Preferences and selection criteria of sweetpotato varieties in rural and urban areas of Tanzania

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Abstract. Sweetpotato is an important staple crop in many areas of Tanzania although countrywide it ranks third after cassava and round potato. Surveys indicate that lack of high yielding, early maturing varieties with desirable storage root quality characteristics is a major constraint. For a successful breeding program to address this it is vital to define the quality characteristics preferred by consumers. A review of existing information on farmers preferences showed that post-harvest qualities ranked almost as high as production characteristics in their variety selection. The main criteria in order of importance were: high yield, early maturity, sweetness, disease and pest tolerance, low fibre content, root firmness, and extended in-ground storability. Root shape, size and processing qualities were specific to particular locations which reflected very much on the utilization aspect. As no information existed on the preference of urban consumers, an increasingly important group in Tanzania , a survey was conducted for consumers and traders in three districts of the Lake Zone. The main criteria mentioned for both groups were: starchiness/ flouriness, taste, cooking time, and color of root flesh/skin.. To help define these complex criteria, information was collected on specific varieties preferred or rejected and the main reasons. Work is on to use an expert taste panel on-station to assess a range of cultivars for these criteria and compare them. With varieties preferred by consumers, the feasibility of using this method within a breeding program will be assessed.

Introduction

Sweetpotato is considered as a household food security crop by much of the population in Tanzania. It is marketed and consumed in both urban and rural areas. It's production, to a great extent is seasonal, although there is some production throughout the year. There is a peak season lasting from May to July and a low season lasting from October to April. This variation in production is reflected in market prices for sweetpotato both in rural and urban markets. These fluctuations in price and the availability of other crops also influence the rate of consumption. As urban populations grow, sweet potato is one of the staple foods which is also becoming increasingly important in urban food systems.

Despite its importance in food systems, there has been little expansion in the aggregate acreage of sweetpotato for several years, and yield per unit area in farmer's fields is still low (Kapinga et al. 1995). However, Kapinga et al. (1995) emphasized that the yield of sweetpotato in farmers fields is significantly under estimated as it is very difficult to accurately measure production from piecemeal harvesting.

The factors mentioned by farmers which limit the production of sweetpotato at the farm level include: insect pests (sweetpotato weevils), drought, shortage of planting material, diseases, low root yield, lack of good varieties, vertebrate pests and late maturity (Farming Systems Research-NCUdata file 1996; Kapinga et al. 1995). These factors, together with socio-economic factors (gender problems, labour and land shortages; and limited utilization of the crop), contribute to the limited production of sweetpotato at farm level.

Research interventions towards addressing these issues are currently on-going. These include both production as well as post harvest interventions. Experience has shown that although research has lead to many recommendations for practices to increase production of sweetpotato at the farm level, the rate of adoption is low. In cases where "Improved" varieties are introduced, a low rate of uptake may indicate that the variety is in some way unacceptable. This has brought about concern of research scientists to revisit the approach by integrating consumers preference in developing sweetpotato varieties.

At urban levels, most consumers obtain sweet potato roots from the markets. Some consumers supplement these by growing sweetpotato themselves. It has been found that not all varieties are acceptable to consumers due to various characteristics such as a low dry matter and high fibre content. This underscores the importance of considering consumer preferences in breeding sweetpotato varieties for increased yield. Therefore baseline studies were conducted in rural areas of selected major sweet potato producing areas. The objectives for the rural areas were to:

Identify the farmers preferences for the sweetpotato varieties currently grown;
Determine the criteria farmers use to abandon or select sweetpotato varieties;
Identify research gaps that need interventions for raising sweetpotato uasge on farms.

For the urban areas the emphasis was geared towards:

Assessing the demand for sweetpotato in both households and markets;
Determining the consumer preferences for specific sweetpotato varieties and ;
Assessing the characteristics preferred for sweetpotato varieties.

This information is essential for assisting breeders to identify the most appropriate varieties for producers and consumers to direct research on sweetpotato post-harvest and production. It was also assumed that determination of key issues raised above will improve the relevance of research towards increasing the utilisation at both farm and urban levels.

Materials and Methods

The information at farm level was collected in 1996 by the Farming Systems Research Program (FSR) in collaboration with the National Root and Tubers Research Program. The study aimed at identifying farmers preference and selection criteria of different crops. In this study checklists were used in conducting informal surveys. Also field visits and transects in farmers fields were made. The information collected was supplemented by the secondary information collected earlier on country wide on the status of sweetpotato in the food and farming systems of Tanzania (Kapinga et al. 1995).

For urban areas the study concentrated in the Lake Zone where a total of 35 market agents and 58 urban households were interviewed from three districts (Meatu, Mwanza and Ukerewe) in Mwanza region.

The study made use of checklists designed to cover both urban households and market agent. These were adopted from the cassava related studies carried out in urban areas by the Collaborative Study of Cassava in Africa (COSCA) and adjusted accordingly to suit the areas of study. The COSCA reference manuals provided a useful guide for the collection of this information. During the surveys, the information collected was considered under two categories. Urban households (consumers) and market agents (traders).

Findings

Preferences and selection criteria of sweetpotato varieties by farmers. These are specific attributes needed by farmers to select sweetpotato varieties to meet their needs. In the rural areas farmers in surveyed zones indicated important criteria acting as basis for selection of good/preferred varieties. These were however categorized into pre-and postharvest attributes. The major ones are as indicated:

High root yield and early bulking. This was the most important and ranked first among all the criteria (Table 1). Yield was important in all surveyed zones. The yield potential of variety was assessed based on the number of roots and root size. A variety was considered to be early bulking when reasonable yield is obtained at three to four months after planting. This was mentioned in all zones surveyed with the overall mean of 88.4% and ranked second among the criteria. This attribute is mostly preferred where the crop is grown for commercial purposes and during extended dry spells when it serves as a food security crop. They also bridge up the gap before harvesting other crops especially in the Lake and Western zones respectively.

Sweetness. This criteria was third in importance in all the zones (Table 1). Eighty six percent of the surveyed areas considered it as an important criteria with Southern, Western and Southern Highland Zones giving the highest percentages. Apart from sugary nature of the sweetpotato root, root consistency and aroma were all considered to play a big role in root sweetness.

Low fibre content. This criteria was fifth in importance and was mentioned in all surveyed zones (Table 1). Varieties preferred need to have low fibre content. 60% of the surveyed villages indicated its importance in selection of sweetpotato varieties. All zones ranked it 100% except Lake and Eastern zones where it was not mentioned. For these zones sweetpotato with high fibre content is normally processed into dry chips for future use.

Disease and pest tolerance. Farmers identified common pests and diseases of sweetpotato and preferred varieties which can tolerate them. It was mentioned in all surveyed zones except Central Zone (Table 1). Some criteria for selection were zone specific and appeared in one or two zones. These include: high dry matter content, high starch and flour production, good in ground storability, and good ability for fresh roots to keep long in storage structures. Varieties which can make good chips, good root shape and large size which were mentioned in the Lake zone where processing is very prominent. Major varieties preferred based on the criteria above are summarised in Table 2.

Preferences and selection criteria of sweetpotato varieties by urban consumers

Consumers indicated that sweetpotato roots with high starch/dry matter content when cooked are very much preferred (Table 3). Good taste was also an extremely important criteria. From discussions it was clear that consumers were expressing good taste in many ways. There is some confusion as to how good taste relates to sweetness. In Swahili (the language in which the interviews were conducted) the word for tasty is the same as the word for sweet. Some considered a root with high sugar contents as good while others considered roots with medium sweetness (neither flat/nor sugary) as good taste. The interviewers tried as much as possible to make the consumers separate all those issues, but this was found to be difficult. It should

Table 1. Percentage distribution of villages mentioning selection criteria of sweetpotato varieties at FARM LEVEL in different zones of Tanzania.

Selection criteria (a) Pre- Harvest	Eastern (N= 10)	Southern (N= 15)	Western (N=13)	SHigh (N=9)	Lake (N=15)	Mean	Rank
High yielding	100	100	100	100	67	93.4	1
Early maturing/bulking	67	100	100	75	100	88.4	2
Disease tolerance	67	100	0	75	67	61.8	4
Insect tolerance	67	100	0	25	67	51.8	6
Good inground storability	0	100	0	75	0	35.0	8
Production of leaf relish	33	0	0	0	0	6.7	11
Tolerant to water logging	33	0	0	0	0	6.7	11
Potential to be grown in all seasons	33	0	0	0	0	6.7	11
(b) Post harvest							
Sweetness	67	100	100	100	67	86.8	3
Low fibre content	0	100	100	100	0	60.0	5
High root firmness	67	0	0	25	100	38.4	7
Marketability	0	0	0	67	0	13.4	10
Less starch for storage	0	0	100	0	0	20.0	9
Large root size	33	0	0	0	33	13.4	10
Good root shape	0	0	0	0	33	6.7	11
Good chips	0	0	0	0	33	6.7	11

Source: Kapinga et al. 1995

Table 2. Popular sweetpotato varieties preferred for growing by farmers and their desired characteristics across zones in which they are grown in Tanzania

Local name(s)	Zone	Desired characteristics
Suguti, Songea Simama Tulwawima	E., S. Highlands, Lake	white skin, yellow flesh, high yield, floury, matures early large roots, Moderate sweet, very firm/floury, no. fibre
Mayai	W., E.	White skin, Orange flesh, High yield, Stores well in ground
Mwezigumo	W., Lake	matures very early; bridges a famine gap between harvests
Karoti	E., S.	matures early, red skin, yellow flesh, medium fibre content moderate sweet, medium root, firm and moderate drought tolerant.
Sinia Kasinia	S. High-lands, Lake	Early maturing, Large root size, Red skin/White flesh, Very sweet, Very firm, No fibre.
Kinahaha	W., S. Highlands	matures v. early, good vegetable, sweet firm, white flesh, no fibre
Kandoro	W., S. Highlands	Medium maturity, Large root size, White skin, White flesh, Sweet, Firm, Not fibrous

Source: Farming Systems Research - NCU data files 1996, and Kapinga et al. 1995

Table 3. Desirable sweetpotato root characteristics by URBAN CONSUMERS and their ranking in selected districts in the Lake Zone of Tanzania

Characteristics	No of households mentioning:				Mean household ranking			
	Mwanza (N-15)	Meatu (N=20)	Ukerewe (N=20)	Total (N=55)	Mwanza (N=20)	Meatu (N=20)	Ukerewe (N=20)	Overall**
Starchy / floury	15	10	12	37	1.4	1.4	1.6	1.5
Good taste	15	8	19	42	1.9	1.8	1.9	1.9
Good cooking qualities	5	4	6	15	3.0	3.5	1.6	2.7
Non/less fibrous	1	2	4	7	4.0	2.8	2.0	2.9
Good storability	-	1	3	4	-	3.0	3.0	3.0
Good root appearance	3	1	4	8	4.2	4.0	4.1	4.1

- not mentioned; good cooking quality = less time to cook and soft when cooked; Good root appearance = shape, size and colour; * Calculated as the mean of the rankings (1 and upwards) given by individual interviewees; ** Calculated as an unweighted mean of the values for the three districts; Source: Kapinga et al. 1997b

Table 4. Sweetpotato varieties most preferred by urban consumers and main criteria considered

District	Variety	Frequency (no of house-holds mention-ing variety)	Preferred characteristics (No. of households) Starchy floury	Tasty/ sweet*	Good cooking qualities**	Good root flesh colour***	Good stora-bility
Mwanza (N=18)	Sinia	10	9	8	2	3	5
	Suguti	6	4	4	-	6	-
	Simama	4	4	3	-	2	2
	Chilile	2	1	-	1	1	-
	Mzondwa	2	1	2	-	-	-
	Polista	1	1	1	-	-	-
Meatu (N=20)	Sinia	5	4	4	-	-	-
	Kibuluu	4	2	3	-	3	-
	Serena	3	1	1	2	-	-
	Ngoshagagaga	3	3	1	-	-	-
	Tulwawima	2	2	2	-	1	-
	Suguti	1	1	1	-	-	-
Ukerewe (N=20)	Mzondwa	14	9	11	-	2	3
	Bilagala	8	3	7	5	-	-
	Chilile	7	5	7	4	3	3
	Sinia	5	2	4	1	1	1
	Lutambi	5	-	4	-	3	-
	Mwiyangi	4	1	-	-	1	-
	Simama	1	1	1	-	-	-

* sweet refers to good taste rather than amount of sugar, preferred taste is usually described as neither bland nor very sugary, ** Good cooking qualities means soft when cooked, with a short cooking time, *** Good root flesh colour is generally considered to be yellow or white.
Source: Kapinga et al. 1997

Table 5. Traders' perception and ranking of good sweetpotato root characteristics of sweetpotato in selected districts in the Lake Zone of Tanzania

Desirable root characteristic	No. traders mentioning characteristic				Mean ranking given by traders*			
	Mwanza (N-16)	Meatu (N=11)	Ukerewe (N=8)	Total (N=35)	Mwanza (N=16)	Meatu (N=11)	Ukerewe (N=8)	Total (N=35)
Starch/floury/high dry matter content	11	5	5	21	1.1	1.0	1.8	1.3
Good taste	7	4	7	18	2.0	2.2	1.4	1.8
Attractive skin and flesh colour	7	5	3	15	1.7	1.7	2.0	1.
Big root size	5	0	1	6	2.8	-	2.0	2.4
Low/no fibre content	0	0	2	2	-	-	2.6	2.6
Good root shape	2	1	2	5	3.0	3.0	2.5	2.8
Good cooking qualities+	0	1	1	2	-	3.0	3.0	3.0
Tolerant to bruises and rotting	1	1	1	3	3.0	4.0	4.0	3.7

+ Less time to cook and soft when cooked. * Calculated as the mean of the rankings (1 and upwards) given by individual interviewees; Where a characteristics was not mentioned by a household the ranking was taken to be 5; ** Calculated as an unweighted mean of the values for the three districts. Sourcce: Kapinga et al. 1997b

therefore be taken into account that in this report good taste refers to various attributes and not only the amount of sugars the root possesses. Results obtained showed that high flour content ranked first, followed by good taste, good cooking qualities and no or less fibre content. Varieties preferred for buying and their desired attributes are summarised in Table 4.

The data indicates that two criteria, starch (floury) and taste(sweet) are particularly important to the consumers in all three regions. Good cooking quality and good flesh colour are also considered. Good storability was mentioned in Mwanza and Ukerewe, but not Meatu. This may be because Meatu is the only one of the three areas where processing is of important.

Interviewees were also asked which varieties they did not like to buy, and for what reasons. The reasons given for unacceptability of the specific varieties are watery roots, bad taste, unattractive root appearance, high fibre content and poor cooking qualities.

Preferences and selection criteria of sweetpotato varieties by market traders. The main reasons given for the preferences of sweetpotato varieties commonly sold are given in Table 5. Not surprisingly, the findings are similar to those obtained during interviews of consumers. The characteristics mentioned most frequently were: high starch/flour content (21 out of 35 traders); good taste (18 out of 35 traders), and attractive root skin and flesh colour (15 out of 35 traders). The definition of good root flesh colour appears to be very subjective; some traders prefer to sell yellow fleshed roots, while others prefer white fleshed roots. Mixed colours in root flesh were said not to be preferred by many customers.

As for the survey of consumers, traders were asked to rank the characteristics of fresh roots according to their perception of the characteristics considered important by their customers. The ranking gave a very similar trend to the characteristics originally mentioned. Thus high flour/starch content ranked first, followed by good appealing root taste and attractive skin colour/root appearance. These criteria were used for selecting varieties for selling.

Conclusions and recommendations for future interventions

Farmers can select sweetpotato varieties for all categories of end-users. Hence their involvement in several key stages of breeding should be compulsory. During breeding and testing of sweetpotato varieties, emphasis should be placed on selecting for those that have the quality criteria highlighted by consumers and traders especially those which are starchy/mealy and have good taste. It is assumed that starchy/mealy correlates with high dry matter content, but this has yet to be verified.

Taste is a subjective quality, and the relationship between "good taste" as perceived by consumers and measurable characteristics is unknown and should be investigated. The most practical way of assessing these characteristics for new varieties is probably to use trained taste panels on-station related to consumer tests off-station.

Storability is one of the qualities identified as being a desirable characteristics, although not as high priority as quality. It is notable that most consumers and traders do not expect to store sweetpotatoes for more than a few days. An extension of shelf-life would greatly increase the potential for transporting and trading this commodity. For future interventions some in-depth investigations should be carried out concentrating on the identification of root qualities associated with extended shelf-life, to enable easy selection of better storing varieties.

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