

Farmers' Awareness of African Yam Bean and Intercropping Practices in Cashew-Based Systems in Ogbomoso, Nigeria

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Abstract

Cashew (*Anacardium occidentale* L.) is an important cash crop in Nigeria, yet its production is constrained by declining soil fertility and limited crop diversification. Farmers often rely on intercropping to secure food and maximize land use efficiency. The African yam bean (*Sphenostylis stenocarpa*), a neglected and underutilized legume with high nutritional value and nitrogen-fixing ability, remains largely excluded from these systems and poorly recognized by cashew farmers. This study investigated farmers' awareness of African yam bean and intercropping practices in Ogbomoso, with the aim of exploring its potential introduction into cashew-based farming systems. Using a multi-stage sampling technique, Ogbomoso and 3 cashew-growing LGAs were purposively selected and 151 farmers randomly selected, then interviewed through structured questionnaires complemented with field observations. Data were analyzed using descriptive statistics. The respondents were predominantly male (78.1%), middle-aged and had long farming experience (mean 24 years), while 27.2% of them had never been visited by an extension agent. Awareness of African yam bean was extremely low, with only 7.3% reporting prior consumption and none having cultivated it or known of market opportunities. Intercropping practices were dominated by cassava, maize, yam and tomato, with cassava-based mixtures accounting for 57% of combinations. Despite this, 96% of farmers expressed willingness to adopt African yam bean if seeds and markets were made available. The findings reveal both low awareness and strong potential for adoption. Deliberate awareness creation, seed system development and market linkage are necessary for promoting African yam bean as a sustainable intercrop in cashew systems.

Keywords: Awareness, African Yam Bean, Cashew Farming Systems, Intercropping Practices, Ogbomoso.

Introduction

Cashew (*Anacardium occidentale* L.) is a major cash crop in Nigeria, contributing significantly to household income, employment, and foreign exchange earnings. Nigeria is one of the leading producers of raw cashew nuts in Africa, with Oyo State being a prominent production hub (Adeigbe *et al.*, 2015). Despite its economic importance, cashew is typically cultivated under low-input systems, which exposes farms to weed pressure, soil nutrient depletion, and reduced productivity (Akinwale *et al.*, 2020). To address these challenges,

intercropping remains a common practice among farmers as it optimizes land use, diversifies income sources, and enhances food security (Etejere and Bhat, 2020).

The African yam bean (*Sphenostylis stenocarpa*) is an underutilized crop that is not a common component of cashew intercropping systems. Unlike yam, cassava, maize, and cowpea which are frequently cultivated alongside cashew in southwestern Nigeria (Olasupo *et al.*, 2022), AYB is still relatively unfamiliar to most cashew farmers. However, it possesses high potential as both a food and soil-improving crop. Its grains and tubers are rich in protein, and as a legume, it contributes to soil fertility through biological nitrogen fixation (Ojuederie and Balogun, 2017). Introducing AYB into cashew-based farming systems could therefore enhance diversification, improve soil health, and support sustainable cashew production. Nonetheless, awareness and adoption of the crop remain limited compared to other legumes such as cowpea and groundnut (Ojuederie *et al.*, 2020).

This study is guided by Rogers' (2003) diffusion of innovation theory, which explains how new practices spread through stages of knowledge, persuasion, and decision, shaped by an innovation's relative advantage and compatibility with existing practices. Applying this framework, farmers' current low engagement with AYB likely reflects an early-stage knowledge gap rather than rejection. This informed the study's assessment of farmers' AYB awareness, existing intercropping practices, and willingness to adopt, corresponding to the knowledge, persuasion, and decision stages respectively.

Despite cashew's economic importance and the well-documented benefits of intercropping in Nigeria, no empirical evidence currently exists on cashew farmers' awareness of AYB or its place within their intercropping practices. This gap leaves extension and policy efforts without a baseline for promoting AYB as a viable intercrop, risking continued underutilization of a legume with proven nutritional and soil-fertility benefits.

Some studies have evaluated AYB in intercropping with more familiar crops. In the rainforest zone of Southwest Nigeria, intercropping AYB with maize and kenaf improved AYB grain yield under mixed cropping and showed economic benefits compared with some sole cropping systems (Saka *et al.*, 2007). Another recent study assessed the nutritional and anti-nutritional effects of intercropping AYB with maize, finding that some AYB accessions respond well in mixed cropping with positive outcomes for protein, ash, fat, and carbohydrate content under certain intercropping arrangements (Ayilara *et al.*, 2023). These suggest AYB can perform well when introduced into systems with other crops, though not specifically as a component crop in cashew fields.

In Ogbomoso, southwestern Nigeria, intercropping of cashew with arable crops such as yam, cassava, maize, and cowpea is common practice (Olasupo *et al.*, 2022). Yet, there is little documented evidence on farmers' knowledge of AYB and its integration into existing cashew-based systems. Understanding farmers' awareness and intercropping practices is crucial for promoting diversification, improving soil health, and enhancing the resilience of cashew farming systems.

Guided by this framework, the study was designed to: (i) assess the socioeconomic characteristics of cashew farmers in Ogbomoso; (ii) determine farmers' awareness and

knowledge of African yam bean, corresponding to the knowledge stage of diffusion; (iii) document existing intercropping practices in cashew-based systems; and (iv) evaluate farmers' willingness to adopt African yam bean as an intercrop, corresponding to the decision stage of diffusion. The findings are expected to provide insights that will guide research, extension, and policy strategies aimed at promoting sustainable cashew-based agroecosystems.

Methodology

Study Area

The study was conducted in Ogbomoso, Oyo State, Nigeria, a major cashew-producing zone in the southwestern region of the country. The area is characterized by a tropical climate with distinct wet and dry seasons, and most households engage in arable farming alongside cash crop cultivation, particularly cashew.

Research Design

A descriptive survey design was adopted to collect primary data from cashew farmers. This design was considered appropriate since the study focused on assessing farmers' awareness of African yam bean (AYB) and documenting common intercropping practices in cashew-based farming systems.

Sampling Procedure and Sample Size

Respondents were selected using a multi-stage sampling procedure. First, major cashew-growing communities in Ogbomoso were identified. The first stage involves the purposive selection of Ogbomoso agricultural zone in Oyo state due to the concentration of cashew farmers in this locality. A purposive selection of 3 LGAs in Ogbomoso zone (Orire, Ogooluwa and Ogbomoso North LGAs) was carried out in the second stage. The final stage involved random selection of 60 cashew farmers in each LGA to make a total of 180 respondents. However, after data cleaning, 151 responses were valid for analysis. Of the 180 questionnaires administered, 29 (16%) were excluded during data cleaning due to incomplete responses to key sections, inconsistent or contradictory answers, and a small number of unreturned questionnaires. The remaining 151 valid responses were retained for analysis.

Data Collection

Data were obtained through the use of a well-structured questionnaire, complemented with field observations. The questionnaire covered the following aspects:

- Socioeconomic characteristics of respondents (age, gender, marital status, education, farming experience, farm size, and number of extension contacts).
- Awareness of African yam bean as a crop and its possible role in intercropping.
- Common intercropping practices adopted in cashew-based farming systems.

Ethical Considerations

Prior to administration, the purpose of the study was explained to respondents, and their verbal informed consent was obtained before participation. Respondents were assured of confidentiality and were free to withdraw at any point.

Data Analysis

Data collected were subjected to descriptive statistics such as frequency counts, percentages, means, and standard deviations to summarize socioeconomic characteristics and awareness levels. The results were presented in tables and figures.

Results and Discussion

Socioeconomic Characteristics of Cashew Farmers

Table 1 presents the socioeconomic characteristics of the respondents. The mean age of the farmers was 55 ± 13.3 years, with the majority (44.5%) falling within the 41–50 age range, followed by those above 60 years (28.6%). This suggests that cashew farming in the study area is dominated by middle-aged and older farmers. Younger farmers (30–40 years) accounted for only 9.3%, which indicates low participation of youths in cashew production. This age distribution reflects findings from Adeigbe *et al.* (2015), who reported that cashew farming in Nigeria is largely carried out by older farmers, possibly due to the perennial nature of the crop and delayed economic returns.

Gender distribution shows a male dominance (78.1%) compared to females (21.9%). This is consistent with previous studies which have shown that men are more engaged in cash crop farming, while women often concentrate on food crops or postharvest processing (Olasupo *et al.*, 2022). The imbalance may influence adoption of new intercrops like African yam bean (AYB), since decision-making in cashew farming is often male-driven.

In terms of marital status, 80.8% of the respondents were married, while only 12.6% were widowed and 6.6% divorced. This implies that cashew farming is mostly practiced by household heads, which may affect labor availability and willingness to grow new crops.

Education level shows that 41.1% of respondents had secondary education, 32.5% primary, 13.2% tertiary, and 13.2% had no formal education. The relatively high literacy rate suggests that most farmers are capable of understanding extension messages on crop diversification, which could support the introduction of AYB. Similar observations were made by Akinwale *et al.* (2020), who noted that education enhances farmers' openness to new agricultural technologies.

The mean farming experience was 24.1 ± 11.5 years, with the majority (40.4%) having between 16–30 years of experience. This long experience indicates familiarity with cashew production and intercrop management. However, such long-term practices may also make farmers conservative in trying unfamiliar crops like AYB, as observed in adoption studies of underutilized legumes (Ojuederie *et al.*, 2020).

Farm sizes averaged 3.4 ± 2.4 ha, with most farms (38.4%) between 2.1–4.0 ha. This reflects the dominance of smallholder farming in Ogbomoso, in line with the structure of cashew

production in Nigeria (Adeigbe *et al.*, 2015). Smaller farms often encourage intercropping to maximize land use efficiency and food security (Etejere and Bhat, 2020).

Extension contacts were generally low; 27.2% of respondents had never been visited, while 46.4% had just one visit in the year. This poor extension linkage may constrain farmers' access to information about AYB and its potential in cashew-based systems. Olasupo *et al.* (2022) noted that, weak extension services in cashew-growing communities hinder the adoption of improved practices and diversification strategies.

The socioeconomic profile shows that cashew farmers in Ogbomoso are predominantly older men with modest education and small-to-medium farm holdings. These characteristics imply both opportunities and constraints: while education and farming experience may support awareness creation, age, gender imbalance, and weak extension contact may slow the adoption of AYB as a new intercrop.

Table 1: Socioeconomic Characteristics of the Respondents

Variable	Frequency	Percentage	Mean±SD
Age (years)			55±13.3
30 – 40	14	9.3	
41 – 50	67	44.5	
51-60	27	17.9	
>60	43	28.6	
Gender			
Female	33	21.9	
Male	118	78.1	
Marital status			
Single	0	0	
Married	122	80.8	
Divorced	10	6.6	
Widowed	19	12.6	
Education level			
No formal Education	20	13.2	
Primary	49	32.5	
Secondary	62	41.1	
Tertiary	20	13.2	
Experience			24.1±11.5
1 to 15	45	29.7	
16 to 30	61	40.4	
>30	45	29.7	
Age of Farm			22.9±9.1
1 to 15	49	32.4	
16 to 30	73	48.3	
>30	29	19.3	
Farm Size			3.4±2.4
0.5 to 2	42	27.8	
2.1 to 4.0	58	38.4	

Variable	Frequency	Percentage	Mean±SD
>4.0	51	33.9	
Number of Extension visit			
0	41	27.2	
1	70	46.4	
2	21	13.9	
>2	19	12.6	
Source: Field Survey (2024)			

Awareness of African Yam Bean among Cashew Farmers

Figure 1 shows the level of awareness of African yam bean (AYB) among cashew farmers in Ogbomoso. The results reveal that a majority of respondents indicated low awareness of AYB, with only a small proportion having ever heard of or cultivated the crop. This suggests that despite its nutritional and soil-enriching potential, AYB remains largely unknown within cashew-based farming systems. This low level of awareness is primarily attributable to the status of the African yam bean (AYB) as an underutilized legume, compounded by a historical lack of promotion from agricultural research and extension services (Ojuederie and Balogun, 2017). Unlike more familiar intercrops such as yam, cassava, maize, and cowpea, which dominate cashew-based farming in southwestern Nigeria (Olasupo *et al.*, 2022), AYB has received minimal attention in terms of awareness campaigns, seed system development, and market linkages.

This contrasts with findings from other regions. In Enugu State, AYB awareness is relatively higher, with farmers not only cultivating the crop but also engaging in value-addition and processing activities (Iwuchukwu *et al.*, 2017). Similarly, in Cross River, AYB is actively grown and studied, particularly for its nutritional properties and potential in local food systems (Anyia and Ozung, 2019). In Kogi, however, evidence suggests only limited familiarity, as AYB seeds appear in some markets but published reports of farmer-level awareness remain sparse. These differences reflect regional variations in crop culture: AYB is more embedded in southeastern and humid zones but remains unfamiliar in cashew-dominated systems such as Ogbomoso.

Poor extension coverage, as earlier shown in Table 1, further explains the weak dissemination of information about AYB. Extension agents are key in creating awareness about novel crops (Agbaje *et al.*, 2019).

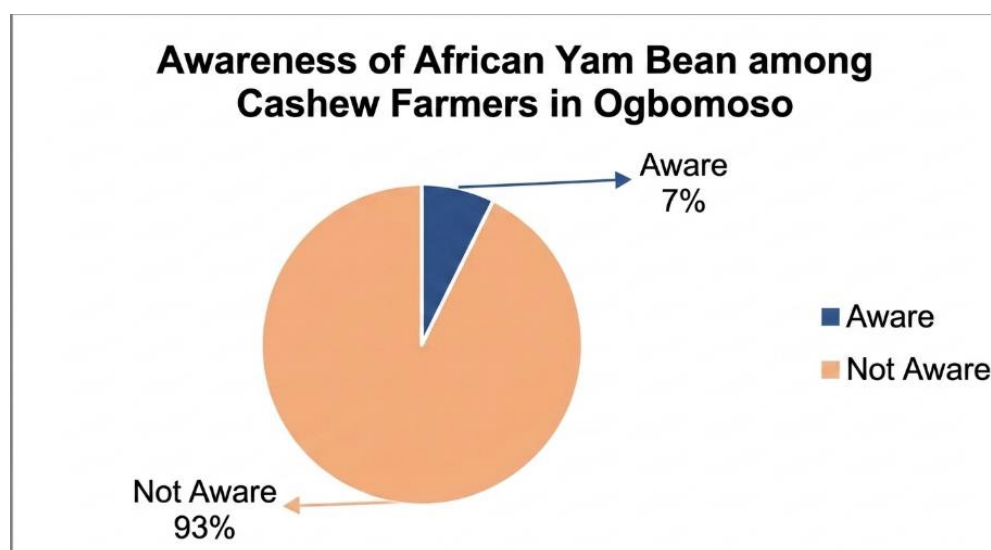


Figure 1: Awareness of African Yam Bean among Cashew Farmers in Ogbomosho

Source: Field Survey (2024)

Farmers' experience and perceptions of African yam bean (AYB)

Figure 2 shows farmers' awareness, experience, and perceptions of African yam bean (AYB). The results reveal that only 7.3% of respondents had consumed AYB, while none had ever cultivated it. Similarly, none reported knowledge of its tuber production or existing markets. This underscores the obscurity of AYB in the study area and explains why it has not entered cashew-based intercropping systems. Similar trends have been documented elsewhere, where AYB is described as a neglected and underutilized crop with very limited awareness among farmers (Ojuederie *et al.*, 2020).

Despite this low exposure, farmers expressed a high willingness to adopt AYB if conditions were favorable: 96% indicated readiness to grow the crop if seeds were available, and 96% were willing to intercrop it with cashew. Within Rogers' (2003) diffusion of innovation framework, this pattern suggests a population still at the knowledge stage rather than one that has evaluated and rejected the innovation. Farmers' perception of AYB's relative advantage and compatibility with existing systems appears favorable; what is missing is exposure to the innovation itself. Low adoption in the study area therefore reflects limited access to information and planting material, not attitudinal resistance, and both are addressable through targeted extension and seed system interventions.

The lack of market knowledge (96.7% reported none) poses a critical constraint. As observed by Popoola *et al.* (2022), underutilized legumes face low adoption when market linkages are weak, since farmers prioritize crops with guaranteed returns. Nonetheless, the strong willingness to grow AYB, once seed access and awareness are improved, indicates a significant opportunity for introduction into cashew systems.

Figure 2 highlights both the constraints and opportunities for promoting AYB. While consumption, cultivation, and market knowledge remain minimal, the overwhelming willingness to adopt the crop presents a strategic entry point for extension services, seed programs, and value-chain development in cashew-based farming systems.

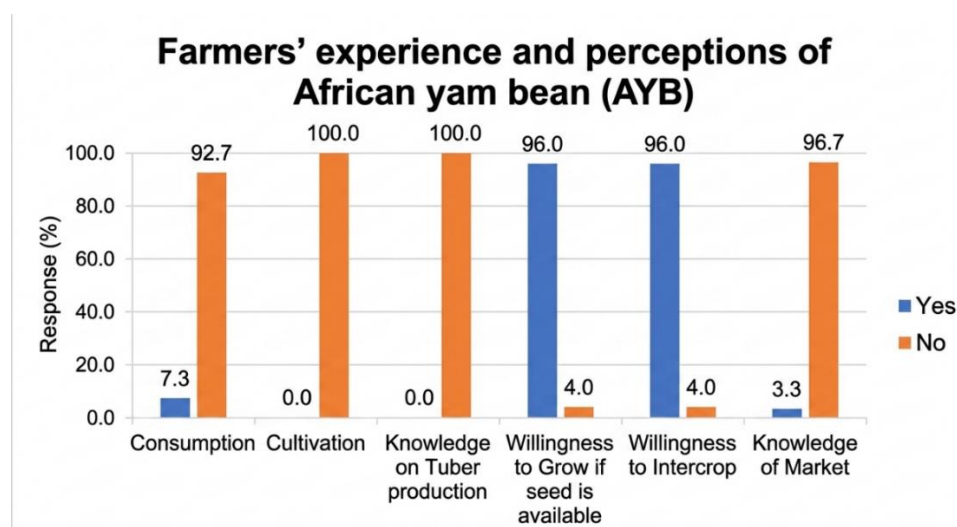


Figure 2: Farmers' experience and perceptions of African yam bean (AYB)

Source: Field Survey (2024)

Intercropping patterns adopted by cashew farmers in Ogbomoso

Figure 3 presents the intercropping patterns adopted by cashew farmers in Ogbomoso. The majority (57%) cultivated a mixture of cassava, tomato, and maize alongside cashew, showing a strong preference for combining staple food crops with a vegetable for household consumption and market sales. The second most common combination was yam, tomato, and maize (21%), followed by maize and cassava (18%). Less frequent combinations included maize and cassava (2%), maize, yam, tomato (1%), and a more diverse mixture of cassava, tomato, maize, and yam (1%).

These findings reveal that intercropping in cashew farms is dominated by food security crops (cassava, yam, maize) combined with short-season crops such as tomato that generate early cash returns. This aligns with earlier reports that smallholder cashew farmers integrate food crops to maximize land use and sustain livelihoods before cashew yields are realized (Olasupo *et al.*, 2022). Cassava and yam serve as major carbohydrate staples, while maize provides both food and fodder, and tomato enhances dietary diversity and market income.

The predominance of cassava-based mixtures may also reflect its adaptability to poor soils and resilience under low-input conditions, making it a strategic intercrop in perennial plantations (Akinwale *et al.*, 2020). The choice of multiple-crop combinations suggests farmers' preference for risk-spreading and efficient land use, consistent with the principle that crop diversity enhances system resilience (Etejere and Bhat, 2020).

However, none of the observed combinations included African yam bean (AYB) or legumes, further confirming the low awareness reported in Figure 1. As noted by Ojuederie and Balogun (2017), AYB remains an underutilized legume despite its potential to enrich soil and diversify diets. Introducing AYB into these existing intercropping patterns will require deliberate awareness and demonstration efforts.

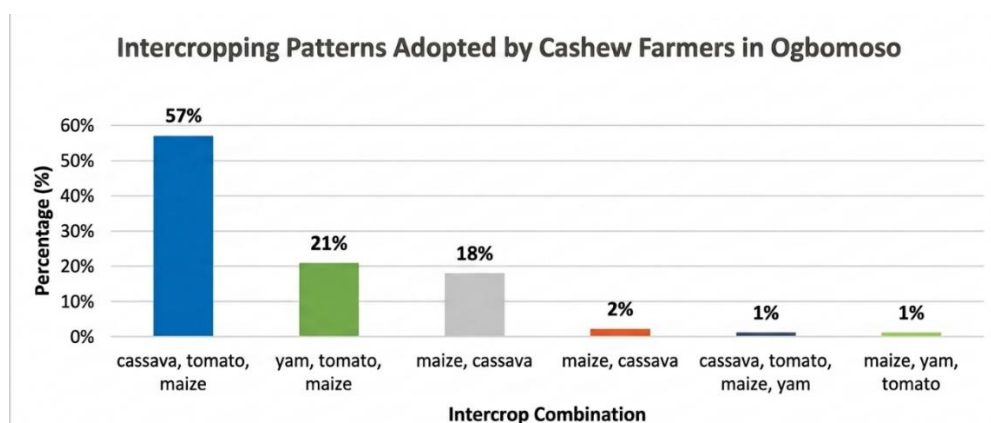


Figure 3: Intercropping patterns adopted by cashew farmers in Ogbomoso.

Source: Field Survey (2024)

Conclusion

This study examined the awareness of African yam bean (AYB) and intercropping practices among cashew farmers in Ogbomoso, Nigeria. The findings revealed that cashew farming is dominated by older male farmers with modest education, long production experience and small to medium landholdings, though with limited extension support. Awareness and knowledge of AYB were generally low, as most farmers had neither cultivated the crop nor recognized its tuber production or market opportunities. Instead, intercropping practices were concentrated on familiar staples such as cassava, yam, maize, and tomato, which ensure household food security and income diversification.

Despite the low exposure to AYB, there was overwhelming willingness among farmers to cultivate and integrate it into cashew systems, provided seeds and markets are accessible. This indicates that adoption barriers are more structural than attitudinal. This finding is consistent with Rogers' (2003) diffusion of innovation theory, which identifies awareness as the critical first step in the adoption pathway; the near-universal willingness to adopt AYB despite minimal prior exposure signals a population poised to move through the later stages of diffusion once information and inputs become available. Promoting AYB in Ogbomoso therefore requires deliberate awareness creation, seed system development, and strengthened extension services to demonstrate its agronomic and nutritional benefits. If these gaps are addressed, AYB could become a valuable intercrop that improves soil fertility, enhances dietary diversity, and supports the sustainability of cashew-based farming systems.

A limitation of this study is that the questionnaire was not formally pretested prior to administration; future studies should incorporate instrument pretesting to further strengthen data reliability.

Recommendations

Based on the findings, the following are recommended:

1. Extension services should run awareness campaigns and on-farm demonstrations, given farmers' strong willingness to adopt AYB once informed.

2. Seed agencies and research institutes should improve access to AYB planting material, a key barrier to adoption.
3. Policymakers should support market linkage development for AYB to guarantee farmer returns.
4. Researchers should conduct on-farm AYB-cashew intercropping trials to generate agronomic data complementing these awareness findings.

Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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