breakfast. Because of their high nutritional value, finger millet and sorghum flour is recommended for small children, breast-feeding mothers, the elderly and sick people. Although all flours can be used for porridge, different flour blends are targeted at different consumer groups. For example, pure finger millet flour is particularly good for people with diabetes. Consequently, when supplies ran short processors could not easily replace finger millet or sorghum with other crops. Only five processors stated that, in case of scarcity, they could use sorghum instead of finger millet and vice versa or that they could increase the share of other cereals like maize or wheat in blended flours.

Besides porridge, there are also other products for which sorghum and finger millet flour could be used by consumers or which could be produced by processors. Processors could imagine a wider use of sorghum than of finger millet (Table 13). Only two sorghum processors (10%) could not imagine any other product for which sorghum could be used whereas there were five

processors (24%) in case of finger millet. For sorghum, the most frequently mentioned products were cakes/cookies (90%), and bread (75%). Others included chapatti, *mandazi*² (25%) and local brews (15%). Local brews ranked first for finger millet (32%), followed by cakes/cookies (28%), soft drinks (16%) and bread (16%). While breweries required sorghum, processors saw local brews as an important market for finger millet.

Processors did not produce these products either because they did not want to make alcohol (42% and 17%, respectively), or because of lack of knowledge (26% and 39%, respectively) and lack of capital to make necessary investments (16% and 39%, respectively). Only two processors gave consumer preferences as a reason for not producing additional products, which suggests that processors believed that consumers would be interested in a wider range of products.

Table 13: Alternative products from finger millet and sorghum, Tanzania

	Finger millet		Sorghum	
	No.	Percent	No.	Percent
<i>Alternative products</i>	N=25		N=20	
None	6	24	2	10
Cakes & cookies	7	28	18	90
Bread	4	16	15	75
Chapatti/ <i>Mandazi</i>	1	4	5	25
Local brew	8	32	3	15
Soft drinks	4	16	1	5
<i>Reasons for non-production</i>	N=19		N=18	
Not willing to make alcohol	8	42	3	17
Lack of knowledge to produce	5	26	7	39
Lack of capital to invest	3	16	7	39
Consumer preferences	2	11	2	11

The important challenge facing processors was the lack of appropriate machinery and facilities (72%) (Table 14). Processors complained that milling machines were so expensive that they had to use public mills for grinding. Many processors did not know where to buy good machinery. Many processors did not have appropriate facilities due to lack of capital to rent or build a proper production plant. Power cuts were the second most important problem (52%). (During the survey period, power cuts were a problem all over Tanzania due to a poor wet season.) Most companies could not afford to buy and operate a generator. Consequently, lack of capital ranked third (16%) together with expensive and/or unavailable packaging (16%) and requirements set by the Tanzania Bureau of Standards (TBS) (16%). Processors complained that the packaging material available in Tanzania was of very low quality, which reduced the

² The Swahili name for doughnut, often used as a breakfast food with tea or as a snack.

attractiveness and shelf life of their flour. Customers expected attractively packed flour with a long shelf life. Packaging material imported from Kenya was expensive and often not affordable for small-scale processors. Packaged flour requires a TBS certificate assuring quality standards have been met and this certificate is also required by many buyers, particularly supermarkets. Solutions to these problems mentioned by processors included investment in machinery (44%), credit facilities (40%) and stabilized power supply (20%). Others, mentioned by only a few processors, were support from the government to obtain a TBS certificate (12%), and training on processing techniques (4%).

Table 14: Processing challenges and solutions, Tanzania (n=25)

Challenges	No.	Percent	Solutions	No.	Percent
Lack of machinery/facilities	18	72	Invest in machines/facilities	11	44
Power cuts	13	52	Attain credit facilities	10	40
TBS requirements	4	16	Stable power	5	20
Lack of capital	4	16	Governmental support to obtain TBS certificate	3	12
Expensive/unavailable packaging	4	16	Training on processing techniques	1	4
Not enough knowledge about processing	2	8			
Other	3	12			

4.4 Marketing

Processors sold flour through various market outlets (Table 15). For both crops, supermarkets were the most important market outlet (88% and 85%, respectively), followed by individuals (76% and 80%, respectively) and small retail shops (75%). Since the survey included only formal processing companies, the finding that retailers were the most important buyers is not surprising. However, even small-scale companies producing only small quantities of one product could supply supermarkets and retail shops and advertised their products door-to-door. The importance of individuals reflected the existence of self-help groups or women's associations that sold their products on an individual basis at trade fairs or through social networks. Schools, hospitals also bought sorghum and finger millet flour, highlighting the importance of these flours as health foods for weaning children and sick people.

As the biggest city in Tanzania, Dar Es Salaam offered the biggest market opportunities. Northern Tanzania with the urban centres Moshi and Arusha ranked second (88% and 45%, respectively). For sorghum, only a few buyers (10%) were located in other regions. By contrast, 64% of finger millet buyers were located in other regions, although none of the processors were. Thus, finger millet flour was more widely traded. Some buyers were located in Central and

Southern Tanzania, which is the major source of the raw material, which suggests that there is potential to locate processing enterprises in these regions.

Table 15: Buyers of finger millet and sorghum flour, Tanzania

	Finger millet		Sorghum	
	No.	Percent	No.	Percent
<i>Customers</i>	<i>N=25</i>		<i>N=20</i>	
Supermarkets	22	88	17	85
Individuals	19	76	16	80
Small retail shops	19	76	15	75
Schools	5	20	4	20
Hospitals	5	20	3	15
Wholesalers	3	12	3	15
Others	3	12	3	15
<i>Location of customer</i>	<i>N=25</i>		<i>N=20</i>	
Dar Es Salaam/Coastal Area	25	100	20	100
Northern Tanzania	22	88	9	45
Central Tanzania	6	24	3	15
Mwanza	7	28	0	0
All over Tanzania	2	8	2	10
Southern Tanzania.	1	4	0	0

Informal arrangements were the most common business arrangement between processors and buyers (Table 16). Each processor had this kind of arrangement with at least one of their buyers. Spot market transactions ranked second (56%). Three processors also had a contract with their buyers; in each case, the buyer was a supermarket and there was a written contract. Informal arrangements were most common with supermarkets and small retail shops. There were two kinds of arrangements. In the first type, the processor deposited their products in the shop and either regularly checked itself if the product was sold out or the shop called when the product was sold out. In both cases the processor delivered new products and was paid for the products deposited last time. Prices were agreed at the time of deposit. In the second arrangement, the shop ordered, the processor delivered and was paid some weeks later, even if the products were not yet sold. In this arrangement, too, processors usually checked if their product was still available in the shops, as shops sometimes delayed new orders.

Table 16: Institutional arrangements between processors and buyers, Tanzania (n=25)

Institutional arrangement	No.	Percent
Contract	3	12
Informal arrangement	25	100
Spot market	14	56

All 25 finger millet processors and 18 sorghum processors (90%) reported enough demand for their flour. However, with one exception, all processors faced challenges marketing their

products (Table 17). Most prevalent were payment problems with customers (36%). Processors complained that supermarkets only paid for the product several weeks after they had been sold, meaning delays in payment. Small retail shops and other customers also delayed payment. Missing market infrastructure and expensive packaging material ranked second (28% each). Processors reported that markets for sorghum and finger millet flour were not well established because the products were not widely known. Thus, door-to-door advertisement was needed, which was costly and time-consuming. Expensive packaging material drove up marketing costs and resulted in higher retail prices, which buyers and consumers were unwilling to pay. High quality packaging was a market requirement, particularly for supermarkets. Other problems were competition and low and unreliable prices. Sorghum and finger millet processing were regarded as a business opportunity by organizations in the field of small-scale business development like the Small Industries Development Organisation (SIDO). Many women's associations and groups have been trained to establish such businesses, thereby increasing competition. Processors offered various solutions to these challenges. The most frequently mentioned was increased capital investment (5%), a key issue in supporting small-scale enterprises.

Although processors complained about competition and unreliable demand, 100% and 88% stated that there is enough demand for their finger millet and sorghum flours, respectively. Moreover, 95% reported that market demand for sorghum and finger millet flour had increased in the last five years and all 25 processors expected that market demand would increase in the future.

Table 17: Marketing challenges and solutions, Tanzania (n=25)

Challenges	No.	Percent	Solutions	No.	Percent
None	1	4	None	1	1
Payment problems of customers	9	36	No supply on credit	1	1
Market infrastructure ¹	7	28	Own transport	2	2
Expensive packaging material	7	28	Increase capital	5	5
High competition	6	24	Improve quality and innovativeness	3	3
Low/unreliable prices	6	24	Written contract	3	3
Costs/procedure of obtaining TSB certificate	4	16	Governmental support to obtain TBS certificate	5	5
Consumers don't know the product	3	12	Promotion of the products	4	4
Storage pests (in supermarkets)	3	12	Supermarkets to control pests	1	1
High tax rate	2	8	Lower tax rate	3	3
Unreliable demand	2	8	Identify alternative markets	2	2
Not able to meet the demand	1	4	Improve packaging/shelf	4	4

life

¹ Problems of market infrastructure included transportation, difficulties reaching new customers, unavailable distribution channels, and lack of information about markets.

4.5 Quality, grades and prices

Table 18 shows that the most important quality for both crops was cleanliness of the raw material (96% and 100%, respectively). Colour ranked second (40% and 69%, respectively). However, brown was the most important colour for finger millet whereas for sorghum it was white. Raw material also had to be free from pest damage (28% and 42%, respectively). The higher response for sorghum suggests that this crop was more affected by pests than finger millet.

Sixty percent of finger millet and 65% of sorghum processors were satisfied with quality of the grain they received. However, this was because they had educated their suppliers about their quality requirements. Processors unsatisfied with quality mentioned dirty raw material as the biggest problem. Since poor quality increased costs for processors, 72% of them were willing to pay a premium for improved quality. Even some processors that reported themselves already satisfied with quality were willing to pay a price premium, indicating further potential for quality improvement. The average price premium that processors were willing to pay was 25%.

Thirty two percent of processors stated that buyers did not specify quality requirements. Packaging of the product was more important (52%). Supermarkets required packaging that looked attractive, was stable, and contained product information such as shelf life. The same held true for the TBS certificate, which was mentioned by 20% of the processors. Forty percent also mentioned that buyers expected good quality flour, meaning flour without any contamination.

Table 18: Quality requirements of processors and buyers, Tanzania

	Finger millet		Sorghum	
	No.	Percent	No.	Percent
<i>Quality requirements of processors</i>	<i>N=25</i>		<i>N=19</i>	
Cleanliness	24	96	19	100
Brown color	9	36	2	11
White color	1	4	11	58
Free from pest damage	7	28	8	42
Maturity	3	12	3	16
Moisture	2	8	2	11
<i>Satisfaction with crop quality</i>	<i>N=25</i>		<i>N=20</i>	
No	10	40	7	35
Yes	15	60	13	65
	Finger millet and sorghum (N=25)			
<i>Willingness to pay price premium</i>	<i>No.</i>		<i>Percent</i>	
No	7		28	
Yes	18		72	
Price premium (%)	-		25	
<i>Regional sources of suppliers</i>				
None	8		32	
Nicely packed	13		52	
Good quality flour	10		40	
TBS certificate	5		20	

Although processors had quality requirements, less than half (32% and 40%, respectively) applied grades (Table 19). Like quality requirements, the most important grading criteria were cleanliness and colour. Processors usually applied a first and a second grade, with higher prices for the first grade. Thus, there was a price incentive for farmers to supply higher quality raw material. However, this price premium may remain with the trader and not be transferred to farmers. Interviews with farmers in Central Tanzania revealed that they are not aware of a price premium for better quality grain. Instead they stated that prices were determined by the season. In all cases, raw material prices for sorghum were lower than for finger millet. However, pure or blended flours sold for the same price, indicating a higher profit margin for processing sorghum. However, profit margins were squeezed because consumers were unwilling to pay higher prices for flour, making it difficult for processors to adjust their prices in response to fluctuations in the price of grain.

Table 19: Grades, seasonality and prices for finger millet and sorghum, Tanzania

	Finger millet	Sorghum
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	No.	Percent	No.	Percent
<i>Application of grades</i>	<i>N=25</i>		<i>N=20</i>	
No	17	68	12	60
Yes	8	32	8	40
<i>Grading Criteria</i>				
Cleanliness	5	63	5	63
Color	2	25	2	25
Other	1	12	1	12
<i>Prices</i>	<i>TSh/kg</i>	<i>US\$/kg</i>	<i>TSh/kg</i>	<i>US\$/kg</i>
First grade	1000		730	
Second grade	800		570	
<i>Seasonality</i>	<i>Month</i>		<i>Month</i>	
Low season	December to May		December to May	
High season	June to November		June to November	
<i>Mean raw material prices</i>	<i>TSh/kg</i>	<i>US\$/kg</i>	<i>TSh/kg</i>	<i>US\$/kg</i>
Low season	960	0.60	820	0.5
High season	680	0.42	550	0.3
Average	800	0.50	650	0.4
<i>Mean flour prices</i>	<i>TSh/kg</i>	<i>US\$/kg</i>	<i>TSh/kg</i>	<i>US\$/kg</i>
Pure flour	1800	1.12	1800	1.12
<i>Lishe flour</i>	2100	1.30	2100	1.30

4.5 Needs

Processors were asked what kind of support and market information they needed to improve their performance. Table 20 shows that the most important needs were information about input (raw material) and output markets (88%) and raw material prices (68%). Processors usually got this information from traders and markets (56%), the radio (52%) and newspapers (44%). Eighteen (72%) of processors reported that they would be interested in other information that was not currently available. This included credit facilities (24%), potential alternative suppliers (20%) and regional/international markets (20%).

Table 20: Market information and sources of information, Tanzania (n=25)

	No.	%	No.	%
<i>Accessed information</i>			<i>Sources of information</i>	

Markets (input – output)	22	88	Market/trader	14	56
Prices (raw material)	17	68	Radio	13	52
Other ¹	6	24	Newspaper	11	44
<i>Missing information</i>			TV	4	16
None	7	28	Competitor	3	12
Credit facilities	6	24	Other ²	7	28
Potential suppliers/ sourcing from farmers	5	20			
Regional/international markets	3	12			
Exhibitions and trainings	2	8			
Suppliers of machines	2	8			
Processing technologies	1	4			

¹ Other includes aspects like information about potential suppliers, competitors, packaging material, product quality, need of customers.

² Other includes information sources like researchers, customers, internet and seminars.

Fifty two percent of processors mentioned lack of knowledge about the crops by both growers and consumers as the most important barrier to growth in the sector (Table 21). Consumer preferences ranked second (28%), followed by lack of governmental support (24%). These barriers are inter-related: if sorghum and finger millet were more popular, they might receive more government support, while support might make the two crops more popular. Lessons learned from the maize sector pointed in the same direction. Seventy one percent of processors attributed success with maize to a functioning market infrastructure, followed by crop promotion (50%).

Table 21: Barriers for a vibrant finger millet and sorghum sector and lessons learned from the maize sector, Tanzania

Barriers (N=25)	No.	%	Lessons learned (N=24)	No.	%
Lack of knowledge (producer and consumer)	13	52	Crops need to be promoted	12	50
Consumer preferences	7	28	Functioning market infrastructure	17	71
Lack of governmental support	6	24	Input provision	11	46
Insufficient market infrastructure	4	16	Training of farmers	6	25
Other ¹	4	16	Other ²	4	17

¹ Other includes low crop quality, droughts and pests and few production areas.

² Other includes mechanization, loan provision, and quality standards.

Processors expected government support in production and farmer training (80% and 60%, respectively) as well as improvement of market infrastructure (32%) (Table 22). They also wanted access to credit (20%) and promotion of the two crops (16%). Interestingly, processors put the sector problems (production and infrastructure) first and rank their own needs (credit) second. Support expected from research was primarily the provision of improved varieties

(72%), followed by market research (36%). Moreover, farmers should be trained (20%) and research results should be better disseminated (20%).

Table 22: Governmental and other support needed for finger millet and sorghum sector, Tanzania

Governmental support (N=25)	No.	Percent	Research support (N=25)	No.	Percent
Support production (inputs, technologies)	20	80	Release/provide improved varieties	18	72
Training of farmers (production/post-harvest)	15	60	Market research	9	36
Make credit available for processors	5	20	Training of farmers (quality issues)	5	20
Improve market infrastructure	8	32	Disseminate research results	5	20
Promote sorghum and finger millet (production/consumption)	4	16	Other	3	12

4.7 Conclusions

The processing sector for sorghum and millets in Tanzania was dominated by small to medium scale processors mostly based in Arusha, Moshi, and Dar es Salaam. Some processors – self-help groups or women’s associations - were established specifically for sorghum and finger millet flour.

Finger millet and sorghum were equally important in terms of the volume of flour processed. However, maize and wheat flour were more popular and flour from sorghum and millets served a niche market. Growing urbanization and health-consciousness among consumers is expected to increase demand for finger millet and sorghum flour. Most processors stated that demand for their finger millet and sorghum products had increased in the last five years and would increase in the future. Demand came not only from urban centres where processors were located, but also from other parts of the country, including the centres of sorghum and millet production. This highlights the potential to decentralize flour processing.

Processors identified several challenges for the sector. On the supply side, the main problems were seasonal supply and price fluctuations, lack of capital, and poor grain quality. The problems were obviously inter-related, since seasonal supply fluctuations led to price fluctuations. Institutional arrangements with suppliers could reduce these fluctuations. However, only half the processors had institutional arrangements with their suppliers, and these were not strong enough to allow large-scale purchases on credit. Similarly, if processors had more capital they could buy bigger volumes at harvest time, or pay a price premium for better quality grain, or invest in machinery to clean the grain. On the demand side, the most important challenge was prompt payment by customers. Again, this highlighted the need for capital since processors often had arrangements whereby the buyer only paid weeks after the product was delivered or

after the product had been sold. This reduced the processors liquidity, since usually they could not buy raw material on credit. Other marketing problems like missing market infrastructure or lack of awareness of consumers reflect the fact that finger millet and sorghum flour were still niche products.

5. Country results: Kenya

5.1 Sector profile

Kenya has the most advanced processing sector of the three countries with many medium- to large- scale flour processors. Historically, they dealt predominantly with maize and wheat but have added sorghum and finger millet flour to their portfolio to take advantage of emerging markets. These companies mostly sold packed flour to supermarkets in Nairobi. However, there were also small- to medium-scale businesses that produce loose flour for sale in their own shops, where customers could mix flours to suit their own tastes. All 13 companies interviewed were flour processors (Table 23). All 13 dealt with finger millet while 11 also handled sorghum. Companies had on average 56 employees, 21 years' experience in flour processing, and had processed finger millet and sorghum for 10 years.

Table 23: Company profiles, Kenya (n=13)

	No.		Percent	
Flour processors	13		100	
No. of employees (mean)	56		-	
Years in business (mean)	21		-	
	Finger millet		Sorghum	
	No.	Percent	No.	Percent
Companies dealing with	13	100	11	85
Years processing (mean)	10	-	10	-
<i>Main products¹</i>				
Pure flour	9	100	5	100
Uji flour ²	8	30	6	30
Other blended flours ³	5	50	6	40

¹ Percentage refers to the share of finger millet and sorghum of the respective flour.

² In addition to sorghum or finger millet, *uji* flour contains cereals such as maize, wheat and rice as well as crops like soybeans, carrots and groundnuts.

³ Other flour blends include finger millet-cassava-sorghum flour; finger millet-amaranth flour; maize-sorghum flour; cassava-sorghum flour; soybean-sorghum flour; and rice-sorghum flour.

For finger millet, the two most important flours produced were pure flour and *uji* flour. *Uji* flour is a mix of finger millet, sorghum and several other crops, containing on average 30% finger millet. Five processors also produced other flour blends, which had an average finger millet content of 50%. Only five sample processors produced pure sorghum flour. Other sorghum products included *uji* flour and other flour blends with a sorghum content of 30% and 40%, respectively.

Since standard recipes for *uji* and other blended flours do not exist, both composition and content differed from processor to processor.

Table 24 shows average turnover by crop. Some companies did not supply information about turnover while some provided information only for finger millet and sorghum. As the most important cereal crop in Kenya, maize had by far the highest turnover. Wheat was more important than sorghum and finger millet. The relatively low figure for wheat implies that few wheat processors had added sorghum or finger millet to their business. Finger millet had the third highest total turnover as well as per company turnover. The total quantity of sorghum processed was only 13% of the quantity of finger millet. Average turnover was also higher for finger millet.

Table 24: Turnover of different crops, Kenya

	Mt/year (total)	MT/year (mean)	No. of companies
Finger millet	7,297	663	11
Sorghum	945	95	10
Maize	107,999	13,500	8
Wheat	8,815	2204	4
Amaranth	10	10	1
Soybean	2	2	1
Barley	1	1	1

One company did not give information about capacity while two stated they were working at full capacity (Table 25). For the remaining 10 companies, the major reasons for not operating at full capacity were unreliable market demand (40%) and insufficient supply (30%).

Table 25: Reasons for not working at full capacity, Kenya (n=10).

	No.	Percent
Unreliable demand	4	40
Insufficient supply	3	30
Lack of machines	1	10
Lack of capital	1	10
Other	3	30

5.2 Procurement

Finger millet was usually sourced from traders (69%) and agents (23%). Interestingly, no company sourced finger millet directly from farmers, whereas two companies sourced sorghum from farmers (Table 26). Traders (73%) were the most important supplier for sorghum followed by agents (27%).

Most companies reported their main source of finger millet and sorghum to be Kenya (nine companies each), followed by Uganda (seven and five companies, respectively) and Tanzania (four and five companies, respectively). More companies would be interested to source finger

millet from Tanzania, but an export ban had restricted imports. For companies sourcing from Kenya, between 72% and 75% of the raw material came from Kenya, compared to 62% and 67% in the case of Uganda and 26% to 29% in the case of Tanzania. This demonstrates limitations in trade between Kenya and Tanzania.

Within Kenya, Western Kenya ranked first for both crops, which is in line with the regional production of sorghum and finger millet. The concentration in Western Kenya highlights the potential to establish local/regional collection centers to improve market access for farmers and link them directly with processors. However, the willingness of processors to invest in such collection centers was low.

Table 26: Finger millet and sorghum suppliers, Kenya

	Finger millet		Sorghum	
	No.	Percent	No.	Percent
<i>Supplier</i>	<i>N=13</i>		<i>N=11</i>	
Farmer	-	-	2	18
Trader	9	69	8	73
Agent	3	23	3	27
Market	1	8	/	/
<i>Sources of raw material</i>	<i>N=13</i>		<i>N=11</i>	
Kenya	9	75	9	72
Uganda	7	67	5	62
Tanzania	4	29	5	26
<i>Regional sources of raw material in Kenya</i>	<i>N=8</i>		<i>N=8</i>	
Western Kenya	8	100	8	100
Eastern Kenya	-	-	3	38
Other	3	38	1	13

A relatively high number of companies (62%) had experience with contracting farmers (Table 27). However, this strategy had failed, mostly for logistic reasons. Companies complained of the need to be permanently in touch with farmers to ensure successful production and supply. Transport logistics were also more complex than if companies were supplied by traders. The same reasons were given by companies that had no experience with sourcing directly from farmers. Where companies have discontinued sourcing directly from farmers, these links may be difficult to re-establish.

Informal arrangements were the most common business model between processors and their suppliers (62%). Processors had a regular supplier who knew their requirements and on whom they called when they needed raw material. Prices were negotiated when raw material was ordered. Some processors collected the raw material themselves, while others had it delivered. The timing of payment was flexible: some processors paid a few weeks after delivery while others had to pay immediately.

Table 27: Business models between suppliers and processors, Kenya (n=13)

	Institutional arrangement		Experiences in contracting farmers		
	No.	Percent		No.	Percent
Contract	2	15	No	5	38
Informal	8	62	Yes	8	62
Spot market	3	23			

For both crops, the most important challenges in procurement were seasonal fluctuations of supply (62% in case of finger millet and 55% in case of sorghum) and low raw material quality (54% and 55%, respectively) (Table 28). Proposed solutions included buying directly from farmers (44% and 43%, respectively), support and promotion of production of the two crops (33% and 57%, respectively) and training of farmers in post-harvest handling (33% and 43%, respectively). These results demonstrate the potential to link farmers directly with processors, although some processors had stopped sourcing from farmers. On the other hand, in Kenya as elsewhere, processors expected third parties to intervene to improve the performance of the sector, for example by training farmers.

Table 28: Procurement challenges and solutions, Kenya

	Finger millet		Sorghum	
	No.	Percent	No.	Percent
<i>Challenges</i>	<i>N=13</i>		<i>N=11</i>	
Seasonal fluctuations of supply	8	62	6	55
Low quality of raw material	7	54	6	55
Price increases and fluctuations	3	23	3	27
Other	2	15	1	9
<i>Solutions</i>	<i>N=9</i>		<i>N=7</i>	
Government to support production	3	33	4	57
Buy directly from farmers	4	44	3	43
Training on post-harvest handling for farmers	3	33	3	43
Other	3	33	2	29

Nine processors (69%) stated that their demand for finger millet had increased in the last five years. Two processors stated constant demand and explained that they preferred to keep their production at a constant level. Two processors who reduced their demand explained that raw material had become too expensive. For sorghum, seven processors (64%) stated an increasing demand over the last five years. Two stated constant demand due to fluctuating raw material prices. Two processors decreased demand in response to reduced market demand. Nevertheless, almost all processors (12 in case of finger millet and nine in case of sorghum) planned to increase their demand, but stressed that their plans might be restricted by the availability of sorghum and finger millet.

5.3 Processing

Table 23 showed that processors produced pure and blended finger millet and sorghum flours. Even though there were no standard recipes for blended flours, in case of scarcity processors could not easily replace finger millet or sorghum by other crops: only one finger millet and two sorghum processors stated that they could increase the share of other crops (e.g. soya, maize or amaranth) in these flours.

Few processors could identify alternative products like cereals and snack bars. They reported that current consumer preferences restricted the development of alternative products. Nevertheless, all processors saw a high potential for different kinds of finger millet and sorghum flours as consumers were becoming more health-conscious and were returning to traditional food crops.

Six processors pointed out challenges in the flour production, chiefly the low quality of the raw material, which made cleaning labour-intensive as appropriate machines were not available. The fact that fewer processors mentioned problems and that fewer problems were mentioned suggests that the processing sector in Kenya was more advanced than elsewhere.

5.4 Marketing

Supermarkets were the most important customer for finger millet (85%) and sorghum (82%) processors (Table 29). Smaller retail shops ranked second (23% and 36%, respectively). Wholesalers and schools were customers on a minor scale. For both crops, customers were mainly located in Nairobi (77% and 73%, respectively). Some companies (five and four, respectively) also supplied customers in Central Kenya, although only two were located there. Companies in Western Kenya supplied customers in this area but some only supplied customers in Nairobi. In contrast to Tanzania and Uganda, processing companies in Kenya were already established in major production areas where they sold ready-processed flour instead of 'exporting' raw material and 'importing' processed goods. Western Kenya may therefore be a promising region for linking farmers to processors.

Table 29: Buyers of finger millet and sorghum flour, Kenya

	Finger millet		Sorghum	
	No.	Percent	No.	Percent
<i>Customers</i>		<i>N=13</i>		<i>N=11</i>
Supermarkets	11	85	9	82
Small retail shops	3	23	4	36
Wholesalers	3	23	2	18
Individuals	2	15	2	18
Schools	2	15	2	18
Hospitals	1	8	1	9

Others	2	15	2	18
<i>Location of customer</i>	<i>N=13</i>		<i>N=11</i>	
Nairobi	10	77	8	73
Central	5	38	4	36
Western	3	23	3	27
Coast	2	15	2	18
Countrywide	3	23	1	9

Again, informal arrangements were the most common business arrangement between processors and buyers (83%) (Table 30). Those arrangements were most common when supplying supermarkets or retail shops. In these cases, the supermarket made a written purchase order and the processor delivered the quantity requested to the supermarket. Prices were fixed once and processors needed to inform supermarkets in advance if they wanted to increase prices. However, supermarkets did not accept monthly price fluctuations. Supermarkets paid for the product a couple of weeks after delivery. Although purchase orders were made by supermarkets and retail shops, some processors visited the shops to check if their flour was still on the shelf and to advertise it again. Processors stated that they could not always trust the automated purchase order system. Larger companies sometimes had written contracts with supermarkets, which in general worked in the same way as informal arrangements.

Table 30: Institutional arrangements between processors and buyers, Kenya (n=12).

Institutional arrangement	No.	Percent
Contract	4	33
Informal arrangement	10	83
Spot market	4	33

All except one processor reported there was sufficient demand for their flour. However, some faced challenges in marketing their products, of which the most important were the lack of consumer awareness and preferences for cheaper products (50%) (Table 31). Other problems included timely payment and competition from other processors (20% each). However, processors in Kenya faced fewer problems than elsewhere. Companies (88 %) recommended that government promote the consumption of sorghum and finger millet flours, although some companies had the financial resources to advertise themselves.

Table 31: Marketing challenges and solutions, Kenya

Challenges (N=12)	No.	Percent	Solutions (N=8)	No.	Percent
None	2	20	Product promotion	7	88
Consumer preferences	6	50	Other	3	38
Payment problems of customers	2	20			
High competition	2	20			
Other	3	25			

Although processors could not provide precise figures, most (11) stated that market demand increased in the last five years and almost all (12) also expected demand to grow in the future. However, market demand was expected to increase more strongly for finger millet than for sorghum products.

5.5 Quality, grades and prices

As in Tanzania and Uganda, Kenyan processors had quality requirements (Table 32). The most important for both crops were cleanliness (85% and 73%, respectively) and moisture content (77% and 82%). Dirty or wet raw material could be used but required cleaning and drying, which reduced profits for processors. More than half the processors were not satisfied with the quality of the delivered raw material (38% and 45%, respectively). The biggest problem was the contamination of raw material. Those processors who were satisfied stated that they had educated their suppliers about their quality standards. Most processors (75%) were willing to pay a price premium, but stressed that profit margins were already low, and that they would only agree to a price premium with selected, trustworthy suppliers.

Ten out of 13 processors also stated the quality requirements of buyers. The most important was attractive packaging (60%), followed by a Kenya Bureau of Standards (KEBS) certificate, which is required by supermarkets. Good flour quality and colour were also mentioned, but not further specified. Medium to large scale companies should not have problems meeting these requirements.

Table 32: Quality requirements of processors and buyers, Kenya

	Finger millet		Sorghum	
	No.	Percent	No.	Percent
<i>Quality requirements of processors</i>	<i>N=13</i>		<i>N=11</i>	
Cleanliness	11	85	8	73
Moisture	10	77	9	82
Color	5	38	6	55
Free from pest damage	3	23	3	27
Other	3	23	4	36
<i>Satisfaction with crop quality</i>				
No	8	52	6	55
Yes	5	38	5	45
	Finger millet and sorghum			
<i>Willingness to pay price premium (N=12)</i>	<i>No.</i>		<i>%</i>	
No	3		25	
Yes	9		75	
<i>Quality requirements of buyers (N=10)</i>				
Nicely packed	6		60	
KEBS	5		50	
Good quality flour	4		40	
Color	2		20	

Although many processors had quality requirements, few applied grades (33% and 9%, respectively) (Table 33). Moreover, processors had their own grading criteria (e.g. colour, cleanliness). Processors did not provide information on price differentials between the first and second grades.

Finger millet and sorghum prices fluctuated according to the season. On average, processors paid 49 KSh/kg of finger millet and 38 KSh/kg of sorghum. In times of scarcity, prices increased to 58 KSh/kg and 50 KSh/kg, respectively, whereas in the low season prices dropped to 49KSh/kg and 38 KSh/kg, respectively. Flour prices differed between pure and blended and also between finger millet and sorghum. However, since few processors produce these flours these figures may not be representative.

Table 33: Grades, seasonality and prices for finger millet and sorghum, Kenya

	Finger millet		Sorghum	
	No.	Percent	No.	Percent
<i>Application of grades</i>	N=12		N=11	
No	9	67	10	91
Yes	4	33	1	9
<i>Seasonality</i>	<i>Month</i>		<i>Month</i>	
Low season	December to May		December to May	
High season	June to November		June to November	
<i>Mean raw material prices</i>	<i>KSh/kg</i>	<i>US\$/kg</i>	<i>KSh/kg</i>	<i>US\$/kg</i>
Low season	58	0.66	50	0.58
High season	37	0.43	26	0.30
Average	49	0.57	38	0.44
<i>Mean flour prices</i>	<i>KSh/kg</i>	<i>US\$/kg</i>	<i>KSh/kg</i>	<i>US\$/kg</i>
Pure flour	91	1.06	97	1.13
Lishe flour	112	1.31	84	0.98

5.6 Needs

Information on potential output markets was the most important information need reported by processors (75%), followed by raw material prices (50%) (Table 34). Potential suppliers and the nutritional value of finger millet and sorghum were also important information needs. Traders/market (55%) were the most important source of information, with networks and newspaper ranked second (33%) and third (25%), respectively. Almost half the processors stated that they required no additional information. Others were interested in information on output markets and potential suppliers. However, almost every processor had different requirements, making it difficult to improve information systems.

Table 34: Market information and sources of information, Kenya (n=12)

	No.	Percent		No.	Percent
<i>Relevant information</i>			<i>Sources of information</i>		
Markets (output)	9	75	Market/trader	6	50
Prices (raw material)	6	50	Networks	4	33
Supplier	4	33	Newspaper	3	25
Nutritional value	2	17	Internet	2	17
Other	2	17	TV	2	17
<i>Missing information</i>			Other	1	8
No	5	42			
Yes	7	58			

Not all processors expected support from the government or research institutions (Table 35). Those that did stressed the need for greater support to finger millet and sorghum production.

This included provision of inputs as well as training, particularly on post-harvest management. Two processors also requested increased access to credit for processors and two processors requested more market research.

Table 35: Governmental and other support needed for finger millet and sorghum sector, Kenya (n=9)

Governmental support	No.	Percent	Research support	No.	Percent
Support production (inputs, technologies)	7	78	Support production	6	66
Access to credits for processors	2	22	Market research	2	22
Other	4	44	Other	2	22

5.7 Conclusions

Of the three countries, Kenya has the most advanced processing sector with many medium to large scale flour processors that have added sorghum and finger millet flour to their portfolio to take advantage of emerging markets. The most important market for finger millet and sorghum flour was Nairobi, but Central and Western Kenya, where finger millet and sorghum is produced and some processors are based, were also important markets. Kenya's relatively good infrastructure and the short distance from Nairobi to other markets may have encouraged the concentration of processing and hindered decentralization. In terms of volume, finger millet was far more important than sorghum. Although they still serve a niche market, flour from both crops was found in all supermarkets. Demand was driven by growing urbanization and rising middle-class income, which had increased consumption of weaning foods. Almost all processors reported that demand for finger millet and sorghum products had increased in the last five years and was expected to increase in the future, with expectations higher for finger millet than for sorghum.

Even long-established companies faced challenges, however. On the supply side, seasonal supply fluctuations and low raw material quality were the most prevalent problems, although more than two-thirds of the processors had formal contracts or informal arrangements with their suppliers. Finger millet and sorghum are not widely grown in Kenya and were sourced from neighboring countries like Uganda and Tanzania. Periodic export bans reduced the availability of imports. Moreover, in Uganda Kenyan companies competed for finger millet with local buyers. Consumer preferences were the most important challenge for processors. They believed that demand would be higher if consumers were more aware of finger millet and sorghum products, their utilization, and health benefits.

6. Country results: Uganda

6.1 Sector profile

Although the finger millet sector is relatively more developed in Uganda, utilization and processing of finger millet flour was still dominated by medium-scale companies. Some had processed finger millet since they were established while others had recently begun processing finger millet to benefit from new market opportunities. Sorghum was far less important than finger millet and was not handled by the formal processing sector. Thus, only finger millet processors were interviewed in Uganda.

In Uganda, 10 of the 15 interviewed enterprises were flour processors while the remaining five were millers (Table 36). While flour processors bought grain, processed it in-house and sold it as flour, millers had a store where they offered milling services for several crops. Customers brought their own grain to the mill, paid for milling services, and took the flour home.

On average, processors had 16 employees, had been in the business for 14 years, and in the finger millet business for nine years. The two most important products were pure finger millet flour (nine out of 10 companies) and millet-soya flour (all companies). Unlike Tanzania and Kenya, the nutritious blended flours *lishe* or *uji* did not exist in Uganda. As in the other two countries, blended finger millet flours did not always contain the same amount of finger millet, indicating that there were no product standards.

Table 36: Company profiles, Uganda (n=15)

	No.	Percent
Flour processors	10	66
Millers	5	33
Companies dealing with finger millet	15	100
No. of employees (mean)	16	-
Years in business (mean)	14	-
Years processing finger millet (mean)	9	-
<i>Main finger millet products¹</i>	<i>No.</i>	<i>Percent</i>
		<i>finger millet</i>
Pure flour	9	100
Millet – soya flour	10	80
Millet – cassava flour	4	50
Other blended flours ²	2	40-75

¹ Percentage here refers to the share of finger millet and sorghum that the respective flour contains.

² Other flour blends include finger millet-rice flour and finger millet-amaranth flour.

Finger millet had the highest turnover (Table 37). However, maize turnover is underestimated because the millers and one processor whose main business was maize and wheat reported only their turnover for finger millet. Otherwise, maize would rank first. Millers had a higher total turnover and also a higher turnover per enterprise. Thus, processors accounted for a smaller

share of the flour market than millers. Soya had a lower total turnover, but a higher turnover per company than finger millet. Since soya accounted for only 20% in finger millet-soya flour, other soya flours must also be produced.

Table 37: Turnover of different crops, Uganda (n=24)

	Mt/year (total)	MT/year (mean)	No. of companies
Finger millet total	1,637	117	14
Processors	272	30	9
Millers	1,365	273	5
Maize	540	270	2
Soya	208	35	6
Rice	74	19	4
Sorghum	32	8	4
Cassava	24	12	2
Plantain	12	12	1

Only one processor reported working at full capacity (Table 38). Other processors and millers were not working at full capacity chiefly because of unreliable demand (54%), lack of capital (31%) and insufficient supply (31%). Thus both input and output markets constrained finger millet processing.

Table 38: Reasons for not working at full capacity, Uganda (n=14)

	No.	Percent
Companies working at full capacity	1	0
<i>Reasons for not working at full capacity</i>	<i>N=13</i>	
Lack of capital	4	31
Unreliable demand	7	54
Lack of machines	2	15
Power fluctuations	1	8
Insufficient supply	4	31
Transport costs and availability	2	15
Other	2	15

6.1 Procurement

Traders were the most important supplier of finger millet (87%) (Table 39). Three millers as well as all processors dealt with them. Individuals ranked second, but only for millers. In addition, two processors sourced from markets, and one Asian-managed company sourced from a company that imported finger millet from India. This company supplied the Asian community which valued Indian finger millet.

Since milling shops exist all over the country, customers in Kampala came from the city itself or from nearby towns and villages. Suppliers came mostly from Kampala (78%). Of the 15

enterprises, 11 knew from where in Uganda their supplier/customer sourced finger millet. Most suppliers sourced from Western Uganda (82%), followed by Northern Uganda (64%). Other regions mentioned were Eastern (36%) and Central Uganda (18%). The main production areas were Northern, Eastern and South-Western Uganda. However, finger millet was sourced from these regions not because these were the main production areas but because of the high quality of the raw material.

Table 39: Finger millet suppliers, Uganda

	Supplier (N=15)		Location of supplier (N=9)		Regional source (N=11)			
	No.	%	No.	%	No.	%		
Trader	13	87	Kampala	7	78	Eastern Uganda	4	36
Individual	4		Western	2		Western Uganda	9	
		27	Uganda		22			82
Import	1		Northern	2		Northern	7	
company		7	Uganda		22	Uganda		64
Market	2	13	India	1	11	Central	2	18

Obviously, millers had spot market transactions with their customers. For processors, however, informal arrangements ranked first (80%) (Table 40). Only one processor dealt with their supplier through spot market transactions, while two processors had formal contracts. In informal arrangements, processors called their regular supplier to make an order that was delivered or collected by the processor. Prices were usually fixed when the order was made and only in one case were prices fixed for several months. Processors had to pay when the raw material was delivered or collected. Some bought raw material on credit. The most important condition was delivery of the required quantity, with payment terms second.

Only 30% of the processors had experience of sourcing directly from farmers. However, none of them was still supplied by farmers, because contract enforcement with farmers was too challenging. Processors that had never sourced from farmers reported that farmers were located too far away, making it time-consuming, and that direct-sourcing was efficient only for larger quantities.

Table 40: Business models between suppliers and processors, Uganda (n=10).

	Institutional arrangement		Experiences in contracting farmers		
	No.	Percent	No.	Percent	
Informal	8	80	No	7	70
Spot market	1	10	Yes	3	30
Contract	2	20			

Ugandan processors faced several procurement challenges (Table 41). The first was the low quality of the raw material (80%), followed by lack of transportation facilities and transport costs (60%). Only 20% mentioned problems with seasonal fluctuations in supply. Since processors stated that 'getting the required quantity' was an advantage of their respective business models,

it seems that most processors have already found a solution to the problem of availability. For the other problems, eight processors recommended solutions, of which the most important was training farmers in post-harvest-handling (50%).

Table 41: Procurement challenges and solutions, Uganda

Challenges (N = 10)	No.	Percent	Solutions N=8	No.	Percent
Low quality of raw material	8	80	Training on post-harvest handling for farmers	4	50
Transportation facilities and costs	6	60	Own vehicle	1	13
Seasonal fluctuations of supply	2	20	Identify alternative suppliers	2	25
Lack of capital (to buy enough produce at harvest time)	1	10	Government to support production	2	25
Other	4	40	Other	3	38

All processors stated that their demand for finger millet had increased in the last five years, and planned to expand production in the future in response to this growing demand.

6.3 Processing

Table 36 showed that processors produced pure and blended finger millet flours. As in Kenya and Tanzania, different flours suited the needs of different customers and when supply was scarce finger millet could not easily be replaced by other crops. Only one finger millet processor stated they could use other crops (sorghum and cassava). Another reported that to keep the business running they would sell more rice and soya-maize flour. The most popular alternative products identified were bread (47%), followed by animal feed (33%) and soft drinks (27%) (Table 42). Production was restricted by consumer preferences (40%) and lack of knowledge about how to produce alternative products (40%).

Table 42: Alternative finger millet products, Uganda

Alternative products (N=15)	No.	Percent	Reasons for non-production (N=10)	No.	Percent
None	4	27	Consumer preferences	4	40
Bread	7	47	Lack of knowledge about production	4	40
Animal feed	5	33	Low innovation level	3	30
Soft drinks	4	27	Millet shortage in the future	1	10
Cakes & cookies	2	13			
Oats	2	13			
Local brew	1	7			

Most processors and all millers faced challenges in the processing sector. The most important were high power tariffs (64%), followed by power cuts (36%) (Table 43). Expensive/unavailable packaging (21%), high losses due to low raw material quality (21%) and lack of capital (21%) ranked third. Only 10 processors could suggest solutions to these challenges. Stable power was mentioned most often (40%), followed by credit facilities (30%) and training on processing techniques (30%). As in the case of Tanzania, most problems were difficult to solve by processors themselves and external support was needed.

Table 43: Processing challenges and solutions, Uganda

Challenges (N=14)	No.	Percent	Solutions (N=10)	No.	Percent
High power tariffs	9	64	Stable power	4	40
Power cuts	5	36			
Lack of capital	3	21	Approach credit facilities	3	30
Expensive/unavailable packaging	3	21	Training on processing techniques	3	30
High losses due to dirty raw material	3	21	Buy a generator	1	10
Lack of machinery/ facilities	2	14	Buy own machines	2	20
Other	3	21	Other	1	10

6.4 Marketing

Millers' customers were traders and individuals. The most important customers for processors were supermarkets (90%), followed by small retail shops (70%) (Table 44). Others included schools, hospitals and NGOs (50%), individuals (40%), and wholesalers (30%). On average, processors had two to three different types of customers. All processors had at least one customer in Kampala. In addition, two sold their products countrywide and two sold them in Eastern Uganda. One processor sold flour in Western and Central Uganda, respectively. This indicated a relatively small return of processed flour to the major areas of finger millet production. We assume that, in other parts of the country, flour is mostly sourced from millers or ground at home.

Table 44: Buyers of finger millet flour, Uganda (n=10)

Buyer	No.	Percent	Location of buyer	No.	Percent
Supermarkets	9	90	Kampala	10	100
Small retail shops	7	70	Countrywide	2	20
Schools/Hospitals/ NGOs	5	50	Eastern Uganda	2	20
Individuals	4	40	Western Uganda	1	10
Wholesalers	3	30	Central Uganda	1	10

Institutional arrangements between millers and buyers were again only spot market transactions. By contrast, only 40% of the processors dealt with their buyers through spot market transactions, while 40% had informal arrangements with their buyers (Table 45). Contracts – primarily between processors and supermarkets – ranked first (70%). These took the form of a local purchase order placed by the supermarket. New orders were placed when the supermarket ran out of finger millet. The order also fixed the time of payment, usually on a monthly basis, and the price. If the processor wanted to change the price, this had to be discussed in advance with the supermarket.

Table 45: Institutional arrangements between processors and buyers, Uganda (n=10).

Institutional arrangement	No.	Percent
Contract	7	70
Informal arrangement	4	40
Spot market	4	40

Challenges also existed in the marketing of finger millet flour (Table 46). Payment problems with customers ranked first (60%). Flour was often sold on credit, particularly to supermarkets and retail shops and payment was made only when the product was sold. Even then, many retailers delayed payment. Low demand/lack of awareness of finger millet flour was mentioned by 40%.

Only seven processors could propose solutions to these problems. Promotion of finger millet products was most often mentioned (40%), followed by support from the government (20%). One processor each thought about improving the packaging material and identifying alternative markets. The low number of responses suggests that it was difficult for processors to find solutions for their problems themselves.

Table 46: Marketing challenges and solutions, Uganda

Challenges (N=10)	No.	Percent	Solutions (N=7)	No.	Percent
Payment problems of customers	6	60	Promotion of products	4	40
Low demand/lack of awareness	4	40	Support from government	2	20
Low/unreliable prices	2	20	Improve packaging material	1	10
High competition	1	10	Identify alternative markets	1	10
Expensive adverts	1	10	Other	1	10
High transport costs	1	10			
Others	2	20			

Although four processors reported low demand as a challenge, the majority of processors stated that there was sufficient demand for their flour, and that demand had increased in the last five years and that they expected demand to grow in the future.

6.5 Quality, grades and prices

All processors and three millers stated that they had specific quality requirements for their suppliers/customers (Table 47). Eighty-five percent mentioned cleanliness as a quality requirement, meaning that the raw material should not be contaminated with sand and dust. Fifty four percent explicitly stated that the raw material should not contain stones. Colour (red or brown) ranked third (46%). Only four processors/millers (31%) were satisfied with quality. Nine in ten processors – including those reportedly satisfied with grain quality – were willing to pay a price premium. As in Tanzania and Kenya, the quality of finger millet was a major issue in the processing sector.

Eighty percent of processors stated that they preferred a specific variety. Rather than being able to name the variety, however, they referred to the region where it was produced or to a particular trait. Thus, the answers reflected processors' preference for finger millet from a certain region.

Quality requirements were also imposed by markets, even though three processors stated that their buyers did not have any requirements. For the others, clean flour ranked first (40%), followed by pure (instead of blended) finger millet flour (20%) and flour with a good smell and taste (20%). Good packaging, which was important in Tanzania, was only mentioned by one processor in Uganda.

Table 47: Quality requirements of processors and buyers, Uganda

	No.	Percent		No.	Percent
<i>Quality requirements of processors (N=13)</i>			<i>Quality requirements of buyers (N=10)</i>		
Cleanliness	11	85	None	3	30
No stones	7	54	Clean flour	4	40
Brown/red color	6	46	Pure millet flour	2	20
Size of grains	3	23	Smell and taste	2	20
Maturity	2	15	Nicely packed	1	10
Other	6	46			
<i>Satisfied with delivered quality (N=13)</i>					
No	9	69			
Yes	4	31			
<i>Willingness to pay price premium (N=10)</i>					
No	1	10			
Yes	9	90			
<i>Preference for certain varieties (N=10)</i>					
No	2	20			
Yes	8	80			

Although all processors had quality requirements, only two applied grades (Table 48). However, these referred not to the quality criteria above, but to the region where the finger millet came from. Processors did not provide price information for grades. However, prices fluctuated according to the season. When finger millet was scarce, prices increased up to 2,000 USh/kg. In the high season, processors paid on average 1,650USh/kg. On average, processors reported paying 1,700 USh/kg. One kg of finger millet flour sold for 2,500 USh/kg, lower than the price of finger millet – soya flour, which sold for 2,750 USh/kg. However, raw material prices for cassava might be higher than those for sorghum. Compared to Tanzania, the profit margin of processors in Uganda was low.

Table 48: Grades, seasonality and prices for finger millet, Uganda

Grades and seasons	No.	Percent	Prices	USh/kg	US\$/kg
<i>Application of grades (N=10)</i>			<i>Mean raw material prices</i>		
No	8	80	Low season (N=6)	2,000	0.79
Yes	2	20	High season (N=6)	1,650	0.65
<i>Grading criteria (N=2)</i>			Average (N=10)	1,700	0.79
Region of supply	2	-			
<i>Seasonality</i>			<i>Mean flour prices</i>		
	<i>Month</i>		Pure flour (N=9)	2,500	1.0
Low season	May to August		Millet-soya flour (N= 7)	2,750	1.1
High season	August to January				

6.6 Market information and sub-sector support

All ten processors accessed market information (Table 49). Most important for them was information about input prices (60%), output markets (40%) and potential suppliers (20%). Processors accessed information mostly through traders and markets (60%), radio (40%) and newspapers (40%). Six processors mentioned the need for information about regional/international markets (30%) and information about farmers (30%), which suggests some unexploited potential for direct linkages between processors and growers.

Table 49: Market information and sources of information, Uganda (N=10).

	No.	Percent		No.	Percent
<i>Accessed information</i>			<i>Sources of information</i>		
Prices	6	60	Market/trader	6	60
Markets	4	40	Radio	4	40
Potential suppliers	2	20	Newspaper	4	40
Other ¹	5	50	TV	1	10
<i>Missing information</i>			Competitor	1	10
None	4	40	Other ¹	7	70
Regional/intern. markets	3	30			
Information about farmers	3	30			
Finger millet varieties	2	20			
Packaging	1	10			

¹ Other includes aspects like information about packaging material, millet varieties and production seasons.

² Other includes information sources like customers, internet and seminars.

Processors and millers regarded the low demand and poor reputation of finger millet (67%) as barriers to a vibrant finger millet sector (Table 50). In some regions, finger millet was not consumed at all, while in others it was seen as a 'poor man's crop'. Production problems were mentioned by 50% of the respondents. Among other barriers they referred to low output and harsh production conditions. Another 42% of processors mentioned the low quality of raw material as a barrier. Seventy-eight percent of the respondents wanted greater promotion and producer support by the government, followed by promotion of finger millet consumption (67%).

Table 50: Barriers to a vibrant finger millet sector and lessons learned from the maize sector, Uganda

Barriers (N=12)	No.	Percent	Lessons learned (N=9)	No.	Percent
Low demand/reputation	8	67	Promote/support production	7	78
Production problems	6	50	Promote consumption	6	67
Low quality	5	42	Mechanization	2	22
Other	1	8	Other	1	11

Learning from experience with maize, processors and millers mentioned several areas where the government could support the millet sector (Table 51). Fifty four percent mentioned training

farmers and access to credit (for farmers and processors), respectively. Availability of machines for both farmers and processors was mentioned by 46%, while other topics included promotion of millet consumption (23%) as well as production (15%). Researchers were expected to develop and provide improved finger millet varieties (50%).

Table 51: Governmental and other support needed for the finger millet sector, Uganda

Governmental support (N= 13)	No.	Percent	Research support (N=12)	No.	Percent
Training of farmers (production/post-harvest)	7	54	Release/provide improved varieties	6	50
Make credit available	7	54	Training of farmers (quality and production)	3	25
Make machines available	6	46	Other ¹	6	50
Promote consumption	3	23			
Support production (inputs, technologies)	2	15			
Other	3	23			

¹Others include aspects like millet preservation, alternative millet products, mechanization of production.

6.7 Conclusions

Although more developed than in Tanzania, finger millet processing in Uganda was still largely semi-industrial and dominated by medium-scale companies. Some had processed finger millet since they were established while others had started to deal with finger millet to broaden their product portfolio. Sorghum was not handled by the formal processing sector. Most finger millet in Uganda was still processed by milling shops. Processors mainly supplied supermarkets and small retail shops, which were still minor market outlets. However, in the future more consumers were expected to buy in retail shops and supermarkets. To explore the potential of finger millet flour in supermarkets and retail shops, consumer preferences and the interest of supermarkets need to be further explored. The majority of processors stated that market demand increased in the last five years and that they also expected demand to grow in the future. Currently, the market for finger millet flour was primarily in Kampala and few processors sold their products in other parts of the country. Thus, the potential to expand to other areas was limited.

On the supply side, the most important challenges were the low quality of finger millet grain together with lack of transportation facilities and high transport costs. Seventy percent of the processors had informal arrangements with their suppliers, but these did not overcome the quality problem. Transportation was a problem because most processors needed to collect the raw material from their suppliers. Linking processors directly with farmers to enable exchange about quality requirements and improve raw material quality seemed to be difficult. Only three processors had experience of sourcing from farmers but they had discontinued this practice. This system required too much effort because production zones were distant from Kampala and processors handled only small quantities. Sourcing directly from farmers was also not mentioned by processors themselves as a possible solution. Seasonal supply fluctuations were a problem for only a few processors because finger millet is widely cultivated in Uganda.

On the demand side, processors complained that many customers only paid once the product had been sold while others delayed payments. As finger millet flour is a niche product, processors were not in a strong position to demand prompter payment. Although most processors reported lack of consumer awareness as a challenge, they also stated that the majority of processors stated that market demand had increased in the last five years and they expected this to continue in the future.

7. General conclusions

The flour processing sector in all three countries operated through two systems. Consumers bought grain and took it to milling shops to be ground into flour, or they bought ready-packed flour which was sold in retail shops and supermarkets. Ready-packed flour was supplied by formal processing companies. Most sorghum and finger millet flour was still processed by milling shops. Supermarkets served only a minority of consumers. Over the longer term, urbanization and a growing middle-class are expected to increase their market share. Nevertheless, because sorghum and finger millet flours are more expensive than flours made from maize or wheat, they will remain niche products.

Although the company profile of finger millet and sorghum processors differed between the three countries, they faced some of the same challenges. On the supply side, the biggest challenge reported was the poor quality of the raw material. There are several options to improve grain quality. One is for processors to establish direct linkages with farmers who receive a premium for cleaner grain. Improved communication on processors' quality requirements could reduce the contamination that occurs when many middlemen are involved in the supply chain. In Kenya, where some companies processed relatively high quantities of finger millet and sorghum, it would be feasible to establish regional collection centers. Farmers would also benefit from higher farm gate prices and a reliable output market when supplying processors directly. However, processors that had experience of sourcing directly from farmers reported high transaction costs and problems with enforcement of contracts. Companies that see finger millet and sorghum flour as niche products lacked the incentive to invest in procurement. They preferred to contract through third parties or buy direct from private traders who delivered to the factory gate. Linking large-scale processors with farmers, therefore, requires a business model in which a third party is responsible for aggregation, quality control, enforcement of contracts, and delivery to the processor. Small- and medium-scale companies lack the capacity to establish linkages with farmers themselves. For them, improving access to capital would allow them to invest in machinery that could clean larger volumes of grain. This would enable them to solve at least some of their problems themselves.

On the demand side, the major challenge found in all three countries was a lack of consumer awareness on the nutrition and health benefits of sorghum and millet flour. Large companies can be responsible for advertising their products. However, consumption can also be promoted by external actors that provide consumers with information about the health benefits of finger millet and sorghum. Given the predominance of small- and medium-scale producers in the processing sector outside Kenya, this would require an externally-funded marketing campaign.

Annex 1. Flour processors and millers interviewed

Country	Name of Company	Town	District
Kenya	Crater Flour Mill	Nakuru	Nakuru
Kenya	Glory Poshomill	Nakuru	Nakuru
Kenya	Kisumu Medical and Education	Kisumu	Kisumu
Kenya	Pembe Flour Mill	Nairobi	Nairobi
Kenya	Chaina Feeds Manufacturer	Thika	Thika
Kenya	Nat. Cereals&Produce Board	Kisumu	Kisumu
Kenya	Newday Products Ltd.	Thika	Thika
Kenya	Muus Ltd.	Thika	Kiambu
Kenya	Unga Ltd. Eldoret	Eldoret	Uasin Gishu
Kenya	Kirdi W. Kenya Reg. Centre	Kisumu	Kisumu
Kenya	Nature's Way Health	Kiambu	Kiambu
Kenya	Wanjis Food Industries	Nairobi	Nairobi
Kenya	Peka Knitters Chamba Uji	Nairobi	Nairobi
Kenya	Mama Millers	Thika	Thika
Kenya	Kirinyaga Flour Mills	Nairobi	Nairobi
Kenya	Capwell Industries	Thika	Thika
Kenya	Kabansora Mills Ltd.	Kisumu	Kisumu
Kenya	Unga Ltd. Nairobi	Kisumu	Kisumu
Kenya	East African Breweries Ltd.	Kisumu	Kisumu
Tanzania	Ari Food Products	Marangu	Moshi rural
Tanzania	JAGEF	Moshi	Moshi rural
Tanzania	Feceh Food Processing	Moshi	Moshi Council
Tanzania	Masanja Family	Moshi	Moshi Council
Tanzania	V&E Food processor company	Moshi	Moshi Council
Tanzania	Frene Arusha Group	Arusha	Arusha
Tanzania	Afri Youth Pride	Arusha	Arusha
Tanzania	Made Foods Arusha	Arusha	Arusha
Tanzania	Nyerifarm	Arusha	Arusha
Tanzania	Rest Food Products	Arusha	Arusha
Tanzania	Jamahedo Health Food Companie	Arusha	Arusha
Tanzania	Esfrita Group	Moshi	Moshi Council
Tanzania	Jihadhari Group	Dar Es Salaam	Temeke
Tanzania	Frahbo Enterprise	Dar Es Salaam	Ilala
Tanzania	Power Foods	Dar Es Salaam	Kinondoni
Tanzania	Charis Food Enterprises	Dar Es Salaam	Ilala
Tanzania	Pamtoto Yangu Lishe Flour	Dar Es Salaam	Temeke
Tanzania	Unga wa Kimea	Dar Es Salaam	Temeke

Tanzania	Nzasa Women Group	Dar Es Salaam	Temeke
Tanzania	Besa Food Supply	Dar Es Salaam	Kinondoni
Tanzania	Wanawake Elimika (Waneda)	Dar Es Salaam	Temeke
Tanzania	Ongoma Food - Mama Sili Food	Dar Es Salaam	Temeke
Tanzania	Solile Grain Mill (New Suraz)	Dar Es Salaam	Kinondoni
Tanzania	Tanzania Breweries Ltd.	Arusha	Arusha
Tanzania	Alomar Food Company	Dar Es Salaam	Ilala
Tanzania	Suji Soya	Dar Es Salaam	Kinondoni
Uganda	Kendo mills	Bukasa	Kampala
Uganda	Kayebe sauce packers	Kasangati	Wakiso
Uganda	Quality Millet Products	Kawempe	Kampala
Uganda	Kakembo and Brothers	Makindye	Kampala
Uganda	The 4Js Natural Foods	Bweyogerere	Wakiso
Uganda	Migadde and sons	Makindye	Kampala
Uganda	Super Agro Food industries	Kawempe	Kampala
Uganda	Makumuga Grain Millers	Banda	Kampala
Uganda	East African Basic foods ltd	Bunga	Kampala
Uganda	Kalu tripple graders	Kisenyi	Kampala
Uganda	Kijjo millers limited	Kisenyi	Kampala
Uganda	Sunday grain millers	Kisenyi	Kampala
Uganda	Yellow star	Kira	Wakiso
Uganda	Sam grain millers	Kisenyi	Kampala

Annex 2. Survey questionnaire



KENYA AGRICULTURAL RESEARCH INSTITUTE

BUSINESS OPPORTUNITIES FOR SORGHUM AND FINGER MILLET

PROCESSING IN KENYA

FACILITATORS'

QUESTIONNAIRE

Rationale of the questionnaire

The aim of this questionnaire survey is to learn about the problems and opportunities for processing sorghum and finger millet in Kenya. To do this, we ask for your kind cooperation in sharing your company's experience with these crops. We particularly want to know about your problems obtaining these crops, what products you make, who you sell to, and what opportunities you see for increasing the demand for sorghum and finger millet products.

Why do we need this information? Until recently, sorghum and finger millet were 'orphan' crops that got little attention from researchers or support from government. But now their market potential is increasingly being recognized in the region.

The information that your company provides will be important in helping us develop a strategy for the finger millet and sorghum sub-sector, which will help to overcome some of the problems that have prevented the growth of markets for these crops in the past. This strategy is being developed as part of the HOPE project (Harnessing Opportunities for Productivity Enhancement of Sorghum and Finger millet), funded by the Bill & Melinda Gates Foundation, which sees market development as the key to benefitting millions of poor farmers in the region.

Survey facilitators

The Kenya Agricultural Research Institute (KARI) is a premier national institution bringing together research programmes in food crops, horticultural and industrial crops, livestock and range management, land and water management, and socio-economics. KARI promotes sound agricultural research, technology generation and dissemination to ensure food security through improved productivity and environmental conservation.

The Eastern Africa Grain Council (EAGC) is a membership-based organization whose mandate is to facilitate, develop, promote and strengthen structured grain trading systems in the Eastern and Southern Africa region. This it achieves through promoting Warehousing Receipting Systems, a robust Market Information System and promoting an enabling Policy environment through advocacy. EAGC currently focuses on six staple (Grain) commodities- Maize, Beans, Wheat, Sorghum, Millet and Rice and has country offices in Uganda and Tanzania and a Nairobi based Secretariat.

The International Crops Research Institute for the Semi-Arid-Tropics (ICRISAT) is a non-profit, non-political organization that conducts agricultural research for development in Asia and sub-Saharan Africa with a wide array of partners throughout the world. Covering 6.5 million square kilometers of land in 55 countries, the semi-arid tropics have over 2 billion people, and 644 million of these are the poorest of the poor. ICRISAT and its partners help empower these poor people to overcome poverty, hunger and a degraded environment through better agriculture. ICRISAT is headquartered in Hyderabad, Andhra, Pradesh, India, with two regional hubs and four country offices in sub-Saharan Africa. It belongs to the Consortium of Centers supported by the Consultative Group on International Agricultural Research (CGIAR).

Note: The data and information collected during this survey will be treated as confidential as stipulated in the Statistics Act 2006 and will only be used strictly for statistical purposes.

Millet and Sorghum Processing Study

Section A: Background Information

- 1.0 Name of the company
.....
- 1.1 Name of the respondent (optional)
.....
- 1.2 Title of the respondent
.....
- 1.3 Contacts:
Town/City
District.....
Cell.....
E-mail.....
- 1.4 No. of employees.....

Section B: Company profile

- 2.0 Briefly explain the role of your company in the grain sector (e.g. miller)
.....
.....
.....
.....
- 2.1 For how many years have you been in the grain processing sector?
.....
- 2.2 How many of these have been in sorghum/finger millet processing? Sorghum:
.....
Finger millet:
- 2.3 Kindly list your major products, starting with the most important one. Please be as specific in the product description as possible (e.g. Name of the product: Wimbi flour – explanation: mixed finger millet – maize flour, ratio 50% -50%).
Sorghum:
Finger millet:
- 2.4 What is your processing capacity for the following crops? Kindly add crops in case some important crops that you process are missing.

Product	Current production in MT/year	Current capacity in MT/year
Finger millet		
Sorghum		
Maize		
Barley		

Wheat		
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2.5 In case you are not operating at full capacity, kindly explain why.

.....

Section C: Procurement of sorghum and finger millet

3.1 Who are your major suppliers for sorghum and finger millet (e.g. brokers, farmers, farmer groups, etc.)? Kindly start with the most important one and provide number of suppliers where possible.

Sorghum
 Finger millet

3.2 Where does your raw material come from (if possible provide information about the regions per country and the % share of produce coming from that country/region)?

Sorghum

Country	% share of product	Region and % share of product
Example: Kenya	20	Kisii (70) and Busia (30)
Uganda	80	Regions are unknown
Kenya		
Uganda		
Tanzania		
Other:		

Finger millet

Country	% share of product	Region and % share of product
Kenya		
Uganda		
Tanzania		
Other:		

3.3 Did your demand for the crops decrease/increase or was it constant in the last 5 years? Kindly give reasons for your answer.

Sorghum

Finger millet

3.4 Kindly describe briefly your business model with your major suppliers (e.g. contract, informal arrangement, spot market transaction, etc.).

.....
.....
.....
.....
.....

3.5 Have you ever tried contracting farmers directly for supply? If yes, kindly share your experiences (kind of contract, how did it work, do you still contract farmers, etc.)

.....
.....
.....
.....

3.6 What are the quality criteria for your suppliers (e.g. colour, purity, etc.)?

Sorghum:

Finger millet:

3.7 Are you satisfied with the quality that your suppliers deliver? Kindly explain your answer.

Sorghum:

Finger millet:

3.8 Do you have different grades for the crops? If yes, kindly provide names and specifications for the grades.

Sorghum:

Finger millet:

3.9 In case you have different grades do you pay different prices per grade? If yes, kindly provide prices per grade and -(metric tons).

Sorghum:

Finger millet:

3.10 In case you do not have different grades:

a) What is your price per metric ton?

Sorghum:

Finger millet:

b) Would you be willing to pay a price premium for especially good quality? If yes, kindly describe which price premium you would pay for which quality upgrade (e.g. 10% price increase for pure variety).

Sorghum:

Finger millet:

3.11 In which month is the most supply and in which month is the least supply of the crops?

Sorghum: Most supply

least supply:

Finger millet: Most supply

least supply:

3.12 What price do you pay in month with most supply and in month with least supply?

Sorghum: Most supply

least supply:

Finger millet: Most supply

least supply:

3.13 What are your major procurement challenges?

Sorghum.....

Finger millet.....

3.14 What could be solutions to overcome your procurement challenges?

Sorghum.....

Finger millet.....

3.15 Do you plan to decrease/increase or have the same demand for these crops over the next three years? Kindly give reasons for your answer.

Sorghum.....

Finger millet.....

Section D: Processing

4.1 Do you produce uniform products or do you differentiate products for different market segments? Please specify products and market segments.

Sorghum.....

Finger millet.....

4.2 What are your substitutes for sorghum and finger millet in case of shortage of these crops?

Sorghum.....

Finger millet.....

4.3 What are sorghum and finger millet products that have market potential in the future?

Sorghum.....

Finger millet.....

4.4 What are the challenges in producing these future products?

Sorghum.....

Finger millet.....

4.5 What challenges do you generally face in the processing sector?

.....

.....

.....
4.6 What solutions/recommendations do you propose?
.....
.....
.....

Section E: Output markets for sorghum and finger millet

5.1 Who are the major buyers of your sorghum and finger millet products? Kindly start with the most important one.

Sorghum.....

Finger millet.....

5.2 Where are your markets for the sorghum and finger millet products that you produce? Kindly provide country and city.

Sorghum.....

Finger millet.....

5.3 Do your buyers have any quality requirements? If yes, kindly explain which.

Sorghum:

Finger millet:

5.4 Kindly describe briefly your business model with your buyers (e.g. written contract, informal arrangements, spot market transaction, etc.).

.....
.....
.....
.....

5.5 What are your selling prices per kg for your three most important sorghum and finger millet products?

Sorghum:

Finger millet:

5.6 Is there enough demand for all your sorghum and finger millet products?

Sorghum:

Finger millet:

5.7 Which companies do you consider as your competitors?

Sorghum.....

Finger millet.....

5.8 What was the change of market demand for your sorghum and finger millet products in the last five years (increase/decrease/stay constant)?

Sorghum:

Finger millet:

5.9 How do you see the future market demand for your sorghum and finger millet products (increase/decrease/stay constant)?

Sorghum.....

Finger millet.....

5.10 Which major challenges do you face in the marketing of your sorghum and finger millet products?

Sorghum.....

Finger millet.....

5.11 What solutions/recommendations do you propose to overcome the challenges?

Sorghum.....

Finger millet.....

Section F: Market information systems for sorghum and finger millet

6.1 What kind of information do you look for? (e.g. potential markets, prices, etc.)

.....
.....

6.2 What are your main sources of information? Kindly give answers according to the information you are looking for. E.g. price information: daily newspaper.)

.....
.....

6.3 What other type of market information do you wish you had access to?

.....
.....

6.4 What kind of support should the government give to the sorghum and finger millet sub-sector?

.....
.....

6.5 How could research institutions support the sorghum and finger millet sub-sector?

.....
.....

6.6 What do you see as the barriers to a vibrant sorghum and finger millet sub-sector?

.....
.....