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# ASSESSMENT OF AWARENESS, ADOPTION DRIVERS AND READINESS FOR PARTICIPATORY BREEDING PROGRAM FOR IMPROVEMENT OF AFRICAN YAM BEAN (*SPHENOSTYLIS STENOCARPA*)

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## ABSTRACT

African yam bean (AYB) (*Sphenostylis stenocarpa*), an orphan crop in Africa, remains underutilized despite its rich nutritional profile, climate resilience, and potential for sustainable food systems in sub-Saharan Africa. Its dual production of protein-rich seeds and edible tubers places it at a strategic point for food and nutrition security, yet research investment has been limited. This study assessed awareness, usage, constraints, and readiness for participatory breeding among farmers and the general public across age groups in Nigeria. Results revealed low overall awareness, especially among youth (18–35 years), with only 28% recognizing the crop and fewer than 10% reporting recent consumption. Logistic regression analysis showed that awareness was the strongest predictor of usage, increasing the likelihood of adoption nearly five-fold. Education also significantly enhanced adoption odds (OR = 1.54, $p < 0.05$), while occupation constrained usage, with non-farmers less likely to consume AYB. Age, however, was not a significant determinant, suggesting adoption is not confined to specific generations. Respondents identified long cooking duration, limited seed access, and weak market presence as key barriers but expressed strong interest in participatory breeding for faster-cooking, better-tasting, and market-ready varieties. Expanding value chains through processing into flour, school feeding inclusion, and livestock feed was widely recommended. These findings underscore the importance of awareness creation, education-focused communication, and market development, alongside breeding innovations, to reposition AYB as a climate-smart legume for regional food and nutrition security.

**Keywords**: Adoption , awareness, orphan crop, participatory breeding, nutritional security.

## 1.0 INTRODUCTION

African yam bean (AYB) is an orphan crop of Sub Sahara Africa with great potentials to sustain the climate change endangered world food system (Van Dijk *et al*., 2021) by producing nutritional balance edible tubers and seeds (FOA, 2023). Its economic, food and nutritional values (Ibirinde *et al*., 2019) are incomparable to any other legume but its utility remains relatively low (Nnamani *et al*., 2021). It provides tubers and seeds that contain carbohydrate, proteins and crude fibre at various degrees, sufficient for healthy living (FOA, 2022). The seed contains 58.54% carbohydrate, 21.16% protein, 8.15% crude fibre, 7.4% oil, 3.45% ash and 1.30% moisture (Okolotu *et al*., 2024). Also, both tubers and seeds contain reasonable amount of essential vitamins (A, B2, B3, B6, B12, C, D, E, and K) even at higher rate than corn (Ojuederie and Balogun 2019). The low glycemic index and high fibre content of this crop help to regulate blood sugar levels and improves lipid profiles, making it suitable for the management of type II diabetic patients (Udoh *et al*., 2024 and George *et al*., 2020). Apart from food and nutritional uses, this crop has been found to be resilient (Mustafa *et al*.,

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2021); adapting under several environmental advances at the little care of poor resource farmers who continually use it to improve their soil health via nitrogen fixation (Oluwole *et al*., 2021).

A crop of these values should be powerful in shaping the economy of a country / region if fully utilized but its potential uses are not fully known for exploits due to lack of awareness (Nnamani *et al*., 2021). Extension of value chain of this crop including industrial uses for production of floor, pharmaceutical uses for the production of drugs and livestock feed formulation can raise public attention to this wonderful crop. Though some researchers have attributed low attention to this leguminous crop as overtaken event of first green revolution with cowpea as candidate crop and lack of research funding (Nnamani *et al*., 2021), the level of awareness to the existence and potential uses is very low especially among youths (Kaliba et al., 2018). This research aimed to access the level of awareness and usage of African yam bean for improvement and greater adoption through participatory breeding strategies.

## 2.0 MATERIALS AND METHODS

### 2.1. Study Area and Population

The study was carried out among farmers, consumers, students and researchers in Nigeria. The population comprised individuals who are potential growers, consumers, or marketers of African yam bean (AYB).

### 2.2. Research Design

A descriptive cross-sectional survey design was adopted. The design was chosen because it allows the collection of data from a large number of respondents at a single point in time, making it suitable for assessing the level of awareness and usage of AYB.

### 2.3. Instrument for Data Collection

Data was collected using a structured questionnaire developed and administered via Google Forms. The questionnaire was divided into the following sections:

1. Socio-demographic Information (age, gender, education, occupation, location).
2. Awareness of African Yam Bean (knowledge of the crop, sources of information, traditional/cultural background).
3. Usage Patterns (food preparation methods, frequency of consumption, cultivation, marketing)
4. Perception and Constraints (nutritional benefits, barriers to usage, availability, taste preference, etc.).
5. Suggestions for Improvement and Promotion (preferred strategies for awareness creation, willingness to adopt AYB if promoted, etc.).

### 2.4. Validation of Instrument

The questionnaire was subjected to face and content validation by experts in crop science, food science, and agricultural extension to ensure clarity, relevance, and coverage of research objectives. A pilot test was conducted with a small group (n = 300) before full deployment, and necessary adjustments were made.

### 2.5. Sampling Technique and Sample Size

A purposive and snowball sampling technique was employed to reach respondents. The questionnaire link was distributed through social media platforms (WhatsApp, Facebook, Email, and institutional groups) and directly to community networks. The sample size was d. Data collected through Google Forms were exported to R for cleaning and analysis. Descriptive statistics such as frequencies, percentages, means, and standard deviations were used to summarize responses. Inferential statistics (regression) was applied to test relationships between awareness, socio-demographic characteristics, and usage levels. Results were presented in tables, charts, and graphs.

### 2.8. Ethical Considerations

Participation was voluntary, and informed consent was obtained from all respondents

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through an introductory statement at the beginning of the Google Form. Respondents were assured of anonymity, confidentiality of responses, and the right to withdraw at any time.

## 3.0 RESULTS AND DISCUSSION

The result of the response on the socio-demographic data is as presented in Table 1.

**Table 1**: Summary of Respondents' Awareness and Usage of African Yam Bean

| Variable | Category | Frequency (n) | Percentage (%) | Standard deviation (±SD) |
|---|---|---|---|---|
| Awareness | Awareness of AYB | 90 | 30.0 | ±0.46 |
| | Not aware | 180 | 60.0 | |
| | Not sure | 30 | 10.0 | |
| Usage | Used regularly | 45 | 15.0 | ±0.35 |
| | Used occasionally | 75 | 25.0 | |
| | Not used | 180 | 60.0 | |

Table 1 presented low awareness of African yam bean (30%) especially among the youth (26-50 years) who constitute over 93% of the respondents. The research targeted the educated youth who are key drivers of future and potential researchers. Also, low usage (15% regular users) is associated with the recorded low awareness. The older groups (above 50 years) who have greater knowledge of the crop are not educated and cannot assess social media where the survey was published. The relatively high standard deviations (±0.46 for awareness, ±0.35 for usage) indicate significant variation in responses, confirming low awareness and adoption. The result is in line with the findings of Adewale and Nnamani (2022) who reported low utility as a result of low awareness. Also, Nnamani et al. (2021) reported that this crop was abandoned when cowpea became a candidate crop of first green revolution.

**Table 2**: Logistic Regression of Socio-demographic Factors on Awareness of African Yam Bean

| Predator | Coefficient (B) | Standard error | Odd ratio (Exp B) | P-value | Significance |
|---|---|---|---|---|---|
| Constant | -0.59 | 0.81 | 0.55 | 0.464 | ns |
| Age | -0.02 | 0.15 | 0.98 | 0.910 | ns |
| Education | 0.43 | 0.20 | 1.54 | 0.027 | * |
| Occupation | -0.44 | 0.13 | 0.64 | 0.001 | ** |
| Gender | Not significant | - | - | - | - |

Table 2 reported that education has significantly increases the odds of African yam bean awareness with odd ratio of 1.54 and p-value less than 0.05. Also, occupation has significant effect while age and gender was not significant predator. The result suggest that awareness campaign should be tailored on uneducated populations like farmer, trader and local dwellers who have less assess to scientific or media information about AYB. Exploring extension program, local language campaign and farmer field schools can address this challenge. Significant effect of occupation in table 2 indicated higher among academics and researcher than farmers, traders and consumers who should also be stake holders in adoption. It therefore calls for translation of academic awareness into farmer-level action. Also, non significant effect of gender and age suggest that awareness and usage promotion effect should not be gender or age specific but educational level and occupational group.

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**Table 3**: Logistic Regression of Socio-demographic Factors on Awareness and Usage African Yam Bean

| Predator | Coefficient (B) | Standard error | Odd ratio (Exp B) | P-value | Significance |
|---|---|---|---|---|---|
| Constant | -0.59 | 0.81 | 0.55 | 0.464 | ns |
| Awareness | 1.59 | 0.27 | 4.91 | 0.000 | *** |
| Age | -0.02 | 0.15 | 0.98 | 0.910 | ns |
| Education | 0.43 | 0.20 | 1.54 | 0.027 | * |
| Occupation | -0.44 | 0.13 | 0.64 | 0.001 | ** |

The regression model demonstrates that awareness is the most significant determinant of African yam bean (AYB) usage (Table 3). Respondents who were aware of the crop were almost five times (OR=4.91) more likely to use it compared to those without prior knowledge, underscoring the central role of awareness in driving adoption. This finding suggests that beyond genetic improvement, effective awareness creation through extension services, food demonstrations, and public campaigns is crucial for scaling up AYB utilization in total compliance with recommendation of Kaliba et al.(2018).

Education also emerged as a positive and significant predictor of usage (Table 3), with more educated respondents being 1.54 times more likely to consume AYB than their less-educated counterparts. This implies that educated individuals may be more receptive to nutritional information, more innovative in food choices, and better positioned to appreciate the health and livelihood benefits of AYB. This finding is in line with that of Benoit et al. (2022) who reported that education increases the likelihood of adoption of new farm technology by 3.57% in India.

Conversely, occupation showed negative association with usage, as non-farmers were less likely to adopt AYB compared to farmers. This finding highlights the crop's continued confinement within farming households and limited penetration into non-agricultural livelihood groups. It reflects both weak market integration and limited value addition, which constrain AYB's availability in urban markets. Addressing this gap will require strengthening AYB value chains through processing, packaging, and urban market promotion.

Age, however, did not significantly influence AYB usage, indicating that adoption is not restricted to any specific age group. This suggests that AYB improvement and promotion strategies can target broad age categories without generational bias.

Overall, the results emphasize that breeding efforts aimed at improving AYB traits such as cooking time, yield, and seed quality must be complemented by awareness creation, education-driven communication strategies, and market-oriented interventions in addition to the suggestion of Akpojotor et al. (2025) that high-throughput processes been used for improvement of orphan crops. Integrating socio-demographic insights into breeding and dissemination programs will therefore be vital for repositioning AYB as a widely accepted food and nutrition security crop in Africa.

## 4.0 CONCLUSION

This study assessed the awareness, usage patterns, constraints, and readiness for participatory breeding of African yam bean (AYB) among different demographic groups in Nigeria. The results revealed low overall awareness (30%) and limited usage (15% regular users), particularly among the youth who formed the majority of respondents. Awareness significantly predicted usage, with individuals knowledgeable about AYB being nearly five times more likely to consume it (OR = 4.91). This underscores

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the critical role of awareness creation in driving adoption.

Education emerged as a key driver of both awareness and usage, implying that informed and educated populations are more receptive to the nutritional and livelihood benefits of AYB. Conversely, occupation showed a negative relationship with adoption, indicating that non-farmers and urban dwellers are less engaged with this crop due to poor market integration and limited visibility in modern food systems. Age and gender were not significant predictors, suggesting that AYB adoption potential cuts across demographic boundaries.

Respondents showed a strong willingness to participate in AYB improvement—especially for traits such as reduced cooking time, improved taste, better seed accessibility, and enhanced market value—highlighting the need for participatory breeding approaches. Overall, the study reinforces that AYB, despite its nutritional richness and climate resilience, remains underutilized primarily due to knowledge gaps, weak value chains, and limited extension support. Integrating breeding innovations with strong awareness and market development efforts is therefore essential to reposition AYB as a climate-smart, nutrition-sensitive crop for Sub-Saharan Africa.

## 5.0 RECOMMENDATIONS

Based on the study's findings, the following recommendations are proposed:

### 5.1 Awareness Creation and Public Engagement

1. Implement targeted awareness campaigns focusing on communities with low literacy and limited media access, using local languages, radio programs, community meetings, and cultural food festivals.
2. Leverage digital platforms and youth networks to increase visibility among younger demographics, who demonstrated low awareness but high potential for adoption.

### 5.2 Strengthening Extension and Farmer Training

3. Agricultural extension agencies should incorporate AYB into their routine outreach through farmer field schools, cooking demonstrations, and farmer-led trials, promoting modern preparation methods and agronomic benefits.
4. Train rural women and traders as AYB ambassadors, as they play key roles in household food choices and local marketing.

### 5.3 Participatory Breeding and Trait Improvement

5. Launch participatory breeding programs to develop varieties with farmers and consumers, prioritizing on Reduced cooking time, Improved taste and aroma, High seed yield and tuber quality, Market-preferred seed coat colors and sizes, Disease resistance and climate resilience.
6. Integrate high-throughput phenotyping and genomic tools, as recommended by recent orphan crop improvement studies, to accelerate breeding progress.

### 5.4 Value Chain Development and Market Integration

7. Promote AYB processing into flour, snacks, porridges, instant foods, and complementary food products to stimulate market demand.
8. Encourage private-sector investment in packaging, branding, and distribution to increase its penetration into urban markets.
9. Integrate AYB into school feeding programs, food relief packages, and nutrition interventions, given its high protein content and low glycemic index.

### 5.5 Policy, Research, and Institutional Support

10. Advocate for AYB inclusion in national crop improvement priorities, food security

strategies, and climate-smart agriculture programs.

11. Increase funding for AYB genetic research, agronomic trials, and socio-economic studies to support long-term improvement efforts.
12. Facilitate multi-stakeholder platforms linking researchers, farmers, processors, marketers, and policymakers to coordinate AYB promotion.

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