



Participatory Approach to Extension Education: A tool for Achieving Sustainability of Forest in Yobe State, Nigeria

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Abstract

Despite understanding the contributions of forest extension workers in literature of management of forests in Sub-Saharan Africa, the forests in Northern Nigeria continue to deteriorate in size and composition, and literatures on suitable methods of forest extension and education is limited. The goal of this study is to examine the characteristics of the methods of forest extension and education in Yobe. The specific objectives are to identify the characteristics of the methods of forest extension and education and assess the level of acceptability of the methods used in the transmission of information on sustainable forest management by forest extension and education workers in Yobe, Nigeria. Data were collected from 150 purposively selected respondents across the three randomly selected local government councils in Yobe, Nigeria. The data were analyzed using descriptive statistics, a general linear mixed model, and thematic analysis. The social (local leader) method passing information on sustainable forest management to forests beneficiaries was found to be the most acceptable method due to its characteristic reliability and fairness. The result from the regression however showed that the social (local leaders) approach and the community approach as the predictors identified within the model that had the lowest Akaike's Information Criterion value of 157.8 and adjusted R^2 value of 26.8%. The adjusted R -squared value indicated that 73.2% of the people's opinions could not be explained by this model. The study recommends policy measures aimed at inclusion of local leaders in the sustainable management of forests.

Keywords:

Sustainability
Forest
Forest Management,
Livelihood improvement
Traditional leaders
Community
Participatory
Nigeria.

JEL Classification: Q010,
Q540, O150

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1. Introduction

The quest that led to the signing of international agreements and the development of laws and policies on the conservation of forests and biodiversity has called for adoption of different strategies for achieving relevant Sustainable Development Goals (SDGs). Forest and Biodiversity are specified in several SDGs; for example, Goal 15 of the SDGs involves “protecting, restoration, and promoting sustainable use of terrestrial ecosystems, sustainable management of forests, combating desertification, halting, and reversing land degradation and stopping biodiversity loss” (UN 2017a). Similarly, SDG 12, addresses sustainable consumption and production patterns, SDG 13 underscores the importance of climate change and its impacts), and SDG 14 focuses on the sustainable use of the oceans and marine resources (UN 2017a; UN 2017b). Forests and biodiversity were also discussed in Goals 1 and 2 as the preservation of a decent livelihood, the alleviation of poverty and hunger depend on Biosphere’s health. Equally, maintaining good health and providing quality education (Goals 3 and 4) require harmony among humans and between humans and their environment (UN 2017a; UN 2017b). Since the SDGs as international agreement promote global initiatives, Its objectives can only be achieved through effective communication provided through an appropriate channel acceptable by society. Therefore, to achieve SDGs, different stakeholders should be identified and included in the planning, decision and implementation processes. The greatest obstacle to an effective forest and wildlife management programme is a lack of clear public support for forest resources management (Bardy, Akolgo-Azupogo, an Rubens, 2022) It is therefore, a fundamental necessity for better public information to generate support for sustainability, which in turn requires competent staff equip with different approaches to be used to transmit accurate information to the public. A

conservation department without a strong and well-trained extension educator is hopelessly inefficient (Bardy et al. 2022). Lack of access to new information on the sustainable management of forest resources by rural and urban people alike has affected the sustainability of some forest resources (Ali, Saadun, Kamarudin, Alias, Nawi and Azhar, 2023). Elena, Rina, Yuliya, Svetlana, Liudmila, and Navai. (2018) identified low awareness and lack of active involvement of local leaders among the factors that contribute to increasing pressure on forest trees. According to Bardy et al. (2022), traditional conservation laws are threatened and no longer adhered to, while the inclusion of local or tribal leaders in community development programme has decreased which has implications for sustainable forest management. Interestingly, new initiatives have been adopted to reduce and revert this threat in some countries. For example, in Ghana, an initiative was proposed for the preservation and application of traditional wisdom for sustainable development by creating regional centers that partner with local or communities’ leaders as stakeholders to promote knowledge sharing and representation, and communicating new information on sustainable management (UNU-IAS n.d.)

Assessing the type, choice, and suitable approach to pass new information from forest department to the public is a key to achieving sustainability and a means for understanding the degree of success made in achieving sustainable development goals. Partnerships between educators, researchers, policymakers, tribal leaders, and situational leaders such as youth leaders within different local communities provide support for different developmental projects (Nunoo, 2010). In the words of Wade, (2013) partnering practice between local leaders and the government is an effective and efficient approach to community development as partnering aims at establishing groups that co-create new compounds of shared knowledge and

form standing committees that build strong bonds within stakeholder groups in addition to the establishment of commonly accepted solutions to problems related to the management of people and their environment. For example, In Southern Nigeria, the participatory approach has been used to resolve forests' related conflicts and issues effectively (Arowolo, Agbonlahor, Okuneye, Soaga. 2014). Similarly, the World Food Program (WFP) has supported different communities to established a "nursery, raise seedlings and manage community-development projects (WFP, 2018). Ensuring the interests of all stakeholders are heard is similar to having a common understanding of principles (Arowolo et al. 2014; Bardy et al. 2022). Previous studies observed that particular approaches to forest extension and education suit particular communities (WFP, 2018; Carter, 2018] and that the factors that may influence the choice of a population to a specific approach to extension and education must be recognized due to cultural differences and beliefs (Elena, 2018; Mark, 2018).

Despite the important contributions of the participatory approach to the efficient management of forest resources across the globe, studies on methods of forest extension and education for enhancing sustainable management of forests in Northern Nigeria remains scarce, and the few available studies mainly focused on the traditional Individual and group top-down method of passing information to communities (Liman and Ngah, 2015). Most importantly, the democratic system of government in Sub-Saharan Africa is often misused as politicians withdraw power from local leaders due to differences in political ideologies, thereby affecting the traditional communities' resource management and developmental issues (Sultan, Benoit, and Evangelos, 2006; Solebo, 2020). The removal of the traditional leaders from their thrones and replacing them with their cronies for the purpose of achieving political interest has been found to

impact on the traditional conservation laws negatively (Arowolo et al, 2014; FAO, 2018). In some cases, political connections have led to non-adherence of the directives of the traditional leaders (e.g. emirs, chiefs and priests), which has since affected sustainable forest management and the conservation of biodiversity (FAO, 2018). This study therefore, addressed the knowledge gaps by presenting a case study that examine the characteristics and acceptability levels of different methods of forest extension and education in Yobe state, Nigeria. The objectives of this study are therefore to: identify the methods used by extension workers in transmitting forest-related information, examine the characteristics of the methods, and determine the acceptability level of the methods of forest extension and education practiced in Yobe. The study is therefore guided by two research questions: how forest extension and education activities is delivered and which of the methods among others is more acceptable and suitable in Yobe state. Two hypotheses were tested to determine the factors contributing to the acceptance of specific approaches of forest extension and education:

H_A: Some factors that influence the suitability of methods of forest extension and education in Yobe state.

H₀: No specific factors influencing the suitability of methods of forest extension and education in Yobe state.

2. Literature review - Conceptual framework

2.1 Concept, Types and Importance of Forestry and Wildlife Extension Methods

Method and approach are synonymous and can be used interchangeably as it simply denotes to an efficient and organized manner of carrying out or executing a specific task to achieve results needed for growth and development of people or nation. Adopting a method aims to ensure that some set of procedures are followed to achieve

accurate or precise results or goal (Srivastava and Priya 2023). Forestry extension services is a system aims to transfer knowledge and skills through individuals and technology proved effective by forest research institutions and agricultural experts to farmers, plantation owners, forest products beneficiaries and members of rural communities who interact or benefit from the forest resources in one way or the other (Rolling, 2019). Extension methods in forestry involve various activities and approaches to support farmers, plantation owners, and forest inhabitants to improve the protection, preservation and conservation of forest resources.

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2023). These approaches are essential in transmitting essential knowledge and skills, innovative ideas and practices, and providing current information to plantation owners, forest products, forest inhabitants, agroforestry farmers, extension agents, and other stakeholders such as value chain actors (harvesters/collectors, transporters, wholesalers, retailers and consumers).

One of the basic roles of forestry and wildlife extension methods is to provide to all stakeholders some practical and science-based guidance (Srivastava and Priya 2023) that enable farmers to make informed decisions about forest products production, transportation, utilization, consumption, protection, preservation and conservation using various skills.

Many different methods including farm visits, demonstration method and mass methods are vital extension activities that successfully enhances forest conservation practices, Forest and wildlife extension agents illustrate the benefits and drawbacks of various approaches that foster the understanding and adoption of innovative ideas and skills for sustainability of the forests (Ray, 2017; Srivastava and Priya 2023). Other examples of benefits derived from the use of various methods of extension education such as mass methods include provision of timely information such as weather updates and market trends that update major stakeholders on the current forestry and wildlife sustainable management and commercialization activities.

The use of social media and other internet facilities organized by forest and wildlife extension agents helped to address pressing forestry and wildlife issues, promote sustainable practices, and inculcate awareness of emerging sustainability issues and trends, which often facilitate dialogue between and among relevant stakeholders, foster collaboration and enhance knowledge-sharing (Srivastava and Priya 2023). Ali et al. (2023) defined sustainability as the

effective and efficient protection, preservation, and conservation for the continuing utilization and consumption of resources by the present and future generations. Sustainability ensures that the resources are used wisely so that the utilization contributes positively to the economic, social, and environmental development of the people and the society and can only be achieved through transfer of indigenous knowledge (I.K), which is traditional means of conservation of forests and wildlife or scientific practices (European Commission, 2020).

3. Methodology

3.1 The Study Area

The study was conducted on Yobe State in north-eastern Nigeria (Fig. 1A), Yobe state has 17 local government councils (Fig. 1B), a total land area of 4,660,900 hectares (ha) (46,609km²), from which 386,710 ha represents areas covered by forests. Yobe State's vegetation is of two types. The southern part of Yobe is Sudan Savannah and is characterized by an annual average rainfall of 713mmHg, and the northern parts of Yobe state remain typical of a Sahel Savannah that has an annual average rainfall of 275mmHg, and a mean annual temperature of 35°C to 39°C (Ali et al. 2023)..

Yobe state has a total population of 2,946,929 comprising 1,49,162 males and 1,452,769 females (Zhujiworld, 2023). According to the National Bureau of Statistics report, the literacy level of adult male and female population in Yobe is 7.23%. As per livelihood source, the population in Yobe State relies on farming, animal husbandry, fishing, grocery, commercialization of NTFPs, and transport (WFP, 2018; Ali et al. 2023).

Nevertheless, the human poverty index (HPI) in Yobe is as high as 70%, with a high unemployment rate in the rural areas (Ali et al. 2023' World Bank, 2024). Most importantly, Yobe state is among the states with low literacy level in Nigeria (Ali et al. 2023; Mohammed, Abdul-hamid, Ali, and Umar, 2023), which in combinations to high unemployment rate and poverty continue to threaten the forest sustainability. This study was specifically carried out in Damaturu, Potiskum, and Karasuwa in Yobe state (Figure 1 B). The selection of the three study areas was purposive because they are the commercial centers of Yobe State, considered among the areas with a high number of forest reserves, and the presence of private plantations and agroforestry farms (Ali et al. 2023).

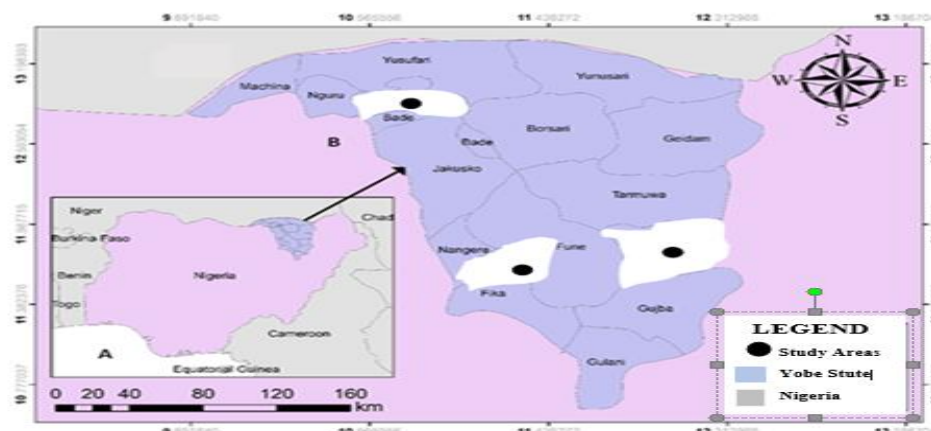


Fig. 1: Geographical Map showing the study areas (A: Nigeria, B: Yobe State and the three study areas [Karasuwa, Potiskum and Damaturu])

3.2 Method of Data Collection

The data of the study was collected through both preliminary and actual surveys. The preliminary survey was carried out in January 2024, using nine key informants' interviews comprising one traditional leader, one religious leader, and forest zonal officers drawn from each of the three purposively selected local government councils. The results of the preliminary survey led to the identification of the different groups of respondents recognized as major forest users or beneficiaries in Yobe (Table 1). The actual survey was carried out between March to July, 2024, using ten items of structured

questionnaire that were distributed to purposively selected 150 respondents spread across the three randomly selected local government councils in Yobe state. The selection of only 150 respondents as a sample across five identified groups of forest users from the three local governments (n=30) was informed because of the qualitative nature of the survey questionnaires (Carter, 1996; Mark, 2018). Additionally, the administration of the questionnaires was by face-to-face consultations was due to the low literacy level of the population (forest users) in Yobe.

Table 1: Sample Size of Respondents and Location

Name of Study Area	Name of Beneficiaries of Forest and Wildlife Resources					Total
	Fuel wood harvesters/ Collectors	Fruits Gatherers/ Collectors	Hunters (Bush-meat Collectors) & Poachers	Agroforestry farmers & Plantation owners	Sculptors & Herbalist	
Damaturu	10	10	10	10	10	50
Potiskum	10	10	10	10	10	50
Karasuwa	10	10	10	10	10	50
Total	30	30	30	30	30	150

(Source: Field Data, 2024)

3.3 Thematic Analysis

Thematic analysis was also used to analyze the qualitative data obtained on characteristics of the methods practiced to promote sustainable forest management in Yobe. Atlas ti8 (GmbH Berlin) was the software used in the analysis. The collected data were typed as word document, export to the software (data transcription), identify the codes (coding), and choose similar codes to develop the sub-themes and main theme (codes integration and development of main theme) following previous studies (European Commission, 2018; UNESCO. 2023).

4. Results and discussions

4.1 Socio-demographic profile of respondents

Table 2 shows that the 150 respondents interviewed comprised 75% men and 25% women. The study further revealed that more than 76% of the total respondents were married and had an average household size of 13 persons. On the respondents' mean working experience, it was found to be 13 years. However, the least experienced categories of the respondents were the fuel wood collectors (one year), while fruit gatherers were the most experienced category of respondents (18 years), followed by Agroforestry farmers & Plantation owners and sculptors and herbalists, with 17 years working experiences each. Hunters and poachers have a mean working experience of 12 years (Table 2). The youngest group of

respondents interviewed were the fuel wood collectors have a mean age of 22 years, On the other hand, the fruit gatherers were characterized by a mean age of 45. Similarly, the agroforestry farmers and plantation owners, as well as sculptors & herbalists have a mean age of 50 years. The hunters (bush-meat collectors) and poachers were the eldest among all respondents with a mean age of 56. In terms of educational level, most respondents across the study area lack formal education comprising 63% of fuel wood collectors and fruit collectors, 60% of hunters & poachers, 47% of agroforestry farmers and plantation owners, and 50% of sculptors and herbalists. Therefore, the sculptors and herbalists have the highest level of tertiary education, followed by agroforestry farmers & Plantation owners, then Hunters (bush-meat collectors) and poachers, who were followed by fruit gatherers. However, the fuel wood collectors generally have the lowest education status (Table 2). In terms of the employment status of the respondents, a majority (77%) of fruit collectors participate in forest fruit commercialization as part-time workers. Interestingly, 97% of the fruit gatherers, 87% of Hunters and poachers, 100% each of agroforestry farmers and plantation owners, and sculptors and herbalist work as full-time employees (Table 2). The result on the respondents' business ownership shows that all fuel wood harvesters, agroforestry farmers and plantation owners, and sculptors and herbalists (100%), and a majority of hunters and poachers (73%) were the sole owners of their businesses. 27% of the hunters and poachers were

contracted, therefore recompensing of agreed bush meat to their sponsors (Table 2).

The results on the characteristics of the respondents indicated that men were the dominant beneficiaries of forest resources in the study area. For example, the fuel wood harvesters, who were mostly men, obtained their fuel wood from a long distance forests (forest reserves), while the few women did not travel long distances but relied on homestead forests such as communal forest areas, federal grazing reserves, buffer zones, and farmlands for domestic and commercial fuel wood. Moreover, fruit gathering and hunting businesses appeared to be gender-dependent in the studied area, as both were found to be dominantly carried out by men which confirm the previous study (Ali et al., 2023). This may be explained by the fact that men are more associated with more physically intense and more risky livelihood activities in an area with high insecurity due to activities of armed bandits in some places in the study area. The result further show that women participate in less physical intense activities such as woodcraft business (wood curving or pestle and mortar construction) as well as participate in farming activity (agroforestry) in the study area. As presented in Table 1, the profile of respondents except for sculptors and herbalists who attended higher level education (27%), all others groups including fuel wood harvesters, fruits gatherers, agroforestry farmers, and hunters and poachers were found to be least educated, as there were no or few persons that attended higher school.

Table 2: Socio-Demographic Profile of the Respondents

Respondents' Characteristic (Frequency [%])						
Variable	Fuel wood Collectors	Fruits Collectors	Hunters & Poachers	Agroforestry farmers & Plantation owners	Sculptors and Herbalist	Mean
Gender (n) [%]						
Male	28[93]	30[100]	30[100]	27[90]	24[80]	NA
Female	2[7]	0[0]	0[0]	3[10]	6[20]	NA
Age (Yr)	22	45	56	50	50	41
Marital status						
Married	1[3]	30[100]	29[97]	27[90]	27[90]	NA
Single (n) [%]	29[97]	0[0]	1[3]	3[10]	3[10]	NA
Educ. Status (n) [%]						
Tertiary Educ.	0[0]	4[13.3]	1[3.3]	2[7]	8[27]	NA
Sec Educ.	7[23.3]	3[10]	4[13.3]	7[23.3]	4[13.3]	NA
Primary Educ.	4[13.3]	4[13.3]	7[23.3]	7[23.3]	3[10]	NA
Informal Educ.	19[63.3]	19[63.3]	18[60]	14[47]	15[50]	NA
Employment status (n) [%]						
Full-time	7[23]	29[97]	30[100]	30[100]	26[87]	NA
Part-time	23[77]	1[3]	0[0]	0[0]	4[13]	NA
Household size (person) (n)	1	14	13	13	13	11

(Source: Authors Computed Field Data, 2024)

Key: Yr =Year; NA (Not Applicable)

This may be explained by the occupation of the sculptors and herbalists that require innovative skills and/or experience acquired usually at lower and higher institutions of learning. According to UNESCO, (2023), the literacy rate in Yobe state, Nigeria, is 26.6%, and access to education for rural people is influenced by poverty and culture on the benefit of girl child education and gender equality that resulted in early marriage (Ali et al, 2023). Moreover, a very low level of education associated with forest users in Yobe state is not surprising as the collection of NTFPs has been considered the primary job of less privileged and uneducated people (Ali et al, 2023; Mohammed et al. 2023). Furthermore, Table 1 shows that the age group of the fuel wood harvesters has deviated far from other groups, which shows that young men are more involved in physically intense activities, and the age group of the fruits gatherers (45 years), hunters and poachers (56 years), agroforestry farmers and plantation owners (50 years) and sculptors and herbalist (50 years) indicates that such occupation//activities are carried out by elderly people with higher experience received from parents or family business.

4.2 Practicing methods of forest extension and education and respondents' acceptability level of the methods

The qualitative data obtained were analyzed using thematic analysis that identified different methods practiced and experienced by the respondents (Table 3). The study identified five (5) methods experienced by the respondents across the three local government areas studied in Yobe. The traditional individual method (TIM) has 4 codes with 11 density count; the social (local leader) approach (SA) has 9 codes and 30 density counts; the community approach

(CA) has 4 codes and 20 density counts; the social situational approach (SSA) has 5 codes with 13 density counts; and the traditional group method (TGM) possesses 8 codes and 29 density counts (Table 3).

4.3 Acceptability Levels of Methods of Forest Extension and Education

The results of the quantitative aspects of the questionnaire further revealed the acceptability level of the methods of the respondents. The social (local leader) approach is the most acceptable method by the respondents across the three local government councils followed by the traditional group method (TGM), which is then followed by the community approach. The fourth popular approach is the situational approach and the traditional individual method was found to be the fifth (Figure 3). Traditional leaders have been known to rise to different challenges of providing credible governance that contribute significantly to the development of society (Selepe et al. 2009; Liman and Ngah, 2015). On the other hand, the community approach has been employed to create an understanding of the roles and participation of forest community in raising and managing of seedlings were observed in previous studies (Liman and Ngah, 2015; Arowolo et al. 2018), while the choice of the situational approach show that the forest department and the forest users believe that forests and wildlife are surrounded by history, and for one to obtain and document historical data, one must rely on the personal-situational approach for a comprehensive study of the people and their culture because personality and his environment cannot be studied in isolation from each other (Elena, 2008).

Table 3: Codes identification, density counts and theme development of methods to Forest Extension and Education in Yobe State

Sub-themes Methods of forest Extension & Education		Building block of sub- theme (Code's Density count/scores)
Contextual meaning		
Traditional Individual Method (TIM),	Refers to the method that involve extension worker meeting the farmer at home, in farm, in the forests, parks, plantation and discusses issues of mutual interests, given the client both information and pieces of advice. The approach believes in personal influence of extension worker in securing people's participation in extension activities	Lecture method (5) Tertiary Institutions training method (4) Individual method (2)
Social (local leader) approach (SA)	This method involves the use of local leaders (king, emirs district heads, wards heads, religious leaders, union leaders, occupational leaders, situational leaders) in transmission of information on sustainable management of forest and wildlife extension resources. The method brings about local support for extension activities. And often increase the coverage of extension teaching that can be done.	Tribal leaders approach (1) Local leaders approach (4) Union leaders approach (2) Occupational leaders approach (7) Situational leaders approach (1) Traditional leaders approach (10) Religious leaders approach (2) Chief's approach (1) Royal approach (2)
Community Approach (CA)	This method involves providing specialized and technical training to 1 or 2 people in a community who then promote a variety of appropriate technologies and provides technical services with occasional support from a supporting organization or institution or government agency and departments.	Education, Consultation and participation method (4) Village training method (5) NGOs training method (6) Inter-stakeholders discussion (3) Forest management training method (2)
Social Situational Approach (SSA)	It is the analysis of peculiarities of perception, motivation and reactions, and others. This involves the extension worker studying the people and their culture through books, periodicals, journals, newspapers, films, and slides or physically visiting the people before the actual extension activity. It provides the extension worker the ability to know the	Rural areas visitation method (2) Familiarization method (2) Research and accommodation method (5) Cultural method (2) Historical method (2)

Traditional Method (TGM)	Group	neighboring communities and their kindred's within a short period and know the kindred leaders and their names and able to conduct himself round and be able to organized clientele to participate in one activity or the other. (Elena <i>et al.</i> , 2018)	
		This refers to bringing together two or more people to a particular spot to educate them on a subject matter of interest to them. Group methods take into account the inclination of the individual to respond to the pressures and opinions of groups in which he participates and to listen to the views of others before arriving at a decision about making changes in his farming operations.	General meetings (7) Group discussion (7) Exhibition (2) Tours and field trips (1) Demonstrations (5) Panel discussion (3) Brainstorming (3) Radio, television, internets, cinema/video, billboards and film strips/slides (1)

NOTE: A code refers to a word/phrase identified or used by the respondents to describe a method of forest extension and education, while 'density code scores/count' refers to the number of times a word/phrase was expressed by a respondent

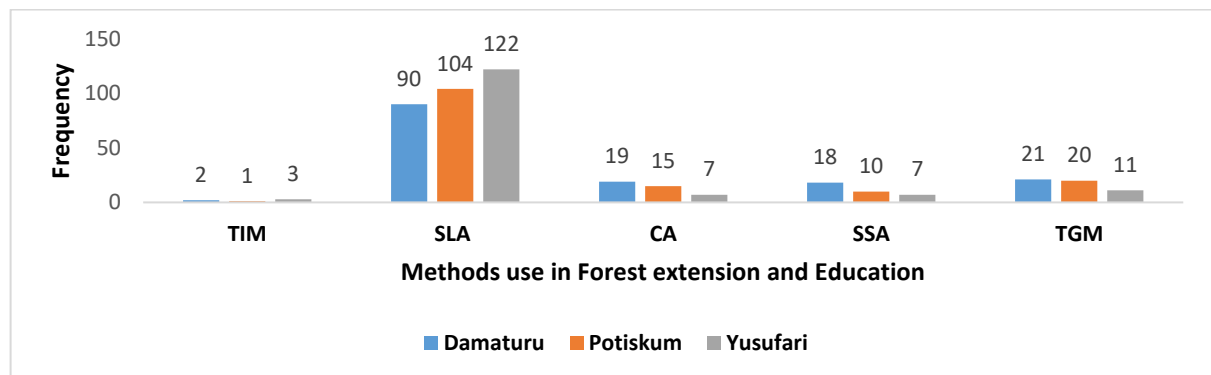


Fig. 2: Acceptability level of methods of forest extension and education for sustainable management of forest resources across the study areas of Yobe state

4.4 Characteristics of practicing methods of forest extension and education

Table 4 shows the characteristics of the methods adopted in transmitting information on sustainable forest management. For example, the traditional individual method (TIM) has the characteristics of timely delivery, and new knowledge. The social (local leader) approach (SA) was considered reliable, equity-inclined, and community development goal-oriented, the community approach (CA) is believed to add

new knowledge and community development goal-oriented. The social situational approach (SSA) has been identified as people's cultural study approach, and respect for cultural norms-oriented goals, designed to achieve government conservational goals, and the traditional group method (TGM) is believed to add new Knowledge, leads to community development that provide direct benefit to the participants among others in the community (Table 4).

4.5 Effects size of the methods of forest extension and education for sustainable forest management in Yobe

Table 5 above shows the results of the levels of impact of the five (5) methods used in education and awareness creation on sustainable forest management in Yobe. Based on the effect size

of each variable (Table 5), the degree of choice of predictor variables on acceptable methods of extension education was from the values of Akaike's Information Criterion (AIC). The AIC is an estimator of prediction error that provides information on the relative quality of the statistical model for a given data.

Table 4. Characteristics of the methods of Forest Extension and Education in Yobe state, Nigeria

S/No.	Approach to Forest Extension and Education	Characteristics
1.	Traditional Individual Method (TIM),	Timely + New Knowledge
2.	Social (local leader) Approach (SA)	Reliability + Equity + Community development Oriented
3.	Community Approach (CA)	Government Oriented Goal + New Knowledge + Community development Oriented
4.	Social Situational Approach (SSA)	Timely + New Knowledge + Equity + Community development Oriented + Respect + Government Oriented Goal
5.	Traditional Group Method (TGM)	Government Oriented Goal + New Knowledge + Community development Oriented + Group Benefit Driving

(Source: Field Data, 2024)

The lower the value of the AIC of a model among others, the higher the quality of the information given by the model (Schall, 1991; Ali, 2023), while, the corresponding adjusted R² of each of the parsimonious models complements the IT approach. In other words,

the adjusted R² value of the model with the lowest AIC (parsimonious model) represents the percentage acceptability contributions of the predictor variables enclosed in the parsimonious model (Whittingham, 2006; Jalam, Sharaai, Ariffin, Zainudin, and Musa, 2020)

Table 5: Effects size of five methods use in education and awareness creating on sustainable forest management in Yobe

S.N.	K: terms	Effect size	
		Adjusted R ²	AIC
1.	TIM	21.35	163.34
2.	SA + CA	26.79	157.79
3.	SSA + CA	24.25	160.62
4.	TIM + CA + SSA	26.93	158.55
5.	SSA + CA + TGM	24.25	160.62

(Source: Authors' Field Data, 2024)

Key: Traditional Individual Method (TIM), Social (local leader) approach (SA), Community Approach (CA), Social Situational Approach (SSA), Traditional Group method (TGM)

5. Conclusion

This study used quantitative and qualitative data obtained from 150 respondents drawn from five (5) groups of forest users across three local government councils in Yobe State, Nigeria. The paper identified five (5) methods of forest extension and education practices in the course of transmitting information on sustainable forest management. The results of the study show the importance of local/traditional leaders in governance especially in promoting sustainable forest management and practices, which was linked to the confidence reposed on them by the population that emanated from the leaders' characteristics reliability, equity, and fairness/justice toward their people. The results of the study also provides an understanding, and importance of selection of appropriate methods that suit specific community for enhance sustainable forest management. The paper revealed that reliability and equity are variables associated to local leaders and can lead to public confidence in Yobe. The results further justify the importance and roles the local leaders in promoting sustainable forest management. Other variables such as timely (passing the information at the right time), new Knowledge, and respect to culture were found as important influencers in the choice of methods of forest extension education. Findings of this study show shows the need for the recognition and training of the local leaders, , as well as providing incentives for enhance sustainable forest management. There is a need for constitutional delegation of power of some aspect of forest management to traditional leaders. There is also the need of policy development on inclusion of local leaders in the sustainable management of forests. The results are significant information to policymakers in developing policy on the economic, social, and

environmental benefits of forest (sustainable forest management). This study has also contributed to the empirical literature on the sustainability of forests in Yobe and Northern Nigeria. Our study focused only on the characteristics and acceptability of the practicing methods of forest extension and education in Yobe. Thus, future studies should focus on the adequacy, competence, and contribution of forest extension workers to sustainable forest management in Yobe State.

Acknowledgments: We thank Tetfund Nigeria for funding the research through Institutional Based research (IBR), and the Federal University, Gashua, for supporting the authors with the release of the IBR fund at the appropriate time.

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