



**ASSESSMENT OF FACTORS INFLUENCING UTILIZATION OF AGRICULTURAL
EXTENSION SERVICES (AES) BY SMALLHOLDER MAIZE FARMERS IN TWO
SELECTED LOCAL GOVERNMENT AREAS OF
KADUNA STATE**

¹Abubakar, A. I., ²Abubakar, M., ¹Alabi, S. I., ³Muhammad, A. T. and ²Abba, K. Z.

¹Department of Agricultural Extension and Rural Development Ahmadu Bello University, Zaria.

²Department of Agricultural Economics and Extension, Federal University Gashua, Yobe State.

³Department of Agricultural Extension and Rural Development, Federal University, Dutse.

Corresponding Author's Email: abuadeiza1@gmail.com, **GSM:** +2348036408020

ABSTRACT

The study assessed the factors influencing utilization of agricultural extension services (AES) by smallholder farmers in two selected Local Government Areas of Kaduna State. A Multistage sampling procedure was used to select 293 smallholder maize farmers. Primary data were gathered using a structured questionnaire. Descriptive statistics (frequency, percentage, mean) and inferential statistics (Multiple regression) were employed to achieve the study's objectives. Results on the socioeconomic characteristics revealed that 29.7% of the farmers were within the ages of 31–40 years which forms the majority with a mean age of 39.03 years. Most (86.3%) of the respondents were male and result also revealed that majority (85.7%) of the respondents are married. Considerable numbers of respondents (43.7%) were literate having at least secondary education. Result on factors influencing the utilization of AES revealed that age ($p < 0.10$), marital status ($p < 0.10$), farming experience ($p < 0.05$), farm income ($p < 0.05$), yield ($p < 0.05$), and number of extension contact ($p < 0.01$) significantly influenced the smallholder maize farmers utilization of AES in the study area. The major constraints affecting the effectiveness of AES included high cost of farm input (92.2%), and high labour cost (82.9%). The concluded that improving farmers' access to extension services, while addressing the financial and institutional constraints faced by smallholder farmers, will enhance the utilization of agricultural extension services. It is therefore recommended that addressing infrastructural and security challenges will further improve the effect of AES and increase maize productivity in the study area.

Keywords: Extension, Services, Maize, Farmer, Smallholder, Utilization.

INTRODUCTION

Maize production is a critical component of Nigeria's agricultural sector, serving as both a staple food and an industrial raw material. However, despite its importance, its productivity among smallholder farmers remains significantly low, with Nigeria struggling to meet its domestic demand due to population growth, urbanization, and industrial needs (NAERLS, 2018 and Benhura *et al.*, 2024). this productivity gap is evident through frequent price hikes and importation, which impact national food security and economic growth. Kaduna State is a leading maize-producing region in Nigeria and its agro-climatic conditions, including fertile soils and adequate rainfall (International Institute for Tropical Agriculture, 2020). Maize production in the State is a key agricultural activity, particularly in Soba and Lere Local Government Areas (LGAs). One of the primary mandates of agricultural extension services in Kaduna State is the dissemination of improved farming practices and these practices have been reproted by the Kaduna State Agricultural Development Agency (KADA) to significantly boost maize yield. For instance, a reprot by KADA (2023), indicated that farmers who received regular extension support experienced a 30% increase in maize productivity compared to those without access to such services. Agricultural extension services in Nigeria are intended to disseminating knowledge to farmers (Momodu *et al.*, 2024). The services are particularly vital in addressing the constraints faced by smallholder farmers, such as low access to inputs, inadequate training and limited knowledge of pest and diseases management (Ajani *et al.*, 2023). Agicultural extension services in Nigeria are designed to facilitate the transfer of agriculturla knowledge, technologies and innovations to farmers with the aim of improving productivity and livelihoods. These services play a critical role in addressing the



production constraints faced by smallholder maize farmers, including limited access to improved inputs, inadequate technical knowledge, poor market access and ineffective pest and diseases management (Ajani *et al.*, 2023). Beyond the dissemination of improved maize production technologies, extension services support farmers by creating awareness of climate change adaptation strategies, linking them to markets and sources of agricultural credit, and providing training on irrigation and water management, safe use of agrochemical operation of farm machinery, pest and diseases management, agroforestry, agro-processing recommendation agronomic practices post-harvest storage, and the use of information and communication technologies (ICTs) and mass media for agricultural information (Osuji *et al.*, 2025). Extension agents also promote the formation and strengthening of farmer cooperatives to enhance farmers' access to production inputs, financial services, and collective marketing opportunities (Arowosegbe *et al.* 2024). The effective utilization of these extension services is therefore expected to improve maize productivity, increase farm income, and enhance the overall resilience of smallholder farming system. Several studies have emphasized the role of AES in enhancing agricultural productivity (Ifeanyi-Obi *et al.*, 2022). for instance, Uchemba *et al.* (2025), note that extension services foster innovation in rural areas, while Amare *et al.* (2021), highlights importance of extension services in addressing climate challenges. The effectiveness of extension services is influenced by factors such as government commitment, infrastructure and local community involvement (Agwu *et al.*, 2023). However, issues such as political instability, corruption and inadequate funding often undermine these efforts in Nigeria (Modupe, 2024). Therefore, this study focuses on identifying factors that enhance or hinder the utilization of Agricultural Extension Services in Lere and Soba Local government Areas of Kaduna State, with the aim of improving agricultural efficiency and support rural livelihoods. It also gives the ideas required for addressing the constraints faced by smallholder maize farmers.

METHODOLOGY

Study Area

The research was carried out in Soba and Lere LGAs from Maigana and Lere zones of Kaduna State, Nigeria, the zone is known for high maize production. The State lies on the Nigerian high plains (Latitudes 9°10'–11°30'N, Longitudes 6°–9°10'E) covering approximately 48,473 km² with about 2.15 million hectares of arable land (National Space Research and Development Agency, 2023 and Ibrahim *et al.*, 2025). Projected population of the State is to be 9,857,682 in 2025 with 9.1% annual growth rate from the 2006 figure of 6,113,503 persons. (National Population Commission, 2006). The wet season commences from the month of April/May and ends by October/November, while the dry season sets in between ending October/early November to March or April (Nigerian Meteorological Agency, 2024). Agriculture is the main stay of the economy of the study area because majority of the people are farmers, with 80% percent them people actively engaged in farming (John and Balogun, 2025). In addition to maize production, sorghum, cowpea, soybeans, potatoes, ginger, groundnut and other crops are also grown. Animals are also reared animals including goats, sheep, cow, pigs, chickens, duck fowls and their likes.

Sampling Procedure and Sample Size

The used multistage sampling in selecting respondents. Firstly, two agricultural zones (Lere and Maigana zones) were purposively selected due to high maize output. From these, Soba and Lere LGAs were randomly chosen in the second stage. Three communities per LGA were then selected randomly using balloting (Soba, Gimba, Turawa in Soba LGA; Abadawa, Sabon Birni, Ramin Kura in Lere LGA). Kaduna State Agricultural Development Agency (KADA) has documented 1100 maize farmers in the study area which form the sample frame, and 293 maize farmers were selected randomly as the respondents. The sample size was calculated using Slovin's formula

Method of Data Collection

Primary data and secondary sources of information were used for the study; structured questionnaire were administered to the selected smallholder maize farmers. Tools were pre-tested and administered by trained enumerators. Secondary sources (literature, government reports) supplemented the context.



Analytical Techniques

Descriptive statistics including measures of central tendencies such as mean, percentages and frequency distribution was used to achieve objective (i) identify the socioeconomics characteristics of the smallholder's maize farmers in the study area; (iii) describe the challenges faced by smallholder maize farmers in utilizing AES. Poisson regression was used to achieve objective ii, which is to determine the factors influencing the utilization of AES. The general Poisson regression model is mathematically expressed as:

$$\log(\mu_i) = \alpha + \beta_1 X_{1i} + \beta_2 X_{2i} + \dots + \beta_k X_{ki}$$

Where:

Y_i = Number of agricultural extension services utilized (count) - dependent variable

$\mu_i = E(Y_i | X)$ is the expected count for observation i

$\log(\mu_i)$ is the log link function used in Poisson regression

α is the intercept

$\beta_1, \beta_2, \dots, \beta_k$ are the regression coefficients

$X_1, X_2, \dots, X_k$ are the independent variables

X_1 = age of farmers (years);

X_2 = Sex (1 = male, 0 = female);

X_3 = household size (number);

X_4 = education level (number of schooling years);

X_5 = farming experience (years);

X_6 = occupational status (years);

X_7 = farm size (hectares);

X_8 = income (Naira);

X_9 = yield (Bags of 100kg);

X_{10} = extension visits (number)

X_{11} = years spent in cooperative society

X_{12} = credit received (amount in naira)

RESULTS AND DISCUSSION

Socioeconomic and Institutional Characteristics

The results in table 1 revealed that Farmers' mean age was 39.03 years, with the largest share been 29.7% who are within ages 31–40. who are at productive and active age that could positively influence adoption. This finding agrees with Oyinbo *et al.* (2022), who reported that the majority of maize farmers in Ogun State were within the active working age. The Table further revealed that most were male (86.3%) and 85.7% are married. This implies that maize farming in the study area is male dominated, which could affect decision making dynamics and access to extension services to enhance productivity, possibly leaving female farmers underrepresented or underserved. As noted by Sennuga *et al.* (2020a), who reported that majority of farmers in Sub-sahara Africa were male. The result on household size revealed that 41.3% of the respondents had a household size of 6–10 members, with a mean household size of 7. consonance with Sennuga *et al.*, (2020b), who reported that majority of farmer in Kaduna State had many members of household members. The result also shows that the respondent has one form of education or the other it revealed that 43.7% of the respondent had secondary education by, implication this enhances their ability to comprehend and apply information received. This reinforced the findings of Lawal (2023), who reported that smallholder maize farmers in Kwara State had at least secondary education. Farm sizes were small: 65.2% cultivated 1–2 ha with a mean of 1.34 ha indicating maize farmers are smallholders, and their productivity heavily relies on access to extension services that promote modern farming techniques This is in line with the work of Umar and Mohammed (2024), they reported that most of the maize farmers in Niger State are smallholder farmers. Respondents had substantial farming experience recording 31.4% who have farmed for 6–10 years with a mean of 8.27 years, indicating that farmers are fully engage in farming activities with a moderate level of experience that can support the effective adoption and benefiting from agricultural extension services, since their livelihoods depend on farm productivity. This is in line



with the work of Afolabi *et al.* (2025), they reported that maize farmers in Nigeria had many years of experience in farming.

Table 1: Distribution of the Respondents according to their Socioeconomic Characteristics (n=293)

Socioeconomic variables	Freq.	Percent	Mean	Std. Dev.
Age				
<20-30	83	28.3		
31-40	87	29.7	39.03	10.51
41-50	81	27.6		
51 above	42	14.3		
Sex				
Male	253	86.3		
Female	40	13.7		
Marital status				
Single	42	14.3		
Married	251	85.7		
Household size				
2-5	113	38.6		
6-10	121	41.3	7	5.37
11-15	41	14.0		
16-20	12	4.1		
21 above	6	2.0		
Level of education				
Quranic education	66	22.5		
Adult education	11	3.8		
Primary education	43	14.7		
Secondary education	128	43.7		
Tertiary education	45	15.4		
Farm size				
1-2	191	65.2	1.34	0.65
3-4	69	23.5		
5 above	33	11.3		
Farming experience				
1-5	39	13.3		
6-10	92	31.4	8.27	6.21
11-15	53	18.1		
16-20	54	18.4		
21 above	55	18.8		

Factors Influencing the Utilization of AES by Smallholder Farmers

Results in Table 2 show the Poisson Regression on socioeconomic and institutional factors influencing the utilization of agricultural extension service in Kaduna State. The Pseudo R-squared value of 0.2891 indicates that approximately 28.91% of the variation in the count of agricultural extension services utilized by smallholder maize farmers is explained by the socioeconomic and institutional factors included in the model. Six independent variables were statistically significant, they include; age, marital status, farming experience, farm income, yield and number of extension visits.

The coefficient of age (-0.0112628) was negative and significant at 10% level of probability on the decision of farmers to utilize agricultural extension services. The corresponding Incidence Rate Ratio (IRR) of 0.9889 indicates that a one-year increase in the age of a farmer decreases the expected number of agricultural extension services utilized by approximately 1.11%. This suggests that older farmers may be less inclined to adopt or seek new practices and innovations promoted by extension agents. This is consonance with the work of Ojo *et al.* (2022), they observed that older are often less receptive to innovation due to risk aversion and entrenched practices.

The coefficient of marital status (-0.2284978) was negative and significant at 10% level of probability on the decision of farmers to utilize agricultural extension services. The IRR of 0.7957



implies that married farmers are expected to utilize agricultural extension services at a rate approximately 20.4% lower than the single counterparts, possibly due to household responsibilities or conservative attitudes. This is in line with the work of Ibrahim *et al.* (2022), they found that marital status is an influencing factor on the utilization of agricultural extension service in the study area.

The coefficient of farming experience (0.0171162) was positive and significant at 5% level of probability on the decision of farmers to utilize agricultural extension services. The corresponding IRR of 1.0173 indicates that each additional year of farming experience increases the expected utilization of agricultural extension services by approximately 1.73%. experience farmers are more likely to appreciate the value of extension support and adopt recommended practices. This aligns with the work of Umeh and Ekong (2019), they found that farming experience influence farmers decision to participate in agricultural extension services.

The coefficient of farm income (7.48e-08) was positive and significant at 5% level of probability on the decision of farmers to utilize agricultural extension services. The IRR of approximately 1.000001 indicates that increases in farm income slightly increase the expected utilization of agricultural extension services. While effect of one Naira is negligible, larger increases in farm income translate into greater capacity to access extension services. This is in line with the work of Lawal *et al.* (2023), they found that farmers income is one of the factors contributing to the use of advisory services in Nigeria.

The coefficient of yield (0.0000533) was positive and significant at 5% level of probability on the decision of farmers to utilize agricultural extension services. The corresponding IRR of approximately 1.00005 indicates that increases in maize yield marginally increase the expected utilization of agricultural extension services. Although the unit effect is small because yield is measured in kilograms/ha, substantial increases in output are associated with greater engagement with extension services. This is in line with the work of Chukwu and Edeh (2021), they posited that, increase in yield is one of the motivation factors for farmer to adopt maize production practices in Southeast Nigeria.

The coefficient of number of extension visits (0.154097) was positive and significant at 1% level of probability on the decision of farmers to utilize agricultural extension services. he IRR of 1.1667 indicates that each additional extension contact increases the expected utilization of agricultural extension services by approximately 16.67%, indicating that frequent contact with extension agents enhances service uptake. This is in line with the work of Adebisi and Adesola (2020), they revealed that access to extension contact influence the adoption of improved crop technologies in the study area.

Table 2: Results of Poisson Regression on Socioeconomic and Institutional Factors Influencing the Utilization of AESs by Smallholder Farmers

Variables	Coefficient	Std. Error	Z-Value	P-Value	IRR
Age	-0.0112628*	0.0064089	-1.75	0.079	0.9888897
Sex	0.0056497	0.1184226	0.05	0.962	1.005666
Marital status	-0.2284978*	0.1196809	-1.91	0.056	0.795728
Household size	-0.0184658	0.0122749	-1.50	0.132	0.9817037
Years in school	0.0083379	0.0061619	1.35	0.176	0.9916968
Farm size	0.0126905	0.0273797	0.46	0.643	0.9873897
Farming experience	0.0171162**	0.0083925	2.04	0.041	1.017264
Farm income	7.48e-08**	2.93e-08	2.55	0.011	1.000001
Yield	0.0000533**	0.0000225	2.37	0.018	0.9999467
Number of extension contact	0.154097***	0.0442639	3.48	0.000	1.666889
Amount of credit received	3.26e-08	2.38e-08	1.37	0.171	1.000000
Years spent in cooperative society	-0.0098923	0.0095264	-1.04	0.299	0.9901565
Constant	3.636952	0.3516634	10.34	0.000 ***	37.97591
Pseudo R ² = 0.2891					
Log likelihood = -219.17128					
LR chi2(12) = 42.86					
Prob > chi2 = 0.0000					
AIC = 464.3426					

***= Significant at 1%, **= significant at 5% and *= significant at 10% levels of probability

Challenges Hindering AES Utilization

The results in Table 3 revealed that high cost of farm inputs was the most severe constraint, reported by 92.2% of the respondents, ranking first among the identified challenges. This indicates that the rising prices of fertilizers, improved seeds, agrochemicals, and other production inputs constitute a major obstacle to farmers' ability to implement extension recommendations. This finding agrees with the National Agricultural Extension and Research Liaison Services (NAERLS, 2020), which reported that agricultural inputs distributed across many Nigerian states were largely inadequate and unaffordable to farmers, thereby limiting technology adoption and agricultural productivity. The second major constraint was high labour cost, reported by 82.9% respondents. This suggests that the increasing cost of hiring labour for land preparation, planting, weeding, fertilizer application, and harvesting discourages farmers from fully implementing recommended extension practices. Recent study (Ogbonna and Adebayo, 2025), have similarly observed that increasing labour costs constitute a major production constraint affecting agricultural productivity and profitability among Nigerian farmers. The findings further showed that inadequacy of capital was reported by 80.2% of the respondents, ranking third. This indicates that many farmers lack sufficient financial resources to purchase improved inputs, hire labour, rent machinery, or invest in recommended technologies promoted through extension services. This finding is consistent with NAERLS (2025), which reported that many Nigerian farmers experienced poor access to affordable agricultural inputs and production resources, partly because of inadequate financial capacity and limited access to agricultural credit. Another important constraint identified was the inadequacy of extension agents, reported by 42.3% of the respondents, ranking fourth. These findings suggest that the available extension personnel are insufficient to adequately serve the growing farming population. This finding corroborates with the reports of NAERLS (2020) and FAO (2023), which reported that a national extension agent-to-farmer ratio of approximately 1:3,500, was far above FAO recommended ratio of 1:800, resulting in inadequate coverage and declining effectiveness of extension delivery in Nigeria. Late arrival of farm inputs was identified by 19.5% of the respondents, making it the least reported constraint. Although relatively few farmers considered this a major problem, delay distribution of improved seeds, fertilizers and agrochemical still affects the timely implementation of recommended agronomic practices. Similar observation were reported by



NAERLS (2020), which found that delays in the procurement and distribution of agricultural inputs constrained crop production across several states in Nigeria.

Table 3: Distribution of the Respondents based on the Challenges Hindering the Utilization of AES

S/N	Constraints	*Freq.	Percent	Rank
1.	High cost of farm inputs	270	92.2	1 st
2.	High labour cost	243	82.9	2 nd
3.	Inadequacy of capital	235	80.2	3 rd
4.	Inadequacy of extension agents	124	42.3	4 th
5.	Late arrival of farm inputs	57	19.5	5 th

*Multiple response

CONCLUSION AND RECOMMENDATION

The findings revealed that the utilization of agricultural extension services is significantly influenced by farmers' age, marital status, farming experience, farm income, maize yield, and the frequency of extension contact in the study area. In addition, the study also identified high cost of farm inputs and high labour cost as the major constraints limiting the effective utilization of agricultural extension services in the study area. The study therefore concludes that improving farmers' access to extension services, while addressing the financial and institutional constraints faced by smallholder farmers, will enhance the utilization of agricultural extension services, increase maize productivity, and improve farmers' livelihoods. It is recommended that;

1. Strengthen agricultural extension delivery by recruiting and deploying more extension agents and increasing the frequency of farm visits to ensure timely dissemination of improved maize production technologies and advisory services.
2. Improve farmers' access to affordable agricultural inputs and finance by expanding input subsidy programme and facilitating access to low-interest agricultural credit, thereby reducing the burden of high input and labour cost.
3. Promote farmers capacity building through regular training and farmer organization by encouraging participation in cooperatives, field demonstrations, e-extension utilization and extension programme to enhance farmers' knowledge, increase utilization of extension services and improve maize productivity and income.

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