Socioeconomics
Discussion Paper Series

Series Paper Number 10

Consumer surveys for sorghum and finger millet in Kenya and Tanzania

C Schipmann-Schwarze, A Orr, J Mafuru, W Mulinge
ICRISAT, Nairobi, A.Orr@cgiar.org

10/31/2013

ICRISAT
Science with a human face

International Crops Research Institute
for the Semi-Arid Tropics

Disclaimer

This paper is part of ICRISAT Economics Discussion paper series. This series disseminates the findings of work in progress to encourage the exchange of ideas about a wide array of issues in the area of agriculture for development. An objective of the series is to get the findings out quickly, even if the presentations are less than fully polished. The papers carry the names of the authors and should be cited accordingly. Any comments and suggestions are more than welcome and should be addressed to the author who's contact details can be found at the bottom of the cover page. The findings, interpretations, and conclusions expressed in this paper are entirely those of the authors. They do not necessarily represent the views of the International Crops Research Institute for the Semi-Arid Tropics and its affiliated organizations.

About ICRISAT

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, of whom 644 million are the poorest of the poor. ICRISAT innovations help the dryland poor move from poverty to prosperity by harnessing markets while managing risks – a strategy called Inclusive Market- Oriented development (IMOD). ICRISAT is headquartered in Patancheru near Hyderabad, Andhra Pradesh, India, with two regional hubs and five country offices in sub-Saharan Africa. It is a member of the CGIAR Consortium. www.icrisat.org

CGIAR is a global agriculture research partnership for a food secure future. Its science is carried out by 15 research Centers who are members of the CGIAR Consortium in collaboration with hundreds of partner organizations. www.cgiar.org

This work has been undertaken as part of the

CGIAR RESEARCH PROGRAM ON Dryland Cereals

CGIAR RESEARCH PROGRAM ON Policies, Institutions and Markets

Executive Summary

Sorghum and finger millet are two important cereal crops for farmers in semi-arid areas in Eastern Africa. Both crops are traditionally cultivated for home consumption, but in recent years market demand has increased. This offers new opportunities for smallholders to commercialize production, which is seen as a pathway for prosperity in the dry lands. The HOPE project aims to support smallholder commercialization in Eastern Africa. Understanding consumption patterns for sorghum and finger millet is important for this objective. The purpose of the consumer survey in Kenya and Tanzania was to provide an overview of sorghum and finger millet consumption compared to maize and wheat, and to understand reasons for consumption and non-consumption, in order to help develop strategies to promote sorghum and finger millet consumption. In Kenya, a total of 454 consumers were interviewed. Two urban centres (Nairobi and Kisii) and two rural locations (villages nearby selected urban locations), one each in a sorghum and finger millet production and non-production area were selected for the survey. At each location, consumers were interviewed at three different market outlets (supermarkets, small retail shops and open-air markets). In addition, Nairobi was stratified into three different strata (low, middle and high income) to capture consumption habits of different income areas of the city. The majority of respondents in Kenya consume sorghum and finger millet on a monthly basis. However, finger millet is more widely consumed than sorghum. For both crops, the highest share of consumers is found in rural areas where the crop is grown. In the case of sorghum, rural areas in non-production zones rank second, followed by urban areas in production zones. Urban areas in non-production zones (Nairobi) have the lowest share of sorghum consumers. For finger millet, urban areas in production zones rank second, followed by rural areas in non-production zones. Nairobi again ranks last. In Nairobi, high income areas have lowest share of sorghum and finger millet consumers. Maize is consumed by almost all respondents and wheat by the vast majority and by a higher share of respondents than sorghum and finger millet. The mean amount consumed in a month is also highest for maize. This holds true in all settings. Wheat ranks second and finger millet and sorghum third and fourth, respectively. As expected, consumers in production zones, in particular in rural areas, consume higher amounts of sorghum and finger millet than those in non-production areas. Consumers in Nairobi have the lowest sorghum and finger millet consumption. Most consumers buy maize, sorghum and finger millet as grain whereas wheat is bought as flour. The relative importance of grain and flour is also reflected in the amount that is bought. Sorghum and finger millet flour are usually bought as blended flour. This reflects the utilization of these crops, which are mixed with other crops and consumed as porridge. By contrast, ugali is made from pure maize flour. A triangulation of results shows that Nairobi has the highest share of consumers buying flour and villages in production areas have the lowest. Urban areas in production zones (Kisii) rank third and villages close by Nairobi second. The opposite holds true for grain. The majority of consumers that buy flour buy it in a loose form. Only high income areas have a higher share of consumers buying packed flour. Urban areas have the same share of respondents buying loose and packed flour. A triangulation of results shows that Nairobi has the highest share of respondents buying packed flour, followed by urban locations in production areas. Villages in non-production and production areas rank third and fourth, respectively. Quality and convenience are in general the most important reasons for buying packed flour. Interestingly, quality is

also the most important reason for buying loose flour. Thus, expectations about quality differ between consumers. Other reasons given for buying loose flour are its lower price and the scope for blending to the suit personal taste. Both reasons are important in rural settings. Availability is the most important reason for buying loose flour in rural settings, suggesting that some consumers in rural areas would buy packed flour if it was available. However, this is only the case in non-production areas, since in areas where the crops are grown consumers do not usually buy flour. Maize, wheat, sorghum and millets can only partly substitute for each other. Maize is consumed as ugali, whereas sorghum and finger millet are both consumed in form of porridge. Only some respondents prepare porridge from maize and few use finger millet and sorghum to prepare ugali. Wheat is mostly used to prepare chapatti. Consumption of different cereals can be restricted by availability. Wheat is mostly bought in small retail shops and supermarkets. For maize, sorghum and finger millet, open-air markets are by far the most important shopping outlets, followed by supermarkets in the case of maize and small retail shops in case of sorghum and finger millet. However, some consumers also buy sorghum and finger millet in supermarkets. Thus, sorghum and finger millet seem to be available in all market outlets. Open-air markets are more important in rural than in urban areas, whereas the opposite holds true for supermarkets. Nevertheless, the majority of urban consumers buy maize, sorghum, finger millet at open-air markets. In Nairobi, however, most maize is bought in supermarkets. Availability and personal preferences are the most important reasons for deciding to buy a particular cereal. Habit and taste are the two most important reasons for consumption of all three crops. Habit and taste are equally important for maize. Taste ranks first for sorghum and habit ranks second. Thus, sorghum and finger millet are consumed more because of their taste than because of tradition, which is not the case for maize. A higher share of respondents in non-production areas stated habit as a reason for sorghum and finger millet consumption compared to production areas. Sorghum and finger millet's as healthy foods was an important reason for consumption in high income areas in Nairobi. The majority of consumers stated they had always consumed sorghum and finger millet. Asked why they started consumption, the majority replied that sorghum and finger millet are healthy and good for children. The majority of consumers expected to increase their demand for the two crops in the future. Villages in production zones have the highest share of consumers that will increase consumption, followed by urban areas in production zones. Villages in non-production zones rank third and Nairobi consequently ranks last. The most important reason given for changing levels of consumption was changing family size. Sorghum and finger millet are often used as food for babies and children to support their growth, thus, the more children in the household, the higher the consumption. Taste and non-availability of other cereals are other important reasons for increasing consumption, whereas the second most important reason for decreasing consumption is price. The only exceptions to increasing demand are for production (sorghum) and high income areas (sorghum and finger millet). In production areas, non-availability of other cereals ranks first. In high income areas, 'healthy' is the most important reason in case of sorghum and 'taste' in case of finger millet. We were also interested why some respondents do not consume sorghum and finger millet. All non-consumers in our sample reported that they knew about the two crops. Apart from common knowledge, they learned about the two crops through friends, relatives and markets. TV and radio play a minor role, being almost only mentioned in high income areas. However, , radio and TV were mentioned as the best means for delivering information about sorghum and finger millet, with TV mentioned by middle and high income areas in Nairobi. Radio is

important means to transfer information in rural areas, while schools are important in rural non-production areas. Information through regular programs was judged to more successful than advertisements. Most non-consumers have consumed sorghum and/or finger millet in the past and half of them consumed it regularly. In case of sorghum, production zones, in particular rural areas, have the highest share of non-consumers with experiences of sorghum consumption and non-production areas, particularly Nairobi, have the lowest share. For finger millet, however, urban areas, in particular in production areas have a higher share of consumers than rural areas, in particular in non-production areas. Taste and the fact that it is not common to consume sorghum are the two most important reasons for non-consumption. Availability ranks third. For finger millet, the majority of non-consumers stated that consumption is not common, followed by availability and taste. Non-availability is more important in rural than in urban settings, which is surprising in case of rural areas in production zones. In case of finger millet, price was also mentioned by a significantly higher share of non-consumers in rural compared to urban areas. Respondents in rural areas are more price sensitive than those in urban areas. In non-production zones, finger millet prices are probably higher than in urban areas. We also asked non-consumers what would encourage them to start consuming sorghum and finger millet. Information on utilization was the most important reason throughout all settings. Availability and price were the other two most important aspects. Improving availability is for both crops mentioned by a significantly higher share of consumers in rural than in urban areas. The same holds true for prices in case of finger millet. One strategy for the promotion of sorghum and finger millet consumption is to point out the high nutritional value of these crops. The majority of sorghum and finger millet consumers are aware that the two crops have a high nutritional value. Even though this holds true for all settings, a significantly lower share of consumers in rural areas, compared to urban areas, is aware of a high nutritional value. In case of finger millet, production areas also have a significantly lower share of aware consumers than non-production areas. In case of non-consumers, only one third is aware about a high nutritional value of sorghum and finger millet. This again holds true for all settings. However, a lower share of respondents in production areas, compared to non-production areas, is aware of a high nutritional value of sorghum and finger millet. The knowledge about the nutritional value is for both crops rather general. In Tanzania, 439 consumers were interviewed in total. Four urban and two rural location were selected for interviews. Two of the urban locations (Dar es Salaam at the coast and Moshi and Arusha in northern Tanzania) are in areas, where sorghum and finger millet is not a major crop and the other two urban sites (Dodoma and Singida) are located in sorghum and finger millet production areas. The two rural locations were one village close by Arusha and one close by Dar es Salaam, respectively. Villages in production areas were not included as ICRISAT conducted in 2010 a farm survey in production areas that captured consumption behavior. Results from this survey are discussed in the respective report (Schipmann-Schwarze et al., 2012). In each setting of the consumer survey, consumers were interviewed at three different market outlets (supermarkets, small retail shops and open-air markets). Dar es Salaam was additionally stratified into three different areas (low, middle and high income) to capture consumption habits of different income classes. The majority of respondents in Tanzania consume finger millet on a monthly base. Sorghum, however, is only consumed by one fourth of the respondents. For both crops, urban settings in production areas have the lowest share of consumers and urban settings in non-production areas the highest. Moreover, in regard to the three income areas, high income settings have the lowest share of consumers for both

crops. Maize is consumed by all respondents. Wheat is consumed by the vast majority and except in Dar es Salaam more respondents consume wheat than finger millet. The mean amount consumed in a month is by far highest for maize. This holds true in all settings. Finger millet ranks second and sorghum and wheat third and fourth, respectively. However, differences between the latter three are small. Even though urban production zones have the lowest share of sorghum consumers, they have the highest mean consumption per consumer. The opposite holds true for finger millet, which shows the highest mean consumption in rural non-production areas. Also in regard to the other crops, finger millet is relatively more popular in rural non-production areas, whereas sorghum is relatively more popular in urban production areas. Whereas maize is by most consumers bought as grain, sorghum, finger millet and wheat are mostly bought as flour. However, in urban production areas, only a minority of consumers buys finger millet as flour and nobody buys sorghum flour. In the latter setting, the mean amount of finger millet bought as grain is also higher than the mean amount bought as flour. This also holds true for rural non-production areas, even though a higher share of respondents in this setting buys flour. For the total amount, mean amounts of sorghum and finger millet bought as grain and as flour, respectively, are around the same. In regard to flour, blended sorghum and finger millet flour is bought by a higher share of respondents than pure flour. However, in case of finger millet, around the same mean amount of pure and blended flour is bought. The majority of consumers, who buy flour, buy it in a packed form. However, in rural non-production areas, loose and packed flour are approximately equally important. Quality and convenience are in general the most important reasons for buying packed flour. However, in case of finger millet quality is far more important than convenience. The most important reason for buying loose flour is that it can be blended according to the respondents taste. However, it is mentioned by a higher share of consumers in case of sorghum. For finger millet, quality is an equally important reason, which is mentioned by less than one fifth of sorghum consumers. Thus, expectations about quality differ in particular for finger millet. Regarding utilization patterns, we can conclude that the four crops rather complement than substitute each other. Maize is mostly consumed as ugali, whereas sorghum and finger millet are both mostly consumed in form of porridge. However, almost half of the respondents prepare porridge from maize and one third uses sorghum to prepare ugali. This at least points out a potential to increase sorghum consumption by promoting to prepare ugali from sorghum. Consumption of different cereals can be restricted by availability. We were therefore interested to find out where consumers buy the four cereals. Maize, sorghum and finger millet are mostly bought at open-air markets and small retail shops. As most consumers buy sorghum and finger millet flour, these findings demonstrate that flour is already widely available in different shopping outlets. Moreover, it highlights that only a minority of consumers shops in supermarkets, so that a restricted availability of sorghum and finger millet in supermarket does not restrict consumption of the two crops. However, in urban production areas, supermarkets already gained in importance, also in regard to sorghum and finger millet. This confirms the general assumption that urbanization processes change the shopping behavior and highlights the importance of making sorghum and finger millet available in all shopping outlets. Most important for the decision to consume a respective foodstuff are availability and personal preferences. We asked consumers, why they consume maize, sorghum and finger millet, respectively. Habit and availability (crop is widely available) are the two most important reasons for maize consumption. For sorghum and finger millet, health ranks first and taste and habit second. However, a lower share of consumers in rural non-production areas and

urban production areas mentioned health compared to urban production areas. This difference is not found for sorghum. Thus, information about health benefits should particularly for sorghum be better distributed. Even though habit was not the most important reason for consumption, the majority of consumers stated that they have always consumed sorghum and finger millet. Moreover, the majority of those who started sometime in the past, did so more than 10 years ago. Interestingly, urban non-production areas, who have the highest share of finger millet and sorghum consumers, have the lowest share of those who always consumed the two crops. Thus, a trend towards sorghum and finger millet consumption can be observed. In line with our expectation about demand trends for sorghum and finger millet, the majority of consumers expect to increase their demand for the two crops in the future. The most important reason is changing family size. This is also the most important reason for a decreasing sorghum and finger millet consumption. We were also interested to understand why some respondents do not consume sorghum and finger millet. At least the vast majority of non-consumers in our sample were aware that sorghum and finger millet exist. Surprisingly, production areas, followed by rural non-production areas have the lowest share of sorghum and finger millet aware non-consumers. These findings demonstrate that, in particular in urban production areas, awareness campaigns could increase sorghum and finger millet consumption. Being asked how they learned about sorghum and finger millet, the majority of non-consumers mentioned friends and relatives and stated that it is common to know the crops. The latter was, however, far less important than the first in case of finger millet. Surprisingly, for both crops urban production areas have the lowest share of non-consumers who stated that it is common to know sorghum and finger millet. Except in urban non-production areas, radio did not play an important role. However, when we asked respondents directly through which means we could best deliver information about sorghum and finger millet, radio was the most important one. Thus, programs currently aired on radio might not deliver much information about sorghum and finger millet. TV ranks second as a tool to deliver information. In both cases, the highest share of respondents stated that information should be delivered through the regular program. Adverts rank second, but were still mentioned by more than half of the respondents. Around half of the non-consumers who are aware of sorghum and/or finger millet have consumed it in the past, but most of them only few times. Again surprisingly, urban production areas have the lowest share of non-consumers who have consumed sorghum and finger millet in the past. In line with earlier results, porridge is the dish that was most commonly consumed. However, in case of sorghum almost half of the respondents also consumed it as ugali. The most important reason for non-consumption of sorghum is that it is not common. Surprisingly, this also holds true in production areas and other reasons are almost not mentioned in this setting. Non-availability, taste and missing information about sorghum utilization rank second. The latter is actually the most important reason in rural non-production areas. ‘Not common’ is also the most important reason for non-consumption of finger millet. However, this result is driven by urban production areas, where ‘not common’ is again almost the only reason for non-consumption. In urban non-production areas, non-availability ranks first and in rural non-production areas, non-availability and difficult preparation are more important than ‘not common’. Thus, reasons for non-consumption differ more than in case of sorghum. This needs to be kept in mind when defining promotion strategies. For the total sample, non-availability ranks second and missing information about the crop and difficult preparation third and fourth, respectively. However, the last three reasons are less important for finger millet. We also asked non-

consumers what would encourage them to start consuming sorghum and finger millet. Obtaining more information about utilization is everywhere the most important pre-condition for starting to consume sorghum. Availability ranks second, except in urban production-areas, which is straightforward to understand. Information about utilization is also the most important requirement to increase finger millet consumption. However, other aspects like clean flour, light color and availability also play a role. The importance of different aspects differs between the settings. While information on utilization ranks first in rural non-production areas, it is availability in urban non-production areas and light color in urban production areas. Thus, finger millet requires more setting specific promotion strategies. We already discussed that one strategy for the promotion of sorghum and finger millet consumption is to point out the high nutritional value of these crops. Around two third of consumers and one third of non-consumers is aware that sorghum and finger millet have a high nutritional value. In case of consumers, rural non-production areas have a lower share of respondents who are aware of a high nutritional value than urban non-production areas. As expected, urban production areas have the highest share of informed consumers. The opposite holds true for non-consumers. In case of sorghum, urban production areas have the lowest share of informed non-consumers. In case of finger millet, urban production areas have a lower share than urban non-production areas, but the lowest share of informed non-consumers is found in urban non-production areas. Even though respondents are aware of a high nutritional value, both consumers and non-consumers' knowledge is rather general. Both crops would benefit from information campaigns about their nutritional value.

Keywords: consumer survey, finger millet, sorghum

JEL classification: Q110, Q02

Contents

1 Introduction

Sorghum and finger millet are two important cereal crops for farmers in semi-arid areas in Eastern Africa. They are grown where maize cultivation often fails due to high temperatures and little rainfall. Both crops are traditionally cultivated for home consumption, but in recent years there has been increasing market demand. This offers opportunities for smallholder farmers to commercialize their production. The HOPE project aims to support commercialization efforts of smallholder farmers in Eastern Africa and to understand consumption patterns of sorghum and finger millet.

The purpose of the consumer survey in Kenya and Tanzania was to provide an overview about sorghum and finger millet consumption, compared to maize and wheat, and to understand reasons for consumption and non-consumption, in order to help develop strategies to promote sorghum and finger millet consumption.

2 Data and methods

In Kenya, the consumer survey was conducted by ICRISAT and KARI in September 2011, while in Tanzania; the survey was conducted by DRD and ICRISAT in February 2012. The idea of the survey was to understand consumption of sorghum and finger millet in different settings. We assumed that consumption habits differ between rural and urban settings as well as between production and non-production areas. Moreover, we assumed that consumption habits differ between income levels. Consequently, we selected in each country one urban and one nearby rural location in a production as well as in a non-production area. Sorghum and finger millet share the same production zone, so that only one production area was selected in each country. However, since we conducted a farm household survey in a production area in Tanzania that captured consumption habits for the two crops, we did not include a rural location in a production area in the Tanzanian sample. Results of the farm household survey are discussed by Schipmann-Schwarze et al. (2012). As information about income is sensitive for many households, we defined income levels according to urban districts. However, this is possible only in bigger cities and was used only in Nairobi and Dar es Salaam.

Consumers may differ not only by where they live but also by where they shop. We therefore included different shopping outlets in our sample. In urban areas, respondents were interviewed in front of supermarkets, small retail shops and at open air markets. In rural areas, where supermarkets do not exist, only the latter two market outlets were included.

In Kenya, where different supermarket chains exist, we selected supermarket branches as follows. In Nairobi, we selected Nakumatt in high income areas, Uchumi in middle income areas and Naivas, which serves low income areas. In Kisii, which is the urban location in the production area, we selected only Nakumatt and Naivas, as Uchumi did not exist at the time of the survey.

Tanzania has many individual supermarkets but only one supermarket chain, Shoprite. We therefore included Shoprite where available (Dar es Salaam and Arusha) and included independent mini-supermarkets in the other urban locations.

Small retail shops are numerous and for interviews we selected those that are either in the vicinity of supermarkets or open-air markets.

In urban locations that were stratified into upper, middle and lower income area, one open-air market was selected per area, as far as available. In the other urban as well as rural locations, only one open-air market was selected. In case several open-air markets existed, the biggest one was selected.

The number of interviewed consumers differs between the market outlets. It was planned that 15 consumers are interviewed per supermarket, 10 per small retail shop and 20 per open-air market. An overview of the sample design and the sample size in Kenya and Tanzania is provided in Table 1 -4.

Table 1: Sample design Kenya

Location/Shopping outlet	Supermarket	Small retail shop	Traditional market
Urban non-production area total (Nairobi)	6	6	3
High income area	2	0	0
Middle income area	2	3	1
Low income area	2	3	2
Urban production area (Kisii)	2	2	1
Rural production area (two villages close by Nairobi)	0	2	2
Rural non-production areas (two villages close by Kisii)	0	2	2
Total	8	12	8

The sample size is presented in Table 2. In total, 454 consumers were interviewed, of which 64% are in urban and 36% in rural locations. Thirty four percent were interviewed in production areas and 66% in non-production areas. In production areas, around half (46%) of the respondents were interviewed in Kisii town and the other half (54%) in close by villages. In non-production areas, 73% were interviewed in Nairobi and 27% in surrounding villages. As fewer market outlets were included in the high income strata, only 14% of the respondents in Nairobi come from the high income strata. Thirty eight percent come from the medium and low income strata, respectively. Concerning the different market outlets, 28% were interviewed in front of supermarkets, 38% in front of small retail shops and 34% at open-air markets.

Table 2: Sample size Kenya

	Total	Rural	Urban
Total	454	164	290
Non-production area[1]	297	80	218
Production area[1]	157	84	72
Low income[2]	105	/	105
Middle income[2]	82	/	82
High income[2]	31	/	31
Supermarket	128	0	128
Retail shop	170	87	73
Open air market	156	77	79

[1]Area in which neither sorghum nor finger millet is produced or both are produced.
[2]Only Nairobi was classified in low, middle and high income area.
The sample design for Tanzania is presented in Table 3.

Table 3: Sample design Tanzania

Location/Shopping outlet	Supermarket	Small retail shop	Traditional market
Urban non-production area total (Dar es Salaam, Arusha, Moshi)	7	5	5
High income area	1	1	1
Middle income area	1	1	1
Low income area	1	1	1
Urban production area (Dodoma and Singida)	3	3	2
Rural non-production area (two villages, one close by Dar es Salaam and one close by Arusha)	0	2	2
Total	10	10	9

The sample size design is presented in Table 4. In total, 4,539 consumers were interviewed, of which 87% are in urban and 13% in rural locations. Twenty-eight percent were interviewed in production areas and 72% in non-production areas. In production areas, all respondents were interviewed in Dodoma and Singida towns. In non-production areas, 81% were interviewed in urban locations and 19% in close by villages. In Dar es Salaam, each income area accounts for 33% of the respondents. Concerning the different market outlets, 31% were interviewed in front of supermarkets, 26% in front of small retail shops and 43% at open-air markets.

Table 4: Sample size Tanzania

	Total	Rural	Urban
Total	439	59	380
Non-production area[1]	314	59	255
Production area[1]	125	/	125
Low income[2]	105	/	50
Middle income[2]	82	/	50
High income[2]	31	/	50
Supermarket	135	0	135
Retail shop	113	23	90
Open air market	191	36	155

[1]Area in which neither sorghum nor finger millet is produced or both are produced.
[2]Only Nairobi was classified in low, middle and high income area.

We analyzed the data according to the different locations. For Kenya, these are total sample, urban and rural areas, non-production and production areas, and low, middle and upper income level. However, the urban areas are very different, Nairobi being the capital city and Kisii being a small urban center. Thus, results for the three income levels are also relevant for pointing out Nairobi specific findings. Moreover, a triangulation of results from urban/rural and non-production/production areas allows conclusions about each specific location. For the category rural, it needs to be kept in mind that villages in non-production areas benefit from the vicinity to Nairobi and are not representative for other rural settings in non-production areas in Kenya. Consequently, results for the non-production area do not reflect a

typical non-production area in Kenya. However, as Nairobi is the major center of consumption in Kenya, we were specifically interested in consumption patterns in Nairobi.

In Tanzania, we differentiated data analysis according to total sample, rural and urban non-production area, urban production area, and low, middle and upper income level. The latter also reflects results specific for Dar es Salaam.

Descriptive statistics are shown for all settings, if this is relevant and the sample size allows. Differences are always tested between urban and rural respondents and respondents in production and non-production areas. In case of continuous variables, t-test was used, in case of categorical variables; the Chi Square test was used. Differences between income levels can only be tested jointly between the three levels. Thus, conclusions about between which income levels differences are significant are not always possible.

3 Country level results, Kenya

Table 5 summarizes three key socio-economic variables of our sample. The mean age of respondents is 33 years and 85% of respondents were female. The average household size is 5 members. There is no relevant difference between respondents in the different settings.

Table 5: Socio-economic sample characteristics Kenya

	Total	Urban	Rural	Producer	Non-producer	Low income	Middle income	High income
Age (years)	33	31	37	34	32	26	32	40
Female respondent (%)	85	80	93	89	82	80	82	65
HH size (No.)	4	4	5	6	4	4	4	4

3.1 Cereal consumption

We are first of all interested to see how widely sorghum and finger millet are already consumed. Table 6 shows that both crops are consumed by the majority of respondents. However, finger millet is more popular than sorghum (77% of the respondents compared to 67%). Figures for the two crops are, as expected, lower than those for maize (97% of respondents) and wheat (89% of respondents). However, particularly for finger millet, differences are not very big. All settings follow this pattern, which highlights that sorghum and finger millet is already widely consumed in Nairobi and vicinity.

Whereas there is no difference between rural and urban areas in the share of respondents that is consuming maize and wheat, rural areas have a significantly higher share of respondents consuming sorghum and finger millet than urban areas. The same holds true when comparing respondents in production and in non-production areas. Combining these results we can conclude that villages in production areas have the highest share of respondents consuming finger millet and sorghum, whereas cities in non-production areas (which is Nairobi) have the lowest share. Surprisingly, rural non-production areas rank second for sorghum, even though we would have expected that sorghum is more likely consumed in urban production areas. The opposite holds true for finger millet.

Significant differences emerge in consumption between income classes. Compared to middle and low income areas, a lower share of respondents in high income areas consumes sorghum and finger millet on a monthly basis. This difference is not found for maize and wheat. It is often argued that market demand for sorghum and finger millet will increase because consumers (especially those with higher income) are becoming more health-conscious. Although sorghum and finger millet consumption in this income stratum might have increased, it still has the lowest share of sorghum and finger millet consumers.

Table 6: Share of households consuming selected cereals on a monthly base (in %)

	Total N=454	Urban N=290	Rural N=164	Non-producer N=298	Producer N=156	Low income N=105	Middle income N=82	High income N=31
Maize	97	97	99	/	/	99	96	81
Wheat	89	88	89	/	/	91	78	90
Sorghum	67	59	77***	60	76***	55	66	26***
Finger millet	77	72	87***	68	95***	66	72	45***

Notes: ***, **, * differences are significant at the 1%; 5% and 10% level, respectively.

Besides knowing how widely different cereals are consumed, we are interested in the amount of consumption and utilization. Table 7 shows that maize, sorghum and finger millet are primarily bought as grain, whereas wheat is bought as flour. This is straightforward to understand. Sorghum and finger millet are often only available in form of grain and maize is for some purposes also consumed as grain, whereas wheat is always needed in form of flour. Regarding flour, maize and wheat are only bought as pure flour, whereas sorghum and finger millet are also bought as blended flour. This can also be explained by utilization patterns, which are displayed in Table 8. Sorghum and finger millet are mostly consumed in a mixture with other crops, whereas maize is usually consumed pure.

In urban areas, more consumers buy maize as flour than grain while for sorghum and finger millet the share is almost the same. By contrast, in rural areas more consumers buy grain for maize, sorghum and finger millet. Except for sorghum, the share of consumers buying grain is significantly higher in rural areas and the share of respondents buying flour is significantly lower. In production areas, almost all consumers buy sorghum and finger millet as grain, whereas non-production areas have a significantly higher share of consumers buying the crops already milled.

A combination of results shows that Nairobi has the highest share of consumers buying flour. Moreover, rural settings in non-production areas have a higher share of respondents buying flour than urban settings in production areas. In our sample, rural non-production areas benefit from their proximity to Nairobi. Thus, ready milled flour might be widely available. As sorghum and finger millet always need to be milled before being cooked, consumers in production areas might switch to buying flour if ready packed flour becomes available. Currently, most consumers mill the grain in milling shops.

Concerning different income areas, high income areas have, as expected, the lowest share of respondents buying grain and the highest share of respondents buying flour. However, low and middle income areas also have a higher share of respondents buying flour than grain. Thus, in Nairobi, respondents in general rather buy flour than grain. In case of maize and wheat, respondents in all income levels only buy pure flour. However, in case of sorghum and finger millet, high income areas have a significantly higher share of respondents buying blended flour. A reason for this is that consumers in low and middle income areas rather buy flour from different crops and mix it themselves to their own taste,

whereas consumers in high income areas prefer ready to use flours. This will be further explored in section 3.4.

Regarding the mean amount of different cereals bought in a month, maize ranks first and wheat second, as expected. Finger millet and sorghum rank third and fourth, respectively. However, compared to maize, differences between the latter three are rather small. As maize is also the crop that is bought by most respondents, the total amount bought of the sample is also highest for maize, followed by wheat, finger millet and then sorghum.

Urban and rural areas have the same ranking, except that consumers in rural areas buy the same mean amount of wheat and finger millet. Whereas differences between urban and rural areas are small for wheat, sorghum and finger millet, consumers in rural areas buy significantly more maize. This can be explained by the fact that urban consumers often have a more diversified diet.

Table 7: Monthly consumption of selected cereals on a household level (N=454)

Cereal	Total	Urban	Rural	Non-producer	Producer	Low income	Middle income	High income
Bought as grain (% hh)								
Maize	68	56	88***	n.a.		48	47	8***
Wheat	13	9	16**			13	11	0
Sorghum	59	55	64	38	92***	45	39	13
Finger millet	58	52	66***	35	91***	41	36	7*
Bought as pure flour (% hh)								
Maize	53	64	35***	n.a.		79	84	92
Wheat	91	95	85***			93	94	100
Sorghum	28	31	25	42	8***	35	50	25
Finger millet	31	35	25**	47	9***	40	54	50
Bought as blended flour								
Maize	0	0	0	n.a.		0	0	0
Wheat	0	0	0			0	0	0
Sorghum	15	18	11	24	1***	28	15	63***
Finger millet	12	14	10	20	1***	22	12	43**
Mean amount bought (kg)								
Maize	19.3	17.0	23.3***	n.a.		14.3	13.1	12.2
Wheat	5.4	5.4	5.2			5.3	5.3	6.9
Sorghum	3.4	3.2	3.6	2.7	4.4***	3.2	2.6	2.5
Finger millet	4.6	4.2	5.2	3.3	6.5***	3.7	3.4	4.1
Amount bought as grain (kg)								
Maize	13.7	9.9	20.3***	n.a.		6.0	4.5	1.2*
Wheat	0.6	0.4	0.8**			0.4	0.7	0.0
Sorghum	2.5	2.1	2.9*	1.4	4.2***	1.8	1.3	0.3
Finger millet	3.4	2.7	4.4***	1.4	6.1***	1.7	1.5	0.4
Amount bought as pure flour (kg)								
Maize	5.6	7.0	3.0***	n.a.		8.4	8.5	11.1
Wheat	4.8	5.0	4.4			4.6	4.7	6.9
Sorghum	0.6	0.7	0.5	0.9	0.2***	1.0	1.0	0.3
Finger millet	1.0	1.3	0.6***	1.5	0.4***	1.7	1.7	1.8
Amount bought as blended flour (kg)								
Sorghum	0.3	0.3	0.2	0.4	0.1***	0.4	0.3	2.0***
Finger millet	0.3	0.3	0.2	0.4	0.1***	0.3	0.3	1.9***

Notes: ***, **, * differences are significant at the 1%; 5% and 10% level, respectively.

Regarding production and non-production areas, consumers in the first buy a significantly higher mean amount of sorghum and finger millet than the latter. Combining these results show that sorghum and finger millet have the highest mean consumption in rural production areas, followed by urban production areas, which is straightforward to understand.

All income levels also follow the ranking of the total sample. Nevertheless, figures for sorghum and finger millet are on average smaller than for the urban setting, which indicates that consumers in Nairobi buy the lowest amount of sorghum and finger millet.

In line with results on the form in which a cereal is bought, the mean amount bought is highest for grain in case of maize, sorghum and finger millet, whereas it is highest for flour in

case of wheat. The same holds true for the amount bought of pure and blended sorghum and finger millet flour.

Rural and urban areas follow the same pattern than the total sample in regard to the amount of grain and flour bought for the different cereals. Even though the share of respondents that buys flour in urban areas was higher than that buying grain, the mean amount of grain is higher than the mean amount of flour. In line with the above results, consumers in rural areas buy significantly more grain of all four crops and significantly less maize and finger millet flour. They also buy less wheat and sorghum flour, but the difference is not significant.

Regarding production and non-production areas, consumers in the first buy higher amounts of grain than flour, whereas consumers in the latter buy as much grain as flour. In both cases pure flour is more popular than blended flour.

All income levels buy more maize and wheat flour than grain and around the same amount of grain and flour in case of sorghum and millet. Thus, respondents in Nairobi in general prefer flour to grain. Only few significant differences exist between the income levels. Respondents in high income areas buy significantly less maize grain and significantly more blended sorghum and finger millet flour. This is in line with our argument above that high income consumers prefer ready to use products. Blended flours often contain crops, sorghum and finger millet. Additionally, crops like soya, groundnuts, amaranth, and cassava are added.

Results discussed above can partly be explained by different utilization purposes of the selected crops. Whereas maize is mostly consumed as Ugali, which is for many Kenyans the most important daily dish, wheat is mostly consumed as chapatti. Sorghum and finger millet are both mostly consumed in form of porridge. Blended porridge is for both crops more common than pure porridge. Even though porridge is also frequently consumed in many households, it is less important than ugali and also consumed in smaller quantities. Figures in Table 8 highlight that the four crops can only partly substitute each other. Only some respondents prepare porridge from maize and few use finger millet and sorghum to prepare ugali. Wheat does not have any common utilization purpose with the other three crops.

In general, this utilization pattern is found in all locations. Interesting differences between the locations are that rural, compared to urban areas, have a significantly higher share of respondents consuming blended porridge and a significantly lower share of respondents consuming pure porridge. The same holds true for production areas when compared to non-production areas. As availability of different kinds of flour cannot be the determining factor for these differences, they might be explained by different consumer preferences. Another interesting difference is that a significantly higher share of respondents in production areas uses sorghum and finger millet for blending ugali. Thus, utilization for alternative products is spurred when sorghum and finger millet are ready available, as it can be assumed to be the case in production areas.

Blended ugali mostly contains maize and one other cereal (finger millet or sorghum). Blended porridge is usually prepared from a mix of finger millet, sorghum, cassava, soya and groundnuts. However, various recipes exist and households often mix different cereals according to their own taste.

Table 8: Utilization of selected cereals in % of consumers

	Total	Urban	Rural	Non-producer	Producer	Low income	Middle income	High income
Maize	*N=442*	*N=162*	*N=280*			*N=104*	*N=79*	*N=25*
Ugali pure	89	92	85			95	91	92
Ugali blended	6	5	9			0	5	4
Githeri	45	35	62			29	32	8
Porridge blended	5	5	5			6	5	4
Porridge pure	2	1	2			1	2	0
Chapatti	1	0	1			0	1	4
Wheat	*N=402*	*N=146*	*N=256*			*N=96*	*N=64*	*N=28*
Chapatti	99	99	98			98	100	96
Other	2	1	2			2	9	4
Sorghum	*N=298*	*N=126*	*N=172*	*N=179*	*N=119*	*N=58*	*N=54*	*N=8*
Porridge blended	77	75	82	71	88***	78	68	63
Porridge pure	20	22	18	30	5***	21	35	38
Ugali blended	9	9	10	2	20***	3	2	13
Other	1	2	0	1	1	0	4	0
Finger millet	*N=351*	*N=142*	*N=209*	*N=203*	*N=148*	*N=69*	*N=59*	*N=14*
Porridge blended	73	67	80**	64	85***	62	61	43
Porridge pure	27	31	20***	37	15***	38	37	50
Ugali blended	4	7	2	2	6**	3	2	7
Other	2	3	2	1	3	0	3	7

Notes: ***, **, * differences are significant at the 1%; 5% and 10% level, respectively.

3.2 place of purchase of food stuff and cereals

Personal taste is one factor determining consumption of different foodstuff and another is availability. We have therefore asked respondents where they usually buy cereals to understand shopping habits. Respondents who produced cereals themselves are skipped in this analysis. This holds true for 10% of the respondents in case of maize, 0.3% in case of wheat, and 3% and 5% in case of sorghum and finger millet, respectively.

As before, similar results are found for maize, sorghum and finger millet, whereas figures differ for wheat. This is because wheat is mostly bought as flour, which is often sold at different market outlets than grain. For maize, sorghum and finger millet, open air markets are by far the most important shopping outlets, followed by supermarkets in case of maize and small retail shops in case of sorghum and finger millet. Supermarkets ranked first for wheat, followed by small retail shops. Few respondents buy wheat at open air markets. Fresh fruits and vegetables are also bought by all respondents at open-air markets and additionally by some in supermarkets and by only very few in small retail shops. Other foodstuffs are usually bought in supermarkets, followed by open-air markets and small retail shops. As sorghum and finger millet are sold in all market outlets, the choice of market outlet does not restrict availability of sorghum and finger millet. However, there may be seasonal fluctuations in availability. Moreover, results for wheat demonstrate that consumers visit

alternative shopping outlets (e.g. small retail shops), if wheat flour is not available at other shopping outlets.

Results for urban and rural locations show that for all foodstuffs that open air markets are more important in rural areas and supermarkets are more important in urban areas. Small retail shops are equally important for buying maize, sorghum, finger millet or fresh fruits and vegetables, but are more important in rural areas for buying wheat or other foodstuffs. The last two are in general mostly bought in supermarkets and small retail shops are the equivalent of supermarkets in rural areas.

Although supermarkets are an important market outlet in urban areas, the majority of urban respondents still buy maize, sorghum, finger millet and fruits and vegetables at open-air markets. However, in Nairobi, maize is mostly bought in supermarkets. Interestingly, open-air markets remain the most important market for sorghum and finger millet in low and middle income areas, though in these two locations, flour is becoming more popular than grain. Thus, flour must be already available at open-air markets in Nairobi. This indicates that markets adjust to changing consumer preferences. High income areas have an equal or higher share of respondents buying sorghum and finger millet in supermarkets. This is not because flour is not available elsewhere, but because they prefer this shopping outlet and most of them also buy other cereals and foodstuffs in supermarkets. Thus, urbanization processes do change shopping behavior, if the desired product is available in new market outlets like supermarkets.

Table 9: Place of purchase for different foodstuff in % of respondents

	Total	Urban	Rural	Low income	Middle income	High income
Maize	*N=397*	*N=261*	*N=136*	*N=99*	*N=77*	*N=25*
Open air market	63	52	85	44	49	12
Small retail shop	19	17	20	22	27	4
Supermarket	35	48	8	55	60	85
Wheat	*N=401*	*N=256*	*N=145*	*N=96*	*N=64*	*N=28*
Open air market	13	8	21	13	9	0
Small retail shop	58	24	63	23	19	7
Supermarket	55	74	21	76	80	93
Sorghum	*N=289*	*N=168*	*N=121*	*N=57*	*N=54*	*N=8*
Open air market	73	69	78	63	59	38
Small retail shop	18	17	21	18	20	25
Supermarket	10	17	1	22	20	38
Finger millet	*N=334*	*N=202*	*N=132*	*N=68*	*N=59*	*N=14*
Open air market	68	62	76	49	56	21
Small retail shop	20	18	23	27	24	14
Supermarket	14	22	2	28	24	64
Fruit and vegetables	*N=437*	*N=283*	*N=154*	*N=104*	*N=81*	*N=30*
Open air market	92	89	96	96	90	50
Small retail shop	3	4	1	4	3	7
Supermarket	17	17	18	12	24	47
Other food stuff	*N =453*	*N=290*	*N=163*	*N=105*	*N=82*	*N=31*
Open air market	46	36	62	33	38	29
Small retail shop	40	28	61	29	34	0
Supermarket	61	79	30	77	81	100

Notes: ***, **, * differences are significant at the 1%; 5% and 10% level, respectively.

3.3 Consumer preferences for selected cereals

There are specific reasons why consumers prefer a specific cereal crop. As sorghum and finger millet are substitutes for maize rather than for wheat, we excluded wheat in this analysis.

Table 10 shows that habit and taste are the two most important reasons for maize as well as for sorghum and finger millet consumption. Interestingly, taste ranks first for sorghum and finger millet and is mentioned by the same share of respondents as in the case of maize. In contrast, habit ranks first for maize and is mentioned by a higher share of respondents than in the case of sorghum and finger millet. Thus, sorghum and finger millet are more often consumed because of their taste than because of a tradition, which is not the case for maize. Other reasons for maize consumption are that it widely available and easy to prepare. Both aspects do not play a role in sorghum and finger millet consumption. Instead, price, colour and own cultivation are mentioned as reasons.

Taste and habit are the most important reasons for maize consumption in both rural as well as urban areas. Other reasons differ in importance. Availability has a higher importance in

rural areas, whereas easy preparation is more important in urban areas. Calorific content and price are again more important in rural areas. Besides the fact the own cultivation is mentioned by a higher share of respondents in rural areas as a reason for sorghum and finger millet consumption, differences between the importance of reasons are small.

Except for own cultivation and utilization, which are more important in production areas, the ranking of reasons in production and non-production areas is similar. However, a far higher share of respondents in non-production areas stated taste and, interestingly, habit as reasons for consumption. Thus, sorghum and finger millet are traditional food crops outside their immediate production areas.

Table 10: Reasons for consumption of selected cereals in % of consumers

	Total	Urban	Rural	Non-producer	Producer	Low income	Middle income	High income
Maize	*N=448*	*N=284*	*N=164*			*N=102*	*N=80*	*N=27*
Habit	83	81	84			81	75	70
Taste	82	79	87			67	86	82
Availability	71	66	79			60	74	52
Easy to prepare	60	66	51			74	77	67
Caloric content	59	50	73			38	42	30
Price	43	35	57			25	37	19
Color	13	17	6			18	17	41
Sorghum	*N=298*	*N=172*	*N=126*	*N=179*	*N=119*	*N=58*	*N=54*	*N=8*
Taste	83	88	77	91	72	14	91	100
Habit	65	64	65	71	54	71	75	50
Price	38	36	42	40	35	36	43	13
Color	30	31	27	30	28	27	34	0
Own cultivation	25	20	31	12	44	14	16	0
Utilization	24	18	31	17	34	14	9	0
Healthy	18	20	15	19	17	19	14	50
Availability	4	5	3	4	4	8	4	0
Other	4	4	3	1	8	2	2	0
Finger millet	*N=351*	*N=209*	*N=142*	*N=203*	*N=148*	*N=69*	*N=59*	*N=14*
Taste	85	89	79	91	76	93	91	94
Habit	66	67	65	71	59	74	78	50
Price	34	33	35	36	31	36	34	25
Color	32	35	26	34	28	28	40	63
Own cultivation	25	18	34	12	42	12	16	0
Utilization	21	16	29	16	30	12	9	13
Healthy	19	20	17	20	17	20	16	38
Availability	5	4	5	3	6	6	2	0
Other	5	5	5	4	6	3	3	0

Notes: ***, **, * differences are significant at the 1%; 5% and 10% level, respectively.

These results do not allow conclusions about why more respondents consume maize instead of sorghum and finger millet and why respondents consume higher amounts. One reason is that maize is used for different dishes. Another reason may be that maize is more

widely available than sorghum and finger millet. A higher share of respondents stated availability as a reason for maize consumption.

3.4 Consumption trends of sorghum and finger millet consumers

Most sorghum and finger millet consumers stated that they always consumed the respective crop and only a minority stated that they have consumed sorghum and finger millet for less than 10 years (Table 11). A minority did not mention the year, but stated that they consume it since they got sick or have children.

In all settings, most respondents always consumed sorghum and finger millet. However, in production areas, a significantly higher share of respondents always consumed the two crops and consequently a significant lower share of respondents started consumption at a certain point in the past. Interestingly, high income areas have the highest share of respondents that have always consumed the two crops.

Among those that have started to consume, the majority stated that it is healthy and good for children. Taste was less important. This confirms our earlier argument that demand for sorghum and finger millet will increase, because consumers are becoming more health-conscious.

Table 11: Start of sorghum and finger millet consumption in % of consumers

	Total	Urban	Rural	Non-producer	Producer	Low income	Middle income	High income
Sorghum	*N=298*	*N=172*	*N=126*	*N=179*	*N=119*	*N=58*	*N=54*	*N=8*
Always	77	74	82	69	90***	68	66	88
Since…	23	26	18	31	10***	32	34	12
>10 years	4	3	5	4	2	3	4	0
<10 years	9	11	6	*13*	*5*	15	10	12
being sick	1	1	0	1	0	3	0	0
Having children	9	11	7	13	3	11	20	0
Finger millet	*N=351*	*N=209*	*N=142*	*N=203*	*N=148*	*N=69*	*N=59*	*N=14*
Always	81	79	84	73	90***	71	74	88
Since…	19	21	16	27	10***	29	26	12
>10 years	3	2	4	4	1	3	3	0
<10 years	9	10	6	11	2	15	7	6
being sick	1	2	0	2	5	4	0	6
Having children	6	7	6	10	2	7	16	0

Notes: ***, **, * differences are significant at the 1%; 5% and 10% level, respectively.

Table 12 shows that the majority of consumers will increase their demand for sorghum in the future. This holds true for all settings. Overall, production areas have the highest share of respondents that plan to increase consumption and the difference to non-production areas is significant. Combining the data for the different settings, we conclude that villages in production areas have the highest share of respondents that will increase consumption, followed by urban areas in production zones. Villages in non-production zones rank third and Nairobi consequently ranks last. This is surprising as villages in production areas already have the highest mean consumption of sorghum and finger millet (compare Table 7). The argument that demand is expected to increase in urban areas due to further urbanization

and health-consciousness nevertheless holds true, because it refers to the number of consumers than to the quantities consumed.

The most important reason why respondents expect to increase their sorghum demand is increasing family size. The only exceptions are production and high income areas. This highlights that sorghum is often used as a food for babies and children, thus, the more children in a household, the higher the sorghum consumption. Availability and taste rank second, followed by low price, health, and own cultivation. Other than family size, there are few significant differences. In rural areas, a significantly higher share of respondents stated availability as a reason. This means that they increase consumption only because of a lack of availability of other crops. Moreover, a significantly lower share of respondents stated health as a reason, which suggests that respondents in urban areas are more health-conscious.

Compared to non-production areas, a significantly lower share of respondents In production areas, stated family size and a significantly higher share stated availability. Again, consumption of sorghum will increase, because other crops are not available. Thus, in production zones and rural areas, consumption is not only determined by personal preferences, but rather by non-availability of other foodstuffs. On the other hand, consumption is likely to decrease, if other food stuffs become available. Own cultivation is obviously mentioned by a significantly higher share of respondents in production areas. Moreover, a significantly lower share of respondents in production areas states health as a reason for consumption. The most prevalent difference between the three income areas is that ‘health’ is the most important reason for increasing consumption in high income areas. This confirms our assumption that better off respondents in Nairobi are most health-conscious.

At all locations, the most important reason for decreasing consumption is family size, followed by high prices. A higher share of respondents in rural settings stated family size as a reason and a significantly lower share stated high prices. Thus, urban consumption is restricted by high sorghum prices. Interestingly, this holds true for Kisii but less for Nairobi, where incomes may be higher. Respondents with constant consumption expectations stated also gave family size as the most important reason. Another interesting reason is that the preparation of sorghum is difficult.

Table 12: Future demand for sorghum and reasons for changing demand in % of consumers

	Total	Urban	Rural	Non-producer	Producer	Low income	Middle income	High income
Demand	*N=298*	*N=172*	*N=126*	*N=179*	*N=119*	*N=58*	*N=54*	*N=8*
Increasing	73	70	76	66	82**	66	66	75
Decreasing	15	16	14	18	11	17	23	0
Constant	13	14	10	16	7	15	11	25
Reasons if increasing	**N=219**	**N=95**	**N=124**	**N=121**	**N=98**	**N=40**	**N=37**	**N=6**
Family size	57	52	63	67	45***	73	62	33
Availability	38	30	48**	24	55***	10	30	17
Taste	37	39	36	40	35	40	41	17
Cheap	19	19	18	16	23	13	14	0
Healthy	17	22	12**	23	10**	20	22	67**
Own cultivation	15	11	19	1	32***	3	0	0
Easy to blend	9	7	12	9	9	10	5	33
Habit	2	1	3	3	1	0	3	0
Learned utilization	2	3	0	3	0	8	3	0
Reasons if decreasing	*N=45*	*N=27*	*N=17*	*N=32*	*N=13*	*N=10*	*N=13*	*N=0*
Family size	71	61	88**	75	62	80	62	
Expensive	33	43	18*	28	46	20	39	n.a.
Taste	7	4	12	6	8	0	0	
Not available	7	7	6	9	0	5	10	
Reasons if constant	*N=38*	*N=13*	*N=25*	*N=29*	*N=9*			
Family size	53	54	52	55	44			
Consume enough	24	23	24	24	22	n.a.		
Difficult to prepare	16	23	12	17	11			
Taste	11	8	12	7	22			
Expensive	5	0	8	7	0			
Constant income	5	0	8	4	11			
Not available	5	15	0	4	11			

Notes: ***, **, * differences are significant at the 1%; 5% and 10% level, respectively.

Most respondents also plan to increase consumption of finger millet. Again, production areas have the highest share of respondents planning to increase consumption and the difference with non-production areas is significant. Comparing across locations, we can conclude that villages in production areas have the highest share of respondents that will increase consumption, followed by urban areas in production zones. Villages in non-production zones rank third and Nairobi consequently ranks last again.

Except in high income areas, increasing family size is the most important reason why respondents expect to increase their finger millet demand. As for sorghum, finger millet is often used as a food for babies and children to support their growth. In total, taste ranks second and availability third. However, there are some differences between the settings.

Taste ranks second in urban areas and non-production areas as well as in all income areas. Thus, taste, particularly in Nairobi, is an important reason for increasing consumption. Availability ranks second in rural areas and production areas. This suggests that there is a problem with availability of other crops, particularly in villages around Kisii. In line with these results, rural areas have a significantly lower share of respondents stating taste and a significantly higher share of respondents stating availability as a reason for increasing consumption. The same holds true for production areas when compared to non-production areas. Moreover, rural areas and production areas have a significantly lower share of respondents stating 'health' and a significantly higher share of respondents stating own cultivation as a reason for increasing consumption.

There are no significant differences between the three income areas. However, high income areas have the lowest share of respondents stating family size and the highest share of respondents stating taste and health as a reason for increasing consumption.

In all locations, family size is the most important reason for decreasing consumption, followed by high prices. However, a significantly higher share of respondents in rural settings stated family size and a significantly lower share stated high prices. Thus, urban consumption is restricted primarily by high finger millet prices. Respondents with constant consumption expectations stated family size as the most important reason. Another interesting reason is that the preparation of finger millet is difficult.

Above, we discussed how far sorghum and finger millet could substitute for maize. However, as both crops are mostly consumed as porridge for breakfast, respondents with an increasing demand stated that they will consume less tea. Milk and wheat rank second, followed by bread. In line with these answers, respondents with a decreasing consumption stated that they will consume more tea.

Table 14 presents figures for consumers who already buy sorghum in form of flour. Results show that the majority of consumers buy loose flour. Only high income areas have a higher share of consumers buying packed flour, which is according to our expectations. Moreover, urban areas have the same share of respondents buying loose and packed flour.

Combining the results, we can conclude that urban locations in non-production areas (Nairobi) have the highest share of respondents buying packed flour, followed by urban locations in production areas. Villages in non-production and production areas rank third and fourth, respectively. These results are in line with our expectations.

Table 13: Future demand for finger millet and reasons for changing demand in % of consumers

	Total	Urban	Rural	Non-producer	Producer	Low income	Middle income	High income
Demand	*N=351*	*N=209*	*N=142*	*N=203*	*N=148*	*N=69*	*N=59*	*N=14*
Increasing	75	71	79	69	82***	71	67	81
Decreasing	13	14	11	15	9	13	24	0
Constant	13	15	10	16	9	16	9	19
Reasons if increasing	*N=265*	*N=114*	*N=151*	*N=143*	*N=122*	*N=49*	*N=39*	*N=13*
Family size	57	52	63*	63	49***	69	56	39
Taste	42	47	34**	47	35*	45	54	54
Availability	37	31	45**	27	48***	10	36	39
Healthy	19	23	13**	25	12**	23	26	39
Cheap	16	17	15	15	18	10	10	23
Own cultivation	13	9	18**	1	27***	2	0	0
Easy to blend	8	6	11	8	8	8	5	15
Habit	3	3	3	4	3	2	5	0
Learned Utilization	1	2	0	2	0	6	0	0
Reasons if decreasing	*N=45*	*N=29*	*N=14*	*N=31*	*N=14*	*N=9*	*N=14*	*N=0*
Family size	64	52	88**	68	57	78	50	
Expensive	38	52	13**	32	50	22	50	
Taste	7	4	13	7	7	0	0	
Not available	7	7	6	10	0	11	7	
Reasons if constant	*N=45*	*N=14*	*N=31*	*N=32*	*N=13*			
Family size	47	57	42	53	31			
Consume enough	18	21	16	19	15			
Difficult to prepare	13	21	10	16	8			
Taste	11	14	10	9	15			
Expensive	9	7	10	13	0			
Not available	7	14	3	6	8			
Constant income	4	0	7	3	8			

Notes: ***, **, * differences are significant at the 1%; 5% and 10% level, respectively.

We asked consumers why they buy packed or loose flour. Table 14 shows that quality and convenience are in general the most important reasons for buying packed flour. Interestingly, quality is also the most important reason for buying loose flour. Thus, expectations about quality differ between consumers. Some judged quality by attractively packed products with information about the product and the company that produced it, while others judged quality by seeing the product itself or even the milling process.

Other reasons for buying loose flour are price and the ability to blend according to taste. Both reasons are important in rural settings. Availability, which is not important in urban areas, is the most important reason for buying loose flour in rural settings. Thus, at least some respondents would most likely buy packed flour, if it would be available. However, this is only the case in rural settings in non-production areas, as almost nobody buys flour in

production areas. Unfortunately, we did not ask how far respondents in production areas were interested to buy flour instead of grain. Of those who already buy packed flour, 41% always buy the same brand. Those who changed brands did so because they like variety and have no preference for a specific brand.

Table 14: Demand for sorghum flour in % of consumers who buy sorghum flour

	Total	Urban	Rural	Non-producer	Producer	Low income	Middle income	High income
Bought	*N=124*	*N=82*	*N=42*	*N=115*	*N=9*	*N=36*	*N=35*	*N=7*
Loose	65	50	93***	64	67	53	51	43
Packed	35	50	7***	36	33	47	49	57
Reasons if packed	*N=44*	*N=41*	*N=3*	*N=41*	*N=3*	*N=17*	*N=17*	*N=4*
Quality	68	n.a.		n.a.		65	71	
Convenience	39					47	18	
Availability	25					24	29	
Other	14					6	24	
Reasons if loose	*N=80*	*N=41*	*N=39*	*N=74*	*N=6*	*N=19*	*N=18*	*N=3*
Quality	44	56	31	n.a.		68	50	
Price	29	15	44			0	28	
Blend to own taste	28	20	36			32	6	
Availability	23	0	46			0	0	
Other	18	27	8			11	39	
Buying same brand if packed	N=44							
No	59							
Yes	41							

Notes: ***, **, * differences are significant at the 1%; 5% and 10% level, respectively.

Results for finger millet are similar to those for sorghum. However, a slightly higher share of respondents is already buying packed finger millet flour. This holds true for all settings, except production areas. Reasons for buying packed or loose flour as well as the share of respondents buying always the same brand are also the similar.

Table 15: Demand for finger millet flour in % of consumers who buy finger millet flour

	Total	Urban	Rural	Non-producer	Producer	Low income	Middle income	High income
Bought	*N=148*	*N=100*	*N=48*	*N=132*	*N=16*	*N=41*	*N=37*	*N=13*
Loose	59	44	90***	57	75	46	43	31
Packed	41	56	10***	43	25	54	57	69
Reasons if packed	*N=61*	*N=56*	*N=5*	*N=58*	*N=3*	*N=22*	*N=21*	*N=9*
Quality	75	n.a.		n.a.		73	76	
Convenience	30					37	14	
Availability	25					23	24	
Other	25					9	19	
Reasons if loose	*N=87*	*N=44*	*N=43*	*N=74*	*N=13*	*N=19*	*N=16*	*N=4*
Quality	44	57	30	n.a.		68	56	
Price	28	16	40			0	25	
Blend to own taste	25	18	33			26	6	
Availability	26	2	51			0	0	
Other	16	23	9			16	34	
Buying same brand if packed	N=61							
No	52							
Yes	48							

Notes: ***, **, * differences are significant at the 1%; 5% and 10% level, respectively.

3.5 Awareness about sorghum and finger millet among on-consumers

All the non-consumers in our sample are aware of sorghum and finger millet, the majority sating their existence was common knowledge. Other channels through which respondents learned about the two crops are relatives and friends, and markets. Radio and TV play only a minor role.

The pattern is similar in all settings. However, in rural areas for sorghum common knowledge is mentioned by a significantly lower share of respondents than in urban areas and markets are mentioned by a significantly higher share. Moreover, in rural areas, markets are the most important channel through which respondents learn about sorghum and finger millet. However, a combination of results highlights that common knowledge and getting to know the crop at the market are more or less equally important in rural production areas, whereas common knowledge is more important than markets in rural non-production areas. Moreover, it is more common to know sorghum in urban than in rural production areas. Thus, villages in production areas have the lowest share of non-consumers who stated that it is common to know sorghum. This can be explained by the fact that not all villages in production zones necessarily produce sorghum and information spreads less between different villages than between villages and urban centers. High income areas have a significantly lower share of respondents stating that it is common to know finger millet. Moreover, this ranks third after relatives/friends and radio.

Table 16: Awareness sorghum and finger millet in % of non-consumers

	Total	Urban	Rural	Non-producer	Producer	Low income	Middle income	High income
Sorghum	*N=119*	*N=91*	*N=28*	*N=86*	*N=33*	*N=34*	*N=22*	*N=15*
Common knowledge	57	63	39**	57	58	65	64	47
Relatives/friends	19	19	7*	21	15	24	18	27
Market	19	9	54***	16	28	9	18	0
Radio	3	4	0	5	0	3	0	20
TV	1	1	0	1	0	0	0	7
Finger millet	*N=78*	*N=61*	*N=17*	*N=70*	*N=8*	*N=27*	*N=20*	*N=9*
Common knowledge	51	54	41	n.a.		56	65	22*
Relatives/friends	22	25	12			26	15	33
Market	21	13	47***			15	20	0
Radio	5	7	0			4	0	33
TV	1	2	0			0	0	11

Notes: ***, **, * differences are significant at the 1%; 5% and 10% level, respectively.

Respondents analyzed in this section are classified as non-consumers, because they do not consume sorghum and/or finger millet on a monthly basis. However, they might have consumed sorghum/finger millet in the past or consume it irregularly. Table 17 shows that 56% of the respondents have consumed sorghum in the past and that half of them consumed it regularly.

Production areas have the highest share of respondents who have consumed sorghum in the past, and a significantly higher share than non-production areas. Urban areas rank second. Thus, urban areas in production zones have the highest share of respondents with experience of sorghum consumption, followed by rural areas in production zones. Urban areas in non-production zones (Nairobi) and rural areas in non-production zones rank third and fourth, respectively. Interestingly, production zones have a significantly lower share of respondents who have consumed sorghum regularly. Moreover, in this setting, far more respondents have consumed sorghum only a few times, whereas it is relatively balanced in the other settings. The other exception is the high income area, where the vast majority of respondents had consumed sorghum only a few times.

The majority of those who have consumed sorghum in the past consumed it as porridge. Moreover, the majority know that it can be consumed as porridge. Ugali ranks second in both cases. Thus, also respondents who never consumed sorghum know at least one or two dishes that can be prepared with it.

Table 17: Consumption experiences of sorghum in % of non-consumers

	Total	Urban	Rural	Non-producer	Producer	Low income	Middle income	High income
Sorghum	*N=146*	*N=110*	*N=36*	*N=108*	*N=38*	*N=45*	*N=26*	*N=18*
No	44	40	56	48	32*	40	46	50
Yes	56	60	44	52	68*	60	54	50
Frequency	*N=76*	*N=61*	*N=15*	*N=50*	*N=26*	*N=24*	*N=14*	*N=9*
Few times	51	53	47	43	70**	42	46	80
Regularly	49	47	53	57	30**	58	54	20
Utilization	*N=76*	*N=61*	*N=15*	*N=50*	*N=26*	*N=24*	*N=14*	*N=9*
Porridge	91	90	93	98	77	26	100	100
Ugali	21	20	21	14	35	24	14	0
Preparation knowing	*N=55*	*N=38*	*N=17*	*N=44*	*N=11*	*N=16*	*N=11*	*N=6*
Porridge	95	100	92	93	100	88	91	100
Ugali	33	53	24	25	64	19	36	0
Drinks	26	29	24	25	27	25	36	0

Notes: ***, **, * differences are significant at the 1%; 5% and 10% level, respectively.

Results for finger millet are similar (Table 18). The majority of respondents consumed finger millet in the past. However, contrary to sorghum results, there is no significant difference between production and non-production areas. Instead, rural areas have a significantly lower share of respondents having consumed finger millet than urban areas. High income areas have the lowest share of respondents that have consumed finger millet in the past. However, the difference is not significant and also in high income areas, the majority of respondents have consumed finger millet in the past. All settings, except high income areas, have a higher share of respondents who have consumed finger millet regularly. Rural areas have a higher share of respondents that consumed finger millet regularly than urban areas. Results for utilization of finger millet are the same as for sorghum.

Table 18: Consumption experiences of finger millet in % of non-consumers

	Total	Urban	Rural	Non-producer	Producer	Low income	Middle income	High income
Finger millet	*N=90*	*N=71*	*N=19*	*N=82*	*N=8*	*N=33*	*N=22*	*N=11*
No	41	37	58*	41	38	33	36	45
Yes	59	63	42*	59	62	67	64	55
Frequency	*N=49*	*N=41*	*N=8*			*N=19*	*N=13*	*N=6*
Few times	46	49	29			47	43	75
Regularly	54	51	71			53	57	25
Utilization	N=49	N=41	N=8	n.a		N=19	N=13	N=6
Porridge	98	98	100			95	100	100
Ugali	14	17	0			26	15	0
Preparation knowing	*N=30*	*N=22*	*N=8*			*N=10*	*N=8*	*N=2*
Porridge	97	96	100			100	88	100
Ugali	37	41	25			20	63	0
Drinks	27	23	38			20	28	0

Notes: ***, **, * differences are significant at the 1%; 5% and 10% level, respectively.

As all non-consumers stated that they know sorghum and finger millet, why do they not consume the crops? Table 19 displays results for sorghum. Taste and the fact that it is not common to consume sorghum are the two most important reasons for non-consumption. This is in line with our earlier results that habit and taste are the most important reasons for consumption. Other reasons are availability, suitability, flour quality, difficult preparation and high price. Suitability in this context means that sorghum is not suitable for the dishes the family likes to eat.

The ranking of reasons differs between the settings. In rural areas, taste ranks only third and the fact that consumption is not common and sorghum is not available rank first and second, respectively. Non-availability was also mentioned by a significant higher share of respondents in rural than in urban areas. Moreover, price and preference for other foodstuffs was mentioned by a significantly higher share of respondents in rural areas.

Non-production areas have a significantly higher share of respondents stating taste as a reason for non-consumption. There is no plausible explanation for this. Even though not significant, production areas also have a higher share of respondents stating non-availability as a reason, which is contrary to our expectations. Moreover, it is interesting that the reason ‘not common’ ranks third in production zones. These results suggest that sorghum cultivation and thus consumption might not be that widespread even in production zones. The three income areas do not show significant differences and reasons for non-consumption follow a similar ranking. In all cases taste and not being common are the two most important reasons for non-consumption.

We also asked non-consumers what would need to be done to encourage them to start consuming sorghum. Information on utilization was the most important reason throughout all settings. Availability ranks second and competitive price third. Compared to other cereals, it might be feasible to make the price competitive, however compared to tea, which is often consumed instead of porridge, this is difficult. In line with results above, improving availability

is mentioned by a significantly higher share of consumers in rural than in urban areas. Interestingly, other differences are not reflected. Even though a preference for other foodstuff was more important in rural areas, a lower share of respondents stated here that they do not want to consume sorghum. By contrast, a significantly higher share of non-consumers in rural areas states that clean flour would increase their likelihood of consumption, even though flour quality was equally important in both settings.

Table 19: Reasons for non-consumption of sorghum in % of non-consumers

	Total	Urban	Rural	Non-producer	Producer	Low income	Middle income	High income
Reasons	*N=146*	*N=110*	*N=36*	*N=108*	*N=38*	*N=45*	*N=26*	*N=18*
Taste	56	59	47	48	79***	49	54	56
Not common	55	52	64	58	45	51	54	67
Availability	38	33	56**	35	47	36	35	22
Not suitable	28	31	19	29	26	29	31	28
Flour quality	25	25	25	22	32	18	27	28
Difficult preparation	23	22	25	23	21	29	15	11
Price	17	15	28*	20	11	20	19	6
Color	8	8	8	6	16**	9	4	6
Prefer other food	8	6	17**	8	8	4	8	11
Other	2	3	0	2	3	2	4	0
Start consumption	*N=146*	*N=110*	*N=36*	*N=108*	*N=38*	*N=45*	*N=26*	*N=18*
Info utilization	77	76	78	77	76	78	81	72
Available	54	50	67*	54	55	44	62	44
Competitive price	47	48	44	47	47	47	62	11
Nice package	21	22	19	22	18	18	31	28
Clean flour	18	14	31**	17	21	20	8	6
Don’t want to	10	12	6	11	8	9	8	28
Light color	7	7	6	5	13	4	8	0
Other	13	10	26	12	20	14	4	6

Notes: ***, **, * differences are significant at the 1%; 5% and 10% level, respectively.

Reasons for non-consumption of finger millet are similar to those for sorghum, but the ranking is different. The majority of non-consumers stated that it is not common to consume finger millet, followed by availability and taste. Other reasons are that finger millet is not suitable for the dishes that the family likes to eat, price, and difficulty of preparation.

The ranking of reasons is similar in all settings, but with some interesting differences. Price ranks second in rural areas and a significantly higher share of non-consumers mentioned it in rural compared to urban areas. Respondents in rural areas are more price sensitive than those in urban areas. Moreover, in rural areas in non-production zones, finger millet prices are likely to be higher than in urban areas. Flour quality is also mentioned by a significantly higher share of non-consumers in rural areas and ranks third, whereas it is not an important reason in urban areas. Packed flour is more common in urban areas, while flour is usually sold loose in rural areas, and may have a higher likelihood of contamination. Another significant difference is that a higher share of respondents in rural areas prefer other food. Thus, consumers in urban areas seem to be more open minded towards new foodstuffs.

Figures for non-production and production areas are not provided as there are only eight non-consumers in production areas. The most interesting differences between income areas is that availability is not mentioned by non-consumers in high income areas. However, this does not necessarily mean that finger millet availability is higher in high income areas. It might be the case that non-consumers in this setting are not looking for finger millet and so are not restricted by availability. In high income areas, by far the most important reason for non-consumption is that it is not common to consume finger millet. In the other two income groups, this reason and availability are equally important.

Asked about what could be done to make non-consumers starting to consume finger millet, the same aspects as for sorghum were mentioned. Information about utilization is most important, followed by competitive prices and availability. The latter is particularly important in rural areas, where it ranks first and was mentioned by a significantly higher share of respondents than in urban areas. Other significant differences do not exist. However, while 10% of the respondents in urban areas stated that they do not want to consume finger millet, none of the respondents in rural areas did so. This is surprising, as a significantly higher share of respondents in rural areas had mentioned preferences for other foodstuff as a reason for non-consumption.

A significantly higher share of respondents in high income areas stated that they do not want to consume finger millet and a significantly lower share of respondents stated competitive prices as an incentive for consumption. Both is in line with results above. However, it is interesting that respondents in high income areas are that reluctant to try finger millet.

Table 20: Reasons for non-consumption of finger millet in % of non-consumers

	Total	Urban	Rural	Non-producer	Producer	Low income	Middle income	High income
	N=90	*N=71*	*N=19*	*N=82*	*N=8*	*N=33*	*N=22*	*N=11*
Not common	56	55	58	n.a.		45	59	73
Availability	39	37	47			42	50	0**
Taste	36	39	21			36	36	46
Not suitable	32	34	26			36	27	36
Price	31	27	47*			30	32	9
Difficult preparation	24	27	16			30	23	18
Flour quality	13	10	26*			6	18	9
Prefer other food	10	7	21*			6	5	18
Color	2	3	0			3	0	0
Other	3	4	0			3	5	0
Start consumption	*N=90*	*N=71*	*N=19*	*N=82*	*N=8*	*N=33*	*N=22*	*N=11*
Info utilization	73	73	74			73	73	64
Competitive price	54	54	58			52	77	9***
Available	51	45	74**	n.a.		42	55	18
Clean flour	24	23	32			33	23	0*
Nice package	19	17	26			15	27	9
Don't want to	8	10	0			3	9	36**
Other	13	13	16			21	5	9

Notes: ***, **, * differences are significant at the 1%; 5% and 10% level, respectively.

3.6 Awareness about the nutritional value of sorghum and finger millet

A common argument for the promotion of sorghum and finger millet consumption is that both crops are highly nutritious, making them valuable for children, weaning mothers, pregnant women and sick and elderly people. We were therefore interested to see in how far respondents are aware of the nutritional value of sorghum and finger millet, and what they consider as their nutritional value.

The majority of sorghum consumers stated that they are aware that sorghum has a high nutritional value. This holds true for all settings. However, compared to urban areas a significantly lower share of consumers in rural areas was aware of the nutritional value. In the case of non-consumers, only one third is aware about the high nutritional value of sorghum. This again holds true for all settings. Interestingly, this time a lower share of respondents in production areas, compared to non-production areas, is aware of a high nutritional value of sorghum.

Knowledge about the nutritional value of sorghum is rather general. The majority of consumers as well as non-consumers stated that sorghum provides energy. This is for both groups the by far most important aspect. Other aspects that were mentioned are that sorghum is nutritious, has proteins and increases the appetite. These results show that respondents might know that sorghum consumption is in general good for them, but they cannot give specific reasons why.

Table 21: Awareness about the nutritional value of sorghum in % of respondents

	Total	Urban	Rural	Non-producer	Producer	Low income	Middle income	High income
Awareness consumers	*N=298*	*N=173*	*N=125*	*N=180*	*N=118*	*N=58*	*N=55*	*N=8*
No	23	19	28*	21	25	22	20	0
Yes	77	81	72*	79	75	78	80	100
Awareness non-consumers	*N=146*	*N=110*	*N=36*	*N=108*	*N=38*	*N=45*	*N=26*	*N=18*
No	71	70	75	68	79*	67	77	72
Yes	29	30	25	32	21*	33	23	28
Knowledge consumers	*N=230*	*N=140*	*N=90*	*N=142*	*N=88*	*N=45*	*N=44*	*N=8*
Provides energy	68	62	76**	63	75**	67	57	50
Nutritious	28	25	31	32	20*	27	20	88**
Has proteins	23	28	16	21	35**	22	32	13
Increases appetite	27	34	16***	30	22	31	34	25
Strengthening	16	16	17	14	21	11	11	0
Other	18	22	12	16	21	9	17	13
Knowledge non-consumers	N=42	N=33	N=9	N=34	N=8	N=15	N=6	N=5
Provides energy	67							
Increases appetite	13				n.a.			
Has proteins	12							
Is nutritious	12							
Good for diabetics	10							
Good for blood	7							
For children	2							

Notes: ***, **, * differences are significant at the 1%; 5% and 10% level, respectively.

Results for finger millet are similar. The majority of consumers are aware about the high nutritional value of finger millet whereas in case of non-consumers only one third is aware. The pattern is the same in all settings. However, rural areas and production areas have a significantly lower share of aware consumers than their respective comparison group. Thus, urban non-production areas have the highest share of consumers who are aware of the nutritional value. In our case, these are consumers in Nairobi and it is not surprising that they are more informed than consumers in other settings.

Although because of the low sample size no significant difference was found between non-consumers in non-production and production areas, results show that respondents in production areas are generally worse-informed and this is particularly true for rural areas.

Results on the details that are known about the nutritional value of finger millet are similar to those of sorghum.

Table 22: Awareness about the nutritional value of finger millet in % of respondents

	Total	Urban	Rural	Non-producer	Producer	Low income	Middle income	High income
Awareness consumers	*N=351*	*N=209*	*N=142*	*N=203*	*N=148*	*N=69*	*N=59*	*N=14*
No	24	16	35***	19	30**	19	15	6
Yes	76	84	65***	81	70**	81	85	94
Awareness non-consumers	*N=90*	*N=71*	*N=19*	*N=82*	*N=8*	*N=33*	*N=22*	*N=11*
No	67	68	63	65	87**	58	77	73
Yes	33	32	37	35	13**	42	23	27
Knowledge consumers	*N=272*	*N=178*	*N=94*	*N=168*	*N=104*	*N=56*	*N=50*	*N=15*
Provides energy	67	62	75**	62	74**	35	64	33
Nutritious	29	27	32	34	21***	22	14	87***
Increases appetite	27	34	14***	31	21*	31	38	33
Has proteins	19	21	16	16	33***	11	26	7**
Strengthening	17	16	19	16	20	9	14	20
Other	18	16	22	17	21	18	18	7
Knowledge non-consumers	*N=30*	*N=23*	*N=7*	*N=29*	*N=1*	*N=14*	*N=5*	*N=3*
Provides energy	63							
Increases appetite	13			n.a.				
Is nutritious	13							
Has proteins	10							
Good for diabetics	10							
Good for blood	7							
For children	3							

Notes: ***, **, * differences are significant at the 1%; 5% and 10% level, respectively.

3.7 Delivery of information about sorghum and finger

To best promote sorghum and finger millet consumption, we asked all respondents through which channels we could deliver information about these crops. Roughly 80% of the respondents mentioned radio, followed by TV, which was still mentioned by more than half of the respondents. School, seminars and social events rank third, but are far less important than the first two information channels. In Nairobi, middle and high income areas show a different ranking. TV is regarded in both areas as a more promising information channel than

radio. Even though all other settings follow more or less the ranking described above, there are also some interesting differences between the importances of different information channels.

Rural areas have a significantly higher share of respondents mentioning radio and a significantly lower share mentioning TV than urban areas. The same holds true when comparing production to non-production areas. Thus, radio is in particular important in rural production areas and TV is in particular important in urban non-production areas (Nairobi). Another interesting finding is that schools are mentioned by a significantly higher share of respondents in production compared to non-production areas. In the first, school even ranks second. Thus, information about sorghum and finger millet should be distributed through different channels in the different settings.

For radio as well as for TV, the vast majority of respondents pointed out that information should be provided through regular programs. Around half of the respondents stated that information would be recognized best if it is presented in form of adverts. All settings follow this pattern. However, in rural as well as in production areas, adverts are less popular.

Table 23: Information channels for sorghum and finger millet

	Total	Urban	Rural	Non-producer	Producer	Low income	Middle income	High income
Media	*N=453*	*N=289*	*N=164*	*N=297*	*N=156*	*N=104*	*N=82*	*N=32*
Radio	82	74	94***	75	93***	74	72	42***
TV	53	67	29***	69	22***	70	79	87
School	15	14	17	9	26***	7	12	29***
Seminar	13	11	17*	12	16	11	12	6
Social event	12	11	14	6	22***	4	12	10*
Newspaper	6	9	1***	8	1***	6	9	36***
Other	13	17	6***	15	8**	14	11	48***
Information channel								
Radio	*N=369*	*N=215*	*N=154*	*N=224*	*N=145*	*N=77*	*N=59*	*N=13*
Program	89	86	92*	86	93**	84	85	77
Advert	39	52	21**	52	19***	61	68	39
TV	*N=240*	*N=193*	*N=47*	*N=205*	*N=35*	*N=73*	*N=65*	*N=27*
Program	90	89	96	89	94	86	91	85
Advert	53	55	45	53	54	63	59	22***

Notes: ***, **, * differences are significant at the 1%; 5% and 10% level, respectively.

4 Country level results, Tanzania

Table 24 displays some key characteristics of the sample. Respondents were on average 37 years old with the youngest respondents found in urban non-production areas, particularly in middle income areas in Dar es Salaam. The majority of respondents in all settings were female. However, urban production areas have a significantly lower share of female respondents than urban non-production areas. Despite these differences, we do not expect any bias in our results. The average household size of the sample is 5 members, with 4 members in urban production areas.

Table 24: Socio-economic sample characteristics

	Total *N=439*	Rural non-producer *N=59*	Urban non-producer *N=255*	Urban producer *N=125*	Low income *N=50*	Middle income *N=50*	High income *N=50*
Age (years)	37	42**	35	40**	40	32	43*
Female respondent (%)	74	80	80	58***	70	68	64
HH size (No.)	5	5	5	4	5	5	5

Notes: ***, **, * differences are significant at the 1%; 5% and 10% level, respectively.

4.1 Cereal consumption

As in Kenya, maize is the most widely consumed cereal (100% of respondents), followed by wheat (88%). Finger millet is also relatively popular (67%), whereas sorghum is only consumed by around one quarter of the respondents (Table 25).

There are no significant differences for maize and wheat between the locations, but in the case of sorghum, urban production areas have a significantly lower share of respondents consuming the crop than urban areas in non-production zones. The same holds true for finger millet. This is surprising at first sight and possible reasons for this finding will be discussed in sections 4.3 and 4.5.

Urban non-production areas have a significantly higher share of respondents consuming finger millet than rural non-production areas. Trade from production areas to non-production areas is first of all directed towards urban centers. Only then are cereals distributed to rural areas. However, there is no significant difference between the two settings in case of sorghum. Finger millet is also consumed by a significantly lower share of respondents in high income areas compared to the other two income areas, which is again not the case for sorghum.

Table 25: Share of households consuming selected cereals on a monthly base

	Total *N=439*	Rural non-producer *N=59*	Urban non-producer *N=255*	Urban producer *N=125*	Low income *N=50*	Middle income *N=50*	High income *N=50*
Maize	100	100	100	/	100	100	100
Wheat	88	85	92	/	96	90	84
Sorghum	26	32	33	9***	24	26	20
Finger millet	67	63***	84	34***	96	90	84**

Notes: ***, **, * differences are significant at the 1%; 5% and 10% level, respectively.

In Tanzania, a bigger share of respondents buy the four crops as flour rather than grain (Table 26). Sorghum and finger millet processing seems to be widespread and few respondents buy grain to mill at home or in public mills. Whereas maize and wheat are mostly bought as pure flour, sorghum and finger millet are more often bought as blended flour, which is in line with results from Kenya. Blended flour is blended with groundnuts, soya or beans.

Regarding rural and urban non-production areas, there are no significant differences in case of maize and wheat. However, a significantly higher share of respondents in rural non-production areas buys sorghum and finger millet as grain. In rural non-production areas, flour is bought by a higher share of respondents than grain. As for the total sample, sorghum and finger millet are by most respondents bought as blended flour whereas maize and wheat are primarily bought as pure flour.

By contrast, in urban production areas the majority of respondents buy maize, sorghum and finger millet as grain. Consequently, compared to urban non-production areas, a significant higher share of respondents buys maize, sorghum and finger millet grain and a significantly lower share buys flour. This indicates that flour processing mostly takes place outside production areas and ready processed flour is less available in production areas. These results are in line with findings from the processor survey conducted by ICRISAT in Tanzania. Results for the three income areas are in line with results for the total sample.

Table 26: Monthly consumption of selected cereals on a household level (N=439)

Cereal	Total	Rural non-producer	Urban non-producer	Urban producer	Low income	Middle income	High income
Bought as grain (% hh)							
Maize	63	60	53	84***	40	50	32
Wheat	5	2	7	2	4	22	5***
Sorghum	38	50	28	100***	50	77	42
Finger millet	34	51**	24	80***	19	40	29*
Bought as pure flour (% hh)							
Maize	54	65	71	15***	90	88	96
Wheat	96	96	94	100**	100	96	100
Sorghum	17	22	18	0	33	31	42
Finger millet	37	24**	46	5***	56	49	50
Bought as blended flour (% hh)							
Maize	15	17	22	0***	4	18	4**
Wheat	17	16	24	0***	2	7	0
Sorghum	54	33**	66	0***	33	39	25
Finger millet	46	51	51	15***	42	42	45
Mean amount consumed (kg)							
Maize	21.4	18.5	21.0	23.6	26.0	20.7	27.1
Wheat	6.5	5.6	7.5	4.7***	8.6	7.0	8.6
Sorghum	6.9	6.5	5.8	15.8***	5.5	5.8	7.6
Finger millet	7.8	11.0	8.2	3.0**	5.1	5.2	5.5
Amount bought as grain (kg)							
Maize	12.2	7.1	8.4	22.4***	7.8	4.9	9.2
Wheat	0.2	0.5	0.3	0.1	0.1	0.5	0.7
Sorghum	3.5	3.6	1.9	15.8***	3.5	4.1	6.0
Finger millet	3.7	7.4*	3.2	2.6	1.4	2.1	1.8
Amount bought as pure flour (kg)							
Maize	8.4	10.9	11.4	1.1***	18.1	14.8	17.9
Wheat	5.5	4.6	6.0	4.6*	8.5	6.3	7.9
Sorghum	0.7	1.6*	0.6	0.0	1.1	1.2	1.2
Finger millet	2.1	2.1	2.6	0.1***	2.1	1.4	1.8
Amount bought as blended flour (kg)							
Maize	0.8	0.5	1.2	0.0***	0.1	0.9	0.1*
Wheat	0.8	0.5	1.3	0.0***	0.1	0.2	0.0
Sorghum	2.6	1.3**	3.2	0.0***	0.9	0.6	0.4
Finger millet	2.0	1.5	2.4	0.3***	1.6	1.6	1.9

Notes: ***, **, * differences are significant at the 1%; 5% and 10% level, respectively.

Information on the amount consumed is shown in Table 26. Consumption figures refer only to respondents who actually consumed the respective crop and not to the total sample.

Maize has by far the highest consumption. Finger millet surprisingly ranks second, followed by sorghum and then wheat. However, differences between the latter three crops are very small. Mean consumption does not differ significantly between rural and urban non-production areas. Nevertheless, the difference between mean consumption of finger millet and (sorghum and wheat is far higher in rural than in urban non-production areas. Thus, finger millet seems to be relatively more popular in rural non-production areas. Respondents in production areas consume on average significantly less wheat and finger millet and

significantly more sorghum. Consequently, sorghum is relatively more popular in urban production areas, whereas there is no difference between sorghum, finger millet and wheat in urban non-production areas.

Although a higher share of respondents buys cereals as flour, the amount of grain and flour bought does not differ much. The exception is wheat, where much less grain is bought. However, the pattern differs between locations. In rural and urban non-production areas, respondents buy higher quantities of flour than grain. The exceptions are sorghum and finger millet in rural non-production areas, which indicates that sorghum and finger millet flour is either less available or less preferred in these areas. By contrast, respondents in urban production areas buy higher quantities of grain than of flour for all crops except wheat, which again points out non-availability or different consumer preferences. In the case of maize and wheat, higher amounts of pure flour are bought, whereas respondents buy higher amounts of blended flour in case of sorghum and equal amounts of pure and blended finger millet flour. Blended sorghum and finger millet flour is more popular than pure flour and vice versa for maize and wheat.

Table 27 shows the utilization of the four cereals. As in Kenya, the four crops are complements rather than substitutes. Maize is mostly consumed as ugali, followed by Makande (a maize bean dish) and as porridge by less than one fourth of the respondents. By contrast, sorghum and finger millet are mostly consumed as porridge, while only one third also prepare ugali from sorghum. Moreover, finger millet is used to prepare alcoholic drinks, particularly in rural and urban non-production areas. As in Kenya, wheat is mostly used to prepare chapattis and mandazis. Utilization patterns are the same in all settings, except in two cases. In urban production areas, most consumers use sorghum to prepare ugali but only one third use it to prepare porridge. In middle income areas, the majority use maize to prepare porridge and only one half of the respondents use it to prepare ugali. These results suggest the potential to increase sorghum and finger millet consumption by promoting ugali from maize flour that is blended with sorghum or finger millet, or both.

Table 27: Utilization of selected cereals in % of consumers

	Total	Rural non-producer	Urban non-producer	Urban producer	Low income	Middle income	High income
Maize	*N=439*	*N=59*	*N=255*	*N=125*	*N=50*	*N=50*	*N=50*
Ugali pure	94	93	94	98	92	24	94
Ugali blended	1	2	1	0	2	24	2
Makande	56	73	54	54	54	42	48
Porridge pure	23	45	29	0	28	90	28
Porridge blended	20	17	27	8	12	0	8
Boiled or roasted	17	24	15	18	26	28	20
Other	1	2	1	1	2	0	2
Wheat	*N=385*	*N=50*	*N=234*	*N=101*	*N=48*	*N=45*	*N=42*
Chapatti	95	100	93	99	100	100	98
Mandazi	79	74	85	68	100	98	93
Other	17	18	25	17	4	4	10
Sorghum	*N=115*	*N=19*	*N=85*	*N=11*	*N=12*	*N=13*	*N=10*
Porridge blended	61	39	73	18	42	46	40
Porridge pure	19	33	14	9	25	31	30
Ugali pure	31	48	20	82	50	46	40
Ugali blended	2	5	1	0	8	0	10
Other	11	22	2	46	8	0	0
Finger millet	*N=293*	*N=37*	*N=213*	*N=43*	*N=48*	*N=45*	*N=42*
Porridge blended	68	54	70	70	69	67	73
Porridge pure	30	32	30	30	29	33	24
Ugali pure	6	5	6	2	10	2	12
Ugali blended	3	5	3	0	2	2	10
Alcoholic brew	15	27	16	0	13	16	19
Other	3	3	4	0	4	9	5

Notes: ***, **, * differences are significant at the 1%; 5% and 10% level, respectively.

4.2 Place of purchase of food stuffs and cereals

In Tanzania, we differentiate three market outlets: open air markets, small retail shops and supermarkets. Respondents obtaining cereals from their own production are not included in the analysis below. This accounts for 4% of the respondents in the case of maize and sorghum, respectively and 1% of the respondents in the case of finger millet.

Open air markets are the most important shopping outlet for maize, sorghum and finger millet, followed by small retail shops. For finger millet, however, they are almost equally important. Wheat is mostly bought in small retail shops, followed by open air markets. All crops are mostly bought as flour and our results indicate that processed flour is widely available and not sold only in selected shopping outlets. Moreover, the fact that availability of sorghum and finger millet is limited in supermarkets should not restrict consumption, since supermarkets play only a minor role in the purchase of cereals,

Rural and urban non-production areas follow the same pattern, with some differences in the importance of selected shopping outlets. For all four cereals, open-air markets are more

important in rural than in urban non-production areas. Small retail shops are equally important and supermarkets are more important in urban non-production areas.

Shopping behavior in urban production and non-production areas differs between the cereals. For maize, sorghum and finger millet, open-air markets are more important in urban production areas. Interestingly, the opposite holds true for wheat. For all crops, supermarkets are less important in urban production areas and almost irrelevant for maize, sorghum and finger millet. This is understandable as few mini-supermarkets are found in urban production areas. Except for wheat, small retail shops also play only a minor role. As small retail shops exist in urban production areas and maize is available there, it seems to be a matter of consumer preference where to buy cereals.

Results show that small retail shops and supermarkets are more important in the three income areas in Dar es Salaam than in the total sample. This confirms that urbanization processes change shopping behavior and highlights the importance of making sorghum and finger millet available in all shopping outlets. Differences between the three income areas are small. Other food stuffs are mostly bought at open-air markets and in small retail shops. Thus, supermarkets play a minor role for food purchases. However, the example of Kenya suggests that this will change in future.

Table 28: Place of purchase for different foodstuff in % of respondents

	Total	Rural non-producer	Urban non-producer	Urban producer	Low income	Middle income	High income
Maize	*N=423*	*N=59*	*N=242*	*N=122*	*N=50*	*N=50*	*N=50*
Open air market	81	92	75	88	60	70	58
Small retail shop	51	68	78	14	90	94	94
Supermarket	26	5	40	9	40	38	44
Wheat	*N=385*	*N=50*	*N=234*	*N=101*	*N=48*	*N=45*	*N=42*
Open air market	38	60	43	14	35	44	33
Small retail shop	90	94	86	98	90	93	91
Supermarket	27	8	51	21	44	33	62
Sorghum	*N=103*	*N=19*	*N=80*	*N=4*	*N=12*	*N=12*	*N=8*
Open air market	72	90	66	100	58	83	50
Small retail shop	64	74	65	0	58	17	63
Supermarket	38	16	45	0	33	0	75
Finger millet	*N=286*	*N=36*	*N=211*	*N=39*	*N=48*	*N=45*	*N=41*
Open air market	67	78	61	90	48	73	54
Small retail shop	65	75	72	23	79	87	88
Supermarket	39	11	50	3	50	36	59
Other food stuff	*N =439*	*N=59*	*N=255*	*N=125*	*N=50*	*N=50*	*N=50*
Open Air Market	92	92	87	100	80	82	86
Small Retail Shop	79	97	76	75	20	82	96
Supermarket	25	0	31	25	20	20	16

Notes: ***, **, * differences are significant at the 1%; 5% and 10% level, respectively.

4.3 Consumer preferences for selected cereals

We asked respondents why they consumed a particular cereal. However, as wheat is utilized in a very different way from sorghum and finger millet, it was omitted from the following analysis.

Reasons for consumption differ between maize on the one hand and sorghum and finger millet on the other (Table 29). Habit and availability are the two most important reasons for maize consumption, followed by ease of preparation and taste. For sorghum and finger millet, the fact that the crops are assumed to be healthy is the most important reason for consumption. Thus, consumers seem to be well informed about the health benefits of sorghum and finger millet, which will also be discussed in section 4.6 below. Taste and habit rank second and utilization (the cereal is needed to prepare a specific dish, e.g. porridge) ranks third. Hence, sorghum and finger millet consumption is common for at least for half of the respondents. However, maize is more likely to be consumed because of habit and availability, whereas respondents deliberately choose to consume sorghum and finger millet.

In rural non-production areas, availability ranks first for maize and is mentioned by a significantly higher share of respondents than in urban non-production areas. In the case of sorghum, urban consumers seem to be better informed about health benefits, as a significantly lower share of respondents in rural non-production areas mentioned 'health' as a reason for consumption. Interestingly, this difference is not found for finger millet.

Reasons for consumption of sorghum and finger millet are more distinct between urban non-production and production areas. Although 'health' is the most important reason for sorghum consumption in both settings, it was mentioned by a significantly lower share of respondents in urban production areas. Again, this emphasizes the greater health awareness in urban non-production areas. Moreover, own cultivation is an equally important reason to consume sorghum in urban production areas, which is almost not mentioned in urban non-production areas. Taste and habit are equally important in both settings, which demonstrates that sorghum is not only consumed because it happens to be available.

In contrast to sorghum, significantly more consumers in urban production areas mentioned 'health' as a reason for consumption, compared to urban non-production areas. Thus, information about the health benefits of finger millet seems to be more widespread. Taste and habit were also mentioned but they are far less important.

Results for the three income areas and for Dar es Salaam are in line with results for urban non-production areas. Between 90% and 100% of respondents mention 'health' as a reason for finger millet consumption. Thus, respondents in Dar es Salaam are just as aware of health benefits as respondents in urban production areas.

Table 29: Reasons for consumption of selected cereals in % of consumers

	Total	Rural non-producer	Urban non-producer	Urban producer	Low income	Middle income	High income
Maize	*N=439*	*N=59*	*N=255*	*N=125*	*N=50*	*N=50*	*N=50*
Habit	81	75	80		88	76	84
Availability	66	92***	79		72	66	60
Easy to prepare	46	58	55		44	54	58
Taste	45	25	34		14	10	16
Caloric content	26	33	37		60	60	60
Color	12	2	1		0	0	0
Price	10	10	14		20	30	10**
Sorghum	*N=112*	*N=18*	*N=83*	*N=11*	*N=12*	*N=13*	*N=8*
Healthy	73	56**	80	55*	92	92	100
Taste	58	56	59	55	50	54	38
Habit	56	61	57	46	50	54	63
Utilization	39	61*	40	0***	0	8	0
Color	14	11	17	0	20	0	0
Own cultivation	9	0	5	55***	0	8	0
Price	9	0	12	0	17	23	38
Availability	4	6	4	0	8	8	0
Finger millet	*N=293*	*N=37*	*N=213*	*N=43*	*N=48*	*N=45*	*N=42*
Healthy	86	84	84	100***	96	91	100
Taste	58	62	66	16***	60	62	67
Habit	57	65	62	28***	54	69	60
Utilization	22	35	24	0***	8	7	0
Price	9	11	11	0**	21	18	7
Color	9	8	11	0**	2	0	0
Own cultivation	4	5	5	0	4	2	10
Availability	2	3	3	0	2	7	0

Notes: ***, **, * differences are significant at the 1%; 5% and 10% level, respectively.

4.4 Consumption trends of sorghum and finger millet consumers

Table 29 showed that habit is one of the reasons for sorghum and finger millet consumption. However, this might have developed recently, so we asked when respondents started to consume these crops.

Two-thirds stated that they always consumed sorghum, whereas for finger millet it was less than half (Table 30). Moreover, two thirds who started consumption of the two crops, did so more than 10 years ago. Thus, sorghum and finger millet consumption has long been common in Tanzania.

A significantly higher share of respondents in rural non-production areas had always consumed sorghum. This is surprising at first sight as only few respondents in rural non-production areas actually consume sorghum. These might be families for whom through one or the other reason (e.g. migration) sorghum consumption is common. Not surprisingly, a higher share of respondents in urban production areas always consumed sorghum. There are no significant differences between the income areas.

Interestingly, there are no significant differences between the locations in the case of finger millet. One reason for this could be that finger millet was always cultivated as a cash crop,

which is traded (and consumed) countrywide, whereas sorghum is often cultivated as a staple crop that is less traded. However, the fact that non-production areas have a higher share of sorghum consumers than, at least, urban production areas, shows that sorghum consumption is gaining popularity.

Respondents who started sorghum consumption sometime in the past pointed out that they started consumption because sorghum and finger millet are healthy and good for children. They also stated that sorghum and finger millet replaced maize. Few respondents answered this question, however.

Table 30: Start of sorghum and finger millet consumption in % of consumers

	Total	Rural non-producer	Urban non-producer	Urban producer	Low income	Middle income	High income
Sorghum	*N=112*	*N=18*	*N=83*	*N=11*	*N=12*	*N=13*	*N=8*
Always	64	83**	57	90**	50	23	37
Since…	36	17**	43	10**	50	77	63
>10 years	63	33	67	0	67	50	60
<10 years	37	67	33	100	33	50	40
Finger millet	*N=293*	*N=37*	*N=213*	*N=43*	*N=48*	*N=45*	*N=42*
Always	45	49	42	56	33	18	24
Since…	55	51	58	44	67	82	76
>10 years	66	53	70	53	50	68	81
<10 years	34	47	30	47	50	32	19

Notes: ***, **, * differences are significant at the 1%; 5% and 10% level, respectively.

Two thirds of the consumers stated that they expect to increase sorghum consumption (Table 31). The most important reason for this is an increasing family size. Population growth is spurring sorghum consumption as pure or blended sorghum porridge is considered a valuable food for children. ‘Health’ is the second most important reason for increasing consumption but is far less important. In line with these results, decreasing family size is the most important reason why consumers expect to decrease sorghum consumption. Thus, promotion of sorghum would not necessarily increase consumption of those who are already consuming sorghum, and might be better targeted towards those who are not yet consuming the crop.

In all locations, the majority of consumers expect to increase sorghum consumption. However, some significant differences are found between the reasons why consumption is expected to increase/decrease.

A significantly higher share of respondents in urban non-production areas reported ‘health’ as a reason for increasing consumption, compared to rural areas. Interestingly, a significantly higher share mentioned ‘availability’, which was assumed to be better in urban settings. In urban production areas, preparation of alcohol is the most important reason for increasing consumption and mentioned by a significantly higher share of respondents than in urban non-production areas.

As a reason for decreasing sorghum consumption, family size is important only in urban non-production areas, whereas the majority of respondents in rural non-consumption areas state

that they are not interested in sorghum consumption. However, the number of observations is very low.

Although utilization patterns showed that sorghum and maize are not full substitutes, respondents stated that they will consume more/less maize when they decrease/increase sorghum consumption.

Table 31: Future demand for sorghum and reasons for changing demand in % of consumers

	Total	Rural non-producer	Urban non-producer	Urban producer	Low income	Middle income	High income
Demand	*N=112*	*N=18*	*N=83*	*N=11*	*N=12*	*N=13*	*N=8*
Increasing	64	50	65	82	42	70	62
Decreasing	15	28	15	0	16	15	25
Constant	21	22	21	18	42	15	13
Reasons if increasing	*N=72*	*N=9*	*N=54*	*N=9*	*N=5*	*N=9*	*N=5*
Family size	64	67	69	33**			
Healthy	26	0**	33	11			
Availability	6	22**	4	0		n.a.	
Prepare alcohol	7	0	0	56**			
Other	8	11	10	0			
Reasons if decreasing	*N=17*	*N=5*	*N=12*	*N=0*	*N=2*	*N=2*	*N=2*
Family size	65	0**	92				
Expensive	12	20	8	n.a.		n.a.	
Not interested	18	60**	0				
Not available	6	20	0				
Reasons if constant	*N=23*	*N=4*	*N=17*	*N=2*	*N=5*	*N=2*	*N=1*
Family size	91						
Prepare alcohol	4		n.a.			n.a.	
Taste	4						

Notes: ***, **, * differences are significant at the 1%; 5% and 10% level, respectively.

Except in urban production areas, the majority of consumers expect to increase finger millet consumption. In urban production areas, around half of the respondents expect to keep finger millet consumption constant while half expects to increase consumption. The difference for urban non-production areas is significant. This is surprising because respondents in urban production areas already consume lower amounts of finger millet than their counterparts in non-production areas.

The most important reason for increasing as well as decreasing consumption in all locations is family size. Other reasons like ‘health’ in case of increasing consumption and ‘expensive’ in case of decreasing consumption are far less important. In line with earlier results, ‘health’ is not mentioned by any respondent in rural non-production areas as a reason for increasing finger millet consumption.

As in case of sorghum, respondents stated that they will consume more/less maize when they decrease/increase finger millet consumption.

Table 32: Future demand for finger millet and reasons for changing demand in % of consumers

	Total	Rural non-producer	Urban non-producer	Urban producer	Low income	Middle income	High income
Demand	*N=293*	*N=37*	*N=213*	*N=43*	*N=48*	*N=45*	*N=42*
Increasing	65	76	67	44***	68	69	71
Decreasing	15	19	18	0***	16	20	19
Constant	20	5*	15	56***	16	11	10
Reasons if increasing	*N=189*	*N=28*	*N=142*	*N=19*	*N=32*	*N=31*	*N=30*
Family size	64	96	80	90	84	90	83
Healthy	13	0***	16	5	13	10	13
Other	12	8	13	5	6	0	3
Reasons if decreasing	*N=45*	*N=7*	*N=38*	*N=0*	*N=8*	*N=9*	*N=8*
Family size	82	71	84				
Expensive	13	29	11		n.a.		
Other	6	0	8				
Reasons if constant	*N=59*	*N=2*	*N=33*	*N=24*	*N=8*	*N=5*	*N=4*
Family size	92		91	100			
Prepare alcohol	3	n.a.	3	0		n.a.	
Habit	2		3	0			
Taste	2		3	0			

Notes: ***, **, * differences are significant at the 1%; 5% and 10% level, respectively.

The majority of consumers buy sorghum and finger millet as flour and flour is available in different shopping outlets. Table 33 shows that more than two thirds of consumers buy packed sorghum flour. However, there is a significant difference between rural and urban non-production areas. In the first, only around half the respondents buys packed sorghum flour. This is in line with results for the place of purchase, where a higher share of respondents in urban non-production areas buys sorghum in supermarkets. These shopping outlets sell only packed flour.

Consumers buy packed flour for convenience and quality. The most important reason for buying loose flour is that it can be blended to the own taste. Price and quality rank only second and third. Thus, it will be difficult to convince consumers who buy loose flour to change to packed flour. Currently, only 19% of consumers who buy loose flour stated that they would be interested in buying packed flour. Price was the most important reason for consumers not buying packed sorghum flour.

Half of the respondents who buy packed flour always buy the same brand, primarily because they trust the quality. Sticking to one brand is more common in urban than in rural non-production areas.

Table 33: Demand for sorghum flour in % of respondents who buy flour

	Total	Rural non-producer	Urban non-producer	Urban producer	Low income	Middle income	High income
Bought	*N=94*	*N=17*	*N=77*	*N=0*	*N=11*	*N=12*	*N=8*
Loose	31	53**	26			n.a.	
Packed	69	47**	74				
Reasons if packed	*N=65*	*N=8*	*N=57*	*N=0*	*N=7*	*N=2*	*N=4*
Convenience	58	50	60			n.a.	
Quality	42	50	40				
Reasons if loose	*N=29*	*N=9*	*N=20*	*N=0*	*N=4*	*N=10*	*N=4*
Blend to own taste	48	33	55				
Price	21	22	20			n.a.	
Quality	17	33	10				
Other	14	11	15				
Buying same brand if packed	*N=62*	*N=7*	*N=55*	*N=0*	*N=7*	*N=2*	*N=4*
No	50	71	47			n.a.	
Yes	50	29	53				
Interested in packed flour	*N=16*	*N=6*	*N=10*	*N=0*	*N=1*	*N=6*	*N=1*
No	81	83	80	n.a.		n.a.	
Yes	19	17	20				

Notes: ***, **, * differences are significant at the 1%; 5% and 10% level, respectively.

Results for finger millet are in line with those for sorghum (Table 34). More than two thirds of consumers buy packed flour and there is a significant difference between rural and urban non-production areas. Moreover, respondents in urban production areas buy only packed flour. Also in all income areas, packed flour is far more popular than loose flour.

Reasons for buying packed flour are quality and convenience, but quality is far more important. This holds true for all settings. The two most important reasons for buying loose flour are quality and that flour can be blended according to the taste of the respondent. The latter is interestingly most important in urban non-production areas, in particular in Dar es Salaam (compare figures for income levels). Thus, also in case of finger millet, consumers will not easily change to packed flour. Currently, only 17% stated that they would be interested to buy packed flour. High price of packed flour was the most important reason for respondents to not be interested in buying packed flour.

In contrast to sorghum, only a minority of consumers who buy packed flour always buy the same brand. Those who did, mentioned availability and quality as reasons.

Table 34: Demand for finger millet flour in % of respondents who buy flour

	Total	Rural non-producer	Urban non-producer	Urban producer	Low income	Middle income	High income
Bought	*N=245*	*N=37*	*N=201*	*N=7*	*N=47*	*N=44*	*N=38*
Loose	26	49***	23	0	19	29	13
Packed	74	51***	77	100	81	71	87
Reasons if packed	*N=181*	*N=19*	*N=155*	*N=7*	*N=38*	*N=31*	*N=33*
Quality	71	84	70	71	63	77	94
Convenience	26	11	28	29	34	16	3
Other	3	5	3	0	3	7	3
Reasons if loose	*N=64*	*N=18*	*N=46*	*N=0*	*N=9*	*N=13*	*N=5*
Quality	31	44	26		0	23	0
Blend to own taste	28	11	35		67	46	80
Price	17	17	17	n.a.	22	23	0
Availability	8	22	2		0	0	0
Other	16	6	19		11	8	20
Buying same brand if packed	*N=177*	*N=18*	*N=125*	*N=7*	*N=38*	*N=31*	*N=33*
No	63	83**	60	57	58	61	73
Yes	37	17**	40	43	42	39	27
Interested in packed flour	*N=48*	*N=16*	*N=32*	*N=0*	*N=5*	*N=8*	*N=1*
No	83	87	81	n.a.		n.a.	
Yes	17	13	19				

Notes: ***, **, * differences are significant at the 1%; 5% and 10% level, respectively.

4.5 Awareness about sorghum and finger millet of non-consumers

We now turn to those respondents who do not consume sorghum and/or finger millet on a monthly basis. In total 84% and 83% of non-consumers know sorghum and finger millet, respectively (Table 35). However, compared to urban non-production areas, a significantly lower share of respondents in rural non-production areas knows about sorghum and finger millet. The same holds true for urban production areas. The latter finding is in line with our earlier results that urban production areas have the lowest share of sorghum and finger millet consuming respondents. These findings demonstrate that, in urban production areas, awareness campaigns could increase sorghum and finger millet consumption. In urban non-production areas, where 99% and 98% are aware of sorghum and finger millet, respectively, but still do not consume it, other strategies are needed to increase consumption. In all three income areas, and thus in Dar es Salaam, all non-consumers know sorghum and finger millet.

Those who know sorghum stated that they got to know the crop through relatives/friends or that it is common to know sorghum. Radio ranks third. In rural and urban non-production areas, common knowledge is stated more often than relatives/friends whereas it is the opposite in urban production areas. In the latter, compared to urban non-production areas, a significantly lower share of respondents mentioned common knowledge and a significantly higher share mentioned relatives/friends. Again, it is surprising that sorghum is not commonly known in production areas. In the three income areas, common knowledge is mentioned most often in middle and high income areas, whereas relatives/friends is most

important in low income areas and was mentioned by a significantly higher share of respondents than in the other two settings.

Except in high income areas, where radio ranks second, radio ranks third in all settings. However, compared to rural non-production areas as well as to urban production areas, a significantly higher share of respondents in urban non-production areas mentioned radio as a source of information about sorghum. Thus, radio could play a role in distributing information about sorghum. However, it still needs to be understood why its importance differs so much between the settings.

In the case of finger millet, relatives/friends are the most important way that consumers learn about the crop. Common knowledge ranks second and radio third. Whereas rural non-production areas and urban production areas follow the pattern of the total sample, common knowledge is most important in urban non-production areas. In the latter a significantly higher share of respondents than in the two other settings respectively, mentioned common knowledge. In line with results for sorghum, also a significantly higher share in urban non-production areas mentioned radio. Relatives/friends are again significantly more important in urban production areas.

Table 35: Awareness sorghum and finger millet in % of non-consumers

	Total	Rural non-producer	Urban non-producer	Urban producer	Low income	Middle income	High income
Sorghum	*N=319*	*N=38*	*N=167*	*N=114*	*N=38*	*N=37*	*N=40*
Not aware	16	16***	1	39***	0	0	0
Aware	84	84***	99	61***	100	100	100
How got to know	*N=268*	*N=32*	*N=166*	*N=70*	*N=38*	*N=37*	*N=40*
Relatives/friends	41	34	31	67**	53	24	25**
Common Knowledge	40	41	45	26**	45	62	48
Radio	16	9**	21	7**	2	14	27*
Other	3	16**	3	0**	0	0	0
Finger millet	*N=147*	*N=22*	*N=43*	*N=82*	*N=2*	*N=5*	*N=8*
Not aware	17	14*	2	26***	0	0	0
Aware	83	86*	98	74***	100	100	100
How got to know	*N=122*	*N=19*	*N=42*	*N=61*	*N=2*	*N=5*	*N=8*
Relatives/friends	57	37	24	87***			
Common Knowledge	24	11**	45	13***			
Radio	7	5**	17	0***		n.a.	
Other	12	47**	14	0***			

Notes: ***, **, * differences are significant at the 1%; 5% and 10% level, respectively.

Although non-consumers who are aware of sorghum and finger millet do not consume the crops regularly, they might have consumed them sometime in the past or consume them occasionally. Fifty percent of the aware non-consumers stated that they have consumed sorghum sometime in the past (Table 36). Interestingly, the figure is highest in rural non-production areas and lowest in urban production areas. However, in all settings around two

third of those who have consumed sorghum sometime in the past stated that they tried it only few times.

The majority of those who consumed sorghum in the past, consumed it as porridge, followed by ugali. Alcohol ranks third. Rural non-production areas have a significantly lower share of respondents who consumed sorghum as alcohol than urban non-production areas. Interestingly, in urban production areas alcohol even ranks second. In the three income areas, low and middle income areas mostly consumed sorghum in form of ugali, whereas high income areas mostly prepared porridge.

Respondents who are aware of sorghum, but did not consume it in the past nevertheless know that porridge, ugali and alcoholic as well as non-alcoholic drinks can be prepared from sorghum. Drinks are most commonly known, followed by ugali and then porridge. These results are somehow surprising as they do not reflect the utilization pattern of sorghum. However, results differ significantly between the settings. It's only in urban production areas where the same ranking of 'dishes' were found. In all other settings, either ugali or porridge is most commonly known.

Significant differences are foremost found between urban non-production and production areas. The latter has a significantly lower share of respondents knowing that porridge and ugali and a significantly higher share of respondents knowing that alcohol can be produced from sorghum. This is in line with earlier results.

Table 36: Consumption experiences of sorghum in % of non-consumers

	Total	Rural non-producer	Urban non-producer	Urban producer	Low income	Middle income	High income
Sorghum	*N=268*	*N=32*	*N=166*	*N=70*	*N=38*	*N=37*	*N=40*
No	50	19***	46	76***	58	57	42
Yes	50	81***	54	24***	42	43	58
Frequency	*N=125*	*N=26*	*N=82*	*N=17*	*N=16*	*N=16*	*N=23*
Few times	69	62	72	65	75	100	78*
Regularly	31	38	28	35	25	0	22*
Utilization	*N=131*	*N=25*	*N=89*	*N=17*	*N=16*	*N=15*	*N=23*
Porridge	63	72	64	47	25	47	78***
Ugali	44	56	46	12***	63	53	39
Alcohol	25	4***	29	41	25	20	22
Preparation known	*N=131*	*N=6*	*N=75*	*N=50*	*N=22*	*N=21*	*N=17*
Porridge	57	83	81	16***	86	81	82
Ugali	73	67*	92	46***	100	100	88*
Drinks	79	33***	68	98***	59	62	65

Notes: ***, **, * differences are significant at the 1%; 5% and 10% level, respectively.

Except in urban production areas, the majority of non-consumers have tried finger millet in the past. Compared to urban non-production areas, the latter also has a significantly lower share of respondents who have consumed finger millet. In total, about half of the non-consumers have consumed finger millet only a few times and the other half has consumed it regularly in the past. Contrary to findings for sorghum, there are significant differences between the settings. Rural non-production areas have a significantly higher share of

respondents than urban non-production areas who have consumed finger millet regularly. However, urban production areas have a significantly lower share of respondents than urban non-production areas that have consumed finger millet regularly.

Most respondents who have tried finger millet in the past consumed it as porridge. Alcohol ranks second and ugali third. All settings follow this pattern. However, in urban production areas a significantly lower share of respondents than in urban non-production areas has consumed finger millet as ugali and alcohol, respectively. This is surprising as it could have been assumed that different dishes are in particular known in production areas. Finger millet 'dishes' that are known by respondents who never consumed the crop are the same and also follow the same ranking. As above, porridge is by far the most known dish.

Comparing results for sorghum and finger millet highlights that more consumers know a wider variety of sorghum than of finger millet 'dishes'.

Table 37: Consumption experiences of finger millet in % of non-consumers

	Total	Rural non-producer	Urban non-producer	Urban producer	Low income	Middle income	High income
Finger millet	*N=122*	*N=19*	*N=42*	*N=61*	*N=2*	*N=5*	*N=8*
No	40	16	19	62***		n.a.	
Yes	60	84	81	38***			
Frequency	*N=64*	*N=16*	*N=26*	*N=22*	*N=0*	*N=3*	*N=6*
Few times	55	19**	54	82**		n.a.	
Regularly	45	81**	46	18**			
Utilization	*N=71*	*N=16*	*N=33*	*N=22*	*N=0*	*N=3*	*N=6*
Porridge	94	88	94	100		n.a.	
Ugali	16	6*	27	5**			
Alcohol	30	38	39	9**			
Preparation known	*N=48*	*N=3*	*N=7*	*N=38*	*N=3*	*N=2*	*N=2*
Porridge	96	100	100	95			
Ugali	15	67*	14	11		n.a	
Drinks	54	67	43	55			

Notes: ***, **, * differences are significant at the 1%; 5% and 10% level, respectively.

To better target the promotion of sorghum and finger millet consumption, we need to understand reasons why respondents are currently not consuming the crops. Table 38 displays figures for those respondents who know sorghum, but do not consume it on a monthly base.

The most important reason for non-consumption is that sorghum consumption is not common. Non-availability, taste and missing information about sorghum utilization rank second. Whereas urban non-production areas and all income areas in Dar es Salaam show the same pattern as the total sample, the most important reason for non-consumption in rural non-production areas is that sorghum preparation is difficult. It was also mentioned by a significantly higher share of respondents than in urban non-production areas. The other reasons mentioned above rank second and are more or less equally important in rural non-production areas. However, a significantly lower share of respondents mentioned 'not common' as a reason for non-consumption. In urban production areas, on the contrary, 'not

common' is by far the most important reason for non-consumption and was mentioned by almost all respondents and thus by a significantly higher share of respondents than in urban non-production areas. Other reasons are not important and mentioned by a significantly lower share of respondents than in urban non-production areas. This result is surprising and it needs to be further investigated why sorghum consumption is not common in urban production areas. Results nevertheless highlight the potential to increase sorghum consumption through promotion of the crop and its preparation and support of sorghum production to make sorghum widely available. The differences between the locations highlight the need to develop different strategies for sorghum promotion.

The circumstances in which non-consumers would consume more sorghum and e.g. substitute maize with sorghum point in the same direction. In all locations, obtaining more information about utilization is the most important pre-condition for starting to consume sorghum. Availability ranks second, except in urban production-areas, which is straightforward to understand. Other reasons are clean flour and a competitive price.

Table 38: Reasons for non-consumption of sorghum in % of non-consumers

	Total	Rural non-producer	Urban non-producer	Urban producer	Low income	Middle income	High income
Reasons	*N=268*	*N=32*	*N=166*	*N=70*	*N=38*	*N=37*	*N=40*
Not common	68	41**	62	93***	74	78	65
Non-availability	37	41	52	1***	50	54	40
Taste	30	44	38	4***	47	38	38
No information	30	38	40	3***	37	41	43
Difficult Preparation	21	50***	25	0***	26	22	28
Other	30	41	36	10***	13	32	13**
Substitute maize	*N=268*	*N=32*	*N=166*	*N=70*	*N=38*	*N=37*	*N=40*
Info utilization	77	84	78	70	87	92	85
Availability	37	47	51	0***	37	32	33
Clean flour	29	31	29	27	5	5	8
Price	16	22	22	0***	16	22	3**
Light color	9	3	7	19***	5	8	3
Doctor's advice	5	6	7	1	8	11	10
Other	7	13	8	1	16	16	3*

Notes: ***, **, * differences are significant at the 1%; 5% and 10% level, respectively.

Results for finger millet are similar to those for sorghum. 'Not common' is the most important reason for non-consumption, followed by non-availability. Missing information about the crop ranks third and difficult preparation fourth. However, the last three reasons are mentioned by a fewer share of respondents than in case of sorghum and are thus, in general, less important for finger millet.

Again there are differences between locations. In rural and urban non-production areas, non-availability ranks first. In rural non-production areas, difficult preparation ranks second and was, as in case of sorghum, mentioned by a significantly higher share of respondents than in urban non-production areas. In the latter, 'not common' ranks second and was mentioned by a significantly higher share of respondents than in rural non-production areas. Missing

information ranks in both settings third. In line with results for sorghum, ‘not common’ is almost the only reason for non-consumption in urban production areas.

As for sorghum, information about utilization is the most important requirement to increase finger millet consumption. However, other aspects also play a role. Clean flour, light color and availability were, besides utilization information, mentioned most often. Interestingly, product attributes play an important role for the non-consumption of finger millet, which is less the case for sorghum. The color of finger millet is difficult to change instantly. However, possibilities to increase the quality, in particular for flour, are already known and strategies how to implement them need to be developed.

The locations show a different ranking of the conditions under which finger millet would be consumed. In rural non-production areas, ‘obtaining more information about finger millet utilization’ ranks first followed by clean flour and competitive prices and then availability. The latter ranks first in urban non-production areas followed by information on utilization and clean flour and then price. However, a significant difference for the share of respondents mentioning the one or the other aspect only exists for information on utilization. Nevertheless, the different priorities need to be kept in mind when developing strategies for the promotion of finger millet.

In the case of urban production areas, light color ranks first and was mentioned by a significantly higher share of respondents than in urban non-production areas. The first are also production areas of maize and also in case of maize, a light color is preferred. Consumers in these areas seem more focused on color than in other areas, where respondents might be more exposed to a greater variety of foodstuffs. On the other hand, clean flour is less an issue in urban production areas and mentioned by a significantly lower share of respondents than in urban non-production areas. Availability is also not important in urban production areas. As in case of sorghum, therefore, promotion of finger millet consumption needs to be targeted by location.

Table 39: Reasons for non-consumption of finger millet in % of non-consumers

	Total	Rural non-producer	Urban non-producer	Urban producer	Low income	Middle income	High income
Reasons	*N=122*	*N=19*	*N=42*	*N=61*	*N=2*	*N=5*	*N=8*
Not common	66	16**	43	97***			
Non-availability	27	58	52	0***			
No information	18	26	41	0***			
Difficult Preparation	16	53**	24	0***		n.a.	
Taste	12	11	24	3***			
Other	34	74	60	3***			
Substitute maize	*N=122*	*N=19*	*N=42*	*N=61*	*N=2*	*N=5*	*N=8*
Info utilization	57	79*	55	51			
Clean flour	45	58	52	36*			
Light color	41	0	7	77***			
Availability	31	53	67	0***		n.a.	
Price	24	58	38	3***			
Doctor's advice	3	0	5	2			
Other	5	16	7	0**			

Notes: ***, **, * differences are significant at the 1%; 5% and 10% level, respectively.

4.6 Awareness about the nutritional value of sorghum and finger millet

Since health benefits are a starting point for the promotion of sorghum and finger millet consumption, we wanted to know how informed respondents already are about the nutritional value of the two crops.

Around two third of consumers and one third of non-consumers are aware that sorghum has a high nutritional value (Table 40). In the case of consumers, rural non-production areas have a significantly lower share of respondents who are aware of a high nutritional value than urban non-production areas. Consumers in urban areas are better informed than those in rural areas. Contrary to our expectations, in the case of non-consumers few respondents in urban production areas are aware of a high nutritional value and awareness is significantly lower than in urban non-production areas.

However, consumers as well as non-consumers do not know much about the nutritional value of sorghum. Most consumers could only state that sorghum is nutritious, not what makes it nutritious. Energy provision ranks second. Fewer consumers knew that it is good for diabetics and releases sugar slowly. As the number of observation is low in most locations, differences between the settings are not discussed, even though they are shown in Table 40.

For non-consumers, energy provision ranks first, followed by 'nutritious'. This holds true in all locations. Few respondents added that sorghum is good for diabetics. Moreover, the latter was only mentioned by respondents in urban non-production areas, and in particular in Dar

es Salaam. Other details were not known in any of the locations.

Table 40: Awareness about the nutritional value of sorghum in % of respondents

	Total	Rural non-producer	Urban non-producer	Urban producer	Low income	Middle income	High income
Awareness consumers	*N=112*	*N=18*	*N=83*	*N=11*	*N=12*	*N=13*	*N=8*
No	31	56**	28	18	17	0	25
Yes	69	44**	72	82	83	100	75
Awareness non-consumers	*N=264*	*N=32*	*N=164*	*N=68*	*N=38*	*N=37*	*N=40*
No	68	69	57	96***	58	43	55
Yes	32	31	43	4***	42	57	45
Knowledge consumers	*N=77*	*N=8*	*N=60*	*N=9*	*N=10*	*N=13*	*N=6*
Nutritious	47	25	53	22	0	62	33
Provides energy	30	63	25	33	60	15	50
Good for diabetics	14	0	18	0	30	23	0
Slow sugar release	8	13	2	44	0	0	0
Has proteins	3	0	3	0	0	0	33
Other	8	0	8	11	10	8	17
Knowledge non-consumers	*N=83*	*N=10*	*N=71*	*N=2*	*N=16*	*N=21*	*N=18*
Provides energy	62	70	61		75	57	89
Is nutritious	30	30	30	n.a.	25	33	11
Good for diabetics	8	0	9		0	10	0

Notes: ***, **, * differences are significant at the 1%; 5% and 10% level, respectively.

Figures for finger millet are similar to those for sorghum (Table 41). More than two thirds of consumers are aware of a high nutritional value, compared to only one third of non-consumers. Urban production areas have the highest share of aware consumers. As in case of sorghum, respondents do not know many details about the nutritional value of finger millet. Most consumers as well as most non-consumers only stated that it is nutritious. Energy provision ranks second in both groups. Whereas non-consumers did not mention any other details, some consumers also stated that finger millet has a high protein content and is good for diabetics.

Interestingly, rural non-production areas have the highest share of consumers stating the latter two aspects. Thus, even though fewer respondents in this setting are aware of a high nutritional value, those who are aware no more details than their counterparts.

Results for both crops highlight the need for information campaigns about the nutritional value of sorghum and finger millet.

Table 41: Awareness about the nutritional value of finger millet in % of respondents

	Total	Rural non-producer	Urban non-producer	Urban producer	Low income	Middle income	High income
Awareness consumers	*N=293*	*N=37*	*N=213*	*N=43*	*N=48*	*N=45*	*N=42*
No	19	32	21	0***	10	7	7
Yes	81	68	79	100***	90	93	93
Awareness non-consumers	*N=121*	*N=19*	*N=41*	*N=61*	*N=2*	*N=5*	*N=8*
No	67	79	63	66	100	80	87
Yes	33	21	37	34	0	20	13
Knowledge consumers	*N=237*	*N=25*	*N=169*	*N=43*	*N=43*	*N=42*	*N=39*
Is nutritious	58	36	53	93	73	65	39
Provides energy	27	40	31	5	37	31	39
Has proteins	7	12	8	0	9	5	21
Good for Diabetics	6	12	7	0	2	0	5
Other	7	0	9	4	3	7	13
Knowledge non-consumers	*N=39*	*N=4*	*N=15*	*N=20*	*N=0*	*N=1*	*N=1*
Is nutritious	67	n.a.	40	90			
Provides energy	33		60	10		n.a.	

Notes: ***, **, * differences are significant at the 1%; 5% and 10% level, respectively.

4.7 Delivery of information about sorghum and finger millet

To best promote sorghum and finger millet consumption, we asked all respondents through which channels we could deliver information about these crops. Roughly 90% of the respondents mentioned radio, followed by TV. School and social events rank third and fourth, respectively, but are far less important than the first two information channels. All settings show the same ranking, but there are nevertheless some differences.

Compared to urban non-production areas, rural non-production areas have a significantly higher share of respondents mentioning radio and a significantly lower share of respondents mentioning TV and newspaper, respectively. Urban production areas also have a significantly higher share of respondents who state radio, but there are no significant differences for the other most important information sources. Thus, obtaining information through television and newspaper seem to be in general more widespread in urban than in rural areas. There are no significant differences between the three income areas.

Information can be delivered through specific programs, advertisements, etc. We were therefore interested to know which kind of information delivery would be most successful. In all three cases (radio, television, newspaper), adverts are less important than regular programs (radio, television) and articles (newspaper). This holds true in all except two settings. In urban production areas, advertisement is as important (radio) or more important (television and newspaper) than regular programs or articles. In high income areas, adverts

are more important than articles in case of newspapers. Even though rural and urban non-production areas follow the same ranking, programs are mentioned in case of radio by a significantly higher share of respondents in urban non-production areas. The same holds true for adverts in case of newspaper. These differences show that promotion channels also need to be chosen according to the target area.

Table 42: Information channels for sorghum and finger millet

	Total	Rural non-producer	Urban non-producer	Urban producer	Low income	Middle income	High income
Media	*N=439*	*N=59*	*N=255*	*N=125*	*N=50*	*N=50*	*N=50*
Radio	89	93*	84	99***	74	78	76
TV	77	56***	80	80	86	78	76
School	28	29	29	25	46	46	56
Social event	22	19	24	20	46	36	42
Newspaper	19	7***	22	18	14	26	24
Brochure	6	0**	10	1***	18	12	20
Other	9	10	12	2***	22	10	18
Information channel							
Radio	*N=392*	*N=55*	*N=213*	*N=124*	*N=37*	*N=39*	*N=38*
Program	77	60***	85	72***	84	82	74
Advert	56	58	47	71***	38	54	55
TV	*N=336*	*N=33*	*N=203*	*N=100*	*N=43*	*N=39*	*N=38*
Program	77	70	82	70**	74	82	71
Advert	61	58	52	82***	44	59	55
Newspaper	*N=83*	*N=4*	*N=57*	*N=22*	*N=7*	*N=13*	*N=12*
Article	74	100	70	77	57	69	33
Advert	59	0***	54	82**	29	46	83**

Notes: ***, **, * differences are significant at the 1%; 5% and 10% level, respectively.

5 Conclusions

Our results show that sorghum and finger millet are already widely consumed in production areas as well as in major urban centres like Nairobi. Moreover, both crops are widely consumed in villages in the vicinity of Nairobi. However, production areas, particularly rural locations, have the most sorghum and finger millet consumers and Nairobi, particularly high income areas, has the fewest. As few respondents in production areas stated that they cultivate sorghum and finger millet themselves, both crops are also consumed by non-producers. Even though urban centres other than Nairobi were not included in the survey, sorghum and finger millet are consumed there. This holds true in particular for urban centres such as Eldoret, which are closer to production areas than Nairobi.

Promotion of sorghum and finger millet consumption can target consumers and aim to increase their consumption or can focus on non-consumers to convince them to start consuming sorghum and finger millet. The majority of consumers have always consumed sorghum and finger millet and around one quarter started consumption sometime in the past. Thus, our data confirms a trend for an increased consumption of the two crops and suggests it is possible to attract new consumers.

Attracting new consumers requires exposure and availability. Sorghum and finger millet are bought in all types of market outlets, so consumption is not restricted to where consumers shop. However, non-consumers stated non-availability as one reason for non-consumption. When bought as grain at open-air markets, sorghum and finger millet availability might be subject to seasonal fluctuations. Thus, measures to make sorghum and finger millet available throughout the year are needed.

Besides availability, personal preferences play a role in consumption decisions. Taste was mentioned by non-consumers as a reason for non-consumption. Whereas it is difficult to change the taste of the grain, it can be adjusted when sorghum and finger millet are bought as flour. Flour is often already blended with other cereals, which changes the taste of the final product. There are also possibilities to add flavour, etc. to change the taste according to consumer preferences. This requires some support from the flour processing industry, which already shows an interest to invest in new sorghum and finger millet products. However, the majority of consumers still buy sorghum and finger millet in the form of grain. Thus, flour also needs to be promoted and made more widely available. Another strategy to improve the taste of sorghum and finger millet for those who buy the crops as grain is to provide recipes for a variety of dishes. This could also overcome another barrier of consumption. Non-consumers stated that they do not consume sorghum and finger millet, because it is not suitable for the dishes that they prepare. Thus, they need to be better informed about the utilization of the two crops. Many non-consumers, even in production areas, stated that it is just not common to consume sorghum and finger millet. The importance of demonstrating how the two crops can be utilized is highlighted by answers to the question, what would encourage non-consumers to start consuming sorghum and finger millet. Information on utilization was the most important reason throughout in all locations.

Another intervention point is to improved information for non-consumers about the health benefits of sorghum and finger millet. Only one third of non-consumers in our sample are aware that the two crops have a high nutritional value, and those who are aware do not know much about the nutritional value. Better educated consumers in urban areas like Nairobi are expected to be increasingly health-conscious.

Promotion of the health benefits of sorghum and finger millet can also increase the amount that is consumed in a household. The majority of consumers expect to increase consumption of sorghum and finger millet, but currently, the most important driver for this is family size. People consider porridge from sorghum and finger millet as a healthy food for children. As children grow older, porridge is often replaced by tea. Thus, information about health benefits for adults needs to be provided to complement the reputation of sorghum and finger millet as a food for children and weaning mothers. This is particularly needed in rural areas, which have the lowest share of consumers who are aware of a high nutritional value of sorghum and finger millet.

Improving information about the different utilization possibilities of sorghum and finger millet can also be a strategy to increase the amount that is consumed. Currently, sorghum and finger millet are mostly used for porridge, whereas maize is used for ugali. For porridge, relatively small quantities of sorghum and finger millet are needed. Thus, consumers need to be shown that sorghum and finger millet can also be used for other dishes, e.g. ugali when blended with maize.

This study highlights the potential to increase sorghum and finger millet consumption, both in regard to the number of consumers and the amount consumed. Distribution of information about the two crops was identified as a key bottleneck. The majority of respondents stated that information should be distributed through regular radio and TV programs.

References

Macharia, I., A. Orr, and C. Schipmann-Schwarze (2012). Cereal Consumption Pattern in Kenya. Unpublished project report.

Schipmann-Schwarze, C., E. Muange, A. Orr, and J. Mafuru (2012). Harnessing Opportunities for Productivity Enhancement for Sorghum and Millets (HOPE). Baseline Survey, Tanzania. Unpublished project report.