

1 **PARTICIPATORY VARIETIES SELECTION AND EVALUATION OF IMPROVED**
2 **SWEET POTATO (*Ipomoea Batatas* (L.) VARIETIES ON-FARM AT**
3 **DIFFERENT AGRO-ECOLOGIES IN WOLAITA ZONES**

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5
6 **Abstract:**

7 Ethiopia is considered to be the one of the major producer of sweet potato and involves major
8 lands for this purpose. Whereas, varieties of sweet potato that yields maximum are not yet
9 known. So this particular study is aimed to identify the variety for high yield, quality sweet
10 potato, as well as its quantitative evaluation to be done.

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12 **Materials and methods:** Area situated at Wolaita zone of SNNP regional state is considered
13 as the major study venue; whereas performance of fields are evaluated and specified the
14 number of crop yield of that particular area.

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16 **Result and Discussion:** Eleven sweet potato varieties and four local varieties were prepared
17 for the preliminary evaluation. Observations came up with the following varieties namely
18 OFSP1, Kulfo, koka 6 and Hawassa 83 which were mostly preferred by farmers. The
19 varieties were divided into four sets, with each set having two test varieties and the check
20 variety. This is to ensure that farmers will not have difficulty in evaluating and comparing too
21 many varieties.

22
23 **Conclusion:** Variety of the potatoes that are preferred by the farmers is different from each
24 other, which are come up with **Participatory varietal selection (PVS) technique**. So as
25 differences in ranking are also preferred by them, which later ensure the genetically diverse factors
26 and differentials in growing yield of the crops.

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29 **1. Introduction**

30 Sweet potato [*Ipomoea batatas* (L) Lam] is an herbaceous dicotyledonous plant,
31 which belongs to the family *Convolvulaceae*. It was originated in Central America
32 and it was domesticated more than 5000 years ago. Currently, it is widely grown
33 throughout the tropics and temperate regions of the world between latitude 400 North
34 and South of the equator and between sea level 2300 m.a.s.l. It is an important crop for
35 food security and cultivated in over 100 developing countries and ranks among the
36 six most important food crops after rice, wheat, maize, Potato and cassava. Over
37 95% of the global sweet potato production is in developing countries. China is a largest
38 grower of sweet potato, producing 80% of the world's supply followed by Nigeria
39 and Uganda which produce each about 2.5% of the world's supply (FAOSTAT,
40 2012; FAO, 2010). Sweet potato is an important food security crop grown in many of
41 the poorest region of the world mainly by women for household consumption and as

42 source of family cash income (Aritua and Gibson, 2002; Scott *et al.*, 2000). It is
43 considered as a poor man's crop because of its low input requirement, ease of
44 production and ability to produce under adverse weather and marginal soil
45 condition (Aritua and Gibson, 2002; Care *et al.*: 1997). Most small-scale farmers in
46 Africa and Asia used sweet potato both the vegetative and storage roots as source of
47 protein and vitamin for human food (Woolfe, 1992; and Scott *et al.*, 2000).

48 Sweet potato produces storage roots rich in carbohydrates and β -carotene, a precursor
49 of vitamin A, and its leaves are rich in proteins. The roots also contain vitamins C, B
50 complex, and E as well as potassium, calcium, and iron. Purple-fleshed ones contain
51 antioxidants such as anthocyanins. In world crop statistics, the sweet potato is ranked
52 seventh, just after cassava, with an annual production around 9 Mt and a cultivated
53 area of 110 M/ha (FAO, 2009). In most developing countries, it is a smallholder crop
54 tolerant of a wide range of edaphic and climatic conditions and grown with limited
55 inputs. It is also quite tolerant of cold and being cultivated at altitudes as high as 2,500
56 m, it has become the staple of communities living in the highlands of Uganda,
57 Rwanda, and Burundi in Eastern Africa and in Papua New Guinea where annual per
58 capita fresh roots consumption is over 150 kg. Asia is the largest producing region and
59 China alone accounts for almost 60% of world production. In the southern provinces of
60 Sichuan and Shandong, sweet potato is a major source of raw material for food
61 processing industries ILSI (2008). Nearly half of the Chinese production is for animal
62 feed (roots and leaves), with the remainder primarily used for human consumption,
63 either as fresh (boiled roots) or processed products (noodles and alcohol). In some
64 temperate countries such as the United States, Japan, and New Zealand, the sweet
65 potato is a high-quality luxury vegetable.

66 In Ethiopia, sweet potato production ranks third after Enset (*Enset ventricosum*(W.)
67 Cheesman) and potato (*Solanum tuberosum* L.) compared to other root and tuber
68 crops. It is one of the major traditional food crops in the country. The crop cultivation
69 is common in densely populated areas of the South, South-West and Eastern parts of
70 the country and Southern Nation and Nationalities People Regions (SNNPR). It is an
71 important food crop during hunger periods in areas such as Wolaita, Sidama,
72 KanbataTanbaro, Gamo Gofa and Hadiya zones in SNNPR from February to May
73 (Endale *et al.*, 1994)

74 Ethiopia has a wide range of agro-climatic conditions and cropping system in the
 75 country is highly diversified with a wide variety of cereals, vegetables, tuber and root
 76 crops (CSA, 1995). Among root and tuber crops especially sweet potato is one of the
 77 third important crops after enset and potato (Endale *et al.*, 1994). The total area under
 78 sweet potato in Ethiopia is 75000ha with an average productivity of 8t/ha (Assefa *et*
 79 *al.*, 2007). It is also grown as a food crop. Sweet potato is consumed in traditional
 80 food. The crop is produced highly for consumption than export. Different sweet
 81 potatoes cultivars **has** (shapes, colors sizes and maturity dates) **are** popular for their
 82 taste and crack ability. Since a research is a crop life time process, it is expected to
 83 bring newly released common varieties to be selected by the end users called farmers.
 84 Different marker classes like speckled, red, white, black and etc. were released in
 85 different production years in the country as well as in the region. However, the genetic
 86 potential of those varieties deteriorates as they pass through a long time production
 87 year in the hand of farmers unless they are either maintained or substituted by better
 88 yielding and recently released varieties of common bean. Thus, newly released sweet
 89 potato varieties have to be selected in the participation of farmers.

90 They further add that most of them are purchasing planting material or cuttings from
 91 adjoining areas. As a result of this they have to pay very expensive prices and still
 92 there is no guarantee for the good quality plant materials, disease-free vine cutting

93 **The existing situation of sweet potato production in Ethiopia in general** **Wolaita in**
 94 **particularly is highly produced area where by farmers is not selected the best varieties**
 95 **and evaluating them for yield, disease and quality is of paramount importance of the**
 96 **communities who lost ample opportunities in terms of house hold food security and for**
 97 **balance diet**; existing issue of sweet potato production is the major concern of zone
 98 and the region as well. Therefore, the following general objectives: to recommend
 99 better yielder, disease and insect pest attack resistant farmers preferred trait sweet
 100 potato

- 101 ❖ To identify variety for high yield, quality sweet potato
- 102 ❖ To evaluate the varieties, acceptance under farm or consumer condition

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106 MATERIALS AND METHODS

107 Description of the Study Area

108 The experiment was conducted at Sodo zuria at Gurumo Koish and Bakuluwa Segno Kebele
109 and Boloso Sore Woreda at Sore Homba Kebele, Wolaita zone, SNNP regional state, which
110 is located 390 km south west of Addis Ababa, 229 km south west of Awassa. The site is
111 located at 37° 45' E longitude and 6° 49' N latitude. The area has an average annual rainfall
112 range of 1212 mm with the main growing season (August-October) 639mm and average
113 minimum and maximum temperatures of 13.5⁰C and 23⁰C, respectively. It is also situated at
114 an altitude of 1850 meters above sea level. The soil type of the site is Sandy clay loam
115 (BOSW, 2003).

116

117 According to the 2000 E.C. data, Sodo Zuria has 307 households with a population of 4350
118 while Boloso bombe has 3056 households with a population of 17004. These areas are
119 characterized by severe heat, lack of water, limited rain and unfavorable soil conditions, i.e.
120 arable land is composed of rock and soil. Despite these marginal conditions, farming is still a
121 major source of food and income. Farmers major one Ginger, grow corn, yam, cassava, sweet
122 potato, mango and banana.

123

124 Field performance evaluation

125 Six varieties were collected from the field biodiversity institutes of Ethiopia, four varieties
126 from local farmer garden and two varieties from Areka Agricultural Research Center
127 (AARC), a research institution working on maintained and conservation of root crops. These
128 varieties were mostly collections from different region in the Ethiopia while some were
129 advanced lines (or elite lines) and recommended varieties. They were selected based on their
130 abundance and availability in the gene-bank. Passport and characterization data were not
131 available during collection.

132 The varieties were distributed to selected farmers in Sodo Zuria in Bakuluwa Segno and
133 Gurumo Koish) and Boloso sore Homba Keble were selected for the study since OVOP (Jica)
134 one village for one production has established several farmer-partners in the areas on
135 September 2017. Distribution was limited to selected farmers and selected Boloso sore in
136 Homba Keble for monitoring purposes. The distributed varieties was disseminate to
137 neighboring farmers and Homba through the local seed supply system since farmers usually
138 exchange and share varieties as also noted by Amanuel 2003 and Tsegay *et al* 2004.

139 **Result and Discussion**

140 The participatory variety selection ensured farmers to be participant in selection of improved
 141 sweet potato crop varieties in comparison with local check based on their preference criteria.
 142 Accordingly, sweet potato varieties such as Falaha 1 Belela, Tula, Beletech, Hawassa 83,
 143 Temesgen, OFSP 1, Guntutea, koka 6, Kulfo, Local were preferred at Sodo Zuria in Bakuluwa
 144 Segno and Gurumo Koish) site as 1st, 2nd, 3rd, 4th, 5th and 6th respectively. Their root yields
 145 were 2115.1 kg/ha, 2110.7kg/ha, 1890.1kg/ha, 1942.1kg/ha, 1837.3kg/ha and 1303.6kg/ha of
 146 Falaha 1 Belela, Tula, Beletech, Hawassa 83, Temesgen, OFSP 1, Guntutea, koka 6, Kulfo,
 147 Local respectively. It can be said that improved sweet potato varieties evaluated in this site
 148 were superior to local check and best adapted to specific environment and similar agro
 149 ecology provided that other factors kept constant. In the same talken, the yield of Falaha 1
 150 Belela, Tula, Beletech, Hawassa 83, Temesgen, OFSP 1, Guntutea, koka 6, Kulfo and local
 151 were 1300kg/ha, 1500kg/ha, 1410kg/ha, 1120kg/ha, 1350kg/ha, 1300kg/ha, 1100kg/ha,
 152 11055kg/ha, 1000kg/ha, 1200kg/ha and 800kg/ha in Gurumo Koisha and Bakuluwa Segno in
 153 sodo Zuria woreda of kebele. According to CSA 2014/2015, area in hectares, production in
 154 Quintals and yield per hectare of sweet potato was 239,755.25, 4,586,822.55, and 19.13
 155 during Meher season in Ethiopia. Similarly, area in hectares, production in Quintals and yield
 156 per hectare of sweet potato was 5,662.23, 93,892.80, and 16.58 during Meher (the main
 157 season) in SNNPR (CSA, 2014/2015)

158 The results showed that four varieties (namely OFSP1, Kulfo, koka 6 and Hawassa 83 were
 159 preferred by farmers. These varieties were sweet and had fine flesh texture and beside three
 160 varieties Temesgen, Tula and beletech has been shows less preference, On the other hand,
 161 Local were not preferred since these varieties were watery and too fibrous. These showed that
 162 farmers prefer varieties that are sweet and have fine flesh texture.


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164 Results showed that farmers have added two selection criteria during the final evaluation.
 165 Aside from taste, flesh texture and water content, farmers evaluated sweet potato varieties
 166 based on color and aroma. This suggests that when equally good varieties are compared,
 167 farmers look for more desired characteristics to determine the best variety. Thus, selection
 168 becomes more stringent.

169 Eleven sweet potato varieties and four local variety) were prepared for the preliminary
 170 evaluation. The varieties were divided into four sets, with each set having two test varieties

171 and the check variety. This is to ensure that farmers will not have difficulty in evaluating and
 172 comparing too many varieties.

173 Twelve farmers participated in the activity from each kebele. They were divided into four
 174 groups wherein each group was given a set of varieties for evaluation. Farmers tried the
 175 varieties one at a time. They were given water to drink after tasting each variety to reduce
 176 error. After tasting all samples, farmers determined their preferred and non-preferred
 177 varieties.

178 **Table 1**  **Results** and Rank of evaluated sweet potato varieties in PVS (participatory variety
 179 selection) trial at Sodo Zuria in Bakuluwa Segno and Gurumo Koish) Kebele during on
 180 September 2016/17 G.C

No	Variety	Individual Scores	Individual Scores	Individual Scores	Individual Scores	Total Score	Rank
		F1	F2	Farmer3	Farmer 4		
1	Falaha 1	4 very little aroma	1(fine fleshtexture, aromatic, sweet)	1 (sweet, fine flesh texture)	6	12	4
2	Belela	3	2	2	4	11	5
3	Tula	2	3	4	1	10	
4	Beletech	4	2	2	4	12	4
5	Hawassa 83	4 watery	4	4(very little taste)	1 sweet	13	3
6	Temesgen	3	2	2	3		
7	OFSP 1	4(sweet)	6(Size ,color)	6(sweet, fine flesh texture)	2	18	1
8	Guntutea	4	3	1	3	11	5
9	koka 6	2color	2	4	5	13	3
10	Kulfo	4	2	2	3	14	2
11	Local	3	2(white color	1	4	10	6

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182 ¹Score given by each farmer on the variety

183 ²Sum of individual scores

184 ³Rank of each variety (based on total scores) 

185 **Conclusion**

186 Participatory varietal selection (PVS) on sweet potato indicated difference of improved
 187 varieties preferences among farmers as well as from districts to districts. For instance, Falaha
 188 1 was selected as 4th variety at Belela and Guntutea where as it was preferred as 5th at Sodo

189 zuria in Gurumo Koish and Bakuluwa Segno Kebele. Beside this, there was a little difference
 190 between farmers' preference rank and rank based on the estimated yield obtained from each
 191 variety. Taking as a whole, continuous evaluation of diverse sweet potato varieties; which is
 192 aimed to substitute local varieties, might accelerate the adoption of improved varieties and at
 193 the same time maintain genetic diversity of the sweet potato.

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