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SCHOLARLY, PEER REVIEWED
Volume 26 No. 5
June 2026
PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST
ISSN 1684 5374

Afr. J. Food Agric. Nutr. Dev. 2026; 26(5): 29675-29700 https://doi.org/10.18697/ajfand.152.26025

Date	Submitted	Accepted	Published
	19th May 2025	19th February 2026	11th July 2026

ASSESSMENT OF AERIAL YAM (*DIOSCOREA BULBIFERA*) PRODUCTION AND PROCESSING PRACTICES: THE CASE OF *YAYO* WOREDA, SOUTHWEST ETHIOPIA

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Volume 26 No. 5
June 2026
PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST
ISSN 1684 5374

ABSTRACT

This study assessed the major traditional techniques for aerial yam production, processing, and consumption using an empirical case from Southwest Ethiopia. A mixed method was employed to generate the primary data: a household survey and in-depth interviews. A household survey was conducted with a total sample of 384 farm households in the Yayo District. To complement the household survey, 12 focus group discussions were held. The survey results showed that the majority of respondents were male (73.2%), 38% had no formal education. The mean age of the sample farmers was 48.5 with a minimum of 24 years and a maximum of 82. This explorative study indicates that two types of aerial yam were identified in this study, the edible and wild aerial yams, respectively. The study also showed that aerial yam is often grown in home gardens as well as in farm plots. The mean size of the aerial yam plot was 0.022 (ha). The mean yield of aerial yam was 70.7 quintals per hectare (ha). The results revealed that 74.5% and 15.4% of the farmers used aerial yam as a food source and additional income source, respectively. In terms of consumption, farmers (43.2% of %) consumed aerial yam as fried, boiled, or roasted. More than 68% of the respondents reported that the wild aerial yam was not consumed due to its toxicity problem. The main challenges in the aerial yam value chain included a lack of extension services (46.9%), lack of awareness about production and consumption (16.1%), traditional farming practices (15.6%), low market demand (14.1%), and lack of sufficient planting land (7.3%). The study concluded that although aerial yam is an important food and income resource for smallholders, its production, processing, and utilization are constrained by knowledge gaps, inadequate support and market limitations. The study mainly recommends improving extension services, raising awareness and promoting better production, utilization and marketing practices for aerial yam in the study area.

Key words: Consumption, Indigenous Techniques, Production, Aerial Yam, Smallholders, Ethiopia

Citation: **Yassin H, Kebede A and H Welday** Assessment of Aerial Yam (*Dioscorea bulbifera*) Production and Processing Practices: The Case of Yayo Woreda, Southwest Ethiopia. *Afr. J. Food Agric. Nutr. Dev.* 2026; **26(5):** 29675-29700. https://doi.org/10.18697/ajfand.152.26025

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June 2026
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INTRODUCTION

Food and nutrition security are major concerns in many developing countries including Ethiopia. Some wild root and tuber crops occupy a remarkable position in food security in these countries because of their high calorific value and superior carbohydrate content. It has become extremely important to diversify the present-day agricultural system and search for alternative food and feed ingredients to address food and nutrition insecurity. Alternative underutilized root and tuber crops may contribute to sustainable food systems under climate change resilience [1].

Root and tuber crops contribute significantly to global dietary needs after cereal crops [2]. Yam is one of the principal root and tuber crops, including cassava and potato, which are widely grown and consumed as subsistence staples [3]. Yams (*Dioscorea* spp.) are vine plants grown as staple food in tropical and sub-tropical regions that produce underground tubers or aerial bulbils [4]. Yams are edible energy-rich tuber crops developed from modified and thickened underground stem storage organs that are bulky, perishable and vegetatively propagated by tuber [5,6]. Among the different types of root and tuber crops, yams (*Dioscorea* spp.) are the most used staple food, livestock feed, and raw materials to produce various industrial products [7].

Yams (*Dioscorea* spp.) constitute the predominant starchy staple in sub-Saharan Africa, where food security is a critical issue for the growing population. Despite the importance of yams for people and as a source of food security, attention to yam production remains questionable. The ever-increasing population and the associated food insecurity problem necessitates research into under-utilized and crops, such as *D. bulbifera* which are less preferred than other yam types.

In Ethiopia, Yam (*Dioscorea* spp.) is widely grown in the southern and southwestern parts of the country and plays a vital role in local food security. It serves as a 'life-saving' plant group for marginal farming and forest-dwelling communities during periods of food scarcity [8]. The aerial yam (*Dioscorea bulbifera*) is a basic food crop for smallholder farmers in these regions [9]. However, studies on the factors affecting production and postharvest handling of aerial yam (AY) are limited. Therefore, this study aimed to assess indigenous techniques in aerial yam production, processing, and postharvest handling in Southwest Ethiopia. The study also focused on the food preparation and consumption practices of aerial yam in the study area.

MATERIALS AND METHODS

Description of study area

This study was conducted between June 2023 and January 2024. The study was conducted in Yayo *Woreda*, Southwest Ethiopia. *Woreda* is located in the Iluabbabor

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Volume 26 No. 5
June 2026
PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST
ISSN 1684 5374

Zone of the Oromia National Regional State in Southwestern Ethiopia. It is located approximately 560 km from Addis Ababa toward the southwest and 38 km from Mettu town toward the east. The biosphere reserve lies between 8°21'–8°26' N latitude and 35°45'–36°3' E longitude within an altitudinal range of 1200–2000 m a. s.l. [10]. The Woreda receives an average annual rainfall of approximately 1600 mm, an average temperature of 23°C, and an elevation range of 1160–2580 m.a.s.l [11]. The 2007 national census reported the Woreda has a total population of 52,851(26,737 men and 26,114 women) and 14.3% urban dwellers. Moreover, the *Woreda* has a United Nations Educational,Scientific Organization (UNESCO) registered Biosphere Reserve, which combines wild coffee forests and agricultural areas.

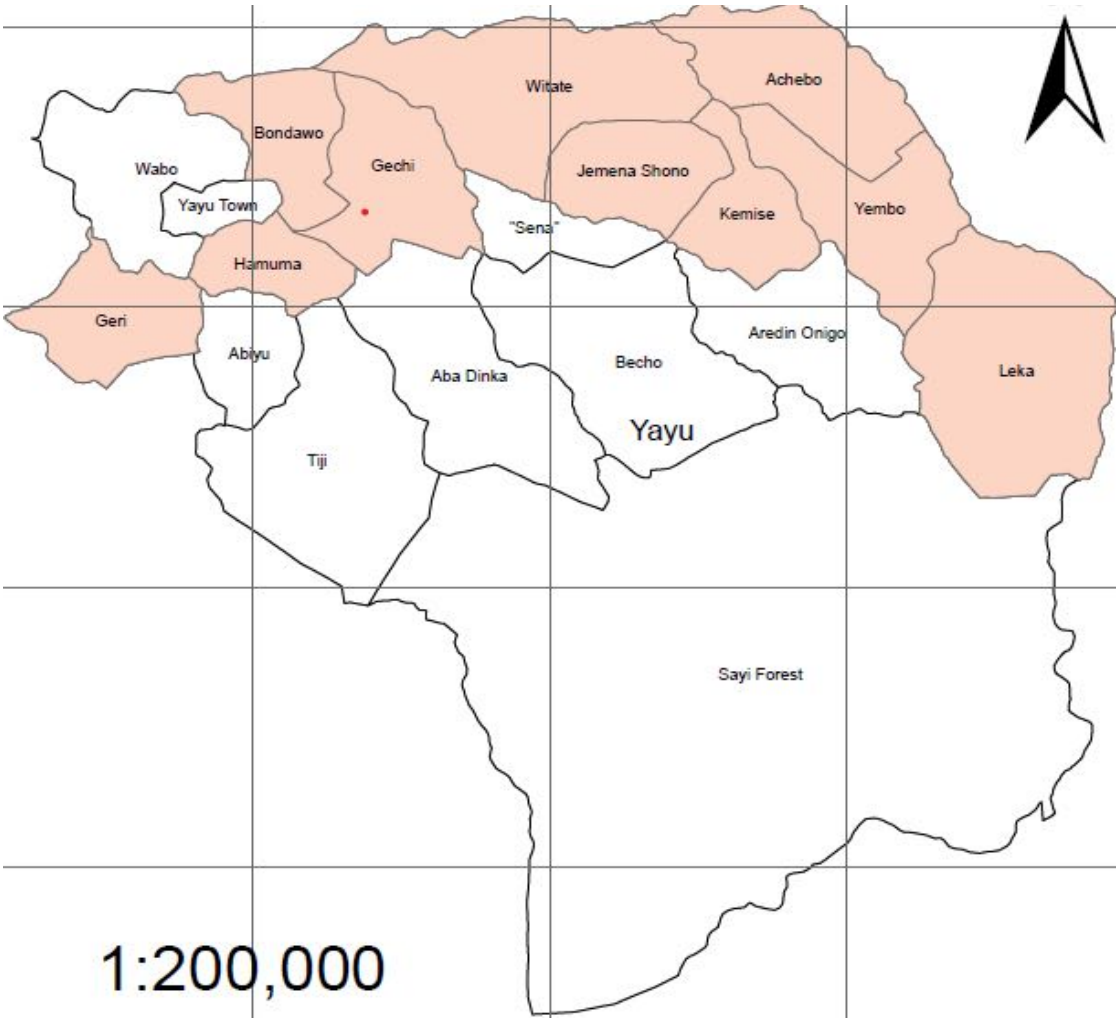


Figure 1: Map of the study Area

Research Design and Sample Size Determination

This study employed a mixed method design. This study has an explorative nature, and exploratory research follows a flexible design and involves a non-probability

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ISSN 1684 5374

sampling design. Hence, the exploratory research design covers the qualitative aspects of focus group discussion (FGD) and key informant interviews. Alternatively, descriptive research design is a rigid design that usually employs probability or random sampling, a pre-planned design for analysis, and involves structured instruments for data collection [12].

The sample size for the household survey was estimated using the sample size determination formula for a single population proportion.

X = (Zα/2)2 *p*(1-p) / d2, where Zα/2 is the critical value of the normal distribution at α/2 (Example, for a confidence level of 95%, α is 0.05, and the critical value is 1.96), d is the allowable margin of error, p is the sample proportion, and N is the population size. The consumption and production were considered as the sample proportion, P. Therefore, the total sample size was calculated with a marginal error of 0.05, with a 95% confidence interval. A contingency of 10% of the total sample size was considered for non-respondents.

Since the exact proportion of households involved in aerial yam production and consumption was unknown, a conservative estimate of p=0.5p = 0.5p=0.5 was used to maximize the sample size. The margin of error was set at 5% (d = 0.05) with a 95% confidence level.

Accordingly, the sample size was calculated as:

n= (Zα/2)2* P* (1-p)/d2

n= (1.96)2 0.5 (0.5)/ (0.05)2 = 384.16

The sample size was 384. Twelve *kebeles* from the *Woreda* were selected based on their potential for aerial yam production. The list of household heads was obtained from each *kebele*, and the sample size was proportionally allocated to each *kebele*. Accordingly, 384 households from the aerial yam growing area (32 from each *kebele)* were selected. Finally, a simple random sampling technique was employed to draw the head of the household from each *kebele* for interviews.

In addition, purposive sampling was used to determine the participants for FGDs. The non-probability sampling technique allows the investigator to rely on their expert judgment to determine representative units [13]. The authors further explained that since the interaction between participants is a key feature of the focus group method, careful consideration of the group composition is vital. Accordingly, a group of eight participants from each *kebele* consisted of three farmers (two men and one woman), encompassing elderly adults who are known to have a better knowledge of the present and past social and economic status of the study area to have diverse ideas

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Volume 26 No. 5
June 2026
PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST
ISSN 1684 5374

about the subject matter. The group members were farmers who were involved in growing aerial yam in their respective locations.

Data Collection

This study employed a mixed-methods approach, integrating both quantitative and qualitative data collection techniques to generate comprehensive and reliable primary data. Data were collected from individual respondents and focus group discussion (FGD) participants after clearly explaining the purpose of the study and participants' rights, including voluntary participation and confidentiality.

Multiple data collection tools were used to address the study objectives and enable triangulation of findings. These included a cross-sectional household survey, focus group discussions (FGDs), key informant interviews (KIIs), and field observations conducted in crop farms and major market areas of aerial yam growers in Yayo woreda.

Household Survey

A semi-structured questionnaire was administered to 384 randomly selected households, comprising both aerial yam growers and non-growers, across twelve *kebeles* in Yayo *woreda*. The questionnaire captured information on aerial yam cultivation and productivity, purposes of production, farmers' perceptions of the crop, production constraints, postharvest handling practices, storage and losses, food preparation methods, modes of consumption, household food security status and the social characteristics of consumers.

Focus Group Discussions (FGDs)

Focus group discussions were conducted to capture collective perspectives and enhance understanding of issues emerging from household surveys. Each FGD consisted of eight participants, including elderly individuals and female household heads. Preliminary field visits were conducted during the proposal development stage, during which discussions were held with Woreda Agriculture Office experts and Development Agents to refine the research tools.

An open-ended discussion checklist was developed, and four FGDs (one per selected *kebele*) were conducted. Discussions focused on the general agricultural context of the study area, growers' preferences for local aerial yam varieties and selection criteria (using pairwise ranking), identification and prioritization of production constraints; income sources; indigenous production practices, utilization of aerial yam; perceptions of production trends, reasons for low production relative to other crops and the perceived contribution of aerial yam to household food

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Volume 26 No. 5
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PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST
ISSN 1684 5374

security. Findings from the FGDs were used to substantiate and triangulate household survey data.

Key Informant Interviews and Field Observations

Key informant interviews were conducted with agricultural experts, development agents, and other knowledgeable stakeholders to obtain contextual and technical insights into aerial yam production and management. Field observations were carried out in crop fields and market areas to directly assess production practices, postharvest handling, and market dynamics.

Data Analysis

Both qualitative and quantitative data were analyzed using a mixed-methods framework. Quantitative data were analyzed using descriptive statistics, percentages, means, standard deviations, frequencies, and ranges, employing Statistical Packages for Social Sciences (SPSS) software (version 16.0). These analyses were used to examine variations in aerial yam production and the influence of sociodemographic factors such as age, farming experience, farm size, family size and education level on the number of morphotypes maintained at household and *kebele* levels. Qualitative data from FGDs, KIIs and observations were thematically analyzed and used to complement and explain quantitative findings.

RESULTS AND DISCUSSION

Socio-demographic characteristics of aerial yam farmers

The socio-demographic characteristics of the surveyed cultivated aerial yam (AY) farmers are summarized in Table 1. Most respondents were male (73.2%) and 26.8% were female, reflecting differences in farmland access. Educational levels varied, with 38% having no formal education, 29.7% primary education, 27.3% secondary education and 5.0% college-level education. The mean age of farmers was 48.5 years (range: 24–82), with a mean farming experience of 26.48 years (range: 2–60), and a mean annual income of 58,056 ETB (range: 10,000–200,000).

Cross-tabulation of socio-demographic factors with indigenous aerial yam practices showed that older farmers (>50 years) maintained more morphotypes (mean: 6.2) than younger farmers (mean: 4.8), and male farmers were more engaged in cultivation (78%) than female farmers (55%). Farmers with primary or secondary education were more likely to adopt improved processing techniques (45% and 52%, respectively) compared to those with no formal education (28%). Income influenced both production scale and morphotype diversity, while older and higher-income farmers tended to maintain a broader variety of aerial yam for household consumption and market sale. These results highlight how socio-demographic

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characteristics shape production, processing, and consumption practices in aerial yam farming.

Productions of Aerial yam

Aerial yam Yield and Production Practices

In this study, farmers relied on both crop farming and livestock husbandry as their primary sources of food and income. The main crops grown in the area were maize (*Zea mays*) and coffee (*Coffea arabica*), while aerial yam was cultivated on a much smaller scale. Survey results showed that the mean plot size allocated to aerial yam production was only 0.022 ha, with an average yield of 70.7 quintals per hectare (qt ha^{-1}), reflecting the low priority given to this crop compared with maize and coffee (Table 2).

Focus group discussion (FGD) participants from the 12 kebeles explained that the local community prioritized coffee and maize because of their higher economic value and familiarity, and they produced limited amounts of aerial yam due to a lack of knowledge about its food uses. Key informants, including Development Agents, noted that aerial yam is often intercropped with coffee, and that its cultivation remains limited because extension services, training programs and input distribution are predominantly focused on cereals and cash crops. As a result, farmers have limited access to improved production practices, yield-enhancing technologies, and information on the crop's full potential. These qualitative insights were strongly supported by the quantitative findings, showing that most land is allocated to maize and coffee, while aerial yam occupies only a minor portion of farmland.

Survey results showed that the majority of farmers obtained planting materials for aerial yam from their own seed tubers (42.7%), followed by neighbors (28.2%), relatives (14.8%), and the market (14.3%) (Table 3). The experience of sharing seed tuber/true seeds imbued society with a sense of the value of the crop for food, cultural and medicinal values. Focus group Discussions added depth to this finding by explaining that seed exchange is based on trust and long-standing social relationships. Participants emphasized that seed sharing plays an important role in conserving local aerial yam types and maintaining cultural ties within the community. Key informant interview confirmed that there is no formal seed system for aerial yam in the study area. Development Agents explained that aerial yam is excluded from certified seed programs, forcing farmers to rely on informal systems. While this system supports genetic diversity, informants warned that it also exposes farmers to yield inconsistency and disease transmission.

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Characterization of aerial yam

The local name of aerial yam is “Kotteharre” or “Kottache” in the study area as it resembles the foot of a donkey. Both cultivated and wild types of aerial yam were grown in the study area. The edible plant is cultivated by farmers, whereas the wild grows by itself. The wild type is usually grown on coffee farms. The survey results clearly differentiated cultivated and wild aerial yam based on plant height, leaf shape, flowering behavior, and tuber characteristics. About 98.2% of the respondents revealed that cultivated aerial yam is taller. However, 1.8% of the respondents indicated that the height of the cultivated aerial yam was shorter than that wild type aerial yam. About 98.7% of the respondents suggested that the wild type of aerial yam had a short height. Ninety-nine percent of the respondents reported that the leaf arrangement of the cultivated aerial yam was heart-shaped, with broad leaves. However, 98.7% of the respondents indicated that the wild type of the aerial yam is also heart-shaped with tapered leaves (Figure 2).



Leaf of Wild AY



Leaf of Cultivated AY

Figure 2: Leaf of Wild and Cultivated Type Aerial Yam

The results highlight a distinct difference in the flowering characteristics of aerial yam types. Survey data showed that 98.2% of respondents reported the wild type aerial yam as flowering, whereas 99.0% indicated that the cultivated type rarely or never flowers (Figure 3). Focus group discussion (FGD) participants confirmed these observations, noting that flowering is a defining feature of the wild type, while cultivated aerial yam is typically non-flowering.

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ISSN 1684 5374

Key informants from the Agronomy section emphasized that the local community possesses strong indigenous knowledge and extensive experience, enabling them to accurately differentiate between wild and cultivated aerial yam based on observable traits, particularly flowering behavior. Focus Group Discussions further reinforced this, with farmers demonstrating detailed ecological knowledge and consistently describing flowering as a hallmark of the wild type. According to informants, wild aerial yam is often tolerated rather than intentionally planted within coffee farms, reflecting a semi-managed production system. These findings underscore that farmers' ability to classify aerial yam types relies on long-term interaction with the crop and a sophisticated understanding of its ecological characteristics.



Cultivated AY (non flowering)



Wild type AY (flowering)

Figure 3: Flowering nature of aerial yam

The tuber characteristics of aerial yam were primarily distinguished based on shape, size and color (Figure 4). Survey results showed that 82.8% of respondents described the cultivated aerial yam bulbils as angular and flattened, while 8.1% were round, 3.9% oval and 5.2% irregular. In contrast, the majority of respondents (82.3%) described the wild type bulbils as non-angular and globate, with smaller proportions reported as round (9.1%), oval (6.5%), or irregular (2.1%). These findings align with the study by Mulualem and Getachew [15], which reported aerial yam bulbils as round, oval (34.04%), elongated (21.28%) and irregular (6.38%).

Regarding tuber color, 71.6% of respondents perceived cultivated aerial yam as dark brown, while 15.9% reported a light tan color and 12.5% white-brown. The wild type was predominantly white-brown (76.6%), with smaller proportions described as

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white-gray (3.4%) or dark brown (10.2%). These observations are consistent with previous studies, which noted a wide range of bulbil skin colors among aerial yam accessions, from light to dark brown [16], and highlight the broader tuber variability reported among *Dioscorea* species in Ethiopia [5].

Focus group discussion (FGD) participants elaborated that the differences in shape and color are important markers for farmers in identifying and selecting aerial yam types for planting, consumption, and storage. They noted that angular and flattened bulbils of cultivated types are preferred for planting due to higher yield and ease of handling, whereas the globate wild types are mostly tolerated in coffee farms rather than deliberately cultivated. Key informants from the Agronomy section emphasized that farmers' detailed knowledge of tuber morphology reflects long-term interaction with the crop and forms the basis for indigenous classification systems that guide selection, management and utilization practices.

Overall, these findings demonstrate that both the shape and color of aerial yam tubers are critical traits recognized by farmers, and that indigenous knowledge complements scientific observations, supporting effective identification and utilization of different aerial yam types.



Figure 4: Bulbils of Wild and Cultivated Type Aerial Yam

Farmers' Perception on Aerial Yam Production Trends

As shown in Figure 5, the majority of respondents (61.7%) perceived that aerial yam production has decreased over the last ten years, while 31% reported no noticeable change, and only 7.3% indicated an increase in production during the same period.

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Volume 26 No. 5
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ISSN 1684 5374

Qualitative insights from focus group discussions (FGDs) and key informant interviews (KIIs) help explain these perceptions. Focus group discussions participants noted that in some areas, production trends have slightly increased due to modest improvements in farmers' awareness of aerial yam's benefits as a food source and source of income, adoption of better management practices, growing market demand, and recognition of the crop's cultural and medicinal value. They also emphasized that the labor-intensive nature of aerial yam cultivation can influence output, with labor shortages leading to reduced production in some years.

Key informants, including Development Agents, explained that historical shifts in crop priorities have significantly affected aerial yam production. In past decades, low coffee production allowed farmers to allocate more land and effort to aerial yams. Over the last ten years, however, increased coffee cultivation has reduced the land available for aerial yam, contributing to the perceived decline. Additional constraints identified include changes in land tenure systems, declining soil fertility, and limited access to improved planting materials.

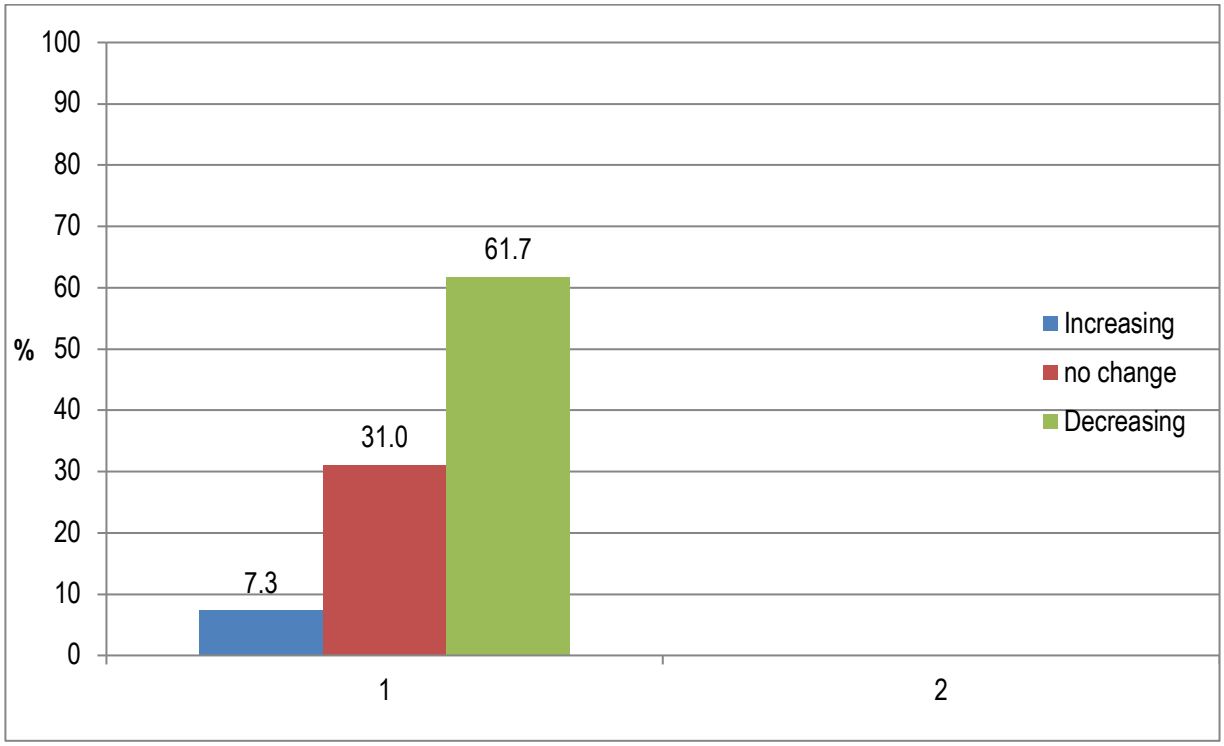


Figure 5: Farmers' perception on production trend of aerial yam over the last ten years

Constraints in the production of aerial yam

The declining production and utilization of aerial yam in Yayo Woreda are influenced by multiple, interrelated constraints identified through household surveys, focus

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Volume 26 No. 5
June 2026
PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST
ISSN 1684 5374

group discussions (FGDs) and key informant interviews (KIIs). Survey results (Table 4) indicate that the exclusion of aerial yam from agricultural extension services is the most critical constraint, with 46.9% of respondents rating it as a high constraint. Additionally, 16.1% of growers associated this challenge with a lack of awareness and promotion regarding the production and consumption of aerial yam. Agronomic and resource-related constraints were also reported. The requirement for climbing stakes was identified by 15.6% of respondents as a major limitation, followed by low market demand and price (14.1%) and shortage of sufficient planting land (7.3%). These findings suggest that both production-related and market-related challenges contribute to the marginalization of the crop.

The qualitative findings from FGDs strongly support the survey results. Participants in Yayo Woreda unanimously reported that they had never received training, technical advice, or extension support related to aerial yam production. They emphasized that limited knowledge on improved agronomic practices and utilization methods discouraged farmers from expanding production. This lack of institutional support has contributed to the perception of aerial yam as a minor or less valuable crop.

Key informant interviews with officials from the Yayo Woreda agriculture office further confirmed these observations. The informants explained that aerial yam has historically received little attention from research and extension services because it is classified as an underutilized crop and not considered a priority root and tuber crop in the area. According to the KI, limited research outputs and low community awareness regarding its nutritional and food security potential have reinforced this neglect.

These findings are consistent with previous studies. Mulualem *et al*. [9] reported that low institutional attention, early-stage drought, replacement of yam with high-value crops, wild animal damage, labor and stake shortages, low soil fertility, land scarcity, and weak extension services were major constraints to yam production. Similarly, Abebe [16] highlighted that inadequate government support in research and extension services is a key constraint affecting the production of other root and tuber crops such as *Plectranthus edulis*.

Harvesting, Postharvest Handling and Storage of Aerial Yam

Harvesting time in a year

The harvesting period of aerial yam in Yayo Woreda extends from August to December, as indicated by household survey results, focus group discussions (FGDs), and key informant interviews (KIIs). According to the survey findings (Table 5), 43.8% of aerial yam growers reported that the crop is ready for harvest in August,

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Volume 26 No. 5
June 2026
PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST
ISSN 1684 5374

followed by 31.3% in September. A smaller proportion of respondents indicated harvesting in October (7.6%), while 17.4% reported harvesting during November and December. Farmers noted that aerial yam generally reaches maturity five to six months after planting, although this varies depending on management practices and local agro-ecological conditions.

Insights from FGDs support these findings, as farmers explained that harvesting is often done in stages rather than at once, depending on household food needs and the maturity status of the crop. Focus group discussion participants also emphasized that early harvesting is sometimes practiced to meet immediate consumption needs, even though it may reduce yield and storability. Key informants from the Yayo Woreda agriculture office confirmed that the extended harvesting period reflects the traditional production system, which lacks standardized agronomic recommendations for planting and harvesting times.

Farmers in the study area rely on indigenous knowledge and visual indicators to determine the maturity of aerial yam (Table 5). Survey results show that 41.7% of respondents identified leaf wilting as the main indicator of maturity, while 34.4% reported that maturity is confirmed when bulbils fall off the vine with slight touch. Additionally, 24.0% of respondents indicated that a change in leaf color from green to yellow signals readiness for harvest. Focus group discussions further revealed that farmers often use a combination of these indicators, rather than a single sign, to avoid harvesting immature tubers.

Key informants highlighted that harvesting practices, maturity indicators, and postharvest handling methods vary across locations and among different root and tuber crops grown in the area. They also noted that the absence of extension support has resulted in non-uniform harvesting practices and limited knowledge of improved postharvest handling and storage techniques. As a result, farmers must wait more than five months to obtain the first harvest, relying heavily on experience rather than technical guidance.

Indigenous Postharvest Handling and Storage of Aerial Yam

Postharvest losses of aerial yam in Yayo Woreda are influenced by a combination of biological and handling-related factors, as evidenced by the survey, focus group discussions (FGDs) and key informant interviews (KIIs). According to the household survey (Table 6), 69.8% of respondents identified rodent and insect infestation as the major postharvest problem, while 30.2% attributed losses to physical damage during transportation and storage. These findings were strongly supported by FGDs, where participants consistently emphasized beetles as the most destructive postharvest pests affecting aerial yam during storage. Similarly, key informants from the district agriculture office confirmed that insect pests particularly beetles are the

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PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST
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most prevalent cause of postharvest deterioration of aerial yam in the area. These results align with findings from a related study by Garedew *et al*. [17] conducted in Sheko District, Southwest Ethiopia, which reported that beetles were the dominant cause of storage damage, with additional spoilage resulting from moisture accumulation. This consistency across studies and data sources highlights insect infestation as a critical challenge in the postharvest management of aerial yam.

Regarding postharvest handling practices, survey results indicated that only a minority of farmers applied any form of preservation treatment before storage. About 29.4% of respondents reported drying aerial yams prior to storage, 16.5% washed the produce, while the majority (54.2%) indicated that no special postharvest treatment was practiced. Focus group discussions revealed that drying is mainly practiced to reduce moisture content and delay spoilage, though the method is often informal and lacks standardization. Key informants further noted that limited awareness and lack of improved storage technologies contribute to the low adoption of effective postharvest treatments.

Smallholder farmers in Yayo Woreda employ multiple indigenous storage technologies. As shown in Table 6, 55.7% of respondents stored aerial yams in jute (fiber) bags, 26.8% stored them on the floor in dry places, and 17.4% used traditional baskets. Focus group discussions provided deeper insight into these practices, explaining that the local community commonly uses *Gundo* and *Guuboo* traditional woven storage baskets made from locally available plant materials. These containers, named in Afan Oromo, are valued for their affordability, accessibility, and ability to allow air circulation, which helps reduce moisture buildup during storage. Key informant interview also acknowledged that these indigenous storage methods are well adapted to local conditions and cultural practices.

However, despite their advantages, FGDs and survey data revealed significant limitations associated with these traditional storage systems. When *Gundo* and *Guuboo* baskets or jute bags are placed directly on open floors, aerial yams become highly vulnerable to pests and environmental stress. Respondents reported common storage-related losses, including sprouting (38.3%), dehydration (33.9%), and rotting (27.9%). Key informants emphasized that poor ventilation, direct contact with the ground, and inadequate protection from insects and rodents exacerbate these losses.

Under these prevailing indigenous storage conditions, the maximum storage duration of aerial yam after harvesting was reported to be approximately five to six months without severe spoilage (Table 6). Overall, the findings of the present study indicate that while indigenous postharvest handling and storage practices are widely used and culturally appropriate, they are insufficient to effectively minimize

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ISSN 1684 5374

postharvest losses. Strengthening these traditional systems through improved pest management, better floor insulation, and enhanced drying and storage techniques could substantially reduce losses and extend the shelf life of aerial yam.

Utilization

Contribution of Aerial Yam for Household Food Security

The contribution of aerial yam to household food security in the study area was perceived differently among respondents. According to the household survey, 54.4% of respondents reported that aerial yam makes a significant contribution to household food security, particularly during periods of food shortage, while 45.6% perceived its contribution as insignificant, describing it as an underutilized crop. The latter group attributed this to limited consumption practices and low awareness of its food use and nutritional benefits, as reported by 99% of respondents.

Findings from FGDs reinforced these perceptions. Participants explained that although aerial yam is locally available, it is not regularly included in household diets because younger generations, in particular, lack knowledge of its preparation methods and nutritional importance. Some FGD participants noted that aerial yam is mainly consumed occasionally or during times of food scarcity rather than as a staple food. Key informant interviews with development agents and district agriculture officials further confirmed that inadequate extension support and the absence of promotion activities for underutilized crops have contributed to the low utilization of aerial yam for food security, despite its production potential.

Purpose of Producing Aerial Yam

The survey results revealed that aerial yam is produced for multiple purposes in the study area (Table 7). The majority of growers (74.5%) reported producing aerial yam primarily for household food consumption. About 13.8% of respondents indicated that they used the crop as a source of additional income, mainly to purchase essential food items such as edible oil, salt and spices. Smaller proportions of respondents reported using aerial yam for medicinal purposes (5.2%), cultural value (3.1%) and animal feed (1.8%).

Focus group discussions participants expanded on these findings by explaining that aerial yam is often consumed during communal farm activities or group labor arrangements, where it is prepared and shared among participants. This observation was also supported by a development agent, who noted that aerial yam is sometimes eaten during group work on farms as a readily available local food. Additionally, some FGD participants reported the use of aerial yam tubers in traditional medicine, particularly for the treatment of gastritis and diabetes. However, both FGDs and KIIs

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emphasized that these medicinal claims are based on indigenous knowledge and require further scientific validation.

Regarding market value, survey results indicated variability in the selling price of aerial yam in local markets. About 57.8% of respondents reported that 1 kg of aerial yam was sold for approximately 10 Ethiopian birr (ETB), while 25.5% reported a price of 5 ETB per kg. A smaller proportion (11.7%) indicated that the price could reach up to 20 ETB per kg, depending on market demand and season (Table 7). Focus group discussions consistently highlighted that the low and unstable market price discourages farmers from expanding aerial yam production, as it is considered less profitable compared to other crops.

Key informant interviews with agricultural extension workers provided further insight into local marketing practices. They explained that aerial yam bulbils are commonly sold in small quantities by placing 7–10 bulbils on the ground (*madab*) for 10–20 ETB at local markets or farm gates (Figure 6). Government officials also noted that marketing is largely informal and poorly organized, with limited market linkage and value addition. These findings are consistent with a study by Mbaya *et al*. [18] in Borno State, Nigeria, which reported that aerial yam marketing is predominantly carried out by women and children and often sold alongside non-timber forest products in open spaces such as roadsides, motor parks and small markets.



Figure 6: Aerial Yam at Local Market and on Farm Gate

The consumption of wild type aerial yam was generally avoided in the study area. According to the survey (Table 8), 68% of respondents reported that wild type aerial yam is not consumed due to its perceived toxicity. Others cited practical limitations,

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PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST
ISSN 1684 5374

including long cooking time (16.4%) and a burning or irritating sensation in the mouth when consumed (15.6%). Focus group discussions confirmed that community members have strong indigenous knowledge distinguishing cultivated aerial yam from wild types and intentionally avoid consuming the latter. Development agents and government officials supported these findings, explaining that extension services discourage the consumption of wild aerial yam due to safety concerns.

Most respondents also indicated that wild type aerial yam is not commonly used as animal feed. However, 22.9% of respondents reported that wild animals, particularly monkeys, consume wild aerial yam (Table 8). Focus group discussions further explained that the presence of wild aerial yam in forested areas mainly serves as a food source for wildlife rather than for domestic use.

Preparation Techniques

Processing and preparation of aerial yam in the southwest part of Ethiopia, particularly in Yayo Woreda, are largely informal and household-based. Evidence from the study consistently indicated that aerial yam processing is limited to simple traditional methods, with no involvement of formal or small-scale processing enterprises in the study area.

According to the survey results, the dominant preparation methods of aerial yam are boiling and frying. For boiled aerial yam, respondents described a common preparation process that involves sorting and washing the raw tubers, followed by boiling in hot water for 30–60 minutes. After boiling, the tubers are cooled, peeled, sliced and consumed. The boiled aerial yam is commonly served with *kochkocha*, a paste made from green or red pepper with a pungent taste. Focus group discussions confirmed that this preparation method is widely practiced at the household level and is considered the simplest and safest way to consume aerial yam. Participants emphasized that boiling reduces bitterness and improves palatability. One key informant, a *kebele* leader, also reported that boiled aerial yam is the most common form of consumption in the local community.

Fried aerial yam is prepared in a manner similar to potato-based dishes (Figure 7). Survey data showed that fried aerial yam is commonly prepared using previously boiled tubers, which are sliced into pieces resembling potato chips or cubes. According to FGDs, onions are first cooked in edible oil, followed by the addition of red pepper and other locally available spices. The sliced aerial yam is then added and fried until fully cooked. This dish is usually served with *injera* or bread. Key informants from the agricultural extension office noted that pre-boiling before frying is a local practice intended to reduce cooking time and improve texture.

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Despite these preparation methods, the survey revealed that aerial yam is not used to prepare major staple foods such as *injera*, nor is it processed into flatbread, bread or porridge. Both FGDs and KIIs explained that this limited culinary use is mainly due to a lack of knowledge on alternative processing techniques, unfamiliarity with recipe diversification and the absence of training or demonstrations on value-added uses of aerial yam. Extension workers further noted that aerial yam has not been incorporated into local food processing initiatives or nutrition education programs.

In terms of consumption patterns, aerial yam is mainly eaten as lunch in boiled or fried form. Roasted aerial yam was also reported as a common practice, particularly during farm work. According to the survey, 43.2% of respondents indicated that they roast aerial yam tubers in the field and consume them as lunch during agricultural activities. Focus group discussions supported this finding, explaining that roasting is convenient during farm work because it requires minimal preparation and no cooking utensils. Aerial yam was also consumed as a snack, especially when boiled, as noted by FGD participants.

Survey results further indicated that 44.5% of respondents consumed aerial yam as a supplementary food, particularly in the evening. Respondents explained that aerial yam is an accessible and low-cost food resource during the dry season, mainly from September to January, when other food options are limited. However, KIIs highlighted that aerial yam is not consumed throughout the year due to its seasonal availability and limited storage life. Government officials and development agents emphasized that the seasonal nature of the crop, combined with inadequate preservation and processing methods, restricts its regular inclusion in household diets.

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Processing and Preparation of Foods from Aerial Yam

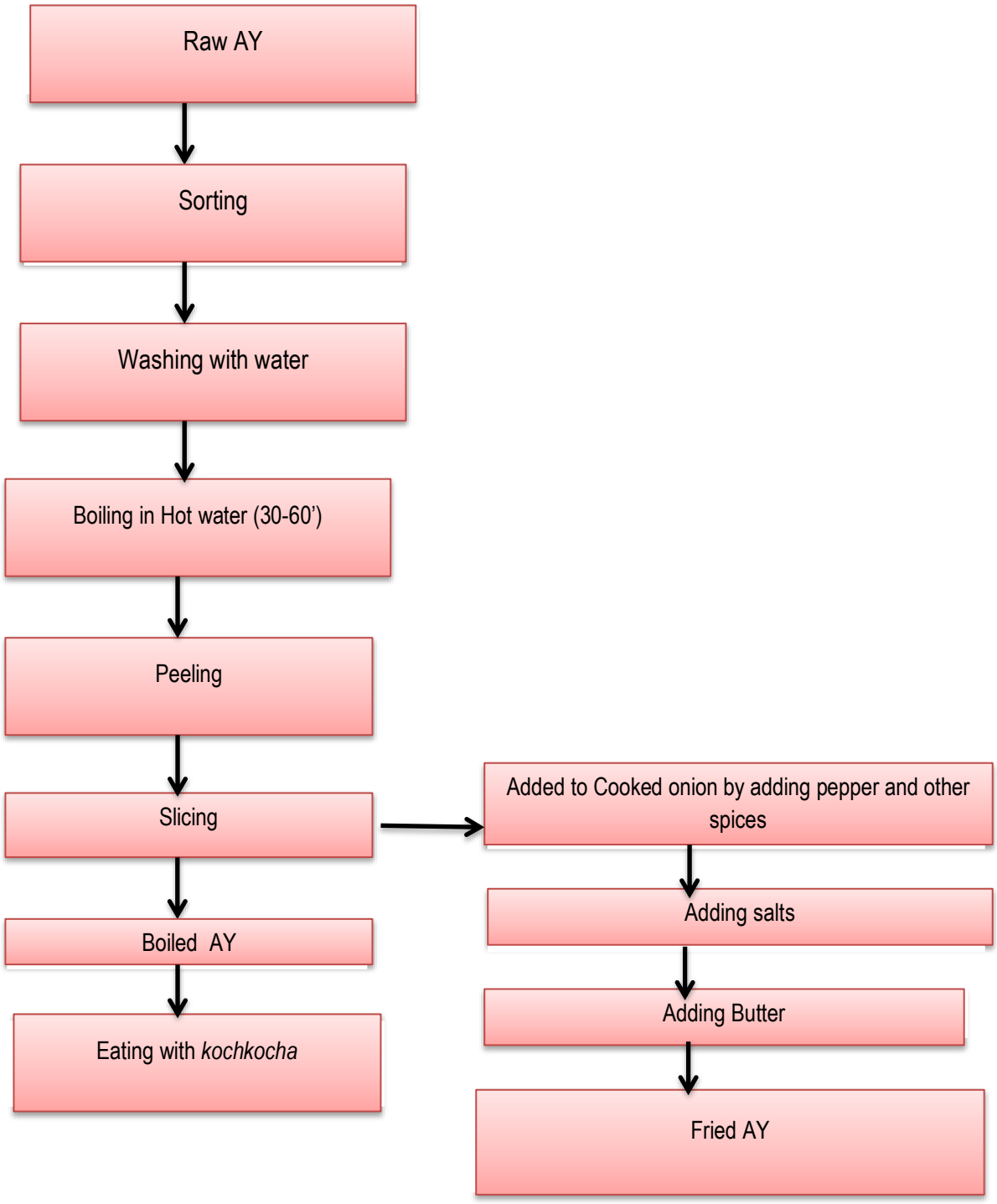


Figure 7: Flow diagram of Preparation of Boiled and Fried Aerial Yam (*Source: Own Sketch based on survey data, 2023)*

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Volume 26 No. 5
June 2026
PUBLISHED BY AFRICAN SCHOLARLY SCIENCE COMMUNICATIONS TRUST
ISSN 1684 5374

CONCLUSION AND RECOMMENDATIONS FOR DEVELOPMENT

This study assessed indigenous techniques for aerial yam (*Dioscorea bulbifera*) production, processing and consumption in Yayo Woreda, Southwest Ethiopia. The findings indicate that aerial yam is cultivated both in home gardens and farm plots, serving as an important food source and an additional income source. The wild type is largely avoided due to toxicity and long cooking time, suggesting the need for further research on its safe utilization.

The production of aerial yam is declining due to low awareness of its nutritional and economic value, limited market demand, and inadequate agronomic practices. Major constraints include insufficient extension support, reliance on traditional farming methods, and limited access to markets. Despite these challenges, farmers possess substantial indigenous knowledge regarding crop identification, harvesting, postharvest handling and household processing.

To enhance aerial yam production and utilization, the study recommends promoting indigenous knowledge alongside improved agronomic practices, postharvest handling and processing techniques. Raising community awareness of aerial yam's role in food security and income generation is essential. Extension services should actively support farmers, integrating traditional practices with research-based interventions to ensure sustainable production, improved utilization, and increased household benefits in the study area.

ACKNOWLEDGEMENTS

This study was partially supported by Hawassa University through the Institutional Collaboration Program between Hawassa University and the Norwegian University of Life sciences (NMBU). We are grateful to all who participated in this study.

Conflict of interest

The authors declare no conflict of interest.

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Volume 26 No. 5
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Table 1: Socio-demographic characteristics of aerial yam farmers at Yayo woreda

Variables	Mean (SD)	Minimum	Maximum
Age	48.45(12.12)	24	82
Farming experience	26.48(11.82)	2	60
Annual Income	58055.99(23299.67)	10000	200000
Variables	Frequency	Percent	
Sex			
Male	281	73.2	
Female	103	26.8	
Education			
Non formal education	146	38.0	
Primary	114	29.7	
Secondary	105	27.3	
College	19	4.9	
Primary occupation			
Farming	370	96.4	
Petty trade	14	3.6	
Income source			
crop and animal sale	351	91.4	
Petty trade	14	3.6	
Land rent	19	4.9	

Table 2: Aerial yam land allocation compared to other crops and its productivity

Main crops	Mean values of Plot size (ha)	Mean values of Quantity produced (kuntal)/ha
Aerial Yam	0.02	70.7
Maize	0.56	27.6
Coffee	0.76	14.0

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Volume 26 No. 5
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Table 3: Sources of aerial yam planting materials and planting sites

Sources Aerial Yam planting materials	(%)	Planting sites	(%)
Own seed tuber	42.7	In the home garden	56.3
From relatives	14.8	In the main field	13.0
From neighbor	28.1	In both areas	30.7
From market	14.3	Total	100
Total	100		

Table 4: Factors influencing the production of aerial yam

Factors affect aerial yam production	Percent
Exclusion of aerial yam from extension service	46.9
Lack of enough planting land	7.3
Lack of awareness and promotion about its production and consumption	16.1
Poor agronomic practices, which is the need for climbing stake	15.6
Low market demand and price	14.1
Total	100

Table 5: Harvesting time and indicators for harvesting of aerial yam

Harvesting time	(%)	Indicators for harvesting	(%)
Once a year in August	43.8	The bulbils fall off the plant at slight touch	34.4
Once in a year in September	31.3	The leaves wilted	41.7
Once a year in October	7.6	The color of the leaves changed from green to Yellow	24.0
November and December	17.4		
Total	100	Total	100

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Table 6: Postharvest and storage mechanisms of aerial yam

Postharvest problem (%)	Preservation treatments (%)	Storage methods (%)	Storage problems (%)	AY keeping quality (%)
Pests, 69.8	Washing, 16.4	Jutes bag, 55.7	Yam rot, 27.9	1-2 months, 17.7
Physical damage, 30.2	Drying, 29.4	Basket, 17.4	Dehydration, 33.9	3-4 months, 61.2
	No special preservation treatment, 54.2	Dry floor, 26.8	Sprouting, 38.3	5-6 months, 21.1

Source: Own survey, 2023

Table 7: Purposes of producing aerial yam and price in nearest market in ETB/kg

Uses/purposes	%	Price AY (ETB/kg)	%	Market place	%
For food consumption	74.5	Five	25.5	Farm gate	40.6
Additional income	15.4	Ten	57.8	Woreda market	22.7
Medicinal value	5.2	Fifteen	3.9	Kebele market	36.7
Cultural/social/ritual value	3.1	Twenty	11.7	Total	100.0
For animal feed	1.8	Twenty-five	1.1		
Total	100	Total	100		

Table 8: Reason for not consuming the wild type aerial yam

Factors that affect consumption of the wild type aerial yam	%	Use of wild type aerial yam by animal	%
Toxicity	68.0	Yes	22.9
Takes long time to cook	16.4	No	77.1
Burning of mouth	15.6	Total	100
Total	100		

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