JIGAWA JOURNAL OF
ENVIRONMENTAL AND EARTH SCIENCES
Federal University Dutse | Department of Environmental Sciences

Volume 1 • Issue 1 • November 2026 ISSN: 3093-8852 ISSN Online: 3093-8842

ORIGINAL RESEARCH ARTICLE

Agricultural extension methods for sustainable adoption of improved cowpea variety (*Sampea 20T*) among small-scale farmers in Bauchi State, Nigeria

Kabiru Shehu[1], Muazu Abubakar[1], Isa Magaji Azare[1], Ibrahim Abdu[2], Aliyu Ja'afar Abubakar[3] & Abdulhamed Adamu Ibrahim[1]

[1]Department of Environmental Sciences, Federal University, Dutse, Jigawa State, Nigeria
[2]Department of Agricultural Education, Aminu Saleh College of Education, Azare, Bauchi State
[3]Department of Geography and Sustainability Studies, Kaduna State University, Kaduna, Nigeria
Correspondence: kbshehu@fud.edu.ng

RECEIVED	ACCEPTED	PUBLISHED
12/09/2026	05/11/2026	06/11/2026

How to cite: Kabiru Shehu, Muazu Abubakar, Isa Magaji Azare, Ibrahim Abdu, Aliyu Ja'afar Abubakar & Abdulhamed Adamu Ibrahim (2026). Agricultural extension methods for sustainable adoption of improved cowpea variety (*Sampea 20T*) among small-scale farmers in Bauchi State, Nigeria. *Jigawa Journal of Environmental and Earth Sciences*, 1(1), 156–167.
Copyright and licence: © 2026 https://jijees.fud.edu.ng

ABSTRACT

This study examines the effectiveness of individual, group, and mass-media agricultural extension methods in teaching the cultural practices of the improved cowpea variety (*Sampea 20T*) to subsistence farmers in Bauchi State. A multi-stage sampling technique was used to select 110 farmers from six major cowpea-producing local government areas. Data were collected using structured questionnaires and analyzed using descriptive statistics and ANOVA at a 0.05 significance level. The findings showed that the group extension method was the most effective (aggregate mean = 2.69), while individual (1.51) and mass media (1.59) methods were less effective. The ANOVA results indicated a significant difference in the effectiveness of the three extension methods ($F(2, 327) = 186.675$, $p < 0.05$). The study concluded that participatory group extension approaches enhance farmers' understanding and adoption of improved cowpea variety (*Sampea 20T*) production practices more effectively than individual and mass media methods. The study recommends increased use of group-based extension approaches such as demonstrations, farmer field schools, and cooperative learning to improve the dissemination and adoption of improved cowpea technologies.

Keywords: Agriculture, Extension Methods, Sustainability, Improved Cowpea & Subsistence Farmers

Introduction

Agricultural development implies a shift from traditional methods of production to new, science-based production methods that include new practices (new varieties, cultural practices, commercial fertilizers and pesticides, as well as new crops and new farming systems). This can be achieved through these practices and communication with farmers through effective and efficient extension methods (Ogunremi, 2013). Agricultural extension is a service or system that assists farmers through educational procedures in improving farming methods and strategies, farm production and income, farm methods and techniques, farm produce, and restructuring their level of living, and uplifts the socio-economic and educational standards of rural life. An extension must have something to

extend, such as new technology or practice, that is reliable, economically attractive, and socially acceptable; the innovation must be communicated effectively.

Agricultural extension education is delivered to farmers by extension agents using various methods. These include interpersonal media, using individual methods through home visits, correspondence, and lectures; group methods such as video, workshops, group discussions, demonstrations, and field or farm visits; and mass media such as radio, television, and printed publications such as posters, instruction leaflets, calendars, and handbills. The objective of these methods is to make the farmer learn some facts and acquire some skills, which can be put into use (adoption) for his socio-economic development. (Okwu & Dauda, 2019)

Umeh (2016) pointed out that extension agents help the farmers to improve on their already acquired skills. This also involves bringing educational breakthroughs into close contact with educational instructors who are likely to retain and continue with the educational training or information needed. Likewise, Srivastava & Singh (2023) expressed the view that effective extension methods must raise awareness of the technologies, provide valid and up-to-date information about the new technologies, their applicability to farming systems, and the technical assistance necessary for the farmers.

Thus, Nazari *et al.,* (2015) posited that the successful adoption of improved farming techniques is predicated upon the effectiveness of dissemination methods to communicate new knowledge and understanding of these new technological practices to rural farmers. At the same time, the effectiveness of a method depends upon selecting the right method, at the right time, for the right people. Different extension methods have been effective in different situations, types of technology, and at different stages in the adoption process.

The improved cowpea variety, *Sampea 20T*, was developed by scientists at the Institute for Agricultural Research (IAR), ABU Zaria, in collaboration with various partners under the coordination of the African Agricultural Technology Foundation (AATF). S*ampea 20T* is highly yielding, early maturing and resistant to striga and Alectra, which are major constraints to cowpea production in most producing areas in Nigeria and other dry savanna regions. This new variety has a yield margin of between 15 and 25% compared to conventional varieties currently in cultivation by farmers (Horn *et al*., 2022). Further to that, cowpea covers the largest area of any grain legume in Africa, where Nigeria and Niger alone account for over 75% of the total cowpea production in the world. Cowpea production in Nigeria is, however, constrained by several factors, which include low-yielding potential, biotic stress (Insects, Pests, Diseases, Striga, and Alectra infection), abiotic stress (drought, heat, and low soil fertility), and poor access to improved varieties and inefficient extension services delivery.

For many years in Nigeria, farmers have been accessing agricultural information from extension on improved cowpea variety cultural practices but have not yielded positive results (Saulawa, 2025). Nasiru *et al.,* (2001) revealed that most of the extension workers use a single method of extension teaching to communicate agricultural information to farmers. Tafida (2017) posited that one of the fundamental problems in the production of improved cowpea varieties among subsistence farmers in Bauchi State, Nigeria, is ineffective extension methods in service delivery and the use of traditional cultural practices.

These problems prompted the need to analyze the effectiveness of agricultural extension methods in teaching cultural practices of the improved cowpea variety *Sampea 20T* among subsistence farmers in Bauchi State, Nigeria. This can be achieved by determining the effectiveness of individual extension methods, group extension methods, and mass media extension methods. This approach was guided by a null hypothesis that there is no significant difference in the effectiveness of individual, group, and mass media extension methods in teaching cultural practices of improved cowpea variety *Sampea 20T* among subsistence farmers in Bauchi State, Nigeria.

The study area

Bauchi State lies between latitudes 9° 30' to 12° 30' N and longitudes 8° 45' to 11° 03' E of the Greenwich Meridian (Ajaegbu, 2000; Logbaby, 2014). Within these coordinates lies the state's total land area, covering about 49,259 km^2. This is about 4.9 million ha out of Nigeria's 92.4 million ha, Nigeria's total land mass (CPN, 2014a and 2014b). The states that shared a common boundary by location, clockwise, are the seven states, including Kano and Jigawa from the north, Yobe and Gombe to the east, Taraba and Plateau to the south, and Kaduna to the west (Bauchi State Government, 2017; National Bureau of Statistics (NBS), 2019) (Fig. 1).

Bauchi State is characterized by a tropical continental climate, which records warm temperatures throughout the year and relatively moderate rainfall for about six to seven months (during the summer season of the Northern Tropics). Temperatures and rainfall range between the annual mean minimum of 21°C in December-January to the annual mean maximum of 33°C in March-April, and rainfall of 700 mm in the northern and 1,300 mm in the southern parts of the state, respectively (Shehu et al., 2018).

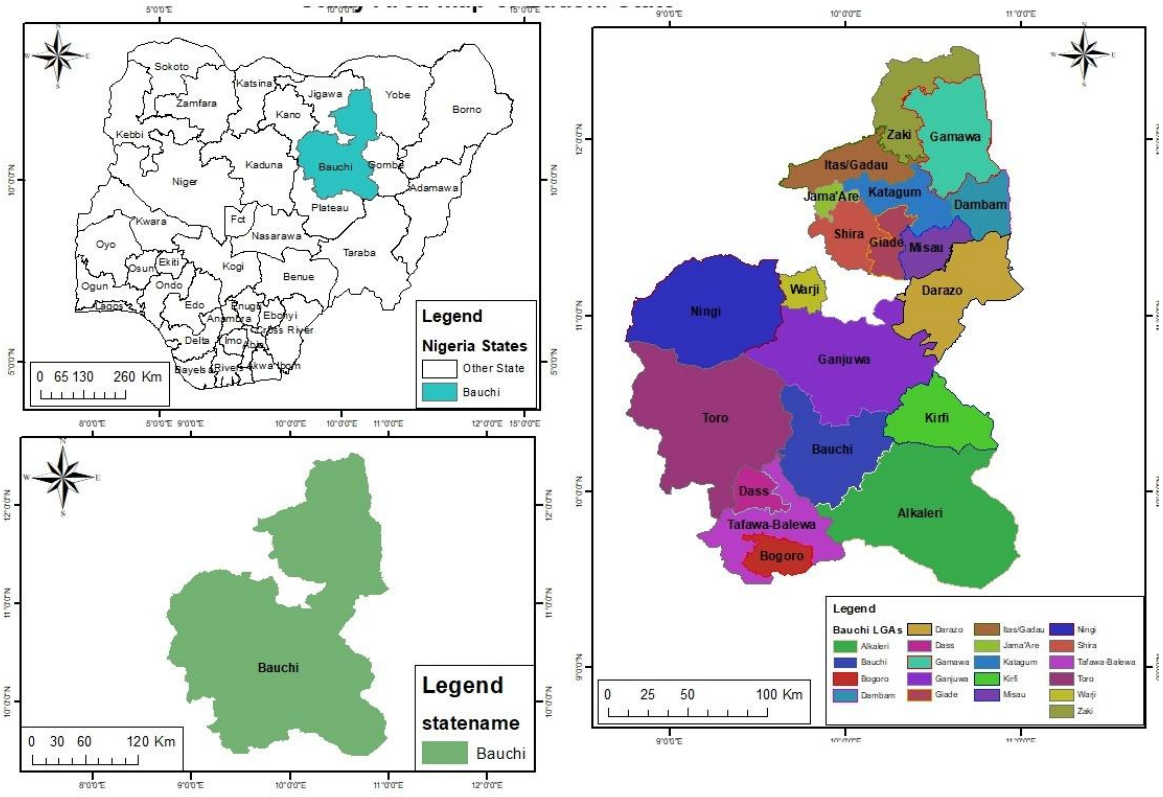


Figure 1: Location of the Study Area

The relief is moderately high, ranging between 600 m and 729 m amsl, and the terrain is well-drained except along rivers' floodplains, where the soils are mainly loam to loam-clay in nature. Large water courses traversing the area include the rivers Gongola and Jama'are (Shehu *et al.*, 2018). Bauchi State has a population of about 4,653,066 (CPN, 2014b) and a density of 94.7/km^2, who are engaged in various economic activities such as agriculture, various trading types, and educational institutions. Most considerably, the population of the state is on the increase. This, coupled with the favourable prevailing climatic conditions, has attracted high agricultural practices. Hence, the need for effective extension methods in teaching the cultural practices of the improved cowpea variety *Sampea 20T* among subsistence farmers in Bauchi State, Nigeria.

Methodology

Data sources

The required data to meet the objectives of this paper were obtained quantitatively about the effectiveness of individual, group, and mass media extension methods, obtained from the cowpea farmers in Bauchi State.

Data collection

Field observations were conducted during the dry and rainy seasons to note the farmers actively engaged in cowpea cultivation. The observations also included noting the traditional farming facilities in the area and the participants' prevailing social behavior and economic trends.

Sampling size and technique

A multi-stage sampling technique was employed for this study. In this regard, twenty (20) LGAs (Bauchi North Senatorial Zone: Gamawa, Giade, Itas/Gadau, Jama'are, Katagum, Shira, and Zaki; Bauchi Central Senatorial Zone: Dambam, Darazo, Ganjuwa, Kirfi, Misau, and Warji; and Bauchi South Senatorial Zone: Alkaleri, Bauchi, Bogoro, Dass, Ningi, Tafawa Balewa, and Toro) form the sampling frame for this work. Out of the 20 LGAs, 6 LGAs (Gamawa, Katagum, Darazo, Misau, Alkaleri, and Ningi) were purposively selected zone-wise for their high cowpea farming in the study area. A structured questionnaire was adopted for data collection in this work.

The population of this study comprises the cowpea subsistence farmers in the selected LGAs in Bauchi State, Nigeria. These are participants in cowpea farming and those who are either directly or indirectly affected by extension services. Krejie & Morgan's (1970) table was used to obtain 110 samples from the population of 635 farmers across the sampled LGAs.

Data analysis

Descriptive statistics were used to analyze data on the effectiveness of individual, group, and mass media extension methods in teaching cultural practices of the improved cowpea variety (*Sampea 20T)* among subsistence farmers in the study area. Also, one-way Analysis

of Variance (ANOVA) was used to test the formulated hypothesis at a 0.05 level of significance.

Ethical consideration

Institutional clearance and approval were obtained from the Bauchi State Ministry of Agriculture and Natural Resources research ethics committee. Also, local permission from LGAs and community leaders was secured. Hence, participants were informed of the study's purpose, their rights, and the confidentiality of their responses before questionnaire administration. For confidentiality, all responses (data) were anonymous, protecting participants' identities.

Results and discussion

Effectiveness of the individual extension method

The effectiveness of individual extension methods was investigated, and results in Table 1 revealed that the mean response of each item on the effectiveness of individual extension methods in

Table 1: Effectiveness of Individual Extension Methods in Teaching Cultural Practices of Improved Cowpea Variety *Sampea 20T* Among Subsistence Farmers in Bauchi State, Nigeria

S/N	Individual Extension Method	Mean	SD	Decision
1	The individual extension method ranked as the first source of information about the cultural practices of the *Sampea 20T* cowpea variety	1.45	0.64	Less effective
2	The individual method is effective in teaching cultural practices of improving the cowpea variety *Sampea 20T* because it can work in combination with other methods.	1.56	0.77	Less effective
3	The individual extension method is not applicable for teaching the cultural practices of improving the cowpea variety *sampea 20T* in the remote area	1.45	0.72	Less effective
4	An individual extension method creates awareness about the cultural practices of improving the cowpea variety *Sampea 20T* among subsistence farmers	1.52	0.67	Less effective
5	A high yield of the *Sampea 20T* cowpea variety will be obtained without an individualized extension method on cultural practices	1.52	0.73	Less effective
6	An individual extension method is most effective in teaching cultural practices of sampea20T to subsistence farmers	1.51	0.70	Less effective
7	An individual extension method is beneficial for behavior change regarding the cultural practices of the *Sampea 20T* cowpea variety	1.55	0.67	Less effective
8	The individual extension method is not effective in teaching the cultural practices of the 20T cowpea variety	1.51	0.67	Less effective
9	An individual extension method is more effective in getting feedback from cowpea subsistence farmers about cultural practices.	1.51	0.73	Less effective
10	The individual extension method is the best method for teaching the cultural practices of the *Sampea 20T* cowpea variety by providing a solution to the problems at the local level	1.55	0.67	Less effective
	Aggregate mean	**1.51**	**0.70**	

Decision Mean=2.50

teaching cultural practices of the improved cowpea variety *Sampea 20T* is less than the decision mean of 2.50, and the aggregate mean of 1.51 is less than the decision mean of 2.50. Therefore, the individual extension method in teaching cultural practices of the improved cowpea variety *Sampea 20T* is less effective among subsistence farmers in Bauchi State, Nigeria.

These findings are consistent with Arowosegbe *et al*., (2024), who observed that individual extension methods have made significant contributions to the welfare of rural farmers by increasing food production, encouraging the adoption of new technologies and innovation systems, improving farmers' income, and enhancing literacy levels among farmers. Despite these benefits, several challenges hinder the effective delivery of agricultural extension services through individual teaching methods, including poor communication skills, the presence of late adopters and non-adopters, transportation difficulties, and inadequate funding.

Effectiveness of the group extension method

The mean score of the effectiveness of the group method in teaching cultural practices of the improved cowpea variety *Sampea 20T* among subsistence farmers in Bauchi State is depicted in Table 2. It was observed that the mean score of each item concerning the effectiveness of the group method for teaching improved cowpea variety *Sampea 20T* is greater than the decision mean of 2.50. Moreover, the aggregate mean (2.69) is greater than the decision mean (2.50). Therefore, the group method in teaching cultural practices of the improved cowpea variety *Sampea 20T* is more effective among subsistence farmers in Bauchi State, Nigeria.

In the present study area, cowpea farmers showed a stronger preference for group extension teaching methods, followed by mass extension methods, individual extension methods, and finally the combined use of individual and group teaching approaches for information dissemination. Similarly, Umeh *et al.,* (2016) found that group extension teaching methods performed effectively in terms of content delivery, skills acquisition, and active participation of beneficiaries. In support of this, research conducted by Waddington *et al*., (2010) revealed that resource-poor farmers actively participated in farmer field schools, whereas relatively wealthier farmers often considered such programmes time-consuming and therefore participated less.

One major advantage of the group extension approach is that interactive learning activities enhance farmers' decision-making abilities and encourage knowledge sharing among participants. Consequently, the present study contributes to existing literature by providing additional evidence on the reach of farmer field schools and the range of technologies disseminated through such platforms, as highlighted by Gaur *et al*., (2025). Furthermore, certain group extension methods, such as field days, were more effective among female farmers, whereas some extension approaches proved to be more effective among male farmers. This suggests that the effectiveness of extension teaching methods may vary across gender groups and farming contexts.

Table 2: Effectiveness of Group Extension Methods in Teaching Cultural Practices of Improved Cowpea Variety *Sampea 20T* Among Subsistence Farmers in Bauchi State, Nigeria

S/N	Group Extension Method	Mean	SD	Decision
1	Group extension method is good for teaching cultural practices because it enables working with many improved cowpea variety samples, 20T subsistence farmers together	1.51	0.73	Less effective
2	I prefer the individual extension method for teaching cultural practices over the group method because it takes a long time before making a decision	1.55	0.67	Less effective
3	Group methods are a powerful delivery system of teaching weed control among a sample of 20 T-cowpea subsistence farmers	3.21	0.66	Less effective
4	The group extension method is the best method for teaching cultural practices, as farmers learn together	2.84	0.82	Less effective
5	The group extension method is not suitable for promoting cultural practices in a single event	3.05	0.93	Less effective
6	Group extension teaching requires much time for facilitation.	2.88	0.83	Less effective
7	The group method is very effective in teaching cultural practices among the *Sampea 20T* cowpea variety subsistence farmers, as the results can be observed and practiced	2.98	0.90	Less effective
8	Only local farmers participate in the group extension method for teaching cultural practices	3.22	0.94	Less effective
9	Through the group extension method, subsistence farmers get a chance to improve their skills in modern cultural practices	2.65	1.04	Less effective
10	In the group extension method, educated subsistence farmers do not participate as the views it as a waste of time	2.99	0.98	Less effective
	Aggregate mean	**2.69**	**0.85**	

Decision Mean=2.50

Effectiveness of mass media extension method

The effectiveness of the mass media extension method in teaching cultural practices of the improved cowpea variety *Sampea 20T* among subsistence farmers in Bauchi State showed that the mean score on each item is less than the decision mean of 2.50 (Table 3). It was further observed that the aggregate mean (1.94) is less than the decision mean of 2.50. Therefore, the mass media extension method in teaching cultural practices of the improved cowpea variety *Sampea 20T* is

Table 3: Effectiveness of Mass Media Extension Methods in Teaching Cultural Practices of Improved Cowpea Variety *Sampea 20T* Among Subsistence Farmers in Bauchi State, Nigeria

S/N	Mass media extension method	Mean	SD	Decision
1	Mass extension method stimulates interest for further use of improved cultural practices among the sample 20T cowpea variety subsistence farmers	1.54	0.63	Less effective
2	Mass extension methods are particularly useful in making a large number of subsistence farmers aware of the 20T cultural practices	1.59	0.76	Less effective
3	The mass media extension method is unable to disseminate information about the *Sampea 20T* cultural practices that need practical dissemination	1.55	0.70	Less effective
4	Printed material is an effective medium of providing quality, timely information about sample 20Tcultural practices among subsistence farmers	1.54	0.66	Less effective
5	Television is an effective mass medium in disseminating information on sample 20T cultural practices among subsistence farmers because of the unavailability of electricity	1.56	0.71	Less effective
6	Mass media extension methods, such as printed material, had low use in teaching cultural practices due to their unavailability	1.64	0.76	Less effective
7	Mass media extension methods, such as printed material, are not suitable for teaching the cultural practices of the 20T cowpea variety among subsistence farmers due to illiteracy	1.62	0.70	Less effective
8	Television offers farmers the opportunity to employ the two major senses of seeing and hearing in teaching sample 20Tcultural practices	1.60	0.65	Less effective
9	Mass media extension method, such as television, is ineffective in teaching sample 20 T cultural practices among subsistence farmers	1.56	0.70	Less effective
10	Newspapers are an important platform of mass media extension method for cultural practices among cowpea subsistence farmers	1.73	0.69	Less effective
	Aggregate mean	**1.59**	**0.70**	

Decision Mean=2.50

less effective among subsistence farmers in Bauchi State, Nigeria.

The findings of this study are consistent with Ebere *et al*., (2023), who investigated the determinants of communication channel use among rice value chain actors in Nasarawa and Benue States, Nigeria. The study revealed that factors such as sex, age, membership in social organizations, and years of farming experience significantly influenced the use of mobile phones, while sex, age, and years of formal education were major determinants of television use among respondents.

According to Saulawa *et al*., (2025), mass extension methods are effective in attracting attention, stimulating interest, and creating a desire for further information among farmers. In support of this assertion, Rogers (2013) explained that mass media methods enable extension agents to reach a large number of people simultaneously across different locations. These methods are particularly valuable for creating awareness of new agricultural innovations and practices, generating farmers' interest, and disseminating urgent information during emergencies.

Furthermore, Rogers (2013) noted that the effectiveness of mass media extension methods lies in their capacity to transform passive situations into active and responsive ones. Mass extension methods encompass both electronic and print media, including radio, television, telephones, newspapers, posters, bulletins, leaflets, exhibitions, and circular letters. These communication channels play a significant role in promoting awareness and dissemination of improved agricultural technologies among farmers. In the context of cowpea production, such media are useful for educating subsistence farmers on improved practices, including appropriate fertilizer types, recommended application rates, and proper agronomic techniques. Similarly, Ogunremi

(2013) reported that radio remains one of the most cost-effective mass media channels due to its extensive geographical coverage and timely dissemination of agricultural information to farmers, particularly regarding fertilizer application and other improved agricultural technologies.

Differences between the extension teaching methods

The responses in Tables 1, 2, and 3 were subjected to one-way ANOVA to test for significant differences between and within the effectiveness of individual, group, and mass media extension methods in teaching cultural practices of the improved cowpea variety *Sampea 20T* among subsistence farmers, and the results are presented in Table 4. It was observed that the F (2,327) = 186.675 ($p < 0.05$); hence, the null hypothesis is rejected because the p-value of .000 is less than

Table 4: Differences Between and Within the Effectiveness of Individual, Group, and Mass Media Extension Methods in Teaching Cultural Practices of the Improved Cowpea Variety *Sampea 20T* among subsistence farmers in Bauchi State, Nigeria.

	Sum of Squares	Df	Mean Square	F	P
Between Groups	9438.588	2	4719.294	186.675	.000
Within Groups	8266.809	327	25.281		
Total	**17705.397**	**329**			

F (2,327) = 186.675, ($p<0.05$)

the alpha value of 0.05 and the alternative hypothesis are accepted. As such, it can be deduced that there is a significant difference in the effectiveness of individual, group, and mass media extension methods in teaching cultural practices of improved cowpea variety *Sampea 20T* among subsistence farmers in Bauchi State, Nigeria.

This finding is consistent with the study conducted by Nwagboso *et al*., (2024), which examined the impact of individual, group, and mass media extension teaching methods on the adoption of improved cowpea cultivation practices among subsistence farmers in three local government areas of Kaduna State, Nigeria. Their findings showed a statistically significant variation in adoption rates across the different extension methods, with the individual extension method recording the highest adoption rate, followed by the group method, and the mass media approach recording the lowest adoption rate.

Similarly, the findings align with those of Ogundele & Ibrahim (2021), who assessed the effectiveness of various communication channels in promoting improved cowpea varieties among smallholder farmers. Their study revealed significant differences in farmers' knowledge retention and adoption of recommended practices across the three communication methods. The individual extension method produced the most favourable outcomes, indicating that personalized communication enhances farmers' understanding and effective application of new agricultural innovations.

Conclusion

The study assessed the effectiveness of individual, group, and mass media extension methods in teaching the cultural practices of the improved cowpea variety *Sampea 20T* among subsistence farmers in Bauchi State, Nigeria. The findings revealed that the group

extension method was more effective than the individual and mass media extension methods in disseminating improved cowpea production practices. Furthermore, farmers perceived group-based approaches as more interactive, participatory, practical, and suitable for knowledge sharing and skills acquisition. In contrast, the individual extension method was limited by poor coverage, inadequate funding, transportation challenges, and limited extension personnel, while the mass media method was constrained by illiteracy, poor access to electricity, inadequate communication facilities, and limited availability of printed materials.

Moreover, the hypothesis test established a significant difference in the effectiveness of the three extension methods, indicating that extension teaching approaches influence the level of understanding and adoption of improved agricultural innovations among subsistence farmers. Therefore, the study concludes that the adoption and effective utilization of improved cowpea cultural practices among subsistence farmers can be enhanced through the use of participatory and farmer-centered group extension approaches.

Recommendations

Based on the findings of this work, it was recommended that;

1. Agricultural extension agencies should prioritize group extension methods such as farmer field schools, group demonstrations, workshops, and cooperative learning activities in disseminating and adopting improved cowpea production technologies among subsistence farmers.
2. Government and agricultural development organizations should recruit and train more extension agents to strengthen extension service delivery, especially in rural farming communities.
3. Farmers should be encouraged to form and participate actively in farmer groups and cooperatives to facilitate knowledge sharing, collective learning, and easier access to extension services.
4. Further studies should be conducted in other states and on other improved crop varieties to compare the effectiveness of extension teaching methods across different farming systems and ecological zones.

Declarations

Author contributions (CRediT): *Not applicable*

Funding: *Not applicable*

Conflict of interest: *Not applicable*

Ethics approval and consent (where applicable): *Not applicable*

Data availability: *Not applicable*

Use of AI tools (where applicable): *Not applicable*

Acknowledgements: *Not applicable*

References

Ajaebgu, H.I. (2000). Nigeria: A People United, A Future Assured (ed.), Bauchi State; Volume 2, Chapter Five, Federal Ministry of Information, Abuja.

Arowosegbe, O. B., Alomaja, O. A., & Tiamiyu, B. B. (2024). The role of agricultural extension workers in transforming agricultural supply chains: enhancing innovation, technology adoption, and ethical practices in Nigeria. *World Journal of Advanced Research and Reviews* (WJARR), 23(03), 2585-2602. https://doi.org/10.30574/wjarr.2024.23.3.2962

Bauchi State Government. (2017). Bauchi State statistical yearbook. *Ministry of Budget, Economic Planning and Multilateral Coordination.*

Community Portal of Nigeria (CPN, 2014a). Geographical Features: Federal Republic of Nigeria, http://www.onlinenigeria.com/geography.asp

Community Portal of Nigeria (CPN, 2014b), Bauchi State of Nigeria, People Population and Settlement, http://www.onlinenigeria.com/links/bauchiadv.asp?blurb=201

Ebere, N. C., John, O. D., Agwu, A. E., & Dupe, I. C. (2023). Determinants of Communication Channel Used among Rice Value Chain Actors in Nasarawa and Benue States, Nigeria. *Journal of Agricultural Extension,* 27(2), https://dx.doi.org/10.4314/jae.v27i2.3

Gaur, R. S., Bunkar, R. C., Zade, S. and Sidharth S. (2025). Participatory Extension Approaches: Engaging Farmers as Stakeholders, In book: *Emerging Paradigms in Agricultural Extension and Development,* 1, 26-39, Nitya Publications

Horn, L. N., Nghituwamata, S. N., & Isabella, U. (2022). Cowpea Production Challenges and Contribution to Livelihood in the Sub-Saharan Region. https://www.scirp.org/journal/as

Krejcie, R. V. & Morgan, D. W. (1970). Determining Sample Size for Research Activities, Lal R, ed. *Encyclopedia of Soil Science* (1st Edition), 745-749.

Logbaby (2014) Bauchi State-Nigeria http://logbaby.com/encyclopedia/bauchi-statenigeria-overview-history-andsummarinformation_9.html#.U53BfXbYEy0

Nasiru, M., Abdurrahman, S., Mahmaod, G., & Yahay, H. (2001). Farmers' Assessment of Extension Services in Nigeria: The Case of Unified Delivery System in Bauchi State *Agricultural Development Programme. Proceedings of the Annual National Conference of the Agricultural Extension Society of Nigeria*. pp. 147-156.

National Bureau of Statistics (NBS). (2019). Demographic and agricultural profile of Bauchi State.

Nazari, M. R. & Hassan, M. S. B. H. (2015). The role of television in the enhancement of farmers' agricultural knowledge. *Africa Journal of Agriculture Research* 6(4), 931–936.

Nwagboso, C., Andam, K. S., Amare, M., Bamiwuye, T. & Fasoranti, A. (2024). The Economic Importance of Cowpea in Nigeria: Trends and Implications for Achieving Agri-Food System Transformation. *International Food Policy Research Institute* (IFPRI) Discussion Paper 02241. https://cgspace.cgiar.org/server/api/core/bitstreams/c1a426e7-6502-416c-9d76-590ac709e704/content

Ogundele, O. O., & Ibrahim, H. Y. (2021). Effectiveness of extension communication channels in disseminating cowpea innovation technologies in Nigeria. *African Journal of Agricultural Research, 16*(5), 234-241. Retrieved from https://doi.org/10.5897/AJA R2021.15543

Ogunremi, J. B. (2013). Assessment of extension agents' use of communication methods and their impact on aquaculture linkage activities in Lagos State, Nigeria. *Journal of Agriculture and Social Research* 13(1), 15-20.

Okwu, O. J. & Daudu, S. (2019). Extension communication channels' usage and preference by farmers in Benue State, Nigeria. *Journal of Agricultural Extension and Rural Development* 3(5), 88-94.

Rogers, E. M. (2003). *Diffusion of Innovations*. (5th Ed.), Free Press, New York. 541pp.

Saulawa, B. U., Hassan, S. & Abdu, I. (2025). Effectiveness of Extension Methods for Teaching Improved Cowpea Variety SAMPEA 20-T Cultural Practices Among Subsistence Farmers in Bauchi State, Nigeria. *International Journal of Multidisciplinary Research in Science, Technology and Innovation (IJMRSTI),* 7(1), 1-17. www.ijmrsti.com

Shehu, K., Bashir, A. & Mubi, A. M. (2018). Implication of Ineffective Policy Implementation for Community Participation on Waste Management in Bauchi State, Nigeria, *Futy Journal of the Environment (FJE),* 12(1), 22-32. http://www.ajol.info/index.phd/fje

Srivastava, D. & Singh, Km. P. (2023). Extension Methods: Individual, Group, and Mass Contact Methods, Himanshu Publication, Udaipur (Raj).

Tafida, A.A. (2017). Agricultural Potentials, Production, and Mechanisms for Sustainability in Adamawa State. *Adamawa Community Advancement Initiative Newsletter* 4, 11-32.

Umeh, O. J. (2016). Farmers' Perception of Extension Service Delivery Methods in Southeast Nigeria: The Case of Farming Households in Abia State. *Journal of Community and Communication Research.* www.sccdr.org. 1(1), 70-76.

Waddington, H., Snilstveit, B., Hombrados, J. G., Vojtkova, M., Anderson, J., and White, H. (2010). Farmer Field Schools for Improving Farming Practices and Farmer Outcomes in Low- and Middle-income Countries: A Systematic Review. *Campbell Systematic Reviews* 10(6), 1-48. DOI:10.1002/cl2.90