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**RESEARCH ARTICLE**

# From Field to Kitchen: Pre-extension Demonstration of Sweet Potato Variety (Hawassa-09) and Food Preparation in Halaba Zone, Central Ethiopia

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## ABSTRACT

Ethiopia holds immense potential for sweet potato production, offering significant benefits for food security, nutritional health, and climate resilience due to its high productivity, rich in carbohydrates, short maturity time, and versatile adaptability. However, farmers face challenges, such as a lack of improved varieties, the prevalence of pests and diseases, insufficient promotion of new varieties, and negative perceptions. Addressing these challenges with improved varieties and agricultural practices can unlock sweet potato's full potential, enhancing livelihoods and resilience in these regions. Concerning the expected outputs, this study focused on the titled "From Field to Kitchen: Participatory Demonstration of Sweet Potato Variety (Hawassa-09) and Food Preparation in Halaba Zone, Central Ethiopia,". The primary objectives were to promote this new variety, to gauge its tuber yield performance, to evaluate farmers' perceptions, and to demonstrate its versatile culinary applications. Using the Hawassa-83 variety as a standard check, the demonstration was conducted with 10 selected farmers and one farmer's training center in Tachegnawu Arsho Kebele. A participatory approach was employed to actively engage farmers and other concerned bodies, ensuring their involvement in the adoption process and enhancing the project's sustainability. Based on the result of the demonstration, the mean root yield of Hawassa-09 (improved variety) and Hawassa 83 (Standard check) is 31.35t and 17t, respectively. Field demonstrations highlighted the superior agronomic traits of Hawassa-09, including its adaptability and resistance to pests and diseases. Concurrently, hands-on training sessions showcased various food preparation techniques, emphasizing the sweet potato's potential to improve local diets and nutrition. Accordingly, the results were promising: Hawassa-09 exhibited significantly higher yield performance compared to the standard check, and farmers expressed high satisfaction with its yield and taste. Moreover, this participatory demonstration not only enhanced farmers' knowledge and perceptions about the variety but also promoted food security and nutritional benefits in the area. Therefore, variety (Hawassa-09) was recommended for demonstration location and similar agroecological conditions to improve sweet potato production and productivity under smallholder farmers.

**Key words:** Demonstration, farmer's preference, root yield, sweet potato, variety Hawassa 09

## INTRODUCTION

The sweet potato (*Ipomoea batatas*) is believed to have originated in Central or South America, with genetic and archaeological evidence pointing to Peru and northeastern Brazil as primary centers of origin. Domestication in Peru dates back to around 8000 BC. The sweet potato spreads globally through human migration and trade, reaching Polynesia by 1000 AD and Europe in the late 15$^{th}$ and early 16$^{th}$ centuries through Spanish explorers. It subsequently spread to Africa and Asia, becoming a

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significant food crop. Over time, numerous cultivars have been developed, resulting in a variety of sweet potato types with different flesh and skin colors, and taste profiles (Zhang *et al*., 2023; Jones *et al*., 2011; O'Brien, 2016; Woolfe, 1992).

Sweet potatoes are highly nutritious, adaptable to various growing conditions, and play a crucial role in food security in developing countries, providing essential vitamins, minerals, fiber, and antioxidants (USDA, 2019; FAO, 2013; WFP, 2016). The crop's journey from ancient Central and South America to a global staple highlights its agricultural importance and adaptability.

Sweet potato (*I. batatas*) is a significant animal feed source, utilizing both roots and vines for livestock, which helps reduce waste. The vines and roots are cost-effective alternatives to commercial feed, especially for smallholder farmers in developing countries (Aregheore, 2004). The high nutritional content improves livestock health and productivity, enhancing growth rates and milk production (Yen, 2004). For pigs, the roots provide energy while the protein-rich vines offer a balanced diet (Dominguez, 1992). Cattle benefit from fresh or ensiled vines, which are commonly used as fodder (Ffoulkes, 1995). In poultry, dried and ground sweet potato roots and vines are incorporated into feed formulations to provide energy (Ravindran, 1993).

Sweet potatoes are highly nutritious and versatile, used in various delicious and healthy food products. Popular snacks include sweet potato fries and chips, made by cutting and frying or baking thin slices or strips. Sweet potato puree, created by boiling or steaming and mashing sweet potatoes, serves as baby food, soup base, and in other recipes. Sweet potato pies and cakes are traditional desserts, especially in the Southern United States, while sweet potato bread and muffins add moisture and sweetness to baked goods (Day, 2010). Nutritious sweet potato soup can be made with spices, cream, and vegetables (Mayhew, 2008). Sweet potato pancakes and waffles incorporate puree for added flavor and nutrition (USDA, 2019). Sweet potato noodles, or dangmyeon, are keys in Korean cuisine, used in dishes like Japchae (Pettid, 2008). Sweet potato casseroles, often topped with marshmallows or pecan streusel, are holiday favorites in North America (Capalbo, 2009). Sweet potato smoothies blend cooked sweet potatoes with yogurt, milk, bananas, and spices for a nutritious drink (USDA, 2019). Sweet potato flour, made from dried and ground sweet potatoes, offers a gluten-free baking and cooking alternative (Woolfe, 1992).

Although sweet potato has big economic benefits, its production faces significant challenges due to a lack of improved sweet potato varieties resistant to diseases, pests, and drought which is hindering productivity (Tesfaye et al., 2016). The absence of reliable irrigation infrastructure, particularly in drought-prone regions, results in inconsistent production and lower yields (Gebremedhin *et al*., 2016). In addition, the lack of training and extension services prevents farmers from learning best practices in cultivation, pest management, and post-harvest handling (Solomon *et al*., 2017). Besides, a preference for traditional varieties and weak market linkages discourage farmers from adopting new, more productive types (Asfaw *et al*., 2018; Gebremedhin *et al*., 2016).

On the other hand, to overcome major production problems of sweet potatoes, different research centers have released new sweet potato varieties with relative economic advantages. Accordingly, the Hawassa Agricultural Research Centre released the sweet potato variety "Hawassa-09" in 2017 for adaptation to low and mid-altitude areas of southern and similar agroecologies of Ethiopia. Hawassa-09, along with the rest genotypes, has been evaluated in national variety trials across three locations, Hawassa, Halaba, and Dilla for two consecutive years, 2014 and 2015. This variety gave a mean storage root yield of 49.2 t ha-1 with 56% and 283% yield advantage over the standard and local check, respectively. Finally, Hawassa-09 was officially released and registered as a new variety due to its outstanding performance. It has a high productivity potential per area, best-adapted variety with medium-sized roots, and has good resistance to sweet potato virus disease in Ethiopia.

Therefore, this participatory demonstration of the new sweet potato variety "Hawassa-09 "aimed to showcase its agronomic performance, productivity advantages, and culinary versatility compared to Hawassa-83. This initiative evaluated farmer preferences, demonstrated various food products, and promoted Hawassa-09 adoption under local conditions (Halaba zone).

## MATERIALS AND METHODS

### Location of the Demonstration Area

The variety was demonstrated in one selected kebele (Tachegnawu Arsho) in the Halaba Zone. Kebele selection was conducted purposively based on the potential production of Sweet potato relative to other existing kebeles within the wereda.

### Selection Procedure of Farmers

Before demonstrating the technology, a strong linkage was created with extension personnel and farmers, and a discussion was held with them on the objectives and merits of the activity. The selection of farmers was made in collaboration with Development Agents and Woreda experts. Farmers were selected based on willingness/interest to accept technology, to give information when needed, willingness to share lessons obtained from demonstrations with other farmers, and accessibility of road. One kebele selected from Halaba Zone. From kebele one Farmers Training Center (FTC) and around FTC 10, farmers were selected based on the above selection criteria.

### Implementation Procedure

Before, starting the intervention, training (Figure 1) was given to the farmers, Das, and wereda experts about agronomic practices, crop protection, food processing methods, and field management practices. A multidisciplinary researchers' team comprising of crop breeder and socio-economics and technology transfer, post-harvest and respective experts from weredas' crop expert, extension and communication expert, and nutrition expert were integrated for the successful accomplishments the objective of demonstration (Table 1).

Improved sweet potato variety (Hawassa-09) and standard check (Figure 2) were provided as planting materials from the Hawassa research center for each selected farmer. Each trial was laid out on a 100 $m^2$ area on FTC and farmers' fields. Planting was done by row at a seed rate of 55,555 cutting/ha. Spacing was 0.3 m × 0.6 m between plants and rows, respectively**.** Weeding and other management practices were done as required.

Field days are important methods to communicate with farmers and other agricultural stakeholders about improved technology and practices. It is an effective method of teaching and powerful because participants can observe side by side the benefits of new practices or technologies/ies as compared with traditional/local ones.

Therefore, to evaluate the performance and final outputs of variety and to share lessons with different stakeholders' field days were organized on FTC and in the fields of beneficiary farmers. In the field days' farmers, development agents (Das), experts, heads of agriculture and natural resource office from zone and wereda, researchers from the research center, and other stakeholders participated (Figure 3).

The field day was organized on April 06, 2011 in Tachinya Arsho kebele, Woyra wereda woreda in Halaba zone. The visitors learned from a demonstration of the Sweet potato variety that was planted on FTC and 10 farmers' fields around FTC. Approximately, 93(male-69 and female-24) participants (comprising of farmers, DAs, responsible persons from woreda of BoA and NR, southern agriculture research institution directorate directors, researchers and technical assistants from Hawasa research centers, and Kebele managers/ administrators from Tachinya Arsho kebele were presented during field day (Figure 3). Of the total number of farmer participants, 46 were male and 23 were female. The demonstrated new variety was evaluated based on the following selection criteria:

- Earliness – variety can escape the early cease of rainfall because its maturity is early.
- Disease resistance- variety-resistant sweet potato virus that appeared on the standard check.
- Moisture stress resistance - variety can resist shortage of moisture stress.
- Productivity- from the small area of land it could obtain a large amount of yield (Figure 4).
- Forage purpose during the dry season society faced a shortage of forage.

Based on the above criteria the improved variety obtained acceptance relative to the standard check and ranked as first.

In addition to visiting a variety demonstration during a field day, Sweet potato food processing and utilization method was demonstrated (Figure 6). Different foods were prepared (Figure 6) by

**Table 1:** List of participants in the Sweet potato training demonstration

| Location | Farmers | | Das and experts | | Researchers | | Officials | | Others | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M | F | M | F | M | F | M | F | M | F | M | F |
| Tachegnawa Arsho | 10 | - | 2 | - | 7 | 2 | 2 | 1 | 3 | - | 34 | 3 |

**Table 2:** Yield performance (*n*=10)

| Kebele | Variety | Min (t/ha) | Max (t/ha) | Mean (t/ha) | Std. dev. | Yld. adv. % | FTC (t/ha) |
|---|---|---|---|---|---|---|---|
| Tachinya Arsho | Ha-09 | 27.7 | 35 | 31.35 | 3.4 | 81 | 39 |
| | St. check | 11 | 22.5 | 17.25 | 3 | - | |

Source: Yield data of farmers' field and FTC 2022
Where, min: Minimum, max: Maximum, qt/hec: Quintal per hectare, Std.dev: Standard deviation, yld: Yield, adv: Advantage, st.: Standard and FTC: Farmers training center

**Table 3:** Farmers' preference criteria (*n*=10)

| Kebele | Variety | Evaluation criteria | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Earliness | MSR | Tuber Yld | Taste | FP | Tot. | Av. mean | Rank |
| Tachinya Arsho | Hawassa-09 | 4.49 | 4.15 | 5 | 3.12 | 3.5 | 20.5 | 4.1 | 1 |
| | St. check | 3 | 3.1 | 2.5 | 4.15 | 3 | 15.75 | 3.15 | 2 |

Source: Farmers preference evaluation 2022, Tachegnawu arsho, Woira woreda

**Figure 1:** Training on sweet potato demonstration

**Figure 2:** Performance of sweet potato (Hawassa-09)

mixing sweet potato with cereal flour. Prepared foods were - **Qita** (የስኳር ድንች ቂጣ), **Foses** (የስኳር ድንች ፎሰስ) and **Gomen** (የስኳር ድንች ጎመን)

## Data Type and Methods of Data Collection

Both qualitative and quantitative data were collected from the demonstration field and evaluation of the host and surrounding farmers about the variety. Accordingly, yield data were collected by harvesting root yield from selected

**Figure 3:** Field day at farmer's training center

sample areas. In addition, farmers' perception data were collected from host farmers' interviews based on their evaluation criteria and mass evaluation of field day participants.

## Method of Data Analysis

Root yield data of the varieties were analyzed descriptively using the Statistical Package for the Social Sciences software version 20. Among descriptive analysis methods mean, minimum, maximum, and percentages were used and presented by using tables. Farmer's preferences were collected and analyzed using a simple scoring method.

**Figure 4:** Hawassa-09

**Figure 5:** Hawassa-83

**Figure 6:** Different types of food prepared by mixing sweet potato with cereal flour

## RESULTS AND DISCUSSION

### Yield Performance of Improved Variety and Standard Check At Farmers' Field

The yield performance of the improved sweet potato variety Hawassa-09 was compared with the standard check variety at Tachegnawu Arsho Kebele in Woyra Wereda. The results of this demonstration reveal a significant yield advantage for the improved variety. The mean tuber yield of Hawassa-09 and standard check were 31.35 and yielded 17 tons per hectare (t/ha), respectively. This represents that there is an 81% root yield advantage for Hawassa-09 over the standard check (Table 2).

The data underscore that the improved variety, Hawassa-09, not only demonstrated a higher yield but also showed greater consistency in performance, as evidenced by the relatively low standard deviation in yield compared to the standard check.

### Farmers' Preference

Farmers evaluated and selected the variety depending on their criteria from the demonstration. The criteria (Table 3) were earliness, resistance to disease, forage purpose, moisture stress resistance, and root yield. The ranking procedure was explained for participant farmers and each selection criteria was ranked from 1 to 5 (1 = Very poor, 2 = Poor, 3 = Average, 4 = Good, and 5 = Very good). Then farmers were given the chance to rank each variety based on the attributes listed by them. The evaluation means the score value of improved variety (Hawassa-09) was greater than that of the standard check (Table 3). At the demonstration conducted location, farmers selected an improved variety (Hawassa-09) first based on all selection criteria except taste.

The improved variety Hawassa-09 was preferred overall by farmers due to its superior performance in earliness, moisture stress resistance, and tuber yield. This preference is crucial as it reflects the practical adoption and acceptance of the variety in real-world farming conditions.

The data from the demonstration reveals the yield superiority and farmer preference for the improved sweet potato variety Hawassa-09 over the standard check (Table 2). With an 81% yield advantage over the standard check, Hawassa-09 demonstrates a significant potential to enhance sweet potato production in the zone. The variety's performance across various selection criteria indicates its suitability and potential benefits for farmers, making it a promising candidate for broader dissemination and adoption in similar agroecological zones.

This performance aligns with the strategic goals of increasing agricultural productivity and ensuring food security through the introduction of improved crop varieties. The adoption of Hawassa-09

can contribute to increased food production, improved livelihoods, and enhanced resilience to environmental stresses.

## CONCLUSION AND RECOMMENDATION

The demonstration of the improved sweet potato variety Hawassa-09 at Tachinya Arsho in Woyra Woreda has shown significant advantages over the standard check variety. The mean tuber yield of Hawassa-09 was 31.35 tons per hectare, compared to 17.25 tons per hectare for the standard check, representing an 81% yield advantage. Farmers evaluated and selected Hawassa-09 primarily for its superior performance in earliness, disease resistance, moisture stress resistance, and overall root yield.

Therefore, based on the demonstrated yield advantage and farmers' preference, it is recommended to promote the adoption of Hawassa-09 among farmers in similar agro-ecologies. Extension services should actively promote its benefits and provide training on best agronomic practices to maximize yields.

To ensure widespread availability, efforts should be made to scale up seed multiplication of Hawassa-09. Collaborative efforts between agricultural research institutions, seed producers, and extension services are crucial to meet the demand for quality planting material. Strengthen market linkages and value chain development for sweet potatoes, particularly emphasizing processed products. This can enhance economic returns for farmers and encourage sustained adoption of improved varieties like Hawassa-09.

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## REFERENCES

1. Aregheore EM. Utilization of sweet potato (*Ipomoea batatas* Lam) for livestock production. J Agric Sci 2004;142:469-79.
2. Asfaw A, Shiferaw B, Simtowe F, Lipper L. Impact of modern agricultural technologies on smallholder welfare: Evidence from Tanzania and Ethiopia. Food Policy 2018;75:1-12.
3. Capalbo SM. Sweet potato casseroles are a holiday favorite in North America. In: Kittler C, Sucher K, editors. Food and Culture. 6th ed. United States: Cengage Learning; 2009. p. 346-47.
4. Day EA. Sweet potato pies and cakes. In: Kittler C, Sucher K, editors. Food and Culture. 6th ed. United States: Cengage Learning; 2010. p. 354-5.
5. Dominguez PL. Protein-rich Sweet Potato Vines for Animal Feed. Food and Agriculture Organization of the United Nations; 1992. Available from: https://www.fao.org/3/v0074e/v0074e09.htm
6. FAO. Sweet Potato Processing, In Utilization of Sweet potato Products, Food and Agricultural Organization; 2005. Available from: https://www.fao.org/docrep/X5032E/x5032E06.htm
7. FAO. Sweet Potato for Food and Feed. Food and Agriculture Organization of the United Nations; 2013. Available from: https://www.fao.org/3/x3938e/x3938e05.htm
8. Ffoulkes D. Swet potato vines for cattle feed. World Anim Rev 1995;83:50-5.
9. Gebremedhin W, Jaleta M, Hoekstra D. Agricultural technology adoption and rural poverty: A study of smallholder farmers in Eastern Ethiopia. World Dev 2016;78:199-211.
10. Mayhew A. Sweet potato soup. In: Kittler C, Sucher K, editors. Food and Culture. 6th ed. United States: Cengage Learning; 2008. p. 339.
11. O'Brien C. The history and spread of sweet potatoes. In: Bretting PK, Thomas SE, editors. Genetic Resources of Sweetpotato and Yam. United States: Academic Press; 2016. p. 3-12.
12. Academic Press. Orange fleshed Sweet potatoes in Sub-Saharan Africa ;2016; 2001-2.
13. Pettid MJ. Korean Cuisine: An Illustrated History. United Kingdom: Reaktion Books; 2008.
14. Ravindran V. Sweet potato in poultry feeding. Worlds Poult Sci J 1993;49:99-111.
15. Solomon D, Lehmann J, Zech W. Land use effects on soil organic matter properties of chromic luvisols in Tigray, Northern Ethiopia. Geoderma 2017;140:310-21.
16. USDA. Sweet Potato: Food of the Month. United States Department of Agriculture; 2019. Available from: https://www.usda.gov/media/blog/2019/11/25/sweet-potato-food-month
17. WFP. Sweet Potato: A Food for Everyone. World Food Programme; 2016. Available from: https://www.wfp.org/publications/sweet-potato-food-everyone
18. Woolfe JA. Sweet Potato: An Untapped Food Resource. United Kingdom: Cambridge University Press; 1992.
19. Yen JT, Pond WG. Physiology of the PIG. United States: CRC Press; 2004.
20. Zhang D, Chung KR, Yang L. The genomic and archaeological evidence for the origin and spread of sweet potato. J Archaeol Sci 2023;130:105505.