Gender-differentiated trait preference for sweetpotato varieties in eastern Uganda

Focus Group Discussion – Final Report

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GENDER-DIFFERENTIATED TRAIT PREFERENCE FOR SWEETPOTATO VARIETIES IN EASTERN UGANDA

A Focus Group Discussion Report

International Potato Center (CIP) and National Crops Resources Research Institute (NaCRRI) of the National Agricultural Research Organisation (NARO)

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Content

Foreword

The International Potato Center (CIP) in collaboration with Uganda's National Agricultural Research Organization (NARO) and its National Crops Resources Research Institute (NaCRRI) conducted focus group discussions (FGDs) and key informant interviews (KII) in Iganga and Kamuli districts in eastern Uganda to understand gender differences in sweetpotato variety trait preferences. The FGDs were conducted between August and September 2020 and the scope of study included information on production trends, variety preferences and marketing capacities. KIIs were taken with stakeholders engaged in promoting sweetpotato production and productivity, and utilization and consumption. The study was supported under the SweetGAINS program, funded by the Bill and Melinda Gates Foundation. Twenty-four FGDs and 12 KIIs were conducted using pre-tested interview guides with root and vine producers and consumers, both men and women. The discussions were voice recorded and photos taken of each meeting. Data was transcribed and analyzed using content analysis approach. The report presented includes gender-differentiated characteristics of different participants, varietal and traits preferences by different market segments, and the effects of different sweetpotato traits on household activities, and decisions and recommendations.

Acknowledgements

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Acronyms and Abbreviations

CIP	International Potato Center
NARO	National Agricultural Research Organisation
NaCRRI	National Crops Resources Research Institute
VEDCO	Volunteer Efforts for Development Corporation

1. Introduction

Sweetpotato value chains are changing rapidly due to changing weather, consumption patterns, increasing incomes, increased awareness and demand for quality products by consumers (Okello et al., 2018). These changes have compelled producers to demand varieties that are more suitable to their unique production environments, new market demands (such as the demand for vitamin A rich sweetpotato) and processing scenarios (Low et al., 2017). To ensure acceptability of new varieties coming out of the breeding pipelines, breeders need to respond to these unique market demands by various segments of sweetpotato end-users.

This qualitative study aimed at providing an understanding of the key preferred sweetpotato varieties across the study regions in eastern Uganda, the traits that make these varieties preferable, and any non-preferred traits of these varieties in these changing production and marketing environments. Information gaps were filled by combining focus group discussions (FGDs) with key informant interviews (KII) and household surveys to understand the trait preference in parts of Eastern Uganda. However, this report only focuses on the FGDs part pf the study. FGDs have proven to be useful in generating information on collective views, knowledge, perspectives and attitudes of people about issues, and seek explanations for behaviors in a way that would be less easily accessible in responses to direct questions, as in one-to-one interviews. This study will inform gender responsive breeding strategies, specifically to help set breeding priorities and to expand the potential impact of improved varieties.

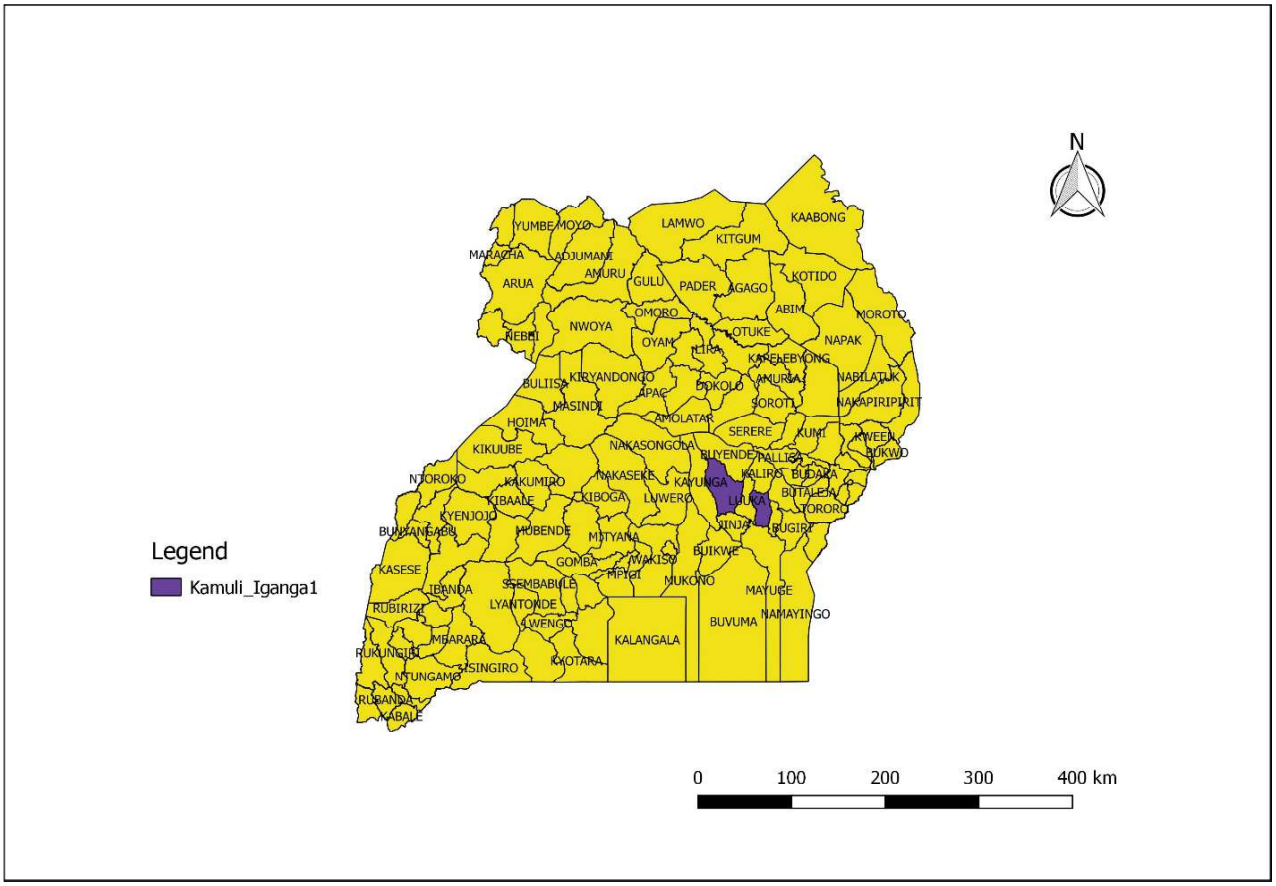

Figure 1. Map of Uganda showing the study area

Iganga and Kamuli are among the major sweetpotato producing areas in Uganda (Yanggen and Nagujja, 2005; MAAIF 2011; UBOS, 2020). According to UBOS (2020), Iganga district in Eastern Uganda is the highest Sweetpotato producer in the country with 270,853 tonnes. The districts with the highest production of sweetpotato in the Central, Northern and Western regions were Nakasongola (66,419 tonnes), Gulu (61,732 tonnes) and Kyenjojo (40,148 tonnes) respectively. Overall sweetpotato production is highest in Eastern region, followed by Western, then Central region and least in the North. The area planted with sweetpotatoes in the Central, Eastern, Northern and Western regions 98,054 ha, 159,948 ha, 60,573 ha and 121,681 ha respectively (UBOS, 2020). The two districts have a total population of about 1,600,000 people (UBOS, 2014) of which 50.5% are female and 49.5% are male, and the majority live in rural areas (FAOSTAT Database, 2004; UBOS, 2020).

2. Research Methods

2.1 Study purpose, objectives and scope

During August to September 2020, International Potato Center (CIP) under the SweetGAINS WP 1 project supported collaborating agricultural research team from NaCRRI and public extension service in Kamuli and Iganga study districts to conduct the FGDs on sweetpotato production and consumption.

The study aimed at providing an understanding of the preferred and non-preferred traits (characteristics) of key varieties in these changing production and marketing environments. The objective of this study was to diagnose gender-differentiated preferences around sweetpotato traits and varieties, while examining gender-based effect in production and consumption of the roots.

These focus groups were undertaken in order to identify and understand desired sweetpotato varietal traits by farmers and consumers which would inform the implementation of the SweetGAINS project in the two districts. The survey scope included training of enumerators, identification of target participants, conducting 24 FGDs in the two districts.

The study involved identification of sweetpotato varieties produced and consumed in the study areas, as well as producer and consumer preferences/non-preference of variety traits (characteristics). Focus Group Discussion (FGD) approach was used to collect information from male and female groups which were organized separately in the study districts. Data were transcribed and analyzed using content analysis approach. The report summarizes the results from group discussions.

2.2 Survey preparations

Considering the COVID-19 pandemic effect, appropriate measures including provision of masks and sanitizers besides regular washing of hands and observation of social distances were applied at all stages of preparations, entry and discussion with communities. Study location and groups were identified through initial consultative meetings with extensionists and district agricultural officials, urban and rural market officials. International Potato Center (CIP) in collaboration with NaCRRI sweetpotato program component implementing the SweetGAINS project conducted joint virtual training of identified enumerators for the FGDs in Kamuli and Iganga districts. Pre-testing the tools took place in Mbulamuti village in Kamuli district which improved the ability of the team to conduct FGD sessions. A total of 24 FGDs each segregated between male and female respondents with 8 to 12 participants who were members of the sub-group targeted for study in each of the two districts, Kamuli or Iganga were conducted. During entry to the communities, confidence building introductions included research team as coming from NARO, the research institution for developing sweetpotato varieties who are interested in learning more about sweetpotato production and consumption in the area. Further assurance was extended for the information provided and its exclusive use for research and analysis and recording the sessions but all responses would appear anonymously.

Adults from rural households were interviewed in focus groups that included women only groups and men only groups. Focus group discussions were held with at least two groups (1 for male and 1 for female participants) in each sampled community and included 8 - 12 participants. Individual Interviews Information was collected principally through survey interviews. Individual farmer interviews were carried out by each of the enumerators who were fluent in the local language of each district. Individual interviews were used to collect information from key informants involved in sweetpotato production and marketing.

2.3 How the focus group discussions were conducted

Twenty-four FGDs, each group size between 8 and 12 people. A team of 3 researchers including facilitator, note taker for detailed notes and interpreter were engaged per FGD session. The interpreter and community guides were enrolled from the respective communities. All quotes from participants given below are verbatim. Prior to FGDs commencement, a short presentation around the data that was to be collected from the survey was undertaken. These data were broken down into modules 1 – 4 that were used to focus the discussion that lasted about 2 hours in total.

Each session in local language was recorded using audio recorders for future reference and additional members of staff sat in the background and made detailed notes of what was said and of how discussions developed. We used the same approach across all the groups.

2.4 Sample selection

2.4.1 Sweetpotato producers

In both Kamuli and Iganga districts, participants were purposely selected from 8 main producing villages, two in each of the four sub-counties. FGD meetings were conducted in Bugaya, Bulopa, Namwendwa and Nawanyago in Kamuli, and Bulamagi, Nambale and Nawanyiyngi sub-counties in Iganga district, respectively. Participants for separated male and female FGDs currently involved in sweetpotato root/vine production were identified through village leaders after prior introduction and explanation on the purpose of the study. A total of 184 farmers participated in the producer FGDs (Table 1).

Table 1. Sweetpotato Root and Vine producers FGD participants

Participant details	District			
	Iganga	Kamuli	Total	
Number of FGDs conducted	8	8	16	
Number of female participants per district	48	34	82	184
Number of male participants per district	50	52	102	
Average age (years) of participants per district	40.6	38.9	39.8	
Educational level of participants in each district	8	7.3	7.7	
Area (acres) (SP)	0.9	1.4	1.1	
Experience (Years)	16.6	12.1	14.5	

2.4.2 Selection of consumers

FGDs for sweetpotato consumers were held at Mbulamuti and Kamuli central markets and Kigulu and Old Kaliro road markets in Kamuli and Iganga districts respectively. The towns have majority of the households who purchase most of the sweetpotato they consume from the markets.

During enumerators' market visits, two approaches were used to identify potential consumer participants. Firstly, contacts of regular customers; buyers and consumers of sweetpotato as targeted respondents were obtained from the retailers and food vendors in the identified markets. Secondly, through strategic self-placement at sweetpotato boiled root-selling points and fresh-roots vendor selling stalls, potential respondents were identified and requested to participate. A master list was generated, screened to get the desired gender-mainstreamed numbers to participate in the FGDs (Table 2) at already organized suitable venue within close proximity.

Table 2. Sweetpotato consumers FGD participants

Participant details	District			
	Iganga	Kamuli	Total	
Number of FGDs conducted	4	4	8	
Number of female participants per district	23	23	46	94
Number of male participants per district	24	24	48	
Average age (years) of participants per district	30	39	34	
Educational level of participants in each district	9	8	8.6	
% changes in sweetpotato purchase and consumption				
Weekly purchase frequency (%)	74.5	72.3	73.4	
Consumption changes (Yes) (%)	93.6	68.1	80.9	
Increased consumption changes (%)	44.7	38.3	41.5	

3. Results and Discussion

3.1 Characteristics of FGD Participants

3.1.1 Socioeconomic Characteristics of Sweetpotato and Vine Producers

Table 3 shows that generally, both sexes were in average age range (about 40 years) in both districts. Whereas in either district men had obtained secondary level education, (beyond 7 years of primary education), majority of the women dropped out in primary school level. Overall, respondents in Iganga were more educated than Kamuli.

Average area under sweetpotato cultivated by the participants was much larger in Kamuli district (1.4 acres) than in Iganga district (0.9 acres). A potential explanation is the higher focus of food security interventions in Kamuli district where biofortification interventions by HarvestPlus, VEDCO and university of Iowa have been reported. These interventions include pushing for the adoption of orange-fleshed sweetpotato (OFSP) accompanied with deliberate commercialization and seed system development activities in the district. Particularly, women in Kamuli cultivated larger areas than men, as most women groups such as Namwendwa women farmers besides growing OFSP varieties for home consumption were involved in fresh root marketing and value addition pastry products that required roots.

Table 3. Socio-economic Characteristics of the Participants

Characteristic	Iganga district			Kamuli district		
	Male	Female	Average	Male	Female	Average
Average age of participants (years)	40.5	40.6	40.6	38.4	39.8	38.9
Education level (years)	8.9	7.0	8.0	8.1	6.0	7.3
Area under sweetpotato (acres)	0.9	0.8	0.9	1.2	1.7	1.4
Experience SP production (years)	14.5	18.9	16.6	9.1	16.7	12.1

Women have significantly higher experience in growing sweetpotato compared to men, seemingly confirming the common saying that sweetpotato production in the region is a woman's crop. Sweetpotato is reportedly the number one preferred dietary food in the area, commonly consumed as 'Mugoyo' (a mix of sweetpotato and beans mashed), which could explain the earlier entry of women in the crop production as it is a prerogative for women to ensure that there is enough nutritious food in the household.

3.1.2 Characteristics of sweetpotato consumers

The average number of years for the consumers in the study was 29.8 and 39.1 years old in Iganga and Kamuli districts, respectively (Table 4). Men were generally younger than women respondents both in Iganga and Kamuli districts. Similarly, as root and vine producers, men consumer respondents were more educated than women in both districts. Evidently, sweetpotato is adequately consumed by all irrespective of the educational caliber (post-secondary as the case of males in Iganga) and less literate individuals.

Table 4. Characteristics of Sweetpotato Consumer Participants

Characteristics	Iganga		Kamuli	
	Male	Female	Male	Female
Age (Years)	28.5	31.0	40.5	38.3
Educational level	10.1	8.0	8.9	7.6
Frequency of purchase				
Weekly	14 (58.3%)	21 (91.3%)	12 (50%)	22(95.7%)
Bi-weekly	4 (16.7%)	0 (0%)	0 (0%)	0 (0%)
Monthly	6 (25%)	1 (4.4%)	0 (0%)	1 (4.4%)
More than a month	0 (0%)	1 (4.4%)	0 (0%)	0 (0%)
Changed consumption				
Yes	44 (93.6%)		32 (68.1)	
No	3 (6.4%)		3 (6.4)	
Yes	21 (87.5%)	23 (100)	12 (50%)	20 (87%)
No	3 (12.5%)	0 (0%)	0 (0%)	3 (13%)
How consumption has changed in Iganga and Kamuli districts				
Increase	13 (54.2%)	8 (34.8%)	12 (50)	6 (26.1%)
Decrease	8 (33.3%)	15 (65.2%)	0 (0%)	14 (60.9)
No change	3 (12.5%)	0 (0%)	0 (0%)	3 (13%)

In both districts, sweetpotato consumer respondents purchased at a shorter frequency (weekly) interval. Possibly, fresh roots were regularly supplied on the market or consumers in the districts have low incomes thus could not afford bulk-buying. It could also imply poor means of fresh root storage, presenting a challenge for bulk-buying. In Kamuli, the respondents reported periodic supplies for varieties such as Tanzania, a commercially important cultivar widely grown in the drier northeastern districts (Mwanga et al., 2001), distant producing areas which strategically maintains the supplies on the market. Respondents in both Iganga and Kamuli reported preference for varieties such as Budunguza (Table 5 and 6) because of long shelf life (referring to extend root multiplication) or in-ground availability of roots for piece-meal harvesting. Commonly, producer harvest for home consumption and extra baskets for sale assumed to maintain consistent supplies to the market. Existence of food vendors and sweetpotato markets in town centers have been the main sources of sweetpotato roots for urban consumers.

Generally, in both districts, the consumption trends have greatly changed, responses indicating both rise and fall. Specifically, more than 60 percent of women respondents in both districts reported decrease in consumption. Reportedly, the increasing production of sugarcane has compromised allocation of productive land to sweetpotato production leading to decline. Other contributing factors include increased competition from other food crops such as maize and cassava. Major reason cited for the decrease was lack of preferred sweetpotato varieties during the off-season, hence, use of other options available to the consumers.

3.2 FGD Producer Participants

3.2.1 Key preferred varieties

Sweetpotato preferred varieties in the study area are indicated in Table 5. Male participants in Iganga district preferred Bunduguza, NASPOT 8 (Kipapaali) and Silk varieties while female participants preferred Umbrella (Kateteeyi/ Kasagaati), Muwulu aduduma and Namugwere varieties. All the varieties are local except NASPOT 8 (Kipapaali). Bunduguza omukaire, NASPOT 8 and Ejumula were grown by majority of the male participants

(91.5%, 87.5% and 85.9%, respectively) while majority of the female participants grew Umbrella, Bunduguza omukaire and Muwulu aduduma (100%, 83% and 75%, respectively).

Irrespective of gender responses, Bunduguza and Kasagaati (Umbrella or Kateteeyi) were the most dominantly grown varieties. Apart from other agronomic attributes (Table 6), Bunduguza was particularly associated with long shelf life which was explained as continuous root formation that favors piece-meal harvesting. Kasagaati foliage grows into umbrella-like shape and known to withstand pro-longed droughts, possibly ensuring that fresh roots besides vines are available even during dry season. Overall, both of these varieties are grown by many households in small plots that reflect the focus for household food security with limited surplus for sales. Notably, Kipapaali (local term referring to all yellow to orange-fleshed varieties including Naspot 8 and Ejumula) were only dominant in Kamuli district that represent the reported previous OFSP interventions the district. The Namugwere variety name implies that the variety was initially sourced from an area called Bugwere proximally located north-east direction of Iganga district. Samples of this variety were collected by the research team based at NaCRRI for subsequent variety tracing. Whereas Muwulu Aduduma (meaning husband complaining because the wife has not served it) only appeared as dominant variety in Iganga, Table 6 shows that it's among the varieties with preferred attributes in Kamuli especially it's long shelf life (as Bunduguza) and non-fibrous roots. Other varieties grown in the area but not in the top three preferred were Kakamega, NASPOT 13O, Bujina, Kinana, NASPOT 9 (VITA), Tontanulula, Nsereko and Yongera abalenzi emboli.

Table 5. Magnitude of the dominant 3 sweetpotato varieties grown identified and ranked by male and female participants in Iganga and Kamuli

Iganga (Male)				Iganga (Female)			
Ranking	Variety name	% growing	Abundance	Ranking	Variety name	% growing	Abundance
1	Bunduguza Omukaire	91.5	1	1	*Kasagaati	100	1
2	Kipapali (Naspot 8)	87.5	2	2	Muwulu Aduduma	59.9	2
3	Silk	17	1	3	Namugwere	67	1
Kamuli (Male)				Kamuli (Female)			
1	Kipapali (Naspot 8)	71.3	3	1	*Kasagaati	100	1
2	Ejumula	85.9	1	2	Bunduguza Omukaire	83	1
3	Kasagaati	27	2	3	Muwulu Aduduma	75	1

*Kasagaati are Umbrella or Kateteeyi (All referring to the foliage forming the umbrella like canopy)

NB: Abundance codes 1 = Many households grow it in small areas, and 2 = Few households grow it in small areas, 3 = Many households grow it in large areas

3.2.2 Preferred traits/characteristics

Table 6 shows variety characteristics preferred by the sweetpotato producers. Both male and female participants in the study area indicated that sweetpotato producers select the varieties based on several characteristics. Genetic attributes are important to make sure that they produce enough sweetpotato for home consumption and marketing. The attributes include early maturing of the variety, resistance to pests and diseases, drought tolerance, high roots and vine yields and long storage shelf life. Producers also consider visual attributes such as skin and flesh color; varieties with purple skin color and yellow/orange flesh color are the most preferred over white skin and flesh color. Shape and size of the roots and dry matter content are also important visual attributes

used by farmers. Organoleptic attributes such as non-fibrous roots, flesh sweetness and good taste are usually used by farmers in variety selection. Visual and organoleptic attributes are the drivers for marketability of the varieties. Commercial sweetpotato varieties should have these attributes to attract the buyers.

Table 6. Preferred Characteristics of Dominant Varieties Grown in the Study Area

Iganga Varieties and traits ranking (Male)			Kamuli varieties and traits ranking (Male)		
Variety	Trait	Rank	Variety	Trait	Rank
1. Bunduguza omukaire	Early maturing	1	1. NASPOT 8	Resistant to drought and bad soils	1
	High dry matter content	2		Has high root yield	2
	Drought tolerant	3		Early maturing	3
	High root yield	4		Good long shaped roots	4
	Sweet taste	5		Has big root size	5
	Long shelf life	6			
2. NASPOT 8	Early maturing	1	2. Ejumula	Not soil selective	1
	Better nutritional & health benefits e.g Vitamin A	2		Early maturing	2
	High root and vine yield	3		Drought tolerant	3
	Big roots	4		High root and vine yield	4
	Cooks easily	5		Big roots	5
	Some resistance to pests and diseases	6		Mealy	6
3. Silk	High root yield	1	3. Umbrella	High root yield	1
	Big roots	2		Drought tolerant	2
	Long storage shelf life	3		Sweet taste	3
				High dry matter content	4
				Not soil selective	5
Iganga Varieties and traits ranking (Female)			Kamuli Varieties and traits ranking (Female)		
1. Umbrella	Early maturing	1	1. Umbrella	High root yield	1
	High root yield	2		Big and long roots	2
	Drought tolerant	3		Drought tolerant	3
	Sweet taste	4		Sweet root taste	4
2. Muwulu Aduduma	High root yield	1	2. Bunduguza omukaire	Early maturing	1
	Big and long roots	2		High root yield	2
	Sweet taste	3		High dry matter	3
				Long shelf life	4
3. Namugwere	Early maturing	1	3. Muwulu aduduma	Long shelf life	1
	Sweet taste	2		Early maturing	2
	High root yield	3		High root yield	3
				Big roots	4
				Drought tolerant	5
				Non fibrous	6

3.3.3 Reasons for traits preferences

- Early maturing trait is preferred because it brings in food early and so the household is food secure and labor for weeding is reduced therefore saves costs of production. Also, households get more income by selling

sweetpotato at the beginning of the marketing season. Most farmers preferred early maturing to high yielding varieties because of the higher prices at the beginning of the harvesting period.

- Recurrent drought due to short rain seasons and uncertain have been a problem for a long time and it affect sweetpotato production, farmers requested drought tolerant sweetpotato varieties which are also early maturing which can also escape the drought by maturing early.
- Resistant to pest and diseases was equally important criteria mentioned by the participants, resistant varieties give high yields and diseases/pest free roots which attract traders and bring in food and money to the households.
- High root yield makes the household more food and income secure

  Long storage shelf life at farmer level referred to continuous root formation, thus, extended piece-meal harvesting and availability of fresh roots for consumption. Notably, most of the storage roots were bought more frequently (Table 4) and most supplies were sourced from within the district.
- High vine yield implies availability of planting material which gives room for the expansion of the variety in the area hence increases volumes of production
- Root size/ shape is among the most important trait considered for commercial purposes. Farmers prefer big and long roots because they are easy to pack in the sack are highly marketable. Small sized roots are not preferred by most of traders (only bought by retailers within the district) but also one bag takes many roots which reduces income to farmers.
- Color of the skin and flesh of sweetpotato root was an important attribute in the marketing of sweetpotato. Varieties with purple skin, yellow/orange flesh are preferred by consumers in rural and urban markets. These varieties also are easily transported without being bruised, hence preferred by traders. White flesh color is good for making mashed food mixed with beans "*mugoyo*" but not OFSP. Nevertheless, white skin and flesh color leads to its low market demand for raw roots because they are easily bruised during transportation which reduces it shelf life, and hence provides household with less income. Furthermore, they lack nutritional and health benefits e.g Vitamin A.
- High dry matter content (starch), flesh sweetness, good taste and non-fibrous roots have high market demand because these traits are preferred by sweetpotato consumers. However, high dry matter is not preferred by some consumers because they cause heartburn problems particularly to people with ulcers.

3.2.3. Effect of traits on the role of men and women

The effects of preferred variety traits on the roles of men and women were stated in general terms by both men and women with no distinct differences in the stated effects between the two groups. Table 7 presents the results obtained in the discussions with both men and women.

Table 7. Effect of sweetpotato traits on the role of men and women

Preferred Traits	Positive or negative effects on role of men/women
1. Early maturity	Early maturing brings in food early and so the household is food secure and income stable and the labor for weeding is reduced therefore saves costs of production. Has positive effect to men and women.
2. Resistance to pests and diseases	Increases root and vine yields and also reduces costs of production. A female participant in kamuli said that: "Pest resistance helps in reducing the cost on pesticides." (Female FGD Kamuli District, 2020). This trait affects men and women equally.
3. High root yield	Increases production of sweetpotato roots hence more food and income secure households.
4. High vine yields	This increases availability of planting material which gives room for the expansion of the variety in the area hence increases volumes of production. This also means high incomes for vine producers.
5. Long storage shelf life	Saves labor and time for women used to harvest sweetpotato roots for home consumption because they can harvest once per week, but also increases household income due to high demand of varieties with this trait in the market.
6. Red/purple skin color and yellow/orange flesh color	Varieties with these traits are preferred by traders, hence increase household income
7. Root size and shape	Small sized roots are not preferred by most of traders (only bought by retailers within the district) but also one bag takes many roots which reduces income to farmers.
8. High dry matter content	High dry matter (starch) in cooked roots increases palatability but also causes heart burn particularly to people with ulcers. A female participant in Iganga market said that: *"Men enjoy the food which is tasty when they are served. Thus they do not complain to their women at home." (Female FGD Iganga District, 2020).*

3.2.4. Missing and recommended traits for inclusion in future breeding activities

Farmers were asked to state the missing attributes in different varieties and give suggestions for their most pressing needs for improving sweetpotato productivity and ultimately attain improved food security and households' incomes. The findings in Table 8 revealed that across all local varieties, the missing attribute was resistance to pests and diseases while for improved varieties the missing attributes were low dry matter content, poor taste and aroma. The respondents expressed their needs for the above-mentioned traits to be improved. Table 8 presents the results obtained in the discussions with men and women in Kamuli and Iganga districts ranked from 1 onwards according to order of importance.

Table 8. Missing traits in dominant varieties and recommendations for improvement

Variety Name	Missing traits	Rank	Recommended traits for inclusion/ improvement	Rank
1. Bunduguza	Resistance to pests and diseases	1	Increase resistance to pests and diseases	1
	Big roots	2	Remove fibrousness	2
	Vitamin A	3		
	Lack of fiber	4		
2. NASPOT 8	High dry matter content	1	Incorporate good taste and aroma	1
	Good aroma	2	Increase dry matter content	2
	Adequate resistance to pests and diseases	3	Increase drought tolerance and shelf life in the soil	3
3. Umbrella	Resistance to pests and diseases	1	Increase resistance to pests and diseases	1
	Low sap content	2	Reduce sap	2
	Vitamin A	3		
	Stable color at maturity	4		
4. Muwulu aduduma	Resistance to pests and diseases	1	Increase resistance to pests and diseases	1
	High dry matter content	2	Increase dry matter content	2
	Good aroma	3		
5. Ejumula	High dry matter content	1	Increase dry matter content	1
	Sweet taste/ aroma	2	Increase resistance to pests and diseases	2
	Resistance to pests and diseases	3	Incorporate good taste and aroma	3
6. Silk	Drought tolerance	1	Increase drought tolerance	1
	Resistance to rotting	2	Increase resistance to rotting	2
7. Namugwere	Drought tolerance	1	Increase drought tolerance	3
	Resistance to rotting	2	Increase resistance to rotting	4

3.2.5. Less dominant/preferred varieties

Results in table 9 indicate that there are slight differences in types of non-preferred varieties between female and male participants hence showing clear gender variations. The differences may be due to the different roles between men and women in the society. Women are more involved in sweetpotato production than men because it is a food crop, providing food security to the families. On the other hand, men produce sweetpotato for commercial purposes so they may not prefer a variety because of low market demand, while women prefer the variety due to home consumption needs. Moreover, the results show that less preferred sweetpotato varieties are grown by only few households in small farms, this is because most of them are mainly used for home consumption as boiled fresh roots, mashed food "*mugoyo*" or processed into chips.

Table 9. Less Preferred Varieties Grown in the Study Area

District	Gender	Variety Name	Participants growing (%)	Rank	Abundance
Iganga	Male (N=50)	1. Kibirikyabidi	17	1	Few households grow it in small areas
		2. Namugwere	31	2	Few households grow it in small areas
		3. Lirawo	0	3	Few households grow it in small areas
	Female (N=48)	1. Silk	4	1	Few households grow it in small areas
		2. Kaawa	17	2	Few households grow it in small areas
		3. Ejumula	25	3	Few households grow it in small areas
Kamuli	Male (N=52)	1. Kabode (NASPOT 10 O)	37.9	1	Few households grow it in small areas
		2. Tompenawena	33	2	Few households grow it in small areas
		3. Silk	25	3	Few households grow it in small areas
	Female (N=34)	1. Nakasoma	0	1	Few households grow it in small areas
		2. Kinana	25	2	Few households grow it in small areas
		3. Kakamega	17	3	Few households grow it in small areas

3.2.6. Traits not preferred and unique traits in the less dominant sweetpotato varieties

Farmers were asked to state the not-preferred traits and give unique attributes in less dominant varieties. The findings in Table 10 revealed that across varieties, the not preferred attributes were late maturity, fibrousness, Low dry matter content and too much sap. The unique attributes were good taste, high dry matter content, high yield, nutritional and health benefits such as vitamin A content. The respondents expressed their desire for the not preferred traits to be improved and the unique traits to be maintained.

Table 10. Non-preferred Sweetpotato Traits in Less dominant Varieties

Variety Name	Traits not Preferred	Unique traits made farmers still grow it
1. Kibirikyambidi	1. Late maturing	1. Big roots
	2. Roots are not sweet when cooked	2. High vine yield (vigorous)
	3. Low dry matter content	
2. Silk	1. Low root yield	1. Good/ sweet taste
	2. Late maturing	2. High dry matter content
	3. Not drought tolerant	3. High vine yield
	4. Susceptible to pest and disease	4. Long roots
		5. Mealy
3. Kabode (NASPOT 10 O)	1. Low root yield	1. Early maturing
	2. Fibrous	2. Big roots
	3. Susceptible to pest and disease	
	4. Too soft	
4. Nakasoma	1. Low root yield	1. Sweet taste
	2. Small roots	2. Big root size
	3. Susceptible to pest and disease	3. Drought tolerant
	4. Not drought tolerant	
5. Namugwere	1. Small roots	1. Sweet taste
	2. Low root yield	

	3. Less marketable	
6. Kaawa	1. Low root yield	1. Sweet taste
	2. Roots have a lot of sap	2. Drought tolerant
7. Tompenawena	1. Low root yield	1. High dry matter content
	2. Fibrous	2. Long shelf life
	3. Roots have a lot of sap	3. Good for processing
8. Kinana	1. Poor taste, not sweet	1. Early maturing
	2. Small roots	2. High yielding
	3. Susceptible to drought	
9. Lirawo	1. Roots have a lot of sap	1. Low price (affordable)
10. Ejumula	1. Late maturing	1. Good taste and aroma
	2. Labor intensive	2. Big and long roots
	3. Soil selective	3. Drought tolerant
	4. Susceptible to drought	
11. Kakamega	1. Poor taste, not sweet	1. Nutritional & health benefits e.g Vitamin A
	2. Susceptible to drought	2. High root yield
		3. Good for processing

3.2.7. Effect of traits on the role of men and women

The effects of not preferred variety traits on the roles of men and women were stated in general terms by both men and women with no distinct differences in the stated effects between the two groups. Table 11 presents the results obtained in the discussions with both men and women.

Table 11. Effect of Non-preferred Sweetpotato Traits

Traits not Preferred	Positive or negative effects on men/women
1. Late maturing; Long growth cycle	Late maturing varieties are less preferred because they don't provide food and income early enough to the household. *A female participant in kamuli said that: "Family expenditure goes high as you look for alternative food." (Female FGD, Kamuli District, 2020).* The varieties are produced to provide food mainly during minor season for home consumption which means women are the ones working in the field more often than men causing labor burden to them. Sweetpotatoes are harvested during low market demand, hence fetches low price which reduces household income affecting both men and women.
2. Low root yield	Reduces food security and household income. This opinion cuts across both male and female participants in the FGDS. For example, *A female participant in Iganga District said that: "the variety is expensive in terms of buying. You have to buy many heaps to raise enough food for home consumption." (Female FGD, Kamuli District, 2020).* At household level, it increases expenditure on food.
3. Susceptible to drought	Leads to low yield of roots and vines which results to low household food and income security. *A woman participant in Kamuli said that: "Family expenditure goes high (has to look for alternative food."(*Female FGD Kamuli District, 2020). To increase production of roots/vines farmers need to apply irrigation in low lands which increases costs to the households and possibly losses when market prices for the roots are low.

4. Susceptible to pests and disease	Diseased vines affect the situation negatively by increasing costs for gap filling; more seeds. *A female participant in Kamuli said that: "A variety can be abandoned by farmers and seed disappears." (Female FGD, Kamuli District, 2020).* That leads to both reduced yield and low household income.
5. Short storage shelf life	A variety with short storage shelf life is not preferred by consumers because its quality deteriorates within few days, therefore it has low demand in the market which means less income to the households. Furthermore, farmers are forced to harvest in a piecemeal to avoid root deterioration when harvested in large quantities than home consumption rates. Varieties with short shelf life are usually processed into chips which also increases workloads to women, despite the fact that they provide food and income to the households.
6. Low dry matter content/high water content	These are not preferred by both groups because when cooked they become too soft and watery and tasteless as well. A female participant in Iganga said that "*consumers look for sweetpotato varieties with high dry matter content, they don't look for nutritional traits that is why Orange Fleshed Sweetpotato (OFSP) varieties are less preferred" (Female FGD, Iganga District, 2020). People need to be trained on the importance of nutritional traits which will increase the consumption of OFSP varieties"*
7. Low sweetness/tasteless roots	Have low market demand which reduces household income to men and women.
8. Low market demand	A variety with low market demand fetches low prices leading to less income from sales which affects both men and women.
9. Fibrous	Consumers do not like a variety with fibrous roots. *A male participant in Kamuli said that: "When the variety is fibrous especially when young does not allow piece mealling."(Male FGD, Kamuli District, 2020)* hence less demand in the market which reduces income for the households.
10. Soil selective	Leads to low yield of roots and vines in some areas which results to low household food and income security.
11. Too much sap	Causes discomfort during peeling and requires a lot of water to clean. It stains clothes hence inconveniencing women during washing.

3.3 Consumers

3.3.1 Key preferred/dominant varieties

Sweetpotato varieties and their traits as preferred by male and female consumers in Iganga and Kamuli districts are indicated in Table 12. The results indicate that urban consumers purchase sweetpotato varieties which are produced in the study area. Umbrella, Muwulu aduduma, Kinana and NASPOT 13 O were the most widely consumed varieties in the two districts.

Table 12. Sweetpotato Varieties Preferred by Consumers in the Study Area

District	Gender	Variety Name	Participants Consuming (%)	Rank
Iganga	Male	1. Bunduguza omukaire	58	1
		2. Silk	50	2
		3. Muwulu aduduma	33	3
	Female	1. Umbrella	100	1
		2. NASPOT 13 O (Kipapaali)	83	2
		3. Muwulu aduduma	58	3
Kamuli	Male	1. NASPOT 8 & NASPOT 13 O (Kipapaali)	50	1
		2. Bunduguza omukaire	30	2
		3. Bujina	20	3
	Female	1. Muwulu aduduma	100	1
		2. Kinana	83	2
		3. Umbrella	67	3

3.3.2 Preferred traits/characteristics

Sweetpotato attributes preferred by male and female consumers in Iganga and Kamuli districts in the consumed varieties are mainly visual attributes of raw roots, organoleptic/sensory, processing and those related to the market. The only genetic attribute important to sweetpotato consumers is storage shelf life. Important attributes to consumers include long storage shelf life, good skin color, good shape, big and long roots, high dry matter content, sweet taste, not fibrous, liked by many (children and adults), easy to peel, soft when cooked and short cooking time. These results are disaggregated by gender as indicated in Table 13.

Table 13. Sweetpotato Traits Preferred by Consumers for each variety

District	Gender	Variety/ Preferred Traits		
Iganga	Male	1. Bunduguzaa omukaire	2. Silk	3. Muwulu aduduma
		1. Good taste	1. Sweet taste	1. Sweet taste
		2. Big roots	2. High dry matter content	2. Big roots
		3. Soft when cooked	3. Big roots	3. Short cooking time
		4. Easily available	4. Long storage shelf life	
		5. Long storage shelf life		
		6. Short cooking time		
	Female	1. Umbrella	2. NASPOT 13 O	3. Muwulu aduduma
		1. High dry matter content	1. Good taste	1. Sweet taste
		2. Big roots	2. Big roots	2. Short cooking time
		3. Long storage shelf life	3. Soft when cooked	3. Big roots
			4. Good aroma	4. Not fibrous
			5. Not fibrous	
Kamuli	Male	1. NASPOT 8 & NASPOT 13 O	2. Bunduguza omukaire	3. Bujina
		1. Nutritional and health benefits e.g vitamin A	1. High root yield	1. High dry matter content
		2. Short cooking time	2. Good taste	2. Sweet taste
		3. High yielding	3. Short cooking time	3. High root yield
			4. High dry matter content	

			5. Big roots	
			6. Mealy	
	Female	1. Muwulu aduduma	2. Kinana	3. Umbrella
		1. Sweet taste	1. Big roots	1. High dry matter content
		2. Mealy	2. Attractive skin color of purple red	2. Big roots
		3. Big roots	3. Mealy	3. Thin smooth skin
		4. High dry matter content		4. Sweet taste
				5. Easy to peel

3.3.3 Effect of preferred traits on the role of men and women

Most traits preferred by sweetpotato consumers affect both men and women equally except root shape and size for which men prefer big roots of any shape because they easily fill up a bag when packing to sell while women prefer long and medium sized roots which are easy to peel. The effect of traits on specific gender groups are described in table 14 below.

Table 14. Effect of Sweetpotato Preferred Traits on men and women Consumers

Preferred Traits	Positive or negative effects on men/women
Long storage shelf life	This attribute means that the variety can stay for about a week after harvesting without getting spoilt, therefore doesn't force consumers to buy more frequently from the market, which saves time and labor for both men and women at the household. Equally important the trait makes the variety to have high market demand which brings money at home. *A male participant in Iganga said that: "Even if it's cooked after a long period of storage, the taste and dry matter content remains good" (Male FGD, Iganga District, 2020).*
Good shape	Good shape, easy to peel which saves time and reduces workload to women because they are responsible for peeling the roots before cooking. But also, good shape of the roots has high market demand which brings income to the household which is positive to both men and women. *A male participant in Iganga said that: "Irregular shaped sweetpotatoes are not easy to handle, our women complain when we buy them (Customers complain of peeling)" (Male FGD, Iganga District, 2020).*
Root size	Small or large and round roots requires more labor to peel when preparing for cooking which increases workload for women. Big and long roots have high market demand. *A female participant in Kamuli said that: "Only a few can fill a bag (Customers complain of packaging)" (Female FGD, Kamuli District, 2020).* Which brings money at home and the save time for women when peeling. On the other perspective the small root affects consumers negatively. *A female participant in kamuli said that: "Psychologically, served on a single plate at a meal un-comfortably creates the impression that one is greedy or eats a lot of food" (Female FGD, Kamuli District, 2020).*
Short time of cooking	Saves women time and labor used to cook, but also saves money for the household. *A female participant in Kamuli said that: "It saves me the time and energy to cook and I spend less money on firewood" (Female FGD, Kamuli District, 2020).*

3.3.4 Less dominant/preferred Varieties and Non preferred Traits

Consumers were asked to state the not-preferred traits and give unique attributes in less dominant varieties. The findings in Table 15 revealed that across varieties, the not preferred attributes were Low dry matter content, fibrousness and too much sap. The unique attributes were good taste, affordability, high dry matter content, big roots, nutritional and health benefits such as vitamin A content. The respondents suggested that the not preferred traits be improved and the unique traits to be maintained.

Table 15. Sweetpotato Varieties less preferred in the Study Area

District	Gender	Variety Name	Non preferred traits	Unique traits
Iganga	Male	1. Kibirikyambidi	1. Bad taste (not sweet)	1. Big roots
			2. Low dry matter content	2. Short cooking time
			3. A lot of sap	3. Low root price (affordable)
		2. Nakasoma	1. Fibrous	1. Good aroma
			2. Small roots	2. Attractive flesh color (purple)
			3. Too much sap	
		3. NASPOT 13 O (Kipapaali	1. Not sweet	1. Short cooking time
			2. Low dry matter content	2. Affordable
			3. Bad aroma	3. Big roots
	Female	1. Silk	1. Small roots	1. High dry matter content
			2. Fibrous	2. Good taste
			3. Scarce	3. Good aroma
				4. Long storage shelf life
		2. Kyebandule	1. Short storage shelf life	1. Soft when cooked
			2. Scarce	2. Good taste
			3. Rots easily	3. Big roots
				4. High dry matter content
		3. Nylon	1. Scarce	1. Less sap
				2. Good aroma
				3. Big roots
Kamuli	Male	1. Museveni	1. Fibrous	1. High dry matter content
			2. Rots easily	
			3. Roots usually affected by pests and diseases	
		2. Kyebandule	1. Short storage shelf life	1. Sweet taste
			2. Rots easily	2. High dry matter content
			3. Scarce	3. Good for preparing mashed food "*mugoyo*"
			4. Small to medium size roots	
		3. Nyindo ya mulalo	1. Small roots	1. Good taste
			2. Too soft when cooked	
			3. Roots usually affected by millipedes	
	Female	1. Tompenawena	1. Not sweet	1. Big roots
			2. Too much sap	2. Good for processing
			3. Oxidizes easily	

		2. NASPOT 13 O (Kipapaali)	1. Not sweet	1. Nutritional and health benefits e.g vitamin A
			2. Too soft when cooked	2. Low price (affordable)
			3. Bad aroma	3. Saves during food scarcity
		3. Kinana	1. Rots easily	1. Good taste
			2. Roots usually affected by weevils	2. Mealy

3.3.5 Effect of traits on the role of men and women

Most non preferred traits of less dominant sweetpotato varieties are related to taste, which influences the rejection of these varieties by the consumers. These traits affect male and female consumer in the same way, however, there are a few traits which affect men and women differently particularly on labor requirement associated with the trait. These include storability of the variety (women prefer varieties that have a long storage period in the soil or after harvesting to allow piece meal harvesting and bulk purchasing while men do not mind as long as the variety is marketable), cooking habit (women prefer varieties that cook in a short time to save time for other activities at home), peeling raw roots (women prefer varieties that are easy to peel as this save them time for other things) and sugar content (women prefer varieties with high sugar content for they are more palatable while men do not mind as long as the sweetpotato is mealy). The effects of these traits are presented in table 16 below.

Table16. Effect of Sweetpotato Traits on the Role of Men and Women in the Study Area

Non preferred traits	Positive or negative effects on men/women
1. Short shelf life	Increases the frequency of purchasing because of poor storage attribute hence taking up time from other household activities. This affects whoever is involved in purchasing of sweetpotato roots for the household.
2. Too soft when cooked	This implies that women will spend less time on cooking it but when served, it will be less palatable prompting food wastage.
3. Produces too much sap (latex) when peeled	Makes the peeling process difficult which increases workload for women who mainly do the peeling.
4. Less sugar content	Positive effect to elderly men and women who are diabetic, but less palatable to children, youths and adults who are not diabetic.

4. Summary and Conclusions

Findings from the study confirm the importance of sweetpotato as an important food security crop that is grown in many small plots by the majority of households in the study area. It is also an important household income earning crop which is increasingly being traded ,especially in urban markets. In terms of involvement in production, women were generally more involved and had more experience in sweetpotato production compared to men, which reaffirms the notion that sweetpotato production is generally conducted by women in the study area. Sweetpotato consumption was also shown to be popular in both rural and urban communities, as shown by the frequent purchases in both market segments, and the preference for varieties such as Bunduguza and Kasagaati that are available for extended piece-meal harvesting and are able to withstand the long dry periods, providing a steady supply of the roots to the market.

Local landraces, including Bunduguza and Kasagaati varieties, were the most preferred varieties across the study regions, with Naspot8 being the only improved variety known and grown by a small proportion of the producers. The result is puzzling given the decades-long research and dissemination of improved varieties in the country, which could point to inadequate or inefficient seed systems, or low demand of the released varieties based on end-user requirements. The preferred traits in these preferred landraces included agronomic traits such as high root yield, drought tolerance and early maturity, but also other visual and quality traits such as sweet taste, high dry matter content, and shape of the roots (big and long). The latter could be the key traits that differentiates these preferred varieties from released improved varieties that mostly focus on the former. It is important therefore for breeding programs to include these trait packages in new varieties, without compromising on agronomic gains, for higher acceptability (Pfeiffer and McClafferty, 2007).

While there were no major differences in trait preferences across the gender divide, more women preferred the visual and quality traits, indicating higher acceptability of new varieties possessing these traits for this group, and thus inclusivity in intervention impacts. Similarly, women were also shown to prefer varieties that were easy to process and cook given that they are the ones mostly involved in meal preparation. For gender-responsive breeding, traits that incur least drudgery in processing, such as shapely roots and thin skin are therefore desirable, together with varieties that take less time to cook.

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