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### Pre-Extension Demonstration of Improved Orange Fleshed Sweet Potato Technology in Baka Dawula Ari Woreda of South Omo Zone

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#### Abstract

Sweet potato is widely used for its roots for humans and fed to livestock as sources of energy, even though farmers have been growing low yielder and less nutritive local varieties in the area yet. Hence, three improved OFS potato varieties with full package were demonstrated in Kaysa and Bytsimal kebeles of Baka Dawula Ari woreda on 10 farmers' land and 2 FTCs with objective of creating farmers' awareness towards its improved varieties and production technology. The demonstration was conducted on land size of 10\*10 m<sup>2</sup> with spacing of 60 cm and 30 cm between rows and plants respectively for each of the variety on each farmer's and FTC demonstration field. On-farm training was provided to 22 farmers and DAs of corresponding kebeles. Farmers preference and root yield data were collected and simple descriptive statistics such as mean, maximum, minimum and

percentage was used. According to this demonstration result, Kabode variety was ranked first compared Naspot-12 and Naspot-13 which were ranked as the second and third respectively based on root size and color, biomass, earliness, cooking quality, food test and resistance to disease. On average root yields of 48, 41.1 and 40.4 t/ha were obtained from Kabode, Naspot-13 and Naspot-12 varieties under farmers management condition respectively. So that, improving access improved seed, linkages between extension and farmers, and organizing on-farm awareness creation trainings at FTC enhanced productivity of root yield of sweet potato in the areas. Therefore, the office of agriculture of the woreda should scale up Kabode and Naspot-12 varieties at large scale in similar agro-ecologies.

**Keywords:** Demonstration, Farmers' Preference, Root Yield, Sweet Potato

#### Introduction

Sweet potato is mainly cultivated in the southern, southwestern and eastern parts of Ethiopia. It is the third most important tuber crop next to Enset and Potato (Amare *et al.*, 2014)<sup>[1]</sup>. The area covered by sweet potato is 53,449.23ha with average yield of 34.58 t/ha in the country (CSA, 2017/18)<sup>[3]</sup>. It is valued for its roots which are boiled, fried, baked or roasted for humans or boiled and fed to livestock as a source of energy. The roots can also be processed into flour for bread making, starch for noodles as well as used as raw material for industrial starch and alcohol (Merga *et al.*, 2017)<sup>[5]</sup>.

Despite this remarkable potential and importance of sweet potato crop, most sweet potatoes varieties currently grown by farmers have low root yields, less nutritive and white fleshed which have no beta carotene, a precursor to vitamin A (Wariboko and Ogidi, 2014)<sup>[7]</sup>. Newly released Orange fleshed sweet potato varieties have high contents of  $\beta$ -carotenoid and dry matter and potentially can reduce the effects of vitamin A deficiency (Fekadu and Shiferaw, 2019)<sup>[4]</sup>. From a dietary point of view and nutritional perspective, OFSP ranked as number one among all vegetables (Satheeth N. and Solomon W., 2019)<sup>[6]</sup>. Therefore, this demonstration was carried out to create awareness of farmers and collect farmers' and other stakeholders' feedbacks on improved OFS potato in the areas.

#### Materials and Methods

##### Description of the Study Area

Baka Dawula Ari woreda is one of the ten woredas in South Omo zone. The woreda has a rain fall pattern of bimodal type/ Belg = February – April and Meher = July – September. The major crops grown in the mid land areas of the woreda are cereals (maize, sorghum, wheat and teff), pulse and oils crops (common bean and ground nut) root and tuber (Enset, taro, sweet

potato, cassava and yam), fruits (avocado, banana, mango, and papaya), coffee and spices (coffee, cardamom, ginger and turmeric) and vegetables (cabbages, onion, beet root, garlic, hot pepper, tomato, carrot) in respective order of their total production and potential.

**Implementation Procedure**

Two kebeles namely Kaysa and Bytsimal kebeles were selected due to high sweet potato production potential in the woreda. Totally, 10 farmers were selected purposively base on willingness to participate on the demonstration, voluntary to provide enough land and manage demonstration and distance from kebele’s FTC and by considering women farmer’s participation in to account. Both site and farmers’ selection were conducted by researcher jointly with agricultural experts of the woreda and DAs of the corresponding kebeles.

The activity was carried out on 10m \* 10m plot size for each variety on each farmer’s field. Three sweet potato varieties such as kabode, Naspot-13 and Naspot-12 varieties with spacing of 60cm and 30cm between rows and plants respectively.

**Trainings**

The Kebele DAs, FREG members and selected farmers and agro pastorals were participated on awareness creation training organized by JARC in collaboration with woreda agricultural office on frequency of land preparation, improved agronomic practices and disease management practices of the crop.

**Data Type and Method of Data Collection**

Yield data were collected from all participant farmers’ demonstration field by taking representative sample, and farmers’ preference data were collected by interviewing individual participant farmer and conducting focus group discussion using pre-selected sets of criteria such as early maturity, bio-mass, root color, root size (length and width), number of roots per plant, and test. Total inputs (seed, fertilizer and chemical) and labor costs and farm gate price of the products were collected and recorded.

**Data Analysis:**

Yield data was analyzed by using descriptive statistics like maximum, minimum, mean and preference data were analyzing using likert scale ranking. Cost benefit analysis was analyzed by using CIMMYT partial budget analysis. Thus, net benefit is calculated by subtracting the total cost from the gross benefit i.e., Net Benefit =Total Revenue-Total Cost (CIMMYT, 2004).

**Result and Discussion**

**Training**

Practically, on-farm training was given to farmers, members of FREGs and DAs of the kebeles to create awareness and improve skill gap on improved sweet potato production package. Totally 22 (Male = 14 and Female = 8) farmers and Keble DAs were participated on training undertake in the demonstration site.

**Root Yield Performance**

In spite of the inevitable variability in performance within locations, the yield performances of improved orange flashed sweet potato (OFSP) varieties were still promising.

The yield performance of Kabode variety was higher when compared to Naspot-13 and Naspot-12 varieties in both kebeles. The differences on root yield might be due to difference in yield potential of the varieties.

**Table 1:** Yield performance of the varieties

Statics	Yield in tons/ha in each keble					
	Kaysa			Bytsimal		
	Kabode	Naspot -13	Naspot -12	Kabode	Naspot -13	Naspot -12
Minimum	28.54	29.56	27	27.35	26.23	30.10
Maximum	53.33	49.65	44.12	51.8	45.35	44.65
Mean	46.53	44.83	39.5	48.0	45.1	40.4
St. Deviation	8.79	12.79	7.95	9.67	11.43	9.55

**Yield Advantages**

Yield advantage of Kabode over naspot-12

$$Y.A = \frac{\text{yield of Kabode} - \text{yield of Naspot} - 12}{\text{yield of Naspot} - 12} * 100\%$$

Where, Y.A is yield advantage

$$= \frac{47-40}{40} * 100\% = 17.5\%$$

Kabode variety has 17.5% yield advantage over Naspot-12 variety.

Yield advantage of Naspot-13 over Naspot-12

$$\frac{45 - 40}{40} * 100\% = 12.5\%$$

Naspot-13 variety has 12.5% yield advantage over Naspot-12 variety.

**Farmers’ Preference Evaluation**

On-farm performance of improved orange fleshed sweet potato demonstration were visited and evaluated by participant farmers. Major criteria used to evaluate on-field performances of sweet potato on the farmers demonstration field were early maturity, biomass, disease resistance, number of tubers per plant, and yield performance. In addition, cooking quality and food test of tuber product was also evaluated by farmers. According to the result of farmer’s preference score result, Kabode variety was ranked first compared to Naspot-12 and Naspot-13 varieties (Table 2).

**Table 2:** Farmers’ preference ranking

Statement								Mean squares	Rank
	EM	BM	DR	NTPP	CQ	TY	TT		
Kabode	4	3.8	4.3	4.8	2.9	4.9	3.4	4.01	1
Naspot 12	3.7	2.9	3.8	3.8	4.4	4.1	4.9	3.94	2
Naspot 13	4.2	2.90	3.7	2.4	4.8	1.9	4.2	3.44	3

Where: EM =early maturity, BM =biomass, DR= disease resistance, NTPP= no of tubers per plant, CQ = cooking quality, TY= total yield performance and TT= taste

The five-point likert scale of measurement as; 5 being very good, and 4= good, 3=satisfactory, 2= poor and 1= very poor

## Partial Budget Analysis

**Table 3:** Partial budget analysis

Item	Unit	Unit price in ETB		Quantity on each practice ETB			
				Kabode	Naspot -13	Naspot -12	
Average yield ha <sup>-1</sup>	Ton	-		47.2	44.9	40.0	
Sales in kg	Birr	1.5		70,800	67,350	60,000	
Total gain				70,800	67,350	60,000	
Item cost	Unit	Quantity	Unit cost	Total cost for each practice			
				Kabode	Naspot -13	Naspot -12	
Cuttings (planting) material	cutting	55,556	0.25	13,889	13,889	13,889	
Labor cost	Oxen	Pair	24	100	2400	2400	2400
	Man power	Person	100	50	5000	5000	5000
Total cost				21,289	21,289	21,289	
Total Revenue				70,800	67,350	60,000	
Net benefit (total gain-total cost)				49,511	46,061	38,711	

The result of partial budget analysis showed that, the highest net income gain was obtained from a hectare land of improved kabode OFSP potato, and following Kabode variety, the net income obtained from Naspot-13 was higher than that of Naspot-12 variety in the areas (Table 3 above). Variation of net income between varieties was due to differences in yield performance of the varieties.

## Conclusion and Recommendations

Production and productivity of sweet potato was decreased due to use of low yielding local variety and traditional farming practices in the area. Use of improved OFS potato with full package increased root yield of the crop, food consumption and income of households. Most of the participant farmers preferred Kabode, Naspot -12 and Naspot-13 varieties as 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> rank respectively. Kabode variety was selected as 1<sup>st</sup> rank based early mature, disease resistant, good root yield and number of tubers per plant, where as Naspot-12 was preferred by its good taste and cooking quality. Training was provided to 14 male and 8 female participants and enhanced awareness and attitude of farmers on improved OFS potato varieties with its full package. Adoption of improve OFS potato with its full agronomic practices can improve yields of sweet potato in the areas. Therefore, office of agriculture Baka Dawula Ari woreda should improve access to improved sweet potato varieties and strength linkage between extension and farmers in order to enhance adoption of improved sweet potato technology in the areas with similar agro-ecologies.

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