Evaluation and large-scale dissemination of orange-fleshed sweetpotato in Sub-Saharan Africa

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Abstract

Current breeding strategies for sweetpotato in sub Saharan Africa (SSA) emphasizes: breeding orange-fleshed sweetpotato (OFSP) with high dry matter content and resistance to sweetpotato virus disease (SPVD), pathogen clean up of promising cultivars for the large scale testing, multiplication and dissemination. Breeding new sweetpotato with high dry matter and high beta-carotene was started by CIP in 1996. Research and development is carried out in collaboration with a range of institutional partners, including NARIs, universities, NGOs, farmers' groups and community-based organizations. Rigorous evaluation and dissemination of the first batch have resulted to several varieties that are acceptable to consumers. In Kenya, varieties Zapallo, SPK 004 and Salybolo are good for high yields and good root characteristics. In Uganda, Ejumula, Kala and SPK 004 have been identified for wider adaptability in different agroecologies and desirable consumer acceptance. The same for Zapallo, Japon Tresimesino and Tainung 64 in Tanzania. In South Africa, varieties Resisto, W-19 and Excel have been selected for high dry matter, high beta-carotene content and processing onto value added products. Distribution of more than twenty promising clones has been done to Madagascar, Mozambique,

Ethiopia, Uganda, Tanzania, Zimbabwe, Egypt, Zanzibar, Malawi, D.R. Congo and Sudan. Over 10 million cuttings of planting material of improved varieties were multiplied and distributed in East African region, covering over 360 hectares of farmers' fields.

Key words: Evaluation, large-scale dissemination, orange-fleshed sweetpotato, SSA

1. 0 Introduction

Vitamin A deficiency (VAD) is a serious wide spread nutritional and health problem affecting most people in the developing countries including the sub-Saharan Africa (SSA). Most countries in SSA region are categorized by WHO (1995) as having a public health concerning clinical and sun-clinical VAD. The total VAD prevalence is estimated at 36 million people in SSA (Mason et al., 2001). It is also estimated that some 3 million children in SSA under the age of 5 suffer partial or total blindness as a result of VAD (Future Harvest, 2004). Two thirds of the children who do not meet their requirements for vitamin A die from increased vulnerability to infection. Sub-Saharan Africa is reported (Rosengrant *et al.,* 2001) as the only region in the developing world where both the number and proportion of malnourished children has been consistently rising and is projected in IFPRI's 2020 Vision project, rise from 33 million in 1997 to between 39 and 49 million in 2020. The deficiency increases children's risk to common illnesses, impairs growth, development, vision, and immune systems, and in severe cases results in blindness and death (Ruel, 2001). In women, vitamin A deficiency increases risk of dying during pregnancy, as well as giving birth to low weight children, and may increase the spread of HIV/AIDS virus infection. New research findings suggest that vitamin A can have profound effects on maternal mortality and protects infants from the effects of maternal to child transmission of HIV/AIDS Virus. Vitamin A is consumed directly in meat products, and is produced in the body if a person consumes sufficient quantities of a

precursor known as ß-carotene. Otherwise, the body cannot produce sufficient Vitamin A.

World development and health agencies have responded to the situation by distributing Vitamin capsules and fortifying processed and packaged food. These efforts have reduced on the levels of cases affected by the deficiency. However, many rural poor families do not adequately and regularly access these supplements due to poor infrastructure characteristic to remote areas of SSA and where chronic VAD is rife. In Kenya, extremely low serum retinal levels have been reported among populations leaving in the arid and semi arid northeast, along the coast, and throughout the densely populated western part of Kenya, which includes Siaya (GoK & UNICEF, 1995). In Uganda about 28% of children and 60% women are vitamin A deficient. One of the alternative options for combating the deficiency is to enhance food-based strategies that aim at modifying people's diets through crops that have rich levels of beta-carotene.

CIP and its partner organizations have therefore taken up the food-based options to combat the VAD in the sub-Saharan Africa through promotion of orange-fleshed sweetpotato (OFSP). This is because the rural and urban poor cannot afford expensive vitamin A rich foods, such as fish oils, liver, milk, eggs and butter that contain vitamin A in its true form (retinol), which can be used by the body directly. The OFSP have emerged as one of the most promising plant sources of Vitamin A and stand to be a cheaper and a complementary source of vitamin A to the rural and urban poor families. By this, sweetpotato combine a number of advantages that make it a choice crop for sustainable food security, improved nutrition and income generation (Ewell, 1990). Sweetpotato is already widely grown as a secondary food crop throughout almost all of Sub-Saharan Africa, and it is a primary food staple in Rwanda, Burundi, and Uganda. Over 7 million tons of sweetpotato are currently produced in Africa annually and is projected to more than double by 2020 (Scot et al., 1999). Promoting a marginal change in dietary practices, such as switching varieties is likely to be easier than introducing a complete new food into the diet (Low, 2003).

In 2001, an international group of 70 agriculturists, health experts, and nutritionists launched what is believed to be the first crop-based initiative to attack Vitamin A deficiency in Sub-Saharan Africa. The initiative is known as VITAA or Vitamin A for Africa. Working under the VITAA umbrella, 40 partner agencies from the health, nutrition and agricultural sectors agreed to collaborate in an coordinated effort to extend the impact of the new orange-fleshed sweetpotato in five partner countries: Ethiopia, Kenya, South Africa, Tanzania and Uganda. The partnership was expanded in 2002 to include Mozambique and Ghana. VITAA initiative is coordinated by the International Potato Center (CIP) and it includes the collaborative work of government ministries, non-governmental organizations, international organizations, local groups, universities and more. Funding agencies for this program include: DFID, Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ), the OPEC Fund for International Development, the Senior Family Fund, The Micronutrient Initiative, the US Agency for International Development (USAID), PRAPACE (regional Program for the Improvement of Potatoes and sweetpotato in East and Central Africa) and SARRNET (Southern Africa Root Crops Research Network.

Breeding and dissemination efforts of OFSP varieties has been spear-headed by CIP through VITAA partnership in collaboration with the Regional Networks (PRAPACE and SARRNET) and the National Agricultural Research Institutes more especially in Kenya, Tanzania, Uganda, Ethiopia, Mozambique, Malawi, South Africa, Ghana, Madagascar, DR. of Congo and Rwanda. The paper attempts to summarize the progress made so-far in assessing the adaptability, consumer acceptability and the large-scale dissemination of planting materials of these noble varieties in SSA region.

2.0 Progress to-date:

2. 1 Farmer participatory assessments and on-farm testing of improved OFSP varieties:

Assessment studies of different orange-fleshed sweetpotato varieties by farmers have been and continue to be conducted in several countries. At regional level, the approach used in these assessments is the same. This is mainly uses individual farmers, farmer

groups or farmer field schools selected on the basis of being well organized, easily accessible, representative of the resource-poor, and willingness and ability to host sweetpotato trials. Ten to 15 individual and/or farmer groups (representing different sites) are normally selected per district. Each farmer (site) is considered a replicate. The most popular variety in the area is used as a local check and this varies among sites. The trials are planned by the researchers, district agricultural extension staff and lead farmers, and the trials are farmer-researcher managed.

In Uganda, on-farm studies have always been targeting different agro ecological zones across the country. Kabale and Ntungamo represent a high altitude with minimal virus pressure; Mpigi and NAARI represent low altitude high rainfall fed areas with high virus pressure while Busia and Soroti are low dry areas with weevil problems. Farmers have assessed both local OFSP and improved / introductions mainly from CIP Lima. During assessments farmers score different attributes; i.e foliage coverage, resistance to pests and diseases, drought tolerance, maturity earliness, root shape, root size, and general acceptability for field evaluation and; appearance, taste, flavour, starchiness, fibrousness. The scores for the different field and post harvest characteristics are then subjected to ordinal regression analysis using GenStat statistical package. In Kenya, evaluations were done both at KARI-Kakamega and Alupe stations as well as farmers in Kisumu and Kakamega districts. This was in collaboration with NGOs; Africa Now in Kisumu and Rural Energy Food Supply Organization (REFSO) in locations around Kakamega. Eleven varieties were evaluated in Kisumu district and 12 - 20 introduced orange-fleshed sweetpotato clones were evaluated in Kakamega area. In Tanzania activities were conducted in Zanzibar , Eastern and Lake Zones. Eleven OFSP varieties (excluding local checks) were assessed by farmers.

To-date different varieties acceptable to farmers have been identified in the region.
In Uganda, there were significant variations in field performance of the sweetpotato varieties over the two seasons (Tables 1 and 2) . Generally, overall field performance was in the order Kala>SPK004> Ejumula> Sudan> 4-4> Sowola > Arivumaku. Ejumula and SPK004 have much higher β-carotene than all local most popular check cultivars

(Table 3). The local popular landraces have yellow- or white-fleshed roots, hence have very little or negligible amounts of β-carotene. On post- harvest attributes, children and adults differed in their rating of the sweetpotato varieties. Overall, in the case of post harvest attributes the preference was in the order SPK004> Ejumula> Sowola 6> Sudan> Kala (Tables 4, 5, and 6). The varieties Ejumula, Sudan and SPK004 had the best overall performance hence acceptable to communities. Ejumula together with SPK 004 are being considered for official release in Uganda. The latter is already released in Kenya.
In Tanzania, W-151 and Zapallo were ranked high for field performance and consumer acceptance across the island of Zanzibar (Table 7) . For the Lake Zone , varieties Zapallo, Tainung 64 and Mafutha tested good to consumers (Table 8). Taste test results show that all the orange varieties except Mafutha were very good in appearance, taste, and low fibre content but poor in dry texture (Table 8). The pair wise ranking show that Tainung 64 is the best variety by farmers

In Kenya , varieties Jewel, Kandie and Brondal emerged as the most preferred varieties based on yield attributes. Reasons for the high ranking included high yields, good shape of tubers and early maturity. In terms of taste attributes Jewel, Tainung 64 and Jonathan emerged as the best preferred varieties. Generally, root yields of the local OFSP varieties were low compared to the introduced clones (Table 9). Varieties K44, K135 and K52 gave 17.1, 14.1 and 13.5 tons/ha, respectively, of storage roots at Kakamega compared to 11.6 tons/ha obtained for SPK004. At Alupe SPK 004 performed better than all OFSP varieties.

In Mozambique, the evaluation of nineteen OFSP clones across twenty one different environments has been completed and eight top varieties were selected for the good performance across a range of agro-ecological conditions (Andrade *et al* 2002).

2.2 Multiplication and dissemination of clean planting material

Most countries in Sub-Saharan Africa have up to date developed or adapted a number of sweetpotato varieties (Table 10) including adaptable and acceptable OFSP. These are varieties that have high dry matter, adapted to the local conditions and therefore highly acceptable to the farmers. The orange-fleshed sweetpotato varieties are still few in most countries since most of them are still in the rigorous process of evaluation or near release. Activities to multiply and distribute planting materials of these popular varieties have continued in collaboration with local and international NGOs operating in target areas as indicated in Table 10. There has been a scaling up in both the area and the amount of clean planting material that has been deployed . For instance, available information from the East African region estimates a total of over 19 million vine cuttings to have been distributed and planted by farmers in the region for 2002/ 2003 cropping only (Table 11). However this is a gross underestimate of the distributed vines since farmers exchange a lot of planting materials that is not recorded.

In Kenya multiplication and distribution of popular OFSP varieties are currently being undertaken by major NGOs that included Rural Energy Food Security Organization (REFSO), Ugunja Community Resource Centre (UCRC) and Africa Now (for western Kenya) and Agriculture Environmental Program (AEP) in Southern Nyanza. The groups undertook the initial primary multiplication of the varieties and later distributed them further to their community-based groups for tertiary multiplication and distribution to local farmers. A total of 106 primary multiplication sites were established in Western Kenya and some parts of South Nyanza. These sites were able to produce over 9 million cuttings of popular varieties (SPK004, Salyboro, Mugande, Kemb 10, Pumpkin) that have been distributed to farmers during the 2002/2003 rainy seasons

In Tanzania, the multiplication system was organized into three levels: primary (nucleus), Secondary and Tertiary. Major collaborators include Tanzania Home Economics Association (TAHEA) and CARE. Plants showing SPVD are rouged out immediately. On-farm seed growers were trained in rapid seed multiplication, crop

management practices and seed storage. A workshop was organized to discuss seed delivery system.

In Uganda, linkage with major partners such as Africare in South Western, James Arwata Foundation in Lira and Apac, Members of the Ugandan Parliament, and Farmer Field Schools (FFS) in Soroti. The partners purchased materials from farmers, which they in turn distributed to farmer groups for further multiplication in their established mother multiplication gardens. Individual farmers would then get cuttings from these gardens. For 2002/2003, over 3 million cuttings comprising 80% SPK004, 10% Ejumula, and 10% high yielding white-fleshed popular varieties have been distributed by the major partners to farmers. Major targeted areas are the war torn areas in Northern Uganda and their neighboring districts. This has been achieved through initiated collaborative activities together with the interested members of Uganda parliament that hail from target areas, James Arwatta Foundation as well as a CIP coordinated project on Integrated crop management using farmer field schools.

In Mozambique, up to March, 2003, estimated families that had benefited from the planting materials were 377,000. 34.3% of farmers in major sweetpotato growing districts are already using OFSP. The utilization of OFSP and nutritional concept has been promoted to students of primary level in some of the primary school (Andrade *et al.* 2003)

3.0 Conclusions:

CIP together with partners in the region have continued to assemble themselves into a regional network of collaborators to evaluate and disseminate improved sweetpotato varieties to farmers. This has enabled more participatory evaluations to be conducted with farmers. Four to six promising sweetpotato varieties most of them orange-fleshed have been identified together with farmers in Kenya, Tanzania and Uganda. More have been identified else where in the continent. These have higher dry matter content and thus more acceptable by farmers. This has resulted to more candidate varieties for release in different countries. For instance, the national sweetpotato program in Uganda is planning

to release Ejumula and SPK 004 during next year. It is anticipated that in the recent years to come a lot more varieties, especially the OFSP varieties will be released. The networks of collaborators have also made it easy to establish systems to multiply and distribute healthy planting materials. More materials will be distributed to farmers through these networks. Of more significant progress is the increased level of knowledge about the OFSP varieties through participatory evaluations and seed multiplication networks. More farmers than ever before are aware about the orange-fleshed sweetpotatoes and their potential benefits. A lot more has to be accomplished in identification of materials resistant to viruses in different agro ecologies.

Participatory research through FFS approaches have showed that: Farmers have a potential to supply quality planting material after internalizing the concepts and practices learnt through self-learning approach. Farmers' collective participation is a tool of capital mobilization and a driving ingredient for self- accountability as skillful performance and financial improvement by the group member(s) portrays community excellence. Farmers are thirsty for a positive change in production and income. Evidence of economic success through changed technological approaches to production by farmer field graduates is not only exemplary but also creates anxiety of others to explore similar avenues to improve farming techniques and enhance adoption as an avenue of improving on food security and household incomes. Researchers, Non-Governmental Organizations (NGOs) policy makers and farmers must collaborate in developing; designing and implementing strategies for transforming agricultural production and bolstering successful attainment. Experience sharing and availing opportunity to farmer field school member(s) to become technical instructor(s) (facilitators) of other promotes ambition of others, encourages active participation, enhance self-confidence and leadership building. Farmers are willing to drop a crop variety for a more promising one. Integrated crop management approach through experience sharing, self-teaching and a hand on technique is a tangible technology uptake pathway for recommended practices.

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Table 1. Performance of orange- fleshed sweetpotato clones across four environments in Uganda, 2002/2003

CIP code		Clone	Site				Mean across sites	SPVD[1] across sites	SPVD (preliminary test: 2 sites at NAARI)
			NAARI	Kachwekano	Ngetta	SAARI			
			Storage root yield (t/ha)						
1	440189	Tainung No. 64	45.7	42.5	33.3	32	38.4	2.6	3.9
2	420009	Japon Tresmesino	19.5	21.4	11.4	14.1	16.6	2.3	3.8
3	440016	Excel	36.3	21.5	22.0	10.4	22.5	2.4	3.8
4	440060	TIB 4	39.5	9.0	8.4	13.4	17.6	2.3	3.9
5	420027	Zapallo	29.9	47.5	20.9	22.4	30.2	2.5	3.6

6	187017.1	Salyboro	41.7	41.9	15.9	32.4	33.0	2.1	3.8
7	440140	Kandee	25.0	18.9	11.5	24.4	20.0	2.7	4.0
8	440005	W-151	21.0	16.8	18.5	18.5	18.7	2.4	4.5
9	440215	Tainung No. 65	19.0	33.5	10.1	47.0	27.4	2.9	3.6
10	420005	Nemanete	26.4	27.8	15.0	18.2	21.8	2.4	3.3
11	440112	Centenial	26.2	14.5	16.6	9.7	16.8	2.8	3.9
12	556638	Jewel	5.7	32.5	10.6	3.5	13.1	2.7	4.0
13	440288	VSP 4	15.0	23.7	11.1	28.5	19.6	2.9	4.0
14	420014	Jonathan	19.0	17.6	14.0	19.7	17.6	2.4	3.6
15	440031	Jewel	23.6	23.5	28.2	12.6	22.0	2.6	3.5
16	440141	Julian	5.8	9.6	12.9	6.7	8.7	2.8	4.3
17	440293	BP-SP-2	46.6	44.5	52.3	32.3	43.9	2.1	2.6
18	440018	W-223	40.5	29.0	29.9	30.0	32.4	2.8	4.0
19	440090	CN 317	46.6	29.0	16.7	14.4	26.7	2.8	4.0
20	Landrace	Sudan	20.3	21.5	30.4	15.5	21.9	1.8	NA
21	-‘’-	Ejumula	42.8	29.4	49.6	24.0	36.4	2.0	NA
22	-‘’-	Kala	47.0	22.5	43.8	25.4	34.7	2.0	NA
23	Local	SPK 004	35.5	24.9	47.0	16.7	31.0	1.9	NA
24	Landrace	Mahuri	40.5	32.0	40.2	24.3	34.2	2.1	NA
25	Local	TZ (check 1)	23.5	26.7	44.0	9.5	25.9	1.8	NA
26	Local	Sowola-6	13.4	22.3	22.6	3.3	15.4	2.0	NA
27	NA	Local check 2	45.8	NA	24.7	NA	NA	NA	NA
Mean			29.7	26.3	24.5	19.6	24.9	2.4	0.6
$LCD_{0.05}$			5.3	5.5	4.4	6	2.7	0.1	0.2
CV (%)			12.8	14.9	12.7	21.9	15.3	20.4	16.2

[1]SPVD = sweetpotato virus disease rating scale = 1-5:
1 = no apparent damage/not present 4 = considerable damage/numbers present
2 = very little damage/few present 5 = severe damage/very high numbers present
3 = moderate damage/numbers present

Table 2. Performance of orange-fleshed sweetpotato clones across four environments in Uganda,2003/2004

Serial No.	CIP code	Clone	Site				Mean across sites	SPVD[1] across sites
			NAARI	Kachwekano	Ngetta	SAARI		
			Storage root yield (t/ha)					
1	440189	Tainung No. 64	21.9	20.4	30.5	17.7	22.6	2.5
2	420009	Japon Tresmesino	7.7	28.2	11.6	18.3	16.5	2.0
3	440016	Excel	10.3	42.3	26.0	11.9	22.6	2.1
4	440060	TIB 4	11.8	11.6	10.4	9	10.7	2.1

5	420027	Zapallo	7.9	25.4	15.5	19.3	17.0	2.1
6	187017.1	Salyboro	21.2	33.1	16.1	24.5	23.7	2.1
7	440140	Kandee	9.0	27.7	18.0	13.8	17.1	2.1
8	440005	W-151	12.8	18.5	20.8	13.7	16.5	2.0
9	440215	Tainung No. 65	25.4	16.6	23.5	16.6	20.5	1.9
10	420005	Nemanete	3.5	19.3	10.0	11.4	11.1	1.8
11	440112	Centenial	8.2	14.8	22.0	18.9	16.0	2.4
12	556638	Jewel	9.1	17.2	17.0	9.6	13.2	2.2
13	440288	VSP 4	16.2	26.6	30.0	16.6	22.4	2.0
14	420014	Jonathan	8.5	24.0	25.7	18	19.1	2.2
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19	440090	CN 317	11.6	27.1	14.2	13.6	16.6	2.3
20	NA[2]	Sudan	28.2	24.3	21.8	22.2	24.1	2.3
21	NA	Ejumula	31.7	27.1	22.0	17.2	24.5	2.3
22	NA	Kala	23.1	22.5	26.0	41.5	28.3	2.3
23	NA	SPK 004	19.8	22.5	29.6	15.3	21.8	1.6
24	NA	Mahuri	17.4	33.8	14.8	26.2	23.1	2.1
25	NA	TZ (check 1)	26.8	22.4	26.4	14.4	22.5	1.9
26	NA	Sowola-6	14.5	20.2	21.9	14	17.7	2.3
27	NA	Local check 2	30.5	32.3	35.0	52.3	NA	NA
28	NA	Local check 3	3.0	NA	22.9	18.9	NA	NA
Mean			17.1	23.6	24.2	19.2	20.6	2.1
$LSD_{0.05}$			4.2	7.1	6.0	5.7	2.9	0.4
CV (%)			17.8	21.4	17.8	21.1	21.0	28.9

[1]SPVD = sweetpotato virus disease rating scale (1-5):

1 = no apparent damage
2 = very little damage
3 = moderate damage
4 = considerable damage/numbers present
5 = severe damage/very high numbers present

[2]NA = Not applicable

Table 3 . Sweetpotato storage root yield and β-carotene content under on-farm trials from Luwero and Mpigi Districts, Uganda 2003/2004)

Cultivar	Root yield (t/ha)				β-carotene content (µg /100g of fresh weight)			
	Season 1		Season 2		Season 1		Season 2	
	Luwero	Mpigi	Luwero	Mpigi	Luwero	Mpigi	Luwero	Mpigi
NASPOT 1	9.7a	20.5a	22.3a	17.9s	800.0c	470.0e	470.0e	330.0c
SPK004	6.5ab	14.0a	12.3b	9.6b	2370.0a	1550.0b	4090.0a	4940.0a
TZ	3.9bc	12.9b	10.9b	10.9b	650.0d	1160.0c	500.0c	440.0c

Loca check	4.0bc	18.2a	19.2s	11.4b	780.0c	580.0d	430.0c	450.0c
Sowola	2.3c	4.5c	2.6c	2.8c	1740.0b	1880.0a	2430.0b	2100.0b
CV (%)	57.0	31.4	36.1	31.8	7.1	3.0	3.3	5.1

Ten farmers groups in each district hosted the trials

Table 4. Odds ratios and ranks for rating of the general crop appreciation of the orange-fleshed sweetpotato varieties by farmers in Soroti and Kumi Districts, Uganda, 2002/2003

Variety	Estimate	se	Odds ratio	Overall rank
Arivumaku	-4.715	0.390	0.009	7
4-4	-1.945	0.289	0.143	6
Sudan	-1.466	0.236	0.231	5
Ejumula	0.000	-	1.000	1
Kakamega	-0.337	0.242	0.714	2
Kala	-0.586	0.251	0.557	3
Sowola 6	-1.428	0.245	0.240	4

Table 5. Odds ratios and ranking of starchiness ratings of the orange-fleshed sweetpotato varieties by adults and children in Soroti and Kumi Districts, Uganda, 2002/2003

Variety	Adults				Children			
	Estimate	se	Odds ratio	Overall rank	Estimate	se	Odds ratio	Overall rank
4-4	-0.782	0.271	0.458	6	-1.268	0.555	0.281	6
Sudan	-0.034	0.218	0.967	2	-0.638	0.421	0.528	5

Kakamega	-0.313	0.218	0.731	3	-0.088	0.422	0.915	4
Ejumula	0.000	-	1.000	1	0.000	-	1.000	3
Kala	-0.271	0.229	0.763	4	0.635	0.454	1.887	1
Sowola 6	-0.543	0.220	0.581	5	0.463	0.432	1.588	2

Table 6. Odds ratios and ranks of general acceptability ratings of the orange-fleshed sweetpotato varieties by adults and children in Soroti and Kumi Districts, Uganda, 2002/2003

Variety	Estimate	se	Odds ratio	Overall rank
4-4	-1.585	0.256	0.205	6
Sudan	-0.335	0.200	0.716	2
Kakamega	-0.498	0.199	0.608	3
Ejumula	0.000	-	1.000	1
Kala	-0.734	0.211	0.480	4
Sowola 6	-0.766	0.201	0.465	5

Table 7. Yield performance of orange-fleshed sweetpotato varieties across eight selected farm sites in Zanzibar, Tanzania during 2002/2003

Variety	Mean root yield (t/ha)	Dry matter content (%)	Mean scores general evaluation	Over all rank
TIB - 4	16.9	34.9	3.4	4
Salyboro	12.7	35.5	2.9	7

Zapallo	15.6	30.1	3.6	3
Tainung 65	25.0	30.1	3.1	5
W - 151	17.5	31.1	3.7	2
SPN/O	25.1	36.2	3.9	1
Shangazi	20.2	36.5	3.0	6

Scores 1 = very bad; 5 = very good

Table 8. Yield performance and overall field and post harvest assessment of sweetpotato varieties by farmers in Kwimba district, Lake Zone of Tanzania 2002/2003

Variety	**Total root yield (t/ha)**	**Mean scores for overall assessment**		
		Field assessment	**Consumer acceptability**	**Ranking**
NC 1560	11.86	4.00	4.90	4
Zapallo	6.04	4.20	3.40	4
Mafutha	3.42	2.40	3.30	2
Tainung No.64	7.68	3.60	3.80	1
Japon tresimesino	4.60	4.10	2.90	3
Simama	8.33	4.10	4.30	4
Local check)	10.72	4.10	3.70	5
Mean	**7.52**	**3.64**	**3.76**	
CV%	**45.81**	**32.17**	**20.52**	
LSD0.05	**4.49****	**1.05****	**0.69*****	

1= Very bad, 2= Bad, 3= Moderate, 4= Good, 5= Very good

Table 9. Yield performance of local orange-fleshed sweetpotato varieties planted at Alupe and KARI Kakamega in Western Kenya 2002/2003

Variety	**Storage root yield (t/ha)**	
	Alupe sub- center	**KARI-Kakamega**
K118	15.7	11.7
K135	14.4	14.1
K207	1.5	0.9
K37	12.4	1.3
K44	4.4	17.1

K46	-	8.8
K52	12.5	13.5
SPK004	23.0	11.6
Sponge	13.0	6.1
Mean	**12.1**	**9.5**
SED±	**2.8**	**3.5**
CV (%)	**28.0**	**34.4**

Table 10. Popular sweetpotato varieties (released and near release) currently disseminated in selected SSA countries

Country	**Disseminated varieties**		**Collaborating partners ****
	Non OFSP	**OFSP**	
Uganda	NewKawogo, Naspot 1, TZ, Kyabandula, Magabale	SPK 004, Ejumula, Kala	AFRICARE, BUCADEF, JAF, SOCADIDO, Parliamentarians, NAADS, Farmer groups
Kenya	Marooko, Kalumb,	Kemb 10, SPK004,	Resource Project Kenya (RPK),

	Nyerere, Jayalo, Nyathiodiewo, Ex-Diani, Muibai	SPK013, KSP20, Mwavuli, 566682/03, Salyboro, Kazinga 2-1, Mogamba	Christian Partners Development Agency (CPDA), Africa Now, Rural Energy Food Security Organization (REFSO), Appropriate Rural Development Agricultural Programme (ARDAP), Catholic Relief Services (CRS), Akukuranut Development Trust (ADT)
Mozambique	Chingowva, Nemanete,	Japon Tres., Zapallo, Mafuta, Zondeni, Resisto	CARE, Action Aid, SARRNET, Save Children, World Vision, INIA, World Relief, Farmer groups
Tanzania	Simama, Juhudi, Sinia, Mavuno, Vumilia	Zapallo, Japon Tres.	CCT, TAHEA, Plan International, WI, KAEMP, CARE-Magu, AIC, EGAJ, World Vision -Magubike,MAFS-Crop promotion, Farmer groups
S. Africa	Mafutha, Bosbok, Ndou, Monate, Mokone, Letlhabula, Amasi, Phala, Mamphenyane	Resisto, Mafuta, Japon Tres. , Excel, Jewel, W-119	-
Ghana	Sauti, Okumkom, Santum Pona, Faara,	-	UNICEF, Farmer groups
Rwanda	Mugande, Wadada, K51/3261, TIS2498	Kwezikumwe, 97-046, 97-004, 4-143	UNICEF, Farmer groups, CRS
Ethiopia	Koka 6, Koka12, 192009 – IX, 192026 – II, Belella, Awassa 83, , Dubo, Falaha, Damota	-	-
Malawi	Mugamba, Cemsa 74-288, Salera, yoyera, Babache, Kakoma, Kenya.	Kamchiputu, Tainoni, Zodeni	SARRNET, Extension Agents

****- List of partners not exclusive**

Table 11. Clean planting material of orange-fleshed sweetpotato planting materials distributed in the East African region in year 2003

Country	Estimated vine cuttings	Estimated area (ha) covered
Kenya	9,740,400	325
Uganda	3,902,400	130
Tanzania	5,659,950	189

Totals	19,302,750	644