

Aitiya Joel Umar¹, Amurtiya Michael^{2✉}, Nubwa Multafu Kyari³, Dauda Yahaya Abubakar⁴

¹ Federal College of Education, Yola, Nigeria

² Modibbo Adama University, Yola, Nigeria

³ Umar Suleiman College of Education, Gashua, Yobe State, Nigeria

⁴ Adamawa State University, Mubi, Nigeria

Socio-Economic Determinants of Agricultural Information Uptake and Structural Constraints to Sesame Productivity in Adamawa State, Nigeria

Abstract. Limited knowledge and weak utilisation of agricultural information continue to hinder sesame productivity in Nigeria. This study assessed Determinants of Information Utilisation and Constraints to Sesame Production in Adamawa State, Nigeria. Data were collected from 250 sesame farmers using structured questionnaires and analysed through descriptive statistics and multiple regression. Results revealed high knowledge in land preparation (84.0%), planting time (76.8%), and seed selection (71.2%), but low knowledge in pest control (39.2%) and post-harvest handling (35.6%). A regression analysis showed that education level, farming experience, farm size, and group membership significantly influenced information use. Key constraints included poor access to inputs and infrastructure. The study concludes that information use is shaped by socio-economic factors and structural conditions. It recommends targeted extension services, adult education, and infrastructural improvements to boost productivity.

Keywords: sesame farming, agricultural information, knowledge sharing, extension services, Adamawa State

JEL Classification: Q12, Q16, O33

Introduction

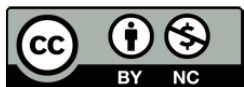
Sesame is a key oilseed crop grown in Nigeria for both domestic consumption and export (Wacal et al., 2021; Oyedepo & Evbuomwan, 2024). It ranks among the top agricultural commodities contributing to non-oil foreign exchange earnings. Despite its economic relevance, sesame production in Nigeria remains suboptimal, largely due to limited farmer knowledge, inadequate extension service provision, and restricted access to pertinent production information (Bonephace et al., 2022). This scenario represents challenges faced by the nation, as the farmers are not able to use better practices. Knowledge base of sesame farmers is important in planning of targeted interventions. Previous research has indicated that, when farmers have proper information on the agronomic practice, there are high chances

¹ PhD; Department of Agricultural Education, Federal College of Education, Yola, Nigeria; e-mail: aitiyaumar@gmail.com; <https://orcid.org/0009-0004-6925-6255>

² PhD; Department of Agricultural Economics, Modibbo Adama University, Yola, Nigeria; e-mail: michaelamurtiya@yahoo.com; <https://orcid.org/0000-0001-5273-9999>; Corresponding author

³ PhD; Department of Agricultural Education, Umar Suleiman College of Education, Gashua, Yobe State, Nigeria; e-mail: nubwakyari@gmail.com; <https://orcid.org/0009-0009-3455-3694>

⁴ MSc; Department of Agricultural Economics and Extension, Adamawa State University, Mubi, Nigeria; e-mail: yahayadauda@gmail.com; <https://orcid.org/0009-0009-7163-1575>



of farmers adopting innovations that would increase productivity (Agbamu, 2006; Sirany and Tadele, 2022).

The quality and frequency of information available to farmers shape how they manage their crops, adopt technologies, and respond to changing conditions. In rural contexts, information flow is often fragmented due to weak extension systems and low literacy levels (Aina et al., 2005; Atinaf et al., 2023). Sesame growers greatly rely on non-educational avenues like neighbours, farmer associations, local broadcasting facilities and the like. According to Adio et al. (2016), the number of formal extension agents is usually small relative to the number of people to cover, and they are not well equipped. This results in minimal uptake of agricultural information and ineffective adoption of recommended production practices. To be able to design responsive extension system, it is critical to understand what factors influence whether farmers use agricultural information or not. Such factors may encompass socio-economic factors like age, education, experience and group-association which would determine information-seeking behaviour as well as adoption decision-making (Agwu & Chah, 2007; Oyedepo and Evbuomwan, 2024).

Agricultural production in Adamawa State faces several structural and technical constraints. These include inadequate access to farm inputs, poor infrastructure, unreliable weather patterns, and insecurity in rural areas (Abdullahi et al., 2026). These factors have a direct impact on sesame farmers, since most of the farmers do not have access to storage, better seeds and mechanisation (Daudu et al., 2009). The access to institutional credit and market linkages are limited further and contribute to the restrictions. Without addressing such constraints, farmers will be less capable of using new knowledge and implementing better technology (Sanni et al., 2026). Research on the nature of production constraints, experienced by sesame producers, will be the basis for realistic suggestions on how to enhance productivity and sustainability.

A clear understanding of how knowledge, information use, and production constraints interact is necessary for agricultural development actors working to strengthen sesame value chains (Kassie et al., 2023; Haque et al., 2025). The success of extension services lies in their capability to align with the conditions of farmers regarding the content provided, its relevance and access. Development partners and state agencies need evidence-based data in terms of guidance concerning allocation of resources on the most pressing needs. This study is part of that contribution that presents field evidence. It augments previous reports by Mapiye et al. (2023), Agbamu (2006), Aina et al. (2005), and Iakovidis et al. (2022), who highlighted how access to information is central in enhancing farm-level decision-making.

Current literature information on sesame production in Nigeria mainly concentrates on the agronomic practises, market performances and export potential with little attention to the dynamics of utilisation of information at the farmer level. Previous studies have documented limited extension coverage, and fragmented information flows among rural producers, and, hence, limiting the adoption of enhanced production practises (Aina et al., 2005; Adio et al., 2016). Additional research has found socio-economic determinants of agricultural technology adoption; however, empirical information linking the socio-economic determinants to actual utilisation of production information is limited (Agwu & Chah, 2007; Sirany & Tadele, 2022). Recent studies emphasise the important role of farmer knowledge systems in fortifying oilseed value chains in developing economies (Kassie et al., 2023; Haque et al., 2025). However, there is a paucity of empirical studies relating to the socio-

economic attributes of sesame farmers and how they influence the utilisation of information in Adamawa State.

This study aimed to generate evidence-based insights into the knowledge base, information utilisation behaviour, and production constraints of sesame farmers in Adamawa State, Nigeria, with a view to informing extension service design, policy interventions, and capacity-building strategies. Specifically, it investigated three aspects: first, the level of farmers' knowledge on sesame production practices to determine their preparedness for adopting improved technologies; second, the socio-economic factors influencing the use of agricultural information among sesame farmers (Agwu & Chah, 2007; Adio et al., 2016); and third, the main structural and institutional constraints limiting sesame production in the study area (Abdullahi et al., 2026; Sanni et al., 2026).

Theoretical Framework

The theoretical framework for empirical research on agricultural information utilisation among farmers draws from the Diffusion of Innovation theory. This study also adopted the same theory. This theoretical construct explains the flow of new agricultural knowledge in a social system and how that knowledge then influences decision-making by farmers about technology adoption and management practises. According to Karbo and colleagues (2024), the diffusion process, in turn, involves sequential stages such as knowledge acquisition, persuasion, adoption decision, implementation and confirmation that leads to the uptake of innovations in agriculture. These stages influence the channels through which farmers receive extension information and translate such knowledge into actionable farm-level decisions, which has been demonstrated by Zondo and Ndoro (2023). Contemporary empirical findings have consistently uncovered strong relationships between the degree of farmers' education, extension contact, exposure to information sources and the likelihood to adopt agricultural technologies in rural production systems.

Behavioural theories of technology acceptance also provide a relevant analytical framework for studying information utilisation among smallholder farmers. The Unified Theory of Acceptance and Use of Technology (UTAUT) posits that constructs including perceived usefulness, perceived benefits, and socio-economic conditions affect a farmer's willingness to use agricultural information in production decisions (Zhang et al., 2024). There is empirical evidence that active participation in extension networks, being a member of farmer groups and accessing advisory services improve the likelihood of adoption of recommended agricultural practices and production technology (Adnan et al., 2025). Consequently, these theoretical perspectives provide a strong foundation for investigation into the effects of socio-economic characteristics and institutional determinants on the utilisation of information on sesame production by farmers.

Research data and methods

The study was conducted in Adamawa State, northeastern Nigeria. The State lies between latitudes 7° and 11° North and longitudes 11° and 14° East. It shares borders with Borno, Gombe, and Taraba States, as well as the Republic of Cameroon (Mbaya, 2022). Adamawa comprises 21 Local Government Areas grouped into three agricultural zones. Most

residents engage in agriculture, with sesame among the key cash crops cultivated due to favourable agro-ecological conditions (Food and Agriculture Organization of the United Nations, FAO, 2019).

A cross-sectional survey design was adopted for the study. This design was appropriate for capturing primary data across different locations within a specific timeframe. The target population comprised all sesame farmers in the selected Local Government Areas. Three LGAs were purposively selected, one from each agricultural zone, based on their prominence in sesame production.

A multistage sampling procedure was used. In the first stage, one LGA was selected from each zone. In the second stage, four communities were chosen from each selected LGA, making a total of twelve communities. In the final stage, a snowball sampling approach was used to identify sesame farmers within each community. A total of 250 sesame farmers were selected, a sample size consistent with similar agricultural research in Nigeria (Adio et al., 2016).

It is recognised that snowball sampling does not provide a true random sample, and therefore the inferences that can be generalised from the regression estimates to the wider population of sesame farmers are restricted. In spite of the presence of sampling constraints, regression analysis is commonly used in agricultural information and extension research studies as an appropriate exploratory tool for revealing the direction of association and the extent of the association between socio-economic variables and information use behaviour, as noted by Adio et al. (2016) and Agwu and Chah (2007). The results of the regression model presented in this study are therefore only descriptive and exploratory in nature and not necessarily representative population-level inferences. For further increase in reliability of the models, the Variance Inflation Factor (VIF) was calculated for all six explanatory variables. The values of VIF ranged between 1.08 and 1.47, which were all below the generally accepted level of 5.0 (Aina et al., 2005), indicating that there was no serious problem with multicollinearity among the predictors used.

The study employed a semi-structured questionnaire as the primary instrument for field data collection among sesame farmers. The instrument contained several sections designed to obtain detailed production and information-related data. The first section captured demographic and socio-economic characteristics of farmers, including age, education level, household size, farming experience, and farm size. The second section examined sources of agricultural information available to farmers, such as extension agents, farmer associations, radio programmes, input dealers, and fellow farmers. Another section measured the frequency and level of information utilisation in sesame production activities, including land preparation, seed selection, pest management, and post-harvest handling. Trained enumerators fluent in local languages administered the questionnaire to ensure accurate responses and improved comprehension among respondents.

To analyse the determinants of agricultural information use, the study employed a multiple linear regression model. A regression analysis provides an appropriate analytical framework for examining the determinants of information utilisation among sesame farmers because the technique estimates the relationship between a dependent variable and multiple explanatory variables simultaneously. Studies of agricultural adoption and information behaviour regularly use regression models to isolate the impacts of socio-economic factors (such as age, education, farm size, and extension contact) on farmer decision-making processes. Empirical research work on agricultural extension has repeatedly proven that

regression methods are well-suited for estimating behavioural factors in the context of rural production systems (Adio et al., 2016; Agwu & Chah 2007). Research on agricultural information systems further identifies the use of regression models as effective instruments of measuring the magnitude and direction of associations between farmer characteristics and information use outcomes (Aina et al., 2005). Although count data models and ordered logit specifications represent legitimate analytical alternatives for discretely measured outcomes (Adio et al., 2016), the composite index constructed here produces a continuous distribution with sufficient variation in magnitude to satisfy the requirements of OLS regression, making the multiple linear regression model an appropriate and defensible analytical choice for this study.

The model is specified as:

$$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \varepsilon$$

Where:

Y – level of agricultural information use (measured by frequency and diversity of sources used);

β_0 – constant term;

β_1 to β_6 – coefficients of explanatory variables;

X_1 – age of farmer (years);

X_2 – education level (years of formal schooling);

X_3 – household size (number of persons);

X_4 – farm size (hectares);

X_5 – farming experience (years);

X_6 – group membership (1 = member, 0 = non-member);

ε – error term.

The dependent variable (Y) is a composite index measuring the level of agricultural information use, constructed from two dimensions: the frequency with which farmers sought and applied production information (scored on a 5-point scale) and the diversity of information sources consulted (count of distinct sources used). The first dimension was the frequency of information use, assessed by asking respondents how often they sought and applied agricultural information across six key sesame production activities: land preparation, seed selection, planting time, fertiliser application, pest and disease control, and post-harvest handling. Responses were scored on a four-point scale (0 = never, 1 = rarely, 2 = sometimes, 3 = always). The second dimension was the diversity of information sources consulted, measured as the count of distinct sources accessed by each farmer from a predefined list of six sources: extension agents, fellow farmers, farmer associations, radio programmes, input dealers, and community leaders. The two standardised dimension scores were summed to produce a continuous composite index for each respondent, which served as Y in the regression model.

The independent variables include continuous measures; age, education level (years of formal schooling), household size, farm size (hectares), and farming experience (years), and one binary variable: group membership (1 = member, 0 = non-member), reflecting social capital and collective access to information (Agwu & Chah, 2007). Descriptive statistics such as frequencies, percentages, and means were used to summarise the data. A multiple regression analysis was conducted to identify the socio-economic factors that significantly influence the use of agricultural information among sesame farmers (Aina et al., 2005).

Research results

Table 1 shows the distribution of farmers according to their knowledge on various sesame production practices. The results indicate that most farmers possessed good knowledge of land preparation (84.0%), appropriate planting time (76.8%), and seed selection (71.2%). However, fewer respondents demonstrated adequate knowledge on the use of fertilisers (43.6%), pest and disease control (39.2%), and post-harvest practices (35.6%). These findings suggest that while foundational knowledge on cultivation is strong, there are knowledge gaps in technical and post-harvest areas. Such gaps reduce the capacity of farmers to optimise productivity and maintain sesame quality. Interventions should prioritise training on input use and post-harvest handling to address these deficiencies and strengthen the knowledge base of producers.

Table 1. Level of Farmers' Knowledge on Sesame Production

Production Practice	Frequency	Percentage
Land preparation	210	84.0
Seed selection	178	71.2
Planting time	192	76.8
Fertiliser use	109	43.6
Pest and disease control	98	39.2
Post-harvest handling	89	35.6

Source: field survey, 2023.

Table 2 presents the multiple regression results including regression coefficients, standard errors, t-statistics, and model diagnostics. To enhance the transparency and interpretability of the regression output, standard errors and t-statistics are reported alongside the regression coefficients. Additionally, the distribution of the residual component was examined to assess whether the OLS assumption of normally distributed errors was satisfied. The residuals were found to be approximately normally distributed, as confirmed by the Shapiro-Wilk test ($p = 0.312$), supporting the validity of the regression estimates (Adio et al., 2016; Agwu & Chah, 2007). Education level, farm size, farming experience, and group membership were statistically significant.

The regression result indicated that education level had a positive coefficient ($\beta = 0.308$, $p < 0.01$), indicating that more years of formal schooling increased the likelihood of agricultural information use. Farm size ($\beta = 0.215$, $p < 0.05$) and farming experience ($\beta = 0.196$, $p < 0.05$) also contributed positively. Group membership ($\beta = 0.248$, $p < 0.05$) was significant, showing that social affiliations play a strong role in enabling access and application of information. Age and household size were not statistically significant. The model had an R^2 of 0.624, indicating that 62.4% of the variance in information use was explained by the included variables. The F-statistic of 11.45 ($p < 0.001$) confirms that the model was statistically significant overall. These results align with empirical literature that links information use to education, land access, and social capital.

Table 2. Factors Influencing Use of Agricultural Information

Variable	Coefficient (β)	p-value	Significance
Constant	1.432	0.000	***
Age (X_1)	-0.132	0.213	NS
Education level (X_2)	0.308	0.006	**
Household size (X_3)	0.072	0.266	NS
Farm size (X_4)	0.215	0.020	*
Farming experience (X_5)	0.196	0.031	*
Group membership (X_6)	0.248	0.018	*
Diagnostics	Score		
R²	0.624		
F-statistic	11.45	0.000	***
Mean VIF	1.275		

Legend: NS – not significant; * – significant at 5%; ** – significant at 1%; *** – significant at 0.1%

Source: field survey, 2023.

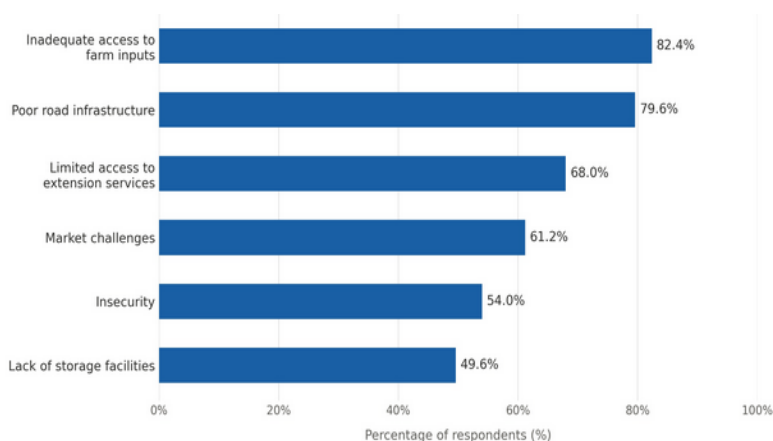


Fig. 1. Constraints to Sesame Production in the Study Area

Source: field survey, 2023.

Figure 1 presents the distribution of major constraints reported by sesame farmers in the study area, displayed using a uniform single-colour bar chart for visual clarity. The most reported constraint was inadequate access to farm inputs (82.4%), followed by poor road infrastructure (79.6%), limited access to extension services (68.0%), and market challenges (61.2%). Other constraints included insecurity (54.0%) and lack of storage facilities (49.6%).

These constraints align with previous studies that underscore the structural and institutional limitations confronting smallholder farmers. They also suggest that knowledge alone is not sufficient if systemic barriers remain. Addressing these constraints requires coordinated efforts from government agencies, NGOs, and community stakeholders to improve service delivery and infrastructure.

Discussion of Findings

The results reveal that farmers in Adamawa State possess substantial knowledge of core sesame production practices such as land preparation, seed selection, and planting time. However, their knowledge declines in more technical areas like fertiliser use, pest control, and post-harvest handling. This pattern of knowledge can also be related to findings by Aina et al. (2005), Agbamu (2006), and Bisheko and Rejikumar (2023), who suggested that basic agricultural practices are more accessed when compared to the technical and post-harvest knowledge. The difference indicates that extension services and training programmes have paid much attention to primary agronomic practices, leaving secondary downstream practices unattended. For development organisations, this requires that their training content be readjusted. Resources must be directed towards areas that are less known with greatest yield losses and post-harvest value erosion.

It is worth noting that the comparatively low knowledge scores in pest control (39.2%) and post-harvest handling (35.6%) observed in this study are more pronounced than those reported in southwestern Nigerian contexts (Adio et al., 2016; Aina et al., 2005), likely reflecting the historically limited extension presence in Adamawa State's northeastern zone and the disruption of agricultural advisory services by prolonged insecurity in the region (Abdullahi et al., 2026). This contextual distinctiveness underscores the importance of interpreting knowledge gaps not merely as individual farmer deficiencies, but as outcomes of a structurally under-resourced extension environment.

The regression analysis indicates that education level, farm size, farming experience, and group membership significantly influence the use of agricultural information among sesame farmers. These findings are consistent with those reported by Adio et al. (2016) and Kafando (2023), who demonstrated that higher education levels enhance farmers' capacity to comprehend and apply agricultural information. Farmer group membership also facilitated access to collective resources and shared knowledge, consistent with the findings of Daudu et al. (2009) and Zamiri and Esmacili (2024). Surprisingly, age and the household size were not significant predictors of information use, suggesting that these demographic aspects play a limited role in explaining information use. For policymakers and practitioners, this implies that strategies focused on improving education and promoting cooperative membership could enhance information uptake more effectively than age-based targeting.

It should be noted that the local context of Adamawa State, its geo-climatic situation in the northeast of Nigeria, agro-ecological diversity of three agricultural zones, as well as its cross-border situation with Cameroon and the presence of conflict zones could magnify the importance of group membership and education on enabling information access compared to other studies conducted in Nigeria's Southwest region like that of Adio et al. (2016). Informational disadvantage is a critical factor affecting farmers in this region, and social

capital and formal education are two important factors that are particularly important as mediators (Daudu et al., 2009; Agwu & Chah, 2007).

The study also identifies major constraints to sesame production. Inadequate access to farm inputs, poor infrastructure, weak extension coverage, and market barriers were the most reported challenges (Azon et al., 2023). These findings corroborate the observations of Auta and Dafwang (2010) and Wacal et al. (2024), who noted that infrastructural deficits and limited extension services consistently undermine productivity in Nigeria's agricultural sector. The exceptionally high prevalence of input access constraints (82.4%) and infrastructure deficits (79.6%) reported in this study exceeds levels documented in comparable studies from other Nigerian states (Auta & Dafwang, 2010), reflecting the compounding effect of Adamawa's geographic remoteness, historical underinvestment in rural infrastructure, and ongoing insecurity. These contextual factors distinguish the production environment of sesame farmers in this state from those in more accessible agricultural zones and underscore the need for region-specific rather than blanket national agricultural policies (Abdullahi et al., 2026; Sanni et al., 2026). The prevalence of these constraints suggests systemic gaps that hinder the full application of knowledge and information. For policy actors and local government authorities, the implication is clear: improving extension reach and investing in rural infrastructure must accompany any strategy aimed at enhancing agricultural information use. Without such support, improvements in awareness will have a limited practical effect.

Therefore, the findings offer insight into how knowledge, information access, and structural constraints interact to shape sesame production outcomes. The patterns observed in Adamawa State are consistent with broader national and regional trends documented by Agwu and Chah (2007) and Daudu et al. (2009), who stressed the importance of tailored extension strategies and capacity-building. Development agencies, NGOs, and state ministries of agriculture should use these insights to design holistic programmes. Interventions must go beyond information dissemination and address the underlying capacity and infrastructural challenges. This integrated approach will ensure that farmers not only receive relevant information but are also empowered to apply it effectively in their production systems.

Conclusions

This study examined farmers' knowledge of sesame production, the factors influencing their use of agricultural information, and the key constraints limiting sesame production in Adamawa State, Nigeria. The results showed that farmers had high levels of knowledge on basic agronomic practices, particularly land preparation, seed selection, and planting periods. However, technical areas such as fertiliser use, pest control, and post-harvest handling reflected weaker knowledge. The regression analysis identified education level, farming experience, farm size, and group membership as significant predictors of agricultural information use, while age and household size were not statistically significant. The study also revealed several constraints faced by sesame producers, including limited access to inputs, poor infrastructure, weak extension services, market challenges, and insecurity.

The findings confirm that knowledge and information use among sesame farmers are closely linked to education, group participation, and production scale. Yet, structural limitations such as poor roads, limited input supply, and weak extension coverage undermine

the translation of knowledge into productivity. These results support previous studies that argue for integrated approaches to agricultural development which consider both farmer capacity and the institutional environment. Enhancing information flow alone is not sufficient unless accompanied by tangible improvements in the agricultural support system.

The findings from this study have several implications for further research. First, the longitudinal design used by the studies would allow for greater causal evidence than the cross-sectional design used here, particularly for the evolution of information utilisation behaviour over time among the sesame farmers. Equally, comparative studies, which can be conducted across other states in Nigeria that produce sesame, particularly Nassawa, Benue and Jigawa, would be able to assess geographic heterogeneity in information utilisation dynamics. Also, disaggregated information access and utilisation is justified, as there may be structural and social barriers to access that affect only female sesame producers, which are not reflected in aggregate data.

Therefore, the following recommendations were made;

- i. Stakeholders in the agricultural sector, particularly policymakers, extension agencies, and development organisations, should prioritise training initiatives that strengthen farmers' capacity in technical and post-harvest aspects of sesame production.
- ii. Policies that promote adult education and encourage group formation among farmers will likely improve information access and utilisation.
- iii. Equally, the government should address infrastructural and service delivery gaps, especially in rural road networks, input supply chains, and extension staffing. Programmes aimed at strengthening farmer cooperatives and enhancing their links to markets and information sources should also be promoted.
- iv. Research institutions should continue to monitor knowledge and information dynamics among smallholder farmers to inform adaptive strategies for improving sesame productivity and livelihoods.

References

- Abdullahi, A.A., Jibrilla, A.A., Adamu, B. (2026). An empirical evaluation of the impact of agricultural programs on food security in Adamawa State. *ADSU International Journal of Applied Economics, Finance and Management*, 11(1). <https://ajaeim.adsu.edu.ng/>.
- Adio, F.E., Abu, Y., Oyetola, S.O. (2016). Use of agricultural information sources and services by farmers for improved productivity in Kwara State. *Journal of Agricultural and Food Information*, 17(4), 291–308. <https://doi.org/10.1080/10496505.2016.1223122>.
- Adnan, N., Rehman, H.M., Alam, M.N. (2025). Exploring agricultural innovation: An empirical investigation of factors influencing the adoption and non-adoption of smart fertilizer technology among farmers in developing countries. *Agriculture & Food Security*, 14, 11. <https://doi.org/10.1186/s40066-025-00529-0>.
- Agbam, J.U. (2006). Essentials of agricultural communication in Nigeria. Malthouse Press Limited.
- Agwu, A.E., Chah, J.M. (2007). Access and utilisation of modern communication media by farmers in Enugu State, Nigeria. *Educational Research and Review*, 2(5), 88–94.
- Aina, L.O., Adedoyin, S.F., Adebayo, E.O. (2005). Agricultural information dissemination in Nigeria. Library and Information Science Research, 27(2), 263–265. <https://doi.org/10.1016/j.lisr.2005.01.006>.
- Atinaf, M., Anteneh, S., Kifle, M. (2023). A holistic understanding of information and communication technology for development through context, resilience, and sustainability: Evidence from a local agriculture extension information service in Ethiopia. *The Electronic Journal of Information Systems in Developing Countries*, 89(4), e12260. <https://doi.org/10.1002/isd2.12260>.
- Auta, S.J., Dafwang, I.I. (2010). The role of extension in agricultural development. *Journal of Agricultural Extension*, 13(1), 66–72. <https://doi.org/10.4314/jae.v13i1.57734>.

- Azon, C.F., Hotegni, N.V.F., Adjé, C.A., Agossou, C.O., Sogbohossou, O.E., Noutelope, H., Achigan-Dako, E.G. (2023). Socio-demographic factors and ethnobotanical knowledge associated with sesame management practices across agroecological zones in Benin. *Experimental Agriculture*, 59, e10. <https://doi.org/10.1017/S0014479722000363>.
- Bisheko, M.J., Rejikumar, G. (2023). Major barriers to adoption of improved postharvest technologies among smallholder farmers in sub-Saharan Africa and South Asia: A systematic literature review. *World Development Sustainability*, 2, 100070. <https://doi.org/10.1016/j.wds.2023.100070>.
- Bonephace, E.M., Gui, X., Makawia, P.J. (2022). Assessment of awareness of farmers on agricultural information services in Mara Region, Tanzania. *Library Philosophy and Practice (e-journal)*, 2022, 7126. <https://digitalcommons.unl.edu/libphilprac/7126/>.
- Daudu, S., Chado, S.S., Igbashal, A.A. (2009). Agricultural information sources utilised by farmers in Benue State, Nigeria. *Patnsuk Journal of Research in Science and Technology*, 6(1), 15-20.
- Food and Agriculture Organization of the United Nations. (2019). Climate-smart agriculture in Adamawa State of Nigeria. <https://openknowledge.fao.org/items/cac6e039-b16d-45b9-990f-618856dba8c7>.
- Haque, M., Umadevi, M., Langyan, S. (2025). Challenges and strategies for global sustainable production, market dynamics, and trade in sesame. In: S. Langyan (Ed.). *Sesame: Sustainable production and applications* (pp. 21-36). Springer Nature Singapore. https://doi.org/10.1007/978-981-97-6802-0_2.
- Iakovidis, D., Gadanakis, Y., Park, J. (2022). Farm-level sustainability assessment in Mediterranean environments: Enhancing decision-making to improve business sustainability. *Environmental and Sustainability Indicators*, 15, 100187. <https://doi.org/10.1016/j.indic.2022.100187>.
- Kafando, W.A. (2023). Impacts of education and the adoption of improved sesame seeds on productivity of sesame farms in Burkina Faso. *African Journal of Economic Review*, 11(2), 21-32.
- Karbo, R.T., Frewer, L.J., Areal, F., Jones, G., Nurudeen, S. (2024). A systematic review of the efficacy of theories used to understand farmers' technology adoption behavior in lower-to-middle-income countries. *Development Studies Research*, 11(1), 2294696. <https://doi.org/10.1080/21665095.2023.2294696>.
- Kassie, G.T., Worku, Y., Bachewe, F.N., Asnake, W., Abate, G.T. (2023). Scoping study on Ethiopian sesame value chain (Initiative Note No. 4). International Food Policy Research Institute (IFPRI). <https://www.ifpri.org/publication/scoping-study-ethiopian-sesame-value-chain>.
- Mapiye, O., Makombe, G., Molotsi, A., Dzama, K., Mapiye, C. (2023). Information and communication technologies (ICTs): The potential for enhancing the dissemination of agricultural information and services to smallholder farmers in sub-Saharan Africa. *Information Development*, 39(3), 638-658. <https://doi.org/10.1177/02666669211064847>.
- Mbaya, L.A. (2022). Reflection of 43 years (1977-2020) of geography research in the north-east region of Nigeria. In *Geographical perspectives of Nigeria* (Vol. 1, pp. 1–[pp.]).
- Muthoni, J., Shimelis, H. (2025). Production of minor tropical oil crops in Africa: Case of sesame (*Sesamum indicum* L.). *Australian Journal of Crop Science*, 19(7), 816-829.
- Oyedepo, E.O., Eybuomwan, G.O. (2024). Effects of sesame production on economic growth in Nigeria (1981 to 2021). *Journal of Agriculture and Environment*, 20(2), 9-19. <https://www.researchgate.net/publication/354953179>.
- Sanni, G.B.T.A., Ezin, V., Odjo, T., Ahanchede, A. (2026). Unlocking the promise of sesame (*Sesamum indicum* L.) industry in Africa: Economics, opportunities, obstacles, and future horizons. *CABI Agriculture and Bioscience*, 7(1), 0022. <https://doi.org/10.1079/ab.2026.0022>.
- Sirany, T., Tadele, E. (2022). Economics of sesame and its use dynamics in Ethiopia. *The Scientific World Journal*, 2022, 1263079. <https://doi.org/10.1155/2022/1263079>.
- Wacal, C., Basalirwa, D., Okello-Anyanga, W., Murongo, M.F., Namirembe, C., Malingumu, R. (2021). Analysis of sesame seed production and export trends, challenges and strategies towards increasing production in Uganda [Unpublished manuscript].
- Wacal, C., Obala, J., Agole, D., Basalirwa, D., Masereka, J., Buwa, R., Andaku, J. (2024). Determinants of adoption of improved agronomic practices of *Sesamum indicum* L. production, challenges and opportunities in Lango sub-region of Northern Uganda [Unpublished manuscript].
- Zamiri, M., Esmaili, A. (2024). Methods and technologies for supporting knowledge sharing within learning communities: A systematic literature review. *Administrative Sciences*, 14(1), 17. <https://doi.org/10.3390/admsci14010017>.

- Zhang, X., Yang, Q., Mamun, A.A., Masukujjaman, M., Masud, M.M. (2024). Acceptance of new agricultural technology among small rural farmers. *Humanities and Social Sciences Communications*, 11, 1641. <https://doi.org/10.1057/s41599-024-04100-7>.
- Zondo, W.N.S., Ndoro, J.T. (2023). Attributes of diffusion of innovation influence on smallholder farmers' social media adoption in Mpumalanga Province, South Africa. *Sustainability*, 15(5), 4017. <https://doi.org/10.3390/su15054017>.

For citation:

Umar A.J., Michael A., Kyari N.M., Abubakar D.Y. (2026). Socio-Economic Determinants of Agricultural Information Uptake and Structural Constraints to Sesame Productivity in Adamawa State, Nigeria. *Problems of World Agriculture*, 26(3), 7-18; DOI: 10.22630/PRS.2026.26.3.9