

# Assessment of the contribution of African Yam Bean (*Sphenostylis stenocarpa*) to farm households' food supply chain in Ekiti State, Nigeria

Baiyeri, S.O.<sup>1</sup>; Amusa T. A.<sup>2</sup>; Otitoju, G.T.O.<sup>3</sup> and Victor-Sunday, S.<sup>4</sup>

<sup>1</sup>Department of Crop Science and Horticulture, Federal University, Oye-Ekiti, Ekiti, State.

<sup>2</sup>Department of Agricultural Economics, Michael Okpara University of Agriculture, Umudike, Abia State.

<sup>3</sup>Department of Hospitality and Tourism Management, Federal University, Wukari, Taraba State.

<sup>4</sup>Department of Agricultural Economics and Extension, Federal University, Oye-Ekiti, Ekiti State.

\*Corresponding author: baiyerisamuel@gmail.com

## ABSTRACT

**Background:** African yam bean (AYB) had been largely grown in time past in Ekiti State for its huge nutritional, nutraceutical, and economic values. AYB's relevance in households' food supply chain and utilization has greatly reduced. Valid information on AYB consumption and utilization and possible constraints associated with its utilization in the State are therefore required to reposition the crop for food and nutrition security and policy-making

**Objective:** The study assessed the contribution of African yam bean to farm households' food supply in Ekiti State.

**Materials and methods:** Multistage random sampling technique was used in selecting 120 farm households for the study. Structured questionnaire and interview schedule were employed in data collection. Data collected were analysed using descriptive statistics.

**Results:** The result showed that AYB delicacies for food security among farm households in the study area include: 75% boil and eat AYB alone, 70% eat it as yam porridge, 64.6% eat AYB as corn porridge, 51.7% eat it as plantain porridge, 26.7% eat AYB as moi-moi, 24.7% eat it as snack (baked), while only 14.2% roast AYB for consumption. AYB seeds (31.7%), fresh leaves (22.5%), tubers (47.5%) and residues (78.3%) are crucial in livestock feeding. Some of the constraints against AYB consumption include: long cooking period (93.3%), poor awareness of its nutritional benefits among the people (81.7%), poor availability of the seeds in market (51.7%), and low demand for the commodity (49.2%).

**Conclusion:** The study recommends improved supply of AYB seeds for increased consumption and more awareness creation on the nutritional benefits of AYB among Nigerians.

**Keyword:** African yam bean, food, supply, households, Ekiti.

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## INTRODUCTION:

Globally, a reasonable proportion of the plant-based foods consumed by the elites and resource-poor people fall into the category of crops known as "minor", "orphan", "underutilized" "under-exploited" or "neglected" crop. These crops are

usually native of various agrarian communities in various countries, grown by the indigenous farmers, and greatly cherished for their various dietary, nutritional, cultural and economic values. Bioversity International/IFAD (1) noted that these

neglected and underutilized crops are resilient and cope with the adverse effects of climate change, play vital roles in local agri-production and food consumption systems. They further noted that these crops are: excluded in development and research agenda and ignored by policy makers, highly adapted to marginal areas and agro-ecological niches, information on their production and utilization are usually based on indigenous knowledge; they are hardly represented in ex situ gene banks.

Some of commonly consumed and notable neglected and underutilized crops are the grain legumes, cereals, root and tuber crops and vegetables. In affirmation, (2) noted that large proportions of neglected crops are grain legumes. According to Baiyeri, *et al.* (3), African yam bean (AYB) (*Sphenostylis stenocarpa*) is one of these important but under-exploited grain legumes producing edible tubers and seeds that are consumed both as food for humans and feed for livestock across Africa including Nigeria. Its potential for enhanced and sustained nutrition and food security has also been reported to be due to its high micronutrient, high dry matter, high protein and energy contents with appreciable fibre contents (4, 5). African yam bean contains phytochemicals that have pharmacological and positive physiological actions and its processed seeds are used in managing high blood pressure and treating mumps in ethno-medicine (4). African yam bean among other underutilized crops are reported to contain compounds that enhance animal and human health. Several of these compounds have not been fully exploited to enhance the nutrition of the malnourished population (6).

African yam bean is widely grown in both Northern and Southern parts of Nigeria. For instance, Southwestern Nigeria especially Ekiti State had been a major producer of African yam bean for its huge nutritional, medicinal, and economic values. Hence, the contribution of African yam bean to households' food supply chain is enormous, if properly harnessed. The older generation of farmers grew the crop as a major crop in traditional cropping systems and it was well known for its excellent grain yield when intercropped with yam and other staple food crops. It is imperative to note that, despite the food security and nutritional

significance of African yam bean, it is hardly grown by the younger generation of farmers across the State. Over the years, the relevance of the commodity in households' food supply chain has dropped significantly and the huge genetic diversity of this important crop is currently being lost among farming households in Ekiti State as its utilization has greatly reduced. Hence, there is need for valid information on the consumption and utilization of African yam bean and possible constraints associated with its utilization in the study area.

### **Methodology**

The study was conducted in Ekiti State. The State is made up of 16 administrative Local Government Areas with an estimated population of 3,270,798 people (7). Ekiti State is one of the main producers of African yam bean in Southwestern Nigeria. Multistage random sampling technique was used in selecting 120 farm households that constituted the respondents for the study across the state. The first stage involved random selection of six Local Government Areas LGAs in the states which include: Ado, Ijero, Ikere, Ise/Orun, Ikole and Oye-Ekiti. At the second stage, two communities were randomly selected from each of the six LGAs making 12 communities for the study. The third stage involved random sampling of 10 farm households from each of the 12 communities giving a total sample of 120 farm households for the study. In each farm household, the home maker was interviewed and made to respond to the items of the questionnaire.

The data for the study were collected by the researchers with research assistants. The questionnaire was structured to obtain data on the socioeconomic attributes of the respondents, various forms of AYB delicacies, livestock feeding, and the challenges observed by households in the use of AYB for food in the area. Data collected were analyzed using descriptive statistics such as charts, frequency, percentage and mean.

## **RESULTS AND DISCUSSION**

### **Socioeconomic Characteristics of the Farmers**

The results in Table 1 show that the mean of gender (1 male, 0 female) of the respondents was 0.65 indicating that there are slightly more male than

female headed farm households. The minimum and maximum years of education of the households heads were 0 (zero) and 18 years respectively with mean of about 10 years of education. The minimum farm household size was 4 persons while the maximum was 12 persons with mean household size of 7 persons. This

indicates a relatively large households' size in the study area. The minimum years of farming experience in producing AYB were 9 years while the maximum years recorded were 53 years with the mean of about 39 years in AYB farming.

**Table 1:** Summarized Statistics of Socioeconomic Characteristics of the Farmers (n = 120)

Variables	Nature of Data	Min.	Max.	Mean	Std. Dev.
Gender	Dummy	0.00	1.00	0.55	0.48
Age of Farmers	Continuous	33.00	77.00	50.59	11.06
Years of Education	Continuous	0.00	18.00	10.14	5.16
Household Size	Continuous	4.00	12.00	7.00	1.55
Primary Occupation	Dummy	0.00	1.00	0.72	0.50
Farm Experience	Continuous	9.00	53.00	38.59	12.02

**Source:** Field Survey, 2022.

**Table 2:** Frequency and Percentage Distribution of Forms of African Yam Bean Delicacies in the Study Area (n = 120).

SN	Forms of AYB Delicacies	Frequency	Percentage	Ranking Order
1	Eaten as snack	29*	24.7	6 <sup>th</sup>
2	Moi-moi	32*	26.7	5 <sup>th</sup>
3	Boil with yam and eaten as porridge	84*	70.0	2 <sup>nd</sup>
4	Boil with plantain and eaten as porridge	62*	51.7	4 <sup>th</sup>
5	Boil and eaten alone	90*	75.0	1 <sup>st</sup>
6	Boil with corn for food	77*	64.6	3 <sup>rd</sup>
7	Roasted	17*	14.2	7 <sup>th</sup>

**Note:** \* = indicates multiple responses

**Sources:** Field Survey Data, 2022.

**Source:** Field Survey, 2022.

### Contribution of African Yam Bean to Households Food Chain

The contribution of AYB to households' food chain is enormous in Ekiti State as it was combined with other staple for production of various delicacies. Table 2 presents the results of multiple responses and ranking order of various forms of AYB delicacies. About 75% reported boiling and eating AYB alone, 70% eats it as yam porridge, 64.6% eats AYB as corn porridge, 51.7% eats it as plantain porridge, 26.7% eats AYB as moi-moi, 24.7% eats it as snack (baked) while only 14.2%

roasts AYB for consumption. AYB porridge, snacks and cookies are widely consumed among people of various socioeconomic statuses.

### Frequency of consumption of African yam bean

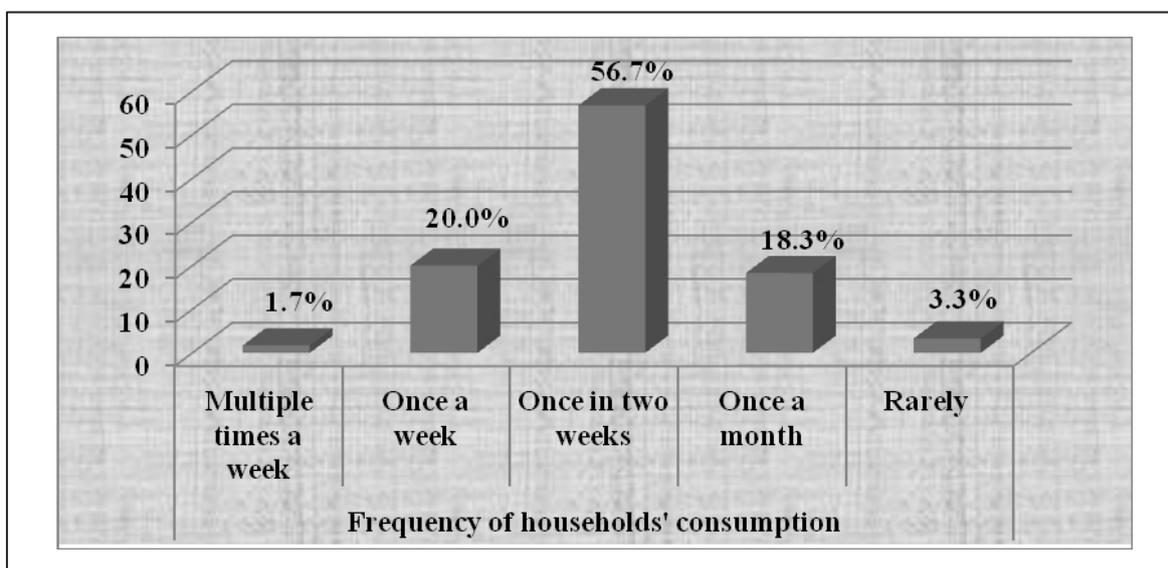
The frequency of consumption of AYB meals by households is presented in figure 1. Only 1.7% of the respondents indicated the consumption of AYB multiple times a week, 20% consumes it once a week, majority (56.7%) indicated the consumption of AYB meals once in two weeks, while 18.3% and 3.3% of the respondents consumes AYB meals in their

households once a month and rarely respectively.

### Use of African Yam Bean for Livestock Feeding

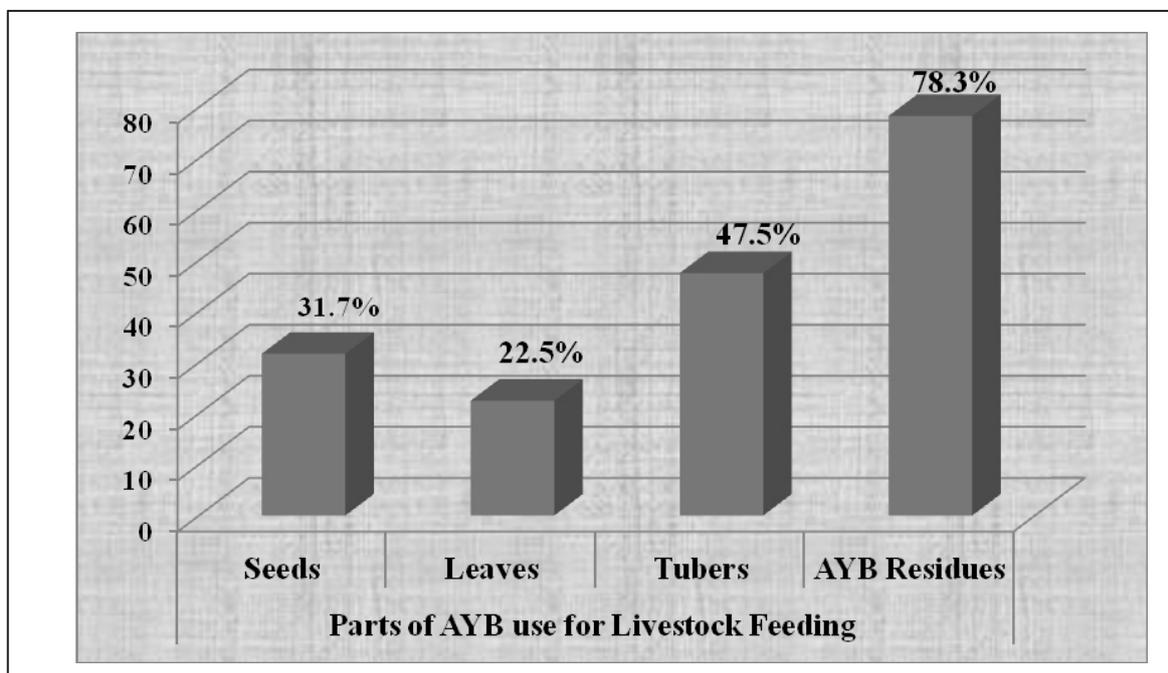
Apart from the crucial contribution of AYB to households' food supply and security, its contributions to livestock feeding is enormous. The result of multiple responses in figure 2 showed that 31.7% of the AYB farmers affirmed the use of

seeds for livestock feed composition, 22.5% agreed to the use of fresh AYB leaves for livestock feeding, while 47.5% and 78.3% of the respondents used AYB tubers and residues respectively for feeding of livestock. Immature AYB seeds, pods, leaves, vines, tubers and other forms of residues after harvesting and processing constitute significant sources of protein to livestock.



**Figure 1:** Bar Chart of Frequency of Households' Consumption of AYB

**Sources:** Field Survey Data, 2022.



**Figure 2:** Bar Chart of Parts of AYB use for Livestock Feeding

**Sources:** Field Survey Data, 2022.

**Table 3:** Frequency and Percentage Distribution of Constraints to Utilization of African Yam Bean for Food in the Study Area (n = 120).

SN	Constraints to consumption of AYB for food	Frequency	Percentage	Ranking
				Order
1	Poor seed quality	34*	28.3	5 <sup>th</sup>
2	Diseases and spoilage in storage	33*	27.5	6 <sup>th</sup>
3	Low demand for African yam bean for food	59*	49.2	4 <sup>th</sup>
4	Poor availability of seeds for food	62*	51.7	3 <sup>rd</sup>
5	Long cooking period	112*	93.3	1 <sup>st</sup>
6	Poor awareness of nutritional values of African yam bean	98*	81.7	2 <sup>nd</sup>

**Note:** \* = indicates multiple responses

**Sources:** Field Survey Data, 2022.

### Major challenges in utilization of African yam bean for food in the area

Despite the huge economic and nutritional potential of AYB, there are some constraints against its consumption among households. Some of the challenges against AYB consumption as indicated by the respondents in Table 3 include: long cooking period (93.3%), poor awareness of its nutritional benefits among the people (81.7%), poor availability of the seeds in market (51.7%), and low demand for the commodity (49.2%).

### Discussion

The socio-economic characteristics of the respondents evaluated in this study included: gender, age of farmers, years of education, household size, primary occupation and farming experience. The results of the study showed that both men and women were involved in the AYB value chain activities. The value chain activities carried out by both men and women suggest a potential for a sustainable production and utilization of AYB in Ekiti State. This agrees with the findings of (8) that found no gender bias in AYB value chain activities in Enugu State. The presence of more male-headed farm households in the study area was in line with the result of (9) that reported that 73.1% of rice farm household-heads in Ekiti State were males. The mean of the minimum and maximum ages of the respondents being 50.59 years suggests that the farm

household heads are still relatively active though tending towards their declining productive stage. Akinagbe and Akinbobola (10) found that the mean age of crop farmers in Ekiti State was 46 years which is within the same bracket with 50 years implying relatively active age. These results conformed with that of Ndubuisi, *et al.* (11) who also found that majority of respondents that were involved in AYB value chain especially the production and utilization of AYB in Abia State were in their middle and active ages with secondary education. There is therefore the need to sensitize the youths about the huge potentials in AYB for food and nutrition security and income generation and get them actively involved in the AYB value chain. The mean household size of 7 persons indicates a relatively large households' size in the study area. Kadiri, *et al.* (12) established the mean farm households' size of 6 persons. The mean value of primary occupation of the respondents of 0.72 indicates that greater percentage of the respondents were primarily into farming for livelihood. Ekiti State is predominantly an agrarian State (13) with majority of the people involved in agricultural activities. This reveals that the respondents are relatively experienced in AYB production activities.

The contribution of AYB to households' food chain is enormous as it is combined with other staple for production of various delicacies. African yam bean has been used by many households to fortify and enrich several staples such as yam, corn,

plantain, potato and traditional snacks (14). Cooked porridge of AYB with other staple improves food taste, protein, and nutrients (15). According to Toyosi *et al.* (16) various African yam bean delicacies contribute to improved food security and human nutrition. Ndubuisi, *et al.* (11) equally identified various AYB delicacies to include being eaten alone as fresh vegetable, eaten with maize, abacha or yam as porridge. The result of the frequency of consumption of AYB meals by households revealed that the majority of the respondents consume AYB meals regularly have clearly shown that AYB meals play significant role in households' food supply chain and nutrition security in the study area. Baiyeri *et al.* (4) and Baiyeri and Samuel-Baiyeri (17) have reported that AYB seeds and tubers are nutrient-dense and have the potentials for combating micronutrient deficiencies and protein-energy malnutrition hence, enhancing human nutrition and health. Ndubuisi *et al.* (11) submitted that AYB is a key commodity for improving food security among African households as an inexpensive source of protein with great potential to meet the increasing food demands of the teeming population. Nnamani, *et al.* (18) noted also that AYB is a significant source of food for the resource-poor rural and semi-rural communities.

Apart from the crucial contribution of AYB to households' food supply and security, its contributions to livestock feeding is enormous. The results of the multiple responses of the AYB farmers affirmed the use of AYB seeds for livestock feed formulation. Worth noting is the fact that up to 78.3% of the respondents use AYB tubers and residues respectively for feeding livestock. Immature AYB seeds, pods, leaves, vines, tubers and other forms of residues after harvesting and processing also constitute significant sources of protein for livestock nutrition. This is therefore signaling an immense opportunity for AYB-based livestock feeds production in Nigeria. Adesiyun (19) reported that AYB is mostly grown in Nigeria for its seeds unlike other parts of Africa countries where it is grown for tubers, for human and feeding of livestock. Baiyeri *et al.* (4) and Baiyeri and Samuel-Baiyeri (17) however suggested the

inclusion of processed AYB seeds and tubers as raw materials in the formulation of both fish and livestock feeds. Ojuederie and Balogun (2) recognized the role of AYB as a major component of animal feeds. Gbenga-Fabusiwa (20) emphasized the significance of AYB plant as a cheaper, and affordable source of food and nutrients to global population and livestock. AYB is loaded with nutrients that are considered good for incorporation in animal feed (Onuoha *et al.*, 2017).

Despite the huge economic and nutritional potentials of AYB, there are some constraints that negatively affect its consumption among households in the study area. Major among the challenges militating against AYB consumption as indicated by the respondents included; long cooking time, poor awareness of its nutritional benefits among the people, poor availability of the seeds in the market, and low demand for the commodity. These results agree with the findings of earlier researchers that reported challenges that have led to its underutilization and production. Baiyeri *et al.* (22); Baiyeri *et al.* (2) identified long cooking time of the seed due to its hard testa, lack of processed products from AYB in eateries and supermarkets, lack of awareness of its nutraceutical and nutritional benefits, high cost of production arising from staking its vine for good yield, paucity of information on improved agronomic management practices, lack of improved varieties, genetic erosion of its biodiversity in major growing areas and very limited funding for research as key constraints that need to be overcome in AYB. Toyosi, *et al.* (16) also affirmed that AYB is widely described as a hard-to-cook and underexploited crop. This has negatively affected its consumption. Ndubuisi *et al.* (11) observed that diseases and pest and inadequate information about AYB are parts of the constraints against its utilization and consumption. Adesiyun (2020) noted that not many people have heard of the nutritional benefits of AYB; its low availability and being categorized as a hard-to-cook crop constitute challenges to its utilization as food among households. Research and funding efforts should therefore be focused on these key challenges in

order to realize the potentials of this invaluable multipurpose tropical legume. Nutritionists, food experts, policy-makers, governmental agencies and researchers need to explore and maximize the huge opportunities in this crop for food and nutrition security, product development, research and income generation.

### CONCLUSION AND RECOMMENDATIONS

African yam bean is an important staple and its contribution to household food security in Africa, Nigeria and Ekiti State in particular cannot be over-emphasized. Though regarded as underutilized, under-exploited, neglected and resource-poor people's food, AYB remains crucial in households' food supply. It is frequently consumed through various delicacies such as: boiled and eaten alone, eaten with yam as porridge, eaten with corn as porridge, boiled with plantain and eaten as porridge, moi-moi and processed and eaten as snack. Apart from contributing to food security for humans, AYB also contributes significantly to livestock feeding. Despite the significance of AYB as a staple, there are some notable constraints to its consumption which include: long cooking period, poor awareness of its nutritional values, poor availability of seeds for food and low demand for African yam bean for food. Based on the findings, the study concludes that AYB is beyond doubt a food and nutrition security staple and its production and consumption should be prioritized to achieve the desired food self-sufficiency and balanced nutrition among the people. It is therefore recommended that there should be improved supply of AYB seeds for increased consumption and improved awareness creation on its nutritional benefits among Nigerians.

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### REFERENCES

1. Bioversity International/IFAD (2021). How to do: Promote Neglected and Underutilized Species. [https://www.ifad.org/documents/38714170/43559125/HTDN\\_NUS\\_3.pdf/297d93eb-330b-19a1-4804-c31d49e9fd37?t=1629384619783](https://www.ifad.org/documents/38714170/43559125/HTDN_NUS_3.pdf/297d93eb-330b-19a1-4804-c31d49e9fd37?t=1629384619783). Accessed 19/08/2022
2. Ojuederie, O. B. and Balogun, M. O. (2019). African Yam Bean (*Sphenostylis Stenocarpa*) Tubers for Nutritional Security. *Journal of Underutilized Legumes*, 1(1):56–68.
3. Baiyeri, S. O., Uguru, M. I., Ogbonna, P. E. and Okechukwu, R. (2018a). Growth, Yield and Yield Components of African Yam Bean and Cassava in African Yam Bean/Cassava Cropping Systems in a Derived Savannah Agro-Ecology. *Nigerian Journal of Crop Science*, 5(2):73–82.
4. Baiyeri, S. O., Uguru, M. I., Ogbonna, P. E., Samuel-Baiyeri, C. C. A., Okechukwu, R., Kumaga, F. K and Amoatey, C. (2018b). Evaluation of the Nutritional Composition of the Seeds of Some Selected African Yam Bean (*Sphenostylis stenocarpa* Hochst ex. A. Rich.) Harms accessions. *Agro-Science: Journal of Tropical Agriculture, Food, Environment and Extension*, 17(2):36–43.
5. Baiyeri, S. O., Uguru, M. I., Ogbonna, P. E. and Okechukwu, R. (2022). Evaluation of Elite and Local African Yam Bean Cultivars for Yield and Yield-related Traits. *Tropical Agriculture (Trinidad)*, 99(2):90-105.
6. Ogwu, M., Ahana, C and Osawaru, M. (2018). Sustainable food production in Nigeria: A case study for Bambara groundnut (*Vigna subterranea* (L) Verdic fabaceae). *Journal of Environment, Technology and Sustainable Development*, 1(1):68–77.
7. National Bureau of Statistics [NBS], (2020). National Population Estimates. Abuja: National Bureau of Statistics.
8. Iwuchukwu, J.C., Nwobodo, C.E. Ezema, C.N. and Udoeye, C. (2017). Value addition activities and challenges of African yam bean (*Sphenostylis stenocarpa*).farmers in Enugu State. *Sustainability, Agriculture*,

- Food and Environmental Research, 5(4):42-65.
9. Osanyinlusi, O. I and Adenegan, K. O. (2016). The Determinants of Rice Farmers' Productivity in Ekiti State, Nigeria. *Greener Journal of Agricultural Sciences*, 6(2):49–58.
  10. Akinagbe, O. M and Akinbobola, T. P. (2022). Farmers Adoption Level of New Rice for Africa (NERICA) Varieties in Ekiti State, Nigeria. *Agricultural Research*, 11:321–329.
  11. Ndubuisi, P. O., Micheal, A., Nwafor, S. C and Amadi, C. O. (2022). Factors Affecting Production and Consumption of African Yam Bean (*Sphenostylis stenocarpa* Hochst. Ex. A. Rich) Harms) in South-East Agro-ecological Zone of Nigeria. *Journal of Natural Sciences Research*, 13(10):43–50.
  12. Kadiri, F. A., Eze, C.C., Orebiyi, J. S., Lemchi, J. I., Ohajianya, D. O and Nwaiwu, I. U. (2014). Technical Efficiency in Paddy Rice Production in Niger Delta Region of Nigeria. *Global Journal of Agricultural Research*, 2(2):33–43.
  13. Popoola, J., Ojuederie, O., Omonhinmin, C and Adegbite, A. (2019). Neglected and Underutilized Legume Crops: Improvement and Future Prospects. Available on DOI: <http://dx.doi.org/10.5772/intechopen.87069>
  14. Babarinde, G. O., Adeyanju, J. A and Omogunsoye, A. M. (2019). Protein Enriched Breakfast Meal from Sweet Potato and African Yam Bean Mixes. *Bangladesh Journal of Science and Industrial Research*, 54(2):125–130.
  15. Obidike, J. (2021). African yam bean (Ijiriji): Nutrition, Benefits, and Uses. Retrieved 23rd March, 2023 from <https://www.healthfulwonders.com/african-yam-bean-ijiriji-nutrition-benefits-and-uses/>.
  16. Toyosi, T. G., Obilana, A. O and Oyeyinka, S. A. (2020). The prospects of African yam bean: past and future importance. *Heliyon*, 6(1):1-10.
  17. Baiyeri, S.O. and Samuel-Baiyeri, C.C. (2023). Nutrients, the Bioavailability of Micronutrients and Antinutrients Composition of African Yam Bean Tubers. *Tropical Journal of Natural Product Research*, 7(4):2823-2828.
  18. Nnamani, C. V., Adewale, D. B., Oselebe, H. O and Atkinson, C. J. (2021). African Yam Bean the Choice for Climate Change Resilience: Need for Conservation and Policy. In W. Leal Filho et al. (Eds.), *African Handbook of Climate Change Adaptation*, page 453 – 469.
  19. Adesiyun, Y. (2020). African Yam Beans – African Indigenous Crop. Retrieved 28th March, 2023 from <https://behealthyafrica.com/african-yam-beans-african-indigenous-crop/>.
  20. Gbenga-Fabusawa, F. J. (2020). African Yam Beans (*Sphenostylis stenocarpa*): A Review of a Novel Tropical Food Plant for Human Nutrition, Health and Food Security. *African Journal of Food Science*, 15(1):33-47.
  21. Onuoha, C. H., Harry, B. J and Eze, S. O. (2017). Evaluation of Nutrients and Anti-Nutritional Factors of Different Species of African Yam Bean (*Sphenostylis Stenocarpa*). *European Journal of Basic and Applied Sciences*, 4 (1):1 – 12.
  22. Baiyeri, S.O., M.I. Uguru, P.E. Ogbonna, and R. Okechukwu. "Comparative and Productive Interactions of African Yam Bean and Cassava Intercrop in a Derived Savanna Agro-Ecology." Paper presented at the World Congress on Root and Tuber Crops, held at Nanning, Guangxi, China. 18-22 January 2016. Electronic proceeding on: [www.gcp21/wcrtc/](http://www.gcp21/wcrtc/)