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PREFERENCES AND SELECTION CRITERIA OF SWEET POTATO VARIETIES AT FARM LEVEL IN TANZANIA (SECONDARY INFORMATION)

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CONTENTS

1. INTRODUCTION

Sweet potato is grown in Tanzania primarily for home consumption, although it may also be grown as fodder for livestock or as a cash crop. In most areas, although grown by almost every family, sweet potato is a secondary crop, e.g. in the Lake, Eastern and Western zones of Tanzania. In many zones, including Southern Highlands, Southern and Central, sweet potato is used as a food security crop, primarily to bridge the gap in food supply that can occur prior to the main harvests of other staple crops.

Despite its importance in the food systems of Tanzania, there has been little expansion in the aggregate acreage of sweet potato over several years, and recorded yield per unit area in farmers' fields is still low (Kapinga *et al.*, 1995). However, Kapinga *et al.* (1995) emphasize that the yield of sweet potato in farmers' fields is significantly underestimated as it is very difficult to measure production accurately where piecemeal harvest is the common practice.

The factors mentioned by farmers which limit the production of sweet potato at the farm level include: insect pests (primarily sweet potato weevils [*Cylas* spp.]), drought, shortage of planting material, disease, low root yield, lack of good varieties, vertebrate pests and late maturity (FSR -NCU data 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 sweet potato 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 sweet potato at the farm level, the rate of adoption of improved practices is low. In cases where "improved" varieties have been introduced, a low rate of uptake may indicate that the variety is in some way unacceptable. This observation has led research scientists to revisit the approaches previously used, and to take more account of consumers' preferences when developing and selecting sweet potato varieties for release.

With respect to post-harvest, one of the main limitations to the development of sweet potato in Tanzania is its low storage potential, as sweet potato is highly susceptible to storage pests, rots and physiological deterioration. There is evidence that some varieties are more perishable than others, suggesting that there is potential to select for more storable varieties. However, the rate of deterioration is increased when fresh sweet potato roots are damaged during harvesting and/or are infested by weevils. Thus, not only choice of variety, but also production and harvesting methods have effects on both storage and marketing quality. Given this, it is very important that any attempt to increase the production of sweet potato at farm level should be accompanied by improvements in post-harvest treatments.

The overall aim of this report is to define the varietal characteristics of sweet potato preferred by farmers. In order to achieve this aim the specific objectives are as listed below:

(i) to identify the farmers' preferences for the sweet potato varieties currently grown;

(ii) to determine the main features of sweet potato varieties currently grown by farmers;

(iii) to determine the criteria farmers use to abandon or select sweet potato varieties;

(iv) to identify the production and post- harvest problems facing farmers in sweet potato farming; and

(v) to identify research gaps that need interventions for increasing sweet potato utilisation at farm level.

The information summarised in this report is meant specifically to serve as a base to direct breeding programs in their attempts to identify most appropriate varieties and to direct research for improving production and post-harvest handling techniques of sweet potato at farm level. It is assumed that determination of key issues raised above will improve the relevance of research towards increasing the utilisation at farm level.

While compiling this report, it was observed that very little information exists on the preferences of urban consumers. Thus, it is planned that information will be collected in future from the urban areas where sweet potato is of importance.

2. METHODOLOGY

Some of the information reported here is a compilation of raw data collected during December 1995 - May 1996 by the Farming Systems Research Program (FSR) in collaboration with the National Root and Tubers Research Program. The study aimed at identifying farmers preferences and selection criteria of different crops. The information was obtained by means of group interviews where a group consisted of 15-20 people. This information was supplemented by interviews of individual households, generally 4-6 per village. Although checklists were used to aid the interviews, the survey depended very much on open discussion with the groups. The study was financed by the National Coordination Unit of FSR (NCU - FSR) based in Dar es Salaam.

In addition, some secondary information on the status of sweet potato in the food and farming systems of Tanzania has been included. This information was collected by the FSR and Root /Tubers programs in collaboration with the International Potato Centre. (Kapinga *et al.*, 1995). No other relevant sources of information could be found.

3. ACKNOWLEDGEMENTS

The authors wish to acknowledge the kind co-operation shown by the national staff of the National Co-ordination Unit - Farming Systems Research (NCU- FSR), Dar es Salaam, Root and Tuber Programme Uyole, Mbeya and FSR Program Central Zone. The above mentioned colleagues provided the information which helped much as a source of the required literature. Also the Natural Resources Institute, United Kingdom (through the DFID Crop Post-Harvest Programme, Project R6507, *The extension of storage life and improvement of quality in fresh sweet potato through selection of appropriate cultivars and handling conditions*) is highly acknowledged for financial assistance. It is hoped that the information generated will improve the relevance of research towards improving the production of sweet potato at farm level in the country.

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4. RESULTS

4.1 FARMERS PREFERENCES AND SELECTION CRITERIA.

Information on farmers preferences and selection criteria was compiled from both Kapinga et al., (1995) and the FSR-NCU survey. Information on zonal differences was compiled from the FSR-NCU survey.

Farmers in all surveyed zones (Eastern, Southern, Western, Southern Highlands, Lake) indicated that there are some important criteria for sweet potato which act as a basis for selection of varieties. The frequencies at which the various criteria were mentioned in the different zones are summarised in Table 1. The attributes considered most important by farmers are high root yield, early maturity, tolerance to pests and diseases and good root characteristics (fibreless, sweetness, high root firmness etc.). The most important characteristics referring to qualities of the roots are described in more detail below. These characteristics have been ranked in Table 1 on the basis of the percentage of farmers mentioning them as important selection criteria, averaged across zones. As this percentage is not weighted for the importance of each zone in total sweet potato production it can only be taken as a qualitative indication of the importance of that criterion. The five zones are considered to rank in the following way with respect to sweet potato production: 1: Lake, 2: Western, 3: Eastern, 4: Southern Highlands, 5: Southern.

(i) High root yield

This was the selection criterion most frequently mentioned. Farmers in all of the surveyed zones indicated that high yield is an important attribute in sweet potato variety selection (Table 1). The root yield in this case depends mainly on the number of storage roots per plant.

(ii) Early maturity (early bulking)

Early maturity was an important criterion in all zones, although with some variation in the frequency at which it was mentioned. The overall percentage for all surveyed areas which mentioned this criterion was 88.4%, and it ranked second among all other criteria across zones. Southern, Western and Lake zones had higher percentage (100%) compared to Southern Highlands and Eastern with 75% and 67% respectively.

Farmers clarified this criterion by mentioning the ability of a variety to give a reasonable number of harvestable storage roots from three months after planting. The early maturing varieties are mostly preferred in areas where sweet potato is commercial crop. In addition early maturing varieties can be particularly important in situations where there is an extended dry spell and sweet potato serves the purpose as a food security crop when others fail. In some zones such as the Lake and Western zones, early maturing varieties bridge up the gap before the harvest of main crops.

(iii) Sweetness

The term "sweet" applied to sweet potato in Tanzania appears to be very subjective and refers to a desired taste rather than sugar levels. Thus root sweetness as explained by farmers indicated a desired taste of a root that is not very sweet nor very "flat" like that of yam. Any sweet potato with that desired taste is considered very sweet. This post-harvest criterion ranked third in importance and was mentioned in all zones. The average percent of surveyed farmers who mentioned sweetness to be important was 86.6% (Table 1). The highest percentage was observed in the Southern, Western and Southern Highlands Zones respectively.

(iv) Low fibre content

Low fibre content was another important selection criterion; varieties preferred by farmers should have a low fibre content. The criterion ranked fifth in importance (Table 1). On average 60% of the surveyed farmers indicated that the criterion was of great value in selection of sweet potato varieties. This may be an underestimate of its importance, since the survey results indicate that this criterion was not mentioned in Eastern and Lake zones, although mentioned by all farmers in the other three zones. It appears that this quality may have been included with root "sweetness" in these two cases.

(v) Disease and pest tolerance.

Farmers interviewed were able to identify some common pests and disease of sweet potato. They preferred sweet potato varieties that can tolerate diseases and also that are tolerant/resistance to sweet potato pests. This criterion was mentioned by farmers in all surveyed zones with the exception of Central zone (Table 1). Tolerance to insects (which would be primarily sweet potato weevil (*Cylas* spp.) was mentioned on average in 51.8% of cases and ranked sixth in importance.

Selection criteria for specific zones

Some selection criteria were very specific to zones, probably because they answer the specific needs of the particular environment.

One example is high root firmness which was mentioned only by farmers in Lake, Eastern and Southern Highlands. This is probably because storage roots with high dry matter contents, and therefore high starch content, are more suitable for secondary processed products such as starch and flour.

Other specific criteria are varieties which can make good chips, have good root shape and large root size. These criteria were mentioned specifically in the Lake zone, and reflects the type of root utilization commonly practiced in this zone.

Good in-ground storability is another specific criteria for Southern and Southern Highlands. This attribute cuts across two issues. One is the extended in-ground storability before harvesting; and the other one is the ability for the fresh roots to keep long in the storage structures for an extended period.

Table 1. Selection criteria by zone for sweet potato varieties as mentioned by surveyed farmers (%). (Compiled from FSR-NCU Data file 1996.)

Criterion	Zones						
	EST	SOUT	WEST	SHL	LAK	MEAN	RANK
Ranking of zones by importance of sweet potato production.	3	5	2	4	1		
(i) Pre-harvest:							
High yielding	100	100	100	100	67	93.4	1
Early maturing	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 in-ground storability	0	100	0	75	0	35.0	8
Tender leaves	33	0	0	0	0	6.7	11
Tolerant to water logging	33	0	0	0	0	6.7	11
Potential to be grown all seasons	33	0	0	0	0	6.7	11
(i) 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

EST, Eastern zone; SOUT, Southern zone; WEST, Western zone; SHL, Southern Highlands; LAK, Lake zone.

For each criterion the % of farmers interviewed who mentioned that as an important criterion is given.

The ranking is calculated using the mean percentage calculated for the five regions. Although the zones are ranked with respect to their importance for producing sweet potato this percentage has not been weighted for the importance of each zone. It can thus only be taken as a qualitative indication of the importance of that criterion.

4.2. CHARACTERISTICS OF SWEET POTATO VARIETIES COMMONLY GROWN BY FARMERS.

Information on characteristics of commonly grown sweet potato varieties was obtained from the FSR-NCU survey.

Data are presented below which indicates the characteristics of sweet potato varieties presently grown in different zones of Tanzania. These data were obtained during FSR surveys on a wide range of crops. As a consequence in some zones, especially those where sweet potato is less important, only a small number of varieties were recorded which may not be a true indication of the real situation. Nevertheless, the overall results can be taken as a tentative indication of the varieties grown nationally. In some cases the characteristics of varieties grown correspond quite closely with farmer's preferences, while in other cases there is clearly room for improvement.

(i) **Maturity:**

Although farmers prefer early maturing varieties most of sweet potato varieties grown by farmers are considered by farmers' definition to be late maturing. Farmers considered the critical time to distinguish late and early maturing varieties to be 4 -5 months. Varieties that do not give mature roots within this period are considered to be late maturing. Early maturing often means that in the case of piecemeal harvesting, big roots can be obtained within three to five months while others are left to bulk. Farmers also mentioned the advantage of early maturity for drought avoidance particularly in areas with long dry spells. Analysis from all zones surveyed (Southern and Northern zones were not included) showed that 55% of the total varieties grown by farmers were referred to as late maturing and 45% early/medium maturing varieties (Table 2). This overall percentage does not take into account the relative importance of varieties nor of zones, but gives an indication that research efforts should be strengthened for the development of early maturing varieties.

Table 2. Type of maturity of commonly grown sweet potato varieties. (Compiled from FSR - NCU data file 1996)

Zone	No. of varieties	Early Maturing	Late Maturing
Eastern	10	3	7
Western	11	3	8
S.Highlands	35	19	16
Central	3	2	1
Lake	18	8	10
Total	77	35	42
Percentage		45%	55%

Varieties have been categorised by the interviewed farmers as early maturing and late maturing. An early maturing variety produces mature storage roots within 4-5 months, whereas a late maturing variety takes longer.
The overall percentage has not been weighted to take into account the relative importance of varieties nor of zones

Root characteristics:

(ii) **Outer skin colour of roots**

Although not mentioned as major selection criteria, skin and flesh colour are likely to be important for uptake of new varieties.

Many of the varieties grown by farmers have purple /red outer skin colour (Table 3). This accounted for 45% of the total varieties mentioned by farmers. The purple/red colour was followed by white/yellow outer skin colour (33%) and brown/cream colour (22%). (N.B. The overall percentage has been calculated without weighting the varieties with respect to their importance in each zone. The relative numbers of varieties with each skin colour may therefore not be an quantitative indication of the popularity of that colour.)

The predominant skin colour appeared to differ between zones, although the results may be distorted by the fact that the number of varieties recorded varied greatly between zones. In Lake zone, the predominant colour was purple/red (51% recorded varieties). On the other hand in Eastern zone most of the varieties assessed (88%) had white/yellow skinned roots, and the same was reported by farmers in the Central and Western zones. If, as this data indicates preference to skin colour varies from one zone to another, this must be taken into account by breeders.

Table 3. Outer skin colours of roots of commonly grown sweet potato varieties. (Compiled from FSR - NCU datafile 1996).

Zone	No of varieties	Skin colour (roots)		
		White/Yellow	Purple/Red	Brown/Cream
Eastern	8	7	1	0
Southern	3	2	1	0
Western	2	2	0	0
S.Highlands	21	8	9	4
Central	3	2	1	0
Lake	68	14	35	19
Total	105	35	47	23
Percentage	-	33	45	22

The overall percentage has been calculated without weighting the varieties with respect to their importance in each zone, nor weighting the zones with respect to their importance for sweet potato production. The relative numbers of varieties with each skin colour may therefore not be an quantitative indication of the popularity of that colour.

(iii) Flesh colour of roots

Two main flesh colours were mentioned by farmers: white and yellow/orange (Table 4). Discussions with farmers indicated that white fleshed roots are preferred because they produce good chips 'michembe' when processed and give good quality flour. In addition, farmers perceive that white flesh in a storage root is a good indicator of high starch/dry matter content. The overall percentage of varieties mentioned with each flesh colour is given in Table 4. As the varieties included have not been weighted with respect to their importance in each zone, this percentage cannot be taken as a strictly quantitative indication of the popularity of that colour. Nevertheless it is consistent with the hypothesis that white fleshed roots are preferred to yellow/orange colour, as 63% of the total varieties assessed have white root fleshed colour.

N.B. the number of varieties mentioned in Table 4 is less than the number noted in Table 3, as the flesh colour was not noted for all mentioned varieties.

In some zones such as Western zone, farmers mentioned varieties with purple or blue coloured roots, which were of low dry matter.

Table 4. Root flesh colours of commonly grown sweet potato varieties. (Compiled from FSR - NCU data file 1996)

Zone	No. of varieties	Root flesh colour	
		White	Yellow/Orange
Eastern	13	7	6
Southern	3	2	1
Western	3	0	3
S.Highlands	-	-	-
Central	-	-	-
Lake	69	47	23
Total	88	56	33
Percentage	-	63	38

The overall percentage has been calculated without weighting the varieties with respect to their importance in each zone, nor weighting the zones with respect to their importance for sweet potato production. The relative numbers of varieties with each flesh colour may therefore not be an quantitative indication of the popularity of that colour.

(iv) Root firmness/hardness

Firmness is an indicator of high dry matter content, which is a preferred attribute in sweet potato roots. However, farmers indicated that most sweet potato varieties that they grew had medium to slightly firm roots. Of the total varieties assessed, only 26% were considered to have very firm roots (Table 5).

These findings suggest that more attention should be given in the breeding scheme to select varieties with firm roots. The chances are high that these varieties once selected by farmers will be adopted.

Table 5 . Root firmness of commonly grown sweet potato varieties. (Compiled from FSR - NCU data file 1996)

Zone	No. of varieties	Very firm	Med. firm	Slightly firm
Eastern	-	-	-	-
Southern	2	2	0	0
Western	-	-	-	-
S.Highlands	36	8	22	6
Central	-	-	-	-
Lake	-	-	-	-
Total	38	10	22	6
Percentage	100	26	58	16

The overall percentage has been calculated without weighting the varieties with respect to their importance in each zone, nor weighting the zones with respect to their importance for sweet potato production

(v) Root sweetness

As discussed above "sweetness" is a very subjective quality, being an indication of good taste, rather than sweetness *per se*. It was observed that most sweet potato varieties grown by farmers have medium "sweet" to very "sweet" taste (Table 6). Any watery root or fibrous root is never considered "sweet". Culinary characteristics of sweet potato roots should be considered very important when selecting sweet potato varieties with farmers (Kapinga *et al.*, 1995)

Table 6. Root sweetness of commonly grown sweet potato varieties. (Compiled from FSR - NCU datafile 1996)

Zone	No. of varieties	Very sweet	Sweet	Not/Slightly sweet
Eastern	4	1	2	1
Southern	3	1	2	0
Western	4	2	0	2
S.Highlands	36	12	21	3
Central	3	0	2	1
Lake	-	-	-	-
Total	50	16	27	7
Percentage		32	54	14

The overall percentage has been calculated without weighting the varieties with respect to their importance in each zone, nor weighting the zones with respect to their importance for sweet potato production

(vi) Root texture

The texture of the root flesh is one of the criteria farmers use for selecting sweet potato varieties. Sweet potato roots with no or low fibre content are preferred.

The majority of sweet potato varieties currently grown by farmers have no fibre or low fibre. It was noted from the study that for the four zones assessed 55% of the total varieties grown had no fibre and only 15% of the total varieties mentioned were considered to be very fibrous (Table 7).

Table 7. Root texture of commonly grown sweet potato varieties. (Compiled from FSR-NCU data file 1996)

Zone	No.of varieties	Texture		
		No fibre	Low fibre	Very Fibrous
Eastern	-	-	-	-
Southern	3	0	3	0
Western	12	6	4	2
S.Highlands	35	21	8	6
Central	3	2	1	0
Lake	-	-	-	-
Total	53	29	16	8
Percentage		55	30	15

The overall percentage has been calculated without weighting the varieties with respect to their importance in each zone, nor weighting the zones with respect to their importance for sweet potato production

4.3 PRODUCTION AND POST-HARVEST PROBLEMS

Information on production and post-harvest problems was compiled from both Kapinga et al., (1995) and the FSR-NCU survey.

There are various pre- and post-harvest problems that are encountered by sweet potato farmers, which it is important to consider when introducing new varieties. These problems are listed in Table 8, together with the percentage of interviewed farmers in each zone which mentioned each of them. An overall mean percentage is calculated for each factor, which was used to rank the problems, but as zones were not weighted with respect to their importance for sweet potato production, this ranking should be considered as approximate only.

The major problems are discussed here, grouped into biotic, abiotic and socio - economic factors

4.3.1. Biotic factors

(i) Insect pests:

Insect pests pose a major problem in almost all the sweet potato producing zones (Table 8). Farmers mentioned weevils to be the most important of all the insect species responsible for damage of sweet potato in the field, followed by millipedes and butterfly larvae. Weevils are mentioned in 54 % of the surveyed area and millipedes and butterfly larvae are mentioned in 25% and 12.5% of the area respectively.

Among the weevils, sweet potato weevils (*Cylas* spp.) are usually the most serious as they infest storage roots. Adult weevils feed on leaves but the larvae are most damaging. As they induce the storage root to produce bitter phytoalexins even light infestation can render a storage root inedible. Rough weevils (*Blosyrus* spp.) attack storage roots by making small channels on the surface of enlarging roots. This is generally less serious than *Cylas* but can render roots less marketable where infestation is high. Striped weevils tunnel through the vines leaving them hollow (Kapinga *et al*, 1995), but are also considered a less serious pest than *Cylas*.

Millipedes bore through storage roots leaving superficial holes behind, which may act as entry points for some pathogens.

Butterfly larvae feed on the leaves scraping off the photosynthetic tissue. Plants are killed as a result of feeding activity. This is however a sporadic pest.

(ii) Diseases.

The most common diseases in farmers fields include: root rot, viral diseases, fungi and wilts. Both root rot and viral diseases are mentioned as causing frequent damage in 50% of the zones surveyed. Fungal diseases are common in the Southern zone and wilts are reported in some areas within Southern Highlands zone (Table 8).

(iii) Wild animals (vermin)

Vermin rank third among the production constraints identified. Farmers in all zones except Western and Central zones cited rats as the most destructive animal, damaging the crop in the field and processed products in store.
Apart from rats; baboons and moles frequently attack farmers' fields and are a serious pest to the crop especially during root bulking when the crop is approaching maturity. Farmers are at times obliged to uproot entire fields of sweet potato prior to full maturity to escape this problem.

4.3.2. Abiotic factors

(i) Low soil fertility

Low soil fertility results in low root yield. This problem is particularly pronounced in the Southern Highlands zone (100%), but is also mentioned in some parts of the Eastern and Lake zones (Table 8).

(ii) Lack of planting material

Inadequate supply of sweet potato planting materials at the time when they are needed is a common problem especially in the Lake and Southern Highlands zones.

(iii) Poor in-ground storability

Poor in-ground storability of fresh sweet potato storage roots is another constraint mentioned by farmers.

(iv) Drought

Drought was mentioned as a serious problem in the Southern zone only (100%).

4.3.3. Socio- economic factors

(i) Land shortage

Among the socio-economic limitations; land shortage was cited by farmers as the most important constraint.

(ii) Shortage of money and labour

Lack of cash for purchasing necessary facilities and shortage of labour for farm work are other important constraints in Lake and Southern zones (20.8%).

(iii) Lack of processing facilities

Processing facilities are often not available for processing of good quality chips. Farmers in Southern Highlands (75%) and Eastern (25%) mentioned this as a constraint to sweet potato utilisation.

(iv) Marketing problems

Marketing problems of sweet potato root are mostly evident in the Southern zone (100%). Poor prices of sweet potato are also reported in Southern Highlands (75%). The problem of low prices is enhanced by poor infrastructure which makes transportation of roots to distant markets difficult.

(v) Gender bias

Kapinga *et al.* (1995) noted that there was a low level of utilization of sweet potato. This was accompanied by, and may be associated with a gender bias in the production of sweet potato. In many zones visited sweet potato is still considered a female and children's crop both in utilization, production and post-harvest handling techniques. This has contributed much in reduced production of sweet potato at farm level.

Table 8. Major production and post-harvest problems facing farmers (percent per zone) (Compiled from Kapinga *et al.*, 1995.)

Criterion	Zones							
	EAST.	SOU	WES	SHL	LAK	CENT	MEAN	RANK
INSECT PESTS	**75**	**100**	**100**	**75**	**100**	**0**	**90.0**	**1**
Weevils	75	0	100	75	75	0		
Beetles	25	0	0	0	25	0		
Elegant grasshopper	25	0	0	0	25	0		
Millipedes	0	100	0	0	50	0		
Butterfly larvae	0	0	0	0	75	0		
Termites	0	0	0	0	25	0		
DISEASES	**75**	**100**	**0**	**75**	**80**	**0**	**82.5**	**2**
Root rot	50	100	0	25	0	0		
Viral	25	0	0	75	100	0		
Fungus	0	100	0	0	0	0		
Wilt	0	0	0	25	0	0		
VERMIN	**25**	**100**	**0**	**75**	**80**	**0**	**75.4**	**3**
Rats	25	100	0	75	75	0		
Baboons	25	0	0	0	0	100		
Pigs	25	0	0	75	0	25		
Moles	0	0	0	75	25	25		
Monkeys	0	0	0	25	0	0		
Porcupines	0	0	0	0	75	0		

cont.

Table 8 (cont.)

Criterion	Zones							
	EAST.	SOU	WES	SHL	LAK	CENT	MEAN	RANK
LOW SOIL FERTILITY	25	0	0	100	25	0	25.0	5
DROUGHT	0	100	0	0	0	0	16.7	7
SHORTAGE OF PLANTING MATERIALS	0	0	0	100	50	0	25.0	5
LATE MATURITY	0	0	0	25	0	0	4.2	9
LACK OF PROCESSING FACILITIES	25	0	0	75	0	0	16.7	7
LACK OF CASH	0	100	0	0	25	0	20.8	6
LABOUR SHORTAGE	0	100	0	0	25	0	20.8	6
MARKETING PROBLEMS	0	100	0	0	0	0	16.7	7
LOW PRICES	0	0	0	75	0	0	12.5	8
POOR INFRASTRUCTURE	0	0	0	75	0	0	12.5	8
POOR STORAGE	0	0	0	50	50	0	16.7	7
LACK OF KNOWLEDGE	0	0	0	0	25	0	4.2	9
LAND SHORTAGE	0	100	0	50	25	0	29.2	4

EST, Eastern zone; SOUT, Southern zone; WEST, Western zone; SHL, Southern Highlands; LAK, Lake zone.

For each zone the percentage of interviewed farmers mentioning each factor as a major production or post-harvest problem is given.

In the case of insect pests, diseases and vermin, more detailed information is given on the insect species, types of diseases and animals respectively.

An overall mean percentage is calculated for each criterion, which was used to rank the problems, but as zones were not weighted with respect to their importance for sweet potato production, this ranking should be considered as approximate only.

5. CONCLUSIONS AND IMPLICATIONS FOR RESEARCH.

Sweet potato is an important food security crop for small holder farmers in Tanzania. Among root crops the crop comes third after cassava and round potato. The production of sweet potato is still low at farm level due to various constraints, the major important ones being: insect pests and diseases, continuous use of low yielding varieties, lack of planting materials, limited use of varieties with desired root characteristics, vermin, drought and post-harvest losses due to limited use of the crop together with lack of good post-harvest handling techniques.

One way to overcome these constraints is the introduction of improved varieties. It is therefore very important to understand the selection criteria of producers and consumers. This report has reviewed all known existing data on selection criteria in Tanzania. No information was found on urban consumer preferences. Therefore a major recommendation is to survey the preferences of urban consumers.

An appreciation of production and post-harvest constraints is also very important when selecting new varieties, and have therefore been considered within this review. The recommendations for research issues put forward by Kapinga *et al.*, (1995) are included in Appendix I.

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APPENDIX I
RECOMMENDATIONS FOR RESEARCH ISSUES as set out by Kapinga *et al.*, (1995)

1. Pests and diseases of sweet potato are major factors limiting production . Flexible integrated pest management packages, which combine varieties with resistance or tolerance with improved cultural control practices, could significantly improve yield.
Sweet potato weevils cause a lot of damage to sweet potato storage roots in the field. In the stores , large grain borers attack and reduce yield and quality of dried chips. Early planting and early harvesting in order to avoid the peak of pest population during dry season, can also help to alleviate the weevil problem. Viral diseases are common in farmers fields and cause a lot of damage. The possible ways to reduce the problem is through training farmers to identify diseased plants, rouging of the diseased plants in order to reduce the rate of spread, and Selection of healthy planting materials is another option. Researchers should emphasize the use of improved cultural practices as the pests weeds act as hosts for various pests and diseases. Other advantages of clean weeding help to prevent vertebrate pests (moles and rats) from entering the fields. The increased use of traps and formation hunting teams at the community level have also proven useful. Another option which need to be investigated further is the use of natural repellents like 'ntwintwi', a plant which is used in the Southern Highlands Zone.

2. Researcher are urged to develop high yielding varieties which are acceptable to consumers for various uses. Important characteristics are high dry matter content, drought tolerance, good root characteristics, low fibre content and good in-ground storability. Good root quality are taken very much in account by farmers when making decisions on which varieties to grow. They show preference to white fleshed varieties, the major reason being easiness to processing. The research program should continue developing a breeding scheme that integrates the farmers view in selecting with farmers varieties with desirable qualities.

3. Inadequate material at planting time is a problem for many farmers. The introduction to community nursery and distribution systems based on rapid multiplication techniques could have an impact. Training of farmers on this techniques and in the management of nurseries at farm level is a key element. The use of healthy, clean materials at farm level should be encouraged through extension and training demonstration with farmers.

4. The limited range of ways in which sweet potato is utilized and the limited storage and processing technologies available prevent sweet potato from achieving its potential importance. The quality of processed product need to be improved and the development of new products which incorporate sweet potato as an ingredient should be promoted. Examples include chips , crisps, composite flours incorporating dried and milled sweet potato, animal feeds, and starch. Baseline information is needed to assess the acceptability of the developed products. It is expected that it would be most efficient to chip and dry on the farm level in the major areas of production, and to make processed products in or near the urban market centres. This strategy would require the improvement of on-farm storage of dried chips. Post harvest research must include market assessment of the taste and preferences of consumers which are expected to vary in different parts of the country.

5. Large areas of Tanzania are semi-arid. Extended dry spell can wipe out a sweet potato crop if the plant are not well established. In many cases the crop survives, but yield s are chronically reduced due to drought stress and increased attack by pests, particularly sweet potato weevils. At the other extreme, In the Southern Highlands and Northern zones low temperatures lead to slow growth and low bulking rates. Research interventions should focus on developing varieties adapted to a wide range of environments and extension needs to help farmers to overcome constraints to timely planting.

6. Poorly developed market systems is another important constraint. Sweet potato is bulky in nature, and perishable fresh roots and leaves need to reach the final consumer within a week of harvest. Improved transport and better information would open up new markets for farmers in many areas of Tanzania. Research should focus on extending the shelf - life of fresh storage roots through improved handling and packing techniques to minimise damage during transport. These would enable farmers to have fresh roots for consumption at home and transport of roots to better markets by traders would be done with minimum loss. along with this introduction of simple processing equipment would minimise loss of roots as the surplus would be processed into quality products.

7. Socio - cultural habits have an important impact on sweet potato production and marketing. It was noted that men contribute little in sweet potato production because the crop is regarded as women crop. For increased production of this crop, this attribute has to change. Men must be enlightened an mobilized about the importance of sweet potato for household food security. This need support of policy makers and extensionists. Sweet potato should be valued like other crops such as sorghum and maize, and both men and men should play an equal role for sustainable crop production. Increasing market potential for sweet potato inevitably changes traditional concepts about the crop. this has been observed in Gairo in the central zone, where men are actively engaged in sweet potato production for commercial purposes.

8. Most of the varieties grown by farmers in most zones are reported to be late maturing; a trait that is not desirable to most farmers. Information collected from the zones surveyed shows that 55 % of the varieties grown are late maturing. This call for research attention towards developing varieties that are early maturing. Such varieties have short growing cycles and thus escape dry spells which are also reported to be a constraint in sweet potato production.

APPENDIX II. LIST OF COMMON VARIETIES AND THEIR CHARACTERISTICS ACROSS ZONES.

Variety	Producing Zones	Characteristics
SPN/O Other names: Suguti (L) Songea (SHL) Simama (L,E) Tulwawima (L,SHL)	Eastern, S. Highlands,Lake	White skin/Yellow flesh High yielding,Semi-erect,Floury, Early maturing, Large root size, Moderate sweet, Very firm, Susceptible to weevils, No fibre.
Mayai	Western, Eastern	White skinned, Orange flesh, High yielding, Late maturing.
Mwezigumo	Western, Lake	Very early maturing, Low yielding, Small roots, White skin/white flesh
Karoti	Eastern, Southern	Early maturing, Broad leaves, Spreading Red skin/Yellow flesh, Medium fibre content, Moderate sweet, Medium root size, Firm and Moderate drought tolerant.
Sinia Other names: Kasinia(L)	S.Highlands, Lake	Early maturing, Large root size, Red skin/White flesh, Very sweet, Very firm, No fibre.
Kinahaha	Western, S.Highlands	Very early maturing, Fibrous flesh, Leaves good as vegetable, Medium root size, White skin/White flesh, Medium sweet, Moderate firm, No fibre.
Kandoro	Western, S.Highlands	Medium maturity, Large root size, White skin/White flesh, Sweet, Firm, Moderately fibrous

L = Lake, SHL = Southern Highlands, E = Eastern Zones
Source: FSR - NCU data files, 1996 and Kapinga et al., 1995

APPENDIX III
LIST OF SWEET POTATO VARIETIES MENTIONED BY INTERVIEWEES PER ZONE. as set out by Kapinga *et al.*, (1995)

Eastern	Southern	Western	S. Highlands	Lake Zone	Central
Ali Mtumwa Chipeko Dihanga Eliasa Hali ya Mtumwa Kisindano Karoti Kiniasa Kanada Mwanahunga Mwanajoni white Mwanajoni red Mkuchu Morogoro Mang'ule (locals) Maria Mang'unda Makuyuni Mwengangulu Shangazi *Simama SPN/O Tembele bangi Taliana Ukerewe	Combat Karoti White (local)	Kinahaha Kandoro Kalambo Kizimabani Makoroboi Magulungoma Mwezigumo Mayai Nyankali Zaire	Buluu Kinahaha Kandoro Kayobe Kaweja Lubisha (si) Masyabala Mbulukutu Mpufya Magoba Mwambasa Mwitika Mboma Mweru Masambungu Mandovisi Makodora Matagasa Mubungu Masandisi Ndeki (Kireni) Songwe (ex-malawi) Songea Sing'pina Semguvanu Sinia Tulwawima Vimbini Vidwidm Vingamba Vidungu	Alinyikira Bigabi Bagaranentukuru Bwanashamba Budagala Gwanchele Ipembe lya ng'hollongo Iboja Ibega Kasinia Kahapa Kwezikumwe Kingambilee mikono Kagnle Kengazibiva Kingambilenyoko Lamadi Mweziguno Mwana migu Mwanagogogo Musoma Manjimailu Maholo Magi Majija Mwanabukwimba Mugowa Mukailculu Oyanja Mkonogwa nyerere Mwasa (Rwasa) Mzungu Maharage Nginghinaji Nyakatoka Nyagusinda Njugu Ngosha Polista *Simama Sinia Sabina Sabale Sapini Sembe Serena Suguti Sungusungu Simbeichumu *Tulwanina Tulomushako *Yanga Rugarza	Gairo Kiboriani Sukuma