AWARENESS AND CONSUMPTION PATTERN OF UNDERUTILIZED LEGUMES AMONG UNDERGRADUATE STUDENTS: A CASE STUDY OF UNILAG

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Abstract

Underutilised Legumes such as Bambara groundnut (*Vigna subterranea*), African yam bean (*Sphenostylis stenocarpa*), Cowpea (*Vigna unguiculata*) and Winged bean (*Psophocarpus tetragonolobus*) have been identified as viable protein sources in regions where animal protein is inaccessible. The University of Lagos is renowned for its commitment to excellence, but it faces a growing challenge that threatens the well-being of its student population as a result of a decline in the affordability and availability of protein-rich foods. This study aims to determine protein availability and affordability for University of Lagos students by promoting the consumption of underutilised legumes. This study adopts a quantitative research approach, emphasising numerical data, objective analysis, and statistical interpretation to examine the feasibility of underutilised legumes as affordable protein sources for UNILAG students. A cross-sectional research design is employed, allowing for data collection at a single point in time to assess students' awareness, consumption patterns, and willingness to adopt these legumes. The study utilises structured surveys, market feasibility analysis, and sensory evaluation trials to gather empirical evidence. This design ensures comprehensive data collection, enabling scientific validation of the legumes' nutritional value, affordability, and consumer acceptance while providing actionable insights for food security interventions. Seventy-one (71.7%) per cent of the participants identified as female, while 28.3% identified as male. The academic level of the respondents. More so, the majority of the respondents (37.4%) were in the 500 level, followed by 400 level students (26.5%). The result of this study also showed that affordability was a major issue in the consumption of the underutilised legumes, as the majority could barely afford the legumes due to the harsh economic realities of the country.

Keywords: Underutilised, Legumes, Cowpea, African Yam Bean, Bambara groundnut

Introduction

The nutritional well-being of university students is a critical factor influencing their academic success and overall health. However, economic challenges, particularly in Nigeria, have led to concerns about the affordability and availability of protein-rich foods for this population. This literature review examines the current state of protein consumption among university students, the potential of underutilised legumes as alternative protein sources, and the factors influencing their adoption. It also highlights the importance of culturally sensitive interventions to promote sustainable dietary changes (Sharmili et al 2023).

The term underutilized legumes " refers to a diverse group of leguminous plants that have been historically overlooked or underused in mainstream agriculture and food systems, despite their potential nutritional, environmental, and socio-economic benefits (Rana et al 2023). These legumes encompass a wide range of species, many of which have been traditionally cultivated by indigenous communities or in specific regions but have received limited attention in terms of research, breeding, and commercialization compared to major crops like soybeans and common

beans (Ayilara et al 2022). The legumes, which include *Vigna radiata* (mung bean), *Macrotyloma uniflorum* (horse gram), *Psophocarpus tetragonolobus* (winged bean), and *Vigna subterranean* (Bambara groundnut), among others, possess genetic diversity and inherent benefits that have often gone unrecognised amidst the dominance of major legumes in global agriculture (Sharmili et al 2023). The primary reason why some legumes have not received the recognition they deserve and remain underutilised is an over-reliance on a few popular legume varieties in the global market (Odeku et al 2024; Ikhajiagbe et al 2022). For example, common beans are widely consumed and cultivated, overshadowing lesser-known legume species (Ayilara et al 2022). More so, the lack of awareness and knowledge about the nutritional and health benefits associated with the consumption of a diverse range of underutilised legumes has led to limited demand and subsequently, limited cultivation and distribution of these legumes (Rana et al 2023).

The University of Lagos, a prestigious institution renowned for its commitment to excellence, faces a growing challenge that threatens the well-being of its student population: a decline in the affordability and availability of protein-rich foods. The economic downturn in Nigeria has led to a significant increase in the cost of essential food items, particularly protein sources like chicken, eggs, and even beans (Adeomi and Klipstein-Grobusch, 2021). This has resulted in a shift towards cheaper, often less nutritious alternatives, leaving many students vulnerable to protein deficiency and its associated health consequences. As a response to a pressing need within the University community, the need to investigate the level of awareness of the affordability of alternative sources of proteins is essential for targeted interventions to address unique needs, barriers and motivations. Therefore, the aim of this study was to enhance protein availability and affordability for University of Lagos students by promoting the consumption of underutilised legumes.

MATERIALS AND METHODS

Sampling methods

This study employed a mixed-method approach using quantitative (nutritional analysis, cost comparison, surveys) and qualitative (sensory evaluation, focus group discussions) methods. A cross-sectional design was used to assess the affordability, acceptability, and nutritional value of Bambara groundnut, African yam bean, Jack bean, Cowpea and Winged bean among UNILAG students. Data collection involved a structured questionnaire, laboratory analysis, and economic feasibility assessment.

Research Approach and Design

This study adopted a quantitative research approach, emphasising numerical data, objective analysis, and statistical interpretation to examine the feasibility of underutilised legumes, Bambara groundnut, and Cowpea as affordable protein sources for UNILAG students. A cross-sectional research design was employed, allowing for data collection at a single point in time to assess students' awareness, consumption patterns, and willingness to adopt these legumes. The study also utilised structured surveys and sensory evaluation trials to gather empirical evidence. This was designed to ensure comprehensive data collection, enabling scientific validation of the legumes' nutritional value, affordability, and consumer acceptance while providing actionable insights for food security interventions.

Research Philosophy

This study adopted a positivist research philosophy, which assumes that knowledge is derived from objective, observable, and measurable phenomena. The research relied on empirical data, statistical analysis, and scientific methods to assess the nutritional value, affordability, and acceptability of underutilised legumes. The positivist stance allowed for data-driven conclusions, ensuring that recommendations for integrating these legumes into students' diets were based on scientific evidence rather than subjective interpretation.

tion of the Study

The population of this study comprised all enrolled students at the University of Lagos (UNILAG), Akoka, Lagos, Nigeria, as of the 2024/2025 academic year. UNILAG, a leading federal university, serves a diverse student body across undergraduate and postgraduate programs, spanning multiple faculties and residential halls. This population was the target for assessing awareness, perception, and utilisation of underutilised legumes to address protein affordability challenges. Official enrollment figures for UNILAG fluctuate, but historical data suggest a student population ranging from 40,000 to 60,000 (UNILAG Annual Report, 2019). Accounting for growth trends in Nigerian tertiary institutions and UNILAG's prominence, the current population was estimated to be approximately 55,000 students for 2024/2025. This includes full-time undergraduates (the majority, est. 45,000), part-time undergraduates (est. 5,000), and postgraduates (est. 5,000), reflecting intake increases and retention rates. The estimate assumes a modest annual growth of 2-3% from pre-2020 figures, consistent with national higher education expansion (NUC, 2022).

Sample Size and Sampling Technique

The sample size for the study was drawn using Taro Yamane's (1967) formula for sample size determination. The formula parameters stated: **N** is the population size, **n** is the sample size, and **e** isthe level of significance, which is usually 0.05 or 0.01. Therefore,

$$n = N/(1+N(e^2)$$

Thereafter, a three-stage sampling technique was applied to reach the actual respondents of the study, and for an appropriate depiction of the population. The first step was to utilise cluster sampling to ensure that all elements of the sample frame were represented. Following this is the use of a stratified sampling technique to group the learners into categories, and proportionate sample sizes allocated to them, then, a convenience sampling technique, a non-probability sampling technique, were also utilised in the distribution of survey materials to the respondents.

Research Instrument/Method of Data Collection

This study employed a mixed-method approach for data collection, utilising a structured questionnaire and practical pilot interventions as primary research instruments. The questionnaire, administered online via platforms like Google Forms, features Likert-scale items (e.g., 1 = "Not Aware" to 5 = "Very Aware") to measure students' awareness of underutilised legumes, perceptions of their affordability and appeal, and current utilisation patterns. Open-ended questions, such as barriers to adoption, were captured to provide qualitative insights. The survey was distributed across faculties and hostels to ensure a broad reach.

Pilot study

Complementing this, pilot interventions, small-scale cultivation trials on campus and tasting sessions of legume-based recipes gathered hands-on data on utilisation feasibility and student acceptance. These methods ensure a robust blend of quantitative precision and qualitative depth, reflecting UNILAG's real-world dietary dynamics.

Method of Data Analysis

Data from the questionnaire and pilot interventions were processed using SPSS version 23, which blended descriptive and inferential techniques for comprehensive analysis. For the survey sample, descriptive statistics, percentages, means, and standard deviations profiled the students' awareness of underutilised legumes, their perceptions of cost and taste, and current utilisation levels. Open-ended responses were also subjected to thematic analysis, manually coded to identify recurring themes like cultural resistance or recipe preferences.

Validity of Research Instrument

This study was subjected to scrutiny from relevant experts in the field (at least four) in addition to other relevant tests. The experts were made to give their professional advice using the content validity approach (CVA) on a four-point scale comprising four categories of non-equivalent item, extensive revision needed, minor adjustment required, and totally equivalent item, adopted from Elangova & Sundaravel (2021). Also, a validated scale for measuring awareness, utilisation, and implication for higher education was be adapted from the works of Domingo *et al* (2023).

Reliability of Research Instrument

The reliability of the validated instrument was pre-tested on a proportion of students from a similar relevant institution, and the amount of the constructs' internal consistency will be determined using Cronbach's Alpha criterion. The result of the pre-test (a pilot test) indicated the range of (0.7 - 0.80), which implied good internal consistency and was used to gauge the interconnection between items of the instrument and regularity of the tool in measuring variables (Mat Nawi *et al.* 2020).

Results Popula

Demography of the student respondents

This study presents the results from the integration of quantitative data within a mixed-methods design to analyse the protein availability and affordability for University of Lagos Students through the promotion of underutilised legumes. The gender distribution of the respondents in this study is presented in Figure 1. The figure included demographic characteristics of 223 students who participated in the study. Seventy-one (71.7%) per cent of the participants identified as female, while 28.3% identified as male. The academic level of the respondents was presented in Figure 1. It showed that the majority of the respondents (37.4%) were in the 500 level, followed by 400 level students (26.5%).

Awareness of underutilised legumes as sources of dietary proteins

The majority of the respondents (73.2%) were aware of the plant Bambara nut, while only 26.8% of the respondents were not aware of Bambara nut as a plant and source of dietary protein (Figure 2). More so, a large proportion of the respondents were also aware of the plant as a source of protein

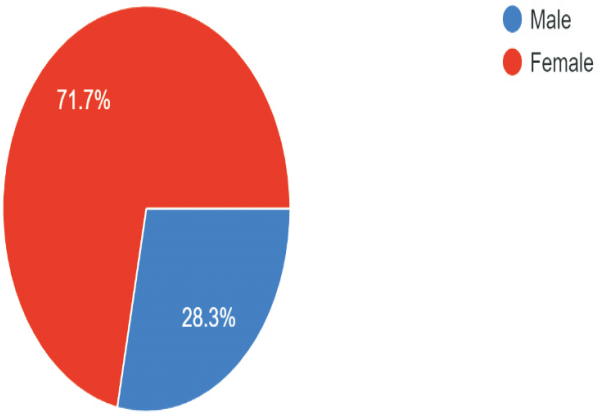

Figure 1: Gender distribution of student respondent

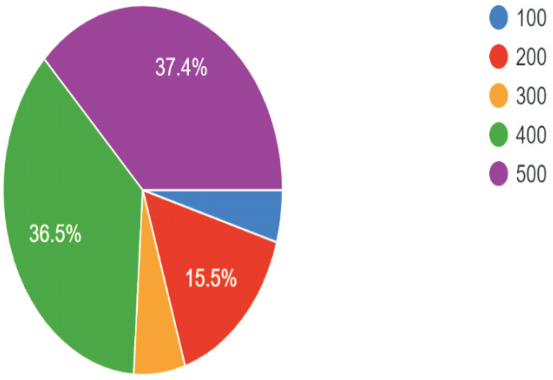

Figure 2: shows the distribution of the academic level of the student respondents in the study

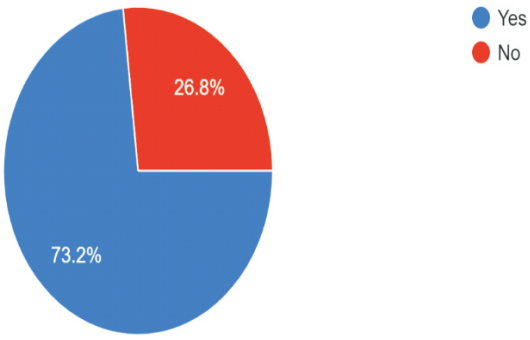

Figure 3: Knowledge of Bambara nut as a source of Dietary protein

Challenges of consuming the underutilised legume

A major challenge the students faced based on their responses to the challenges faced when consuming cowpea was long cooking time (41.5%), high cost (24.1%), while poor taste was the least challenging (6.3%) (Figure 7). The highest number of respondents on challenges faced with consuming Bambara groundnut was the unavailability of the Bambara nuts (28.1%). However, a considerable number of the respondents chose long cooking time (18.6%) and digestive issues (16.7%) as the main challenges faced with consuming Bamara groundnuts (Figure 4). The level of affordability was assessed from the respondents, and the highest number of respondents (96) answered that the cowpea is moderately available (43.4%), while a total of 40 (18.1%) responded that the cowpea was very unaffordable to them (Figure 5).

Figure 6 shows the rate of consumption of both common beans and Bambara nuts. Approximately thirty two percent (31.8%) of the respondents answered that they consume both Bambara nuts and cowpea on a weekly basis, while more than half of the respondents (53.8%) said they consume both underutilised legumes occasionally. A total of 65.5% of respondents said they consume common beans alone, while 25.6% said they do not consume common beans alone (Figure 7).

The majority of the respondents (48.4%) acknowledged that they have a good knowledge of the nutritional benefits of legumes generally, while approximately 36% of the respondents said they have excellent knowledge of the nutritional benefits of legumes generally (Figure 8). More so, a large percentage of the respondents 60.7% said they like eating cowpea and Bambara nuts as a source of protein (Figure 9).

The respondents reply to their liking for Bambara groundnut product is presented in Figure 10. A significant number of the respondents (54.1%) said they like the products of Bambara groundnuts while 23.9% said they do not like the products (Figure 10). While Figure 11 show the product of Bambara nuts that the respondents appreciated the most and 41.9% showed appreciation for moi-moi while 26.6 % preferred Akara while the lowest was for Bean flour 0.4%.

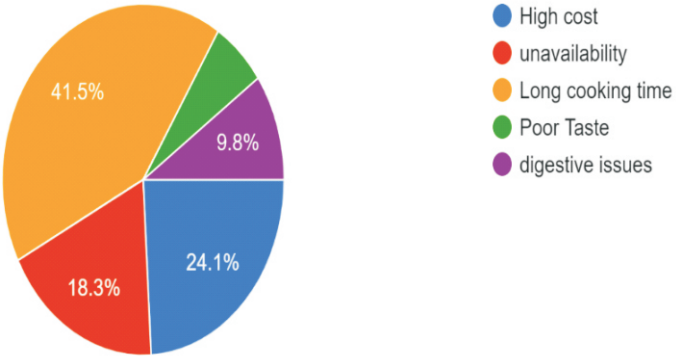

Figure 4: Challenges faced in consuming cowpea regularly

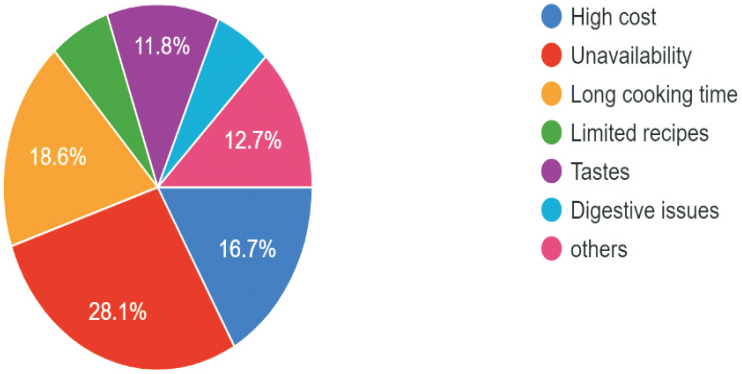

Figure 5: Challenges faced in consuming Bambara groundnuts

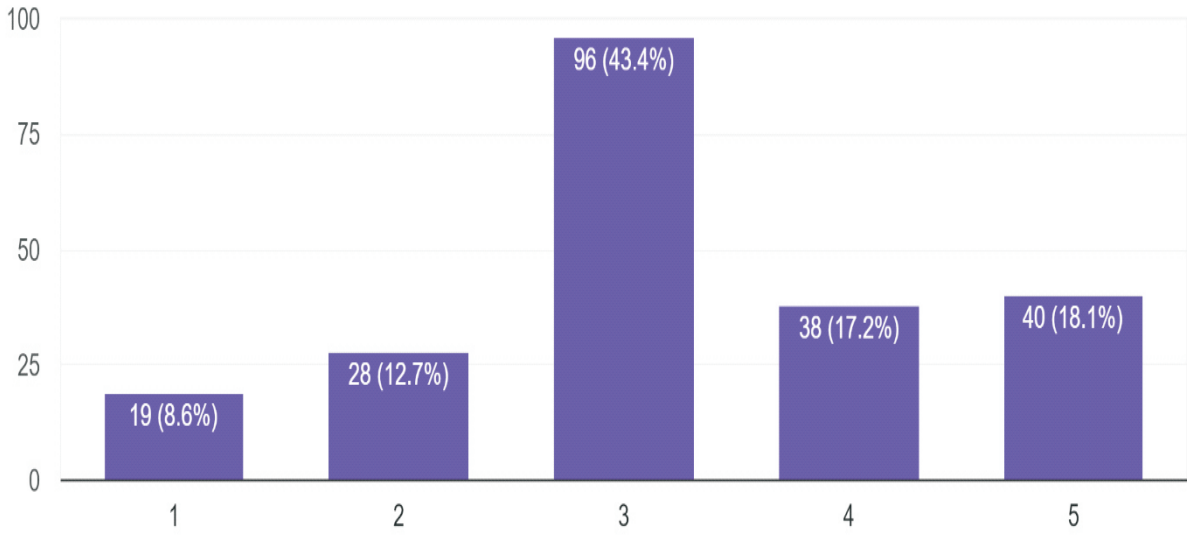

Figure 6: The level of affordability of cowpea

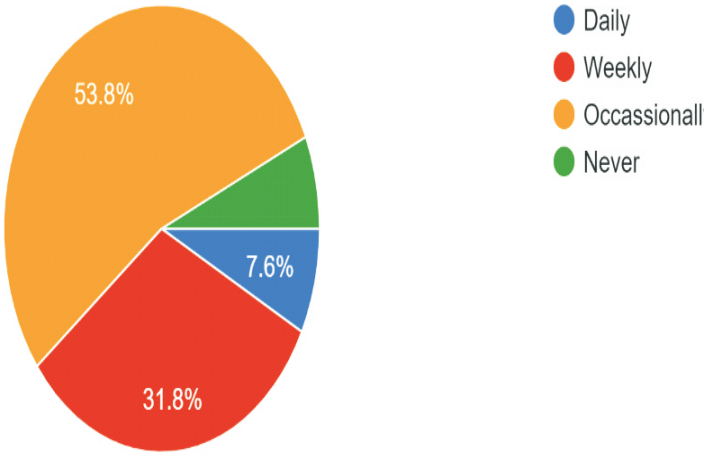

Figure 7: The rate of consumption of common beans and Bambara nuts

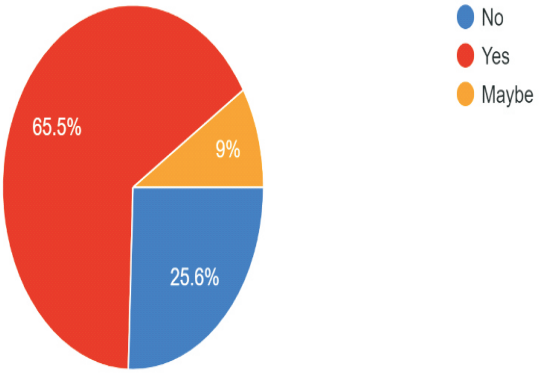

Figure 8: Consumption of common beans alone

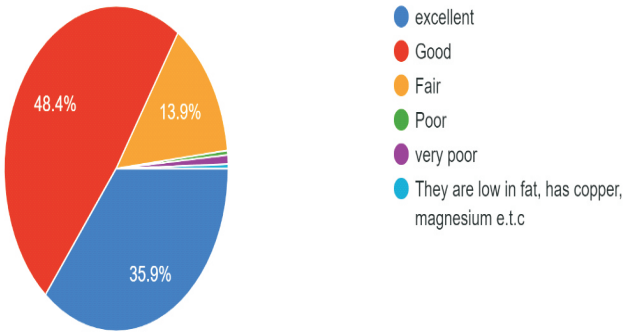

Figure 9: Knowledge of nutritional benefits of legumes generally

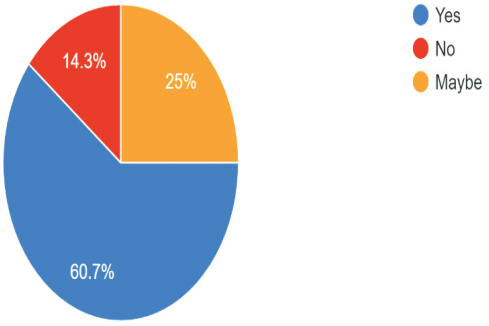

Figure 10: Eating cowpea and Bambara groundnuts as source of protein

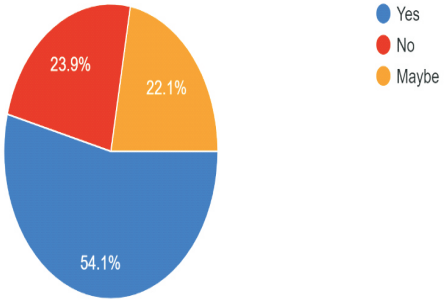

Figure 11: like and dislike of Bambara groundnut or its products

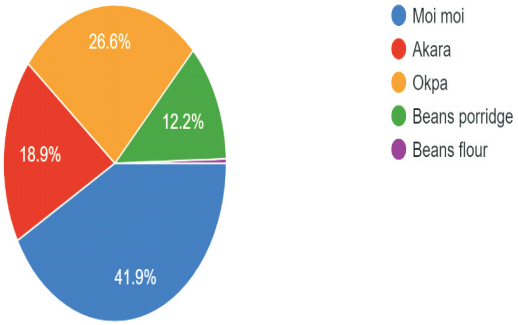

Figure 12: The Bambara groundnut product consumed by respondents

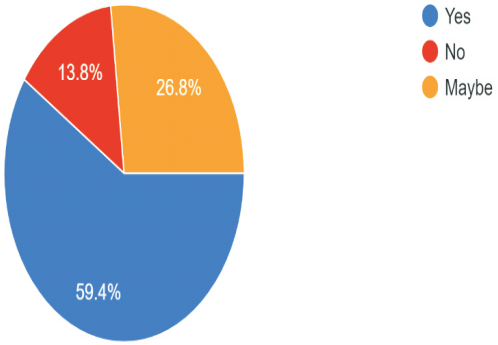

Figure 13: Willingness to increase the consumption of Bambara groundnut

Discussion

University students experience many life changes, and unhealthy diets become commonplace, especially with the twin policies of fuel subsidy removal and the floatation of the currency by the Federal government of Nigeria. The demography of the respondents did not really show any effect on the awareness and utilisation of the two indigenous legumes studied. The results of the study revealed that the respondents had positive knowledge of underutilised legumes as a source of dietary proteins. This suggests that students of the University of Lagos have significant knowledge of both Bambara nut and Cowpea and their products. This study is in accord with the study of Tham-Agyekum et al (2023), who reported significant awareness and consumption patterns of legumes in general among communities in Ghana. More so, this study is also in accord with the study of Adesiyan (2022), who reported that a larger percentage (76%) of the respondents in his study were aware that the neglected and underutilised crops are safe to consume, healthy and nutritious for consumption.

The result of this study also showed that affordability was a major issue in the consumption of the underutilised legumes among the student respondents, as the majority of them could barely afford the legumes due to the harsh economic realities of the country. The majority of the respondents also prefer to consume the common bean alone, showing their appreciation for the beans.

This study revealed that Bambara groundnut is a less popular legume compared with the common bean, which is in agreement with previous reports by Oyeyinka et al (2017) and Bashaiye et al (2011). Unavailability of Bambara groundnut and lack of knowledge of its nutritional benefits were some of the reasons for its underutilization. The participants in this study showed that their preference for Bambara groundnut products is for moi-moi and okpa. Therefore, Bambara groundnut could potentially serve as a source of affordable food protein, especially in low socio-economic regions. The results of this study concur with the results of Oyeyinka et al (2017), who also reported the unaffordability of Bambara groundnut if available in the grocery stores. More so, the study also agrees with the study of Udofia et al (2025) for reported high awareness of Bambara nut, moderate awareness of lima beans, and low awareness of African Yam beans in his study.

The respondents also show a significant willingness to increase consumption of both Bambara groundnuts and common beans as a source of their protein. However, the long hours of cooking time of both Bambara groundnut and common beans are a major barrier to the continuous utilisation as an alternative source of dietary proteins.

Conclusion

Bambara groundnut and common beans are quite popular among the undergraduate students of the University of Lagos, undergraduate students and its utilization seems to be limited due to poor market availability and long cooking time. However, Bambara groundnut has the potential to be used as a protein source as well as income to reduce economic hardship, which can strengthen the global resolve to reduce poverty and ensure food security. Further awareness and nutritional education on the benefits of Bambara groundnut and cowpea are encouraged by all stakeholders. This should include improving market availability and affordability, which may help to improve overall utilization of indigenous legumes. More so, relevant authorities should explore more time-saving preparation training to be delivered through extension and primary health platforms. Furthermore, the supply of dehulled and precooked products should be encouraged to mitigate against the effect of cooking time to provide access to fast cooking varieties of these legumes.

Authors' contribution

The Authors have equal contributions to the study.

Acknowledgement

The authors would like to show their appreciation to the director of DK Olukoya Central Research Laboratory and the Department of Cell Biology and Genetics for their support during the research work

Funding statement

The study was self-funded by students and the researchers

Competing interests

The Authors declare no competing interests

References

Adeomi, A., Fatusi, A., & Klipstein-Grobusch, K. (2021). Double burden of malnutrition among school-aged children and adolescents: evidence from a community-based cross-sectional survey in two Nigerian States. *AAS open research*, *4*, 38.

Adesiyan, O. F. Promoting the Awareness and Consumption of Underutilized and Neglected Crops for Improved Food and Nutrition Security in Osun State, Nigeria. *International Journal of Agriculture and Food Science*, 12:1907 - 1919

Ayilara, M. S., Abberton, M., Oyatomi, O. A., Odeyemi, O., & Babalola, O. O. (2022).Potentials of underutilized legumes in food security. *Frontiers in Soil Science*, *2*, 1020193.

Bamshaiye O, Adegbola J, Bamshaiye E. 2011. Bambara groundnut: an under-utilized nut in Africa. *Advances in Agricultural Biology*.1:60–72.

Ikhajiagbe, B., Ogwu, M. C., Ogochukwu, O. F., Odozi, E. B., Adekunle, I. J., & Omage, Z. E. (2022). The place of neglected and underutilized legumes in human nutrition and protein security in Nigeria. *Critical Reviews in Food Science and Nutrition*, *62*(14), 3930-3938.

Obayelu, O. A., Adeyeye, A. I., Adepoju, A. O., & Ayanboye, A. O. (2022). Protein food consumption among students in a Nigerian university: A demand modelling. *Agricultura Tropica et Subtropica*, *55*(1), 83-91.

Odeku, O. A., Ogunniyi, Q. A., Ogbole, O. O., & Fettke, J. (2024). Forgotten gems: exploring the untapped benefits of underutilized legumes in agriculture, nutrition, and environmental sustainability. *Plants*, *13*(9), 1208.

Oyeyinka, A. T., Pillay, K., & Siwela, M. (2017). Consumer awareness and acceptability of bambara groundnut as a protein source for use in complementary foods in rural KwaZulu-Natal. *South African Journal of Clinical Nutrition*, *30*(4), 87-92.

Rana, S., Agnihotri, V., & Bhandari, N. S. (2023). Nutritional characteristics of horsegram (*Macrotyloma uniflorum*) and its value-added food products: A review. *IJFMR-International Journal for Multidisciplinary Research*, *5*(2), 1-17.

Sharmili, K., Parasuraman, P., & Sivagamy, K. (2023). Effect of Inter and Sequential Cropping of Pulses in Little Millet (*Panicum sumatranse* L.) based Cropping System. *Indian Journal of Agricultural Research*, *57*(1).

Smýkal, P., Nelson, M. N., Berger, J. D., & Von Wettberg, E. J. (2018).The impact of genetic changes during crop domestication. *Agronomy*, *8*(7), 119.

Tham-Agyekum, E. K., Ntem, S., Sarbah, E., Anno-Baah, K., Asiedu, P., Bakang, J. E. A., & Jones, E. O. (2023). Resilience against climate variability: The application of nature-based solutions by cocoa farmers in Ghana. *Environmental and Sustainability Indicators*, *20*, 100310.

Udofia, F. A., Adepoju, O. T., Chata, D. M., Oyatomi, O. A., & Abberton, M. T. (2025). Consumption patterns and perceived health benefits of underutilized legumes among women in selected local government areas of Niger State, Nigeria. *Discover Food*. 5:438 https://doi.org/10.1007/s44187-025-00735-6

Vilakazi, B., Mafongoya, P. L., Odindo, A. O., & Phophi, M. M. (2025).The role of neglected grain legumes in food and nutrition security and human health. *Sustainability*, *17*(1), 350.

Wambugu, P. W., & Muthamia, Z. K. (2009).The state of plant genetic resources for food and agriculture in Kenya. *Submitted to FAO Commission on Plant Genetic Resources for Food and Agriculture*, 1-67.