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Training needs and effectiveness of agricultural extension agents in Delta State, Nigeria

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Abstract

This study investigates the training needs and effectiveness of agricultural extension agents in Delta State, Nigeria, aiming to identify gaps in their competencies and the relationship between these gaps and their overall effectiveness. Utilizing a descriptive survey design, data were collected from 237 extension agents and 226 farmers across the state's three agricultural zones. The study revealed that the majority of extension agents (59.07%) are male, with a mean age of 39.5 years and a significant portion having 11-20 years of work experience. Despite a relatively educated workforce, with 50.63% holding Bachelor's degrees, 67.51% reported a lack of access to agricultural training. The findings indicate a critical need for training in various competencies, notably in problem-solving (mean = 2.33), critical reasoning (mean = 2.13), and modern technology (mean = 1.91), while agents showed competence primarily in communication (mean = 2.85). The effectiveness of these agents was generally perceived as low, with an aggregate mean score of 2.35, indicating that they do not effectively meet farmers' needs or facilitate the adoption of new agricultural technologies. Statistical analysis confirmed a significant relationship between training needs and the effectiveness of extension agents (R^2 = 0.987; $p < 0.001$), leading to the rejection of the null hypothesis. Additionally, socioeconomic factors such as marital status, household size, education, work experience, income, and access to training were found to significantly influence the effectiveness of extension agents. The study underscores the necessity for targeted training programs to enhance the capabilities of agricultural extension agents, thereby improving agricultural productivity and farmer support in Delta State.

Keywords: Training needs; Agricultural training; Effectiveness; Extension service; Agricultural extension

1. Introduction

Agricultural extension is a process whereby modern farming techniques and research findings are taken to the farmers through extension workers and problems of the farmers are taken to research institutions for solution. However, Agricultural extension is an informal, out-of-school and voluntary agricultural education involving the spread or dissemination on recent and improved development in agriculture from researchers to the farmers through extension agents. In other words, Agricultural extension is the process or system or service which assists farmers or farm people through educational procedures in improving farming methods and techniques (Ogieva, 2018) & (Ovharhe, 2019).

Nigerian agriculture, historically dominated by small-scale family operation farms, has been largely neglected since the 1960s due to petroleum exploration. This has led to increased poverty and food insecurity, limiting the country's capacity to meet its food and fiber needs (Obayelu, Obayelu and Bolarinwa, 2021). Kouadio, Ta, Ali, Toualy, Aman and Yoroba (2016) noted that an effective extension system can transform Nigerian agricultural resources for sustained development. Training is crucial for agricultural extension workers, as it helps them develop the necessary attitude,

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knowledge, skill, and behavioral patterns. The effectiveness of extension services relies on their preparedness and professional competencies. However, barriers like farmer resistance and complex land tenure arrangements can hinder these efforts (Philip and Lindsay, (2021)

Thomson (2016) stated that extension workers in Nigeria deliver educational programs like the Agricultural Development Program, focusing on experiential learning and client-centered problem-solving. Regular analysis of technical competence and job performance is necessary to meet these needs. The use of the word "extension" derives from an educational development in England during the second half of the nineteenth century (Eromedoghene, *et al*., 2024). Around 1850, discussions began in the two ancient universities of Oxford and Cambridge about how they could serve the educational needs, near to their homes, of the rapidly growing populations in the industrial, urban area. It was not until 1867 that a first practical attempt was made in what was designated "university extension," but the activity developed quickly to become a well-established movement before the end of the century. Initially, most of the lectures given were on literary and social topics, but by the 1890s agricultural subjects were being covered by peripatetic lecturers in rural. The growth and success of this work in Britain influenced the initiation of similar activity elsewhere, especially in the United States. During the first two decades of this century, the extramural work of the land-grant colleges, concerned with serving the needs of farm families, was to expand dramatically and become formally organized; but the use of the term "extension" continued and has persisted as the designation for the work (Amafade, U.G, 2014). The overt use of the notion of "extending" relevant and useful information to the adult population at large, however, predates the university extension movement. Earlier in the nineteenth century, a British politician, Lord Henry Brougham, an influential advocate of formal education for the poor and of mass adult education, founded the Society for the Diffusion of Useful Knowledge in 1826. Its objective was "imparting useful information to all classes of the community, particularly to such as be unable to avail themselves of experienced teachers, or may prefer learning by themselves." The society sought to do this largely through producing low-priced publications and establishing local committees throughout the country "for extending the object of the Society" During its twenty years' existence, agricultural topics were well covered in the society's publications.

According to *Tom, et al.,* (2018), Extension is an education system that addresses the needs of rural people, providing services and education beyond educational institutions. Addressing poverty, food insecurity, and infrastructural issues can increase productivity. Nigeria's agricultural sector, dominated by peasant farmers, relies on improved technologies for productivity growth. The sustainability of agricultural development depends on the quality and effectiveness of extension services. However, there is a gap between agricultural performance and available research information in developing countries due to poor delivery and limited interaction between researchers and extension agents (Shiferaw and Lipper, 2016).

Indeed, high level of crop productivity and income are possible with an effective agricultural extension system supported by agricultural research that is relevant to farmers' needs. Over the years, peasant farmers have failed to meet food and agricultural needs of the country largely due to use of traditional methods of production (Edward, 2018). To achieve agricultural development, farmers are encouraged to use improved farm technologies through an extension approach that would reach the farmers promptly and effectively. According to Tchouamo and Steele (2018), viewed extension approach as the basic planning philosophy that is being adopted by an agricultural extension organization. Hangman and Shultz (2016) explained extension model as a way in which different guiding principles are applied in a specific situation to fulfill different purposes or target specific development. This helps extension agents to understand the fundamentals, concepts and functional methods of extension adopted to fulfill its aims, especially in the planning phase. Bollinger, (2016), see an extension approach as consisting of a series of procedures for planning, organizing and managing the extension institution as well as for implementing practical extension work by staff with technical and methodical qualification and using the necessary and appropriately adapted means.

Agricultural (Crop) productivity is the ratio of agricultural outputs to inputs. The outputs are usually measured as the market value of final outputs. The output value may be compared to the inputs in terms of the labor and land used (Adedoyin, 2016). Agricultural productivity benefits farmers through increased production and the creation of employment opportunities or indirectly, by boosting their relative wages or reducing food prices Tambari, Attahiru and Moyi, (2018). The need to increase agricultural productivity is underscored by the fact that Nigeria's population continue to increase at an increasing rate thereby imposing lots of pressure on food needs. Thus, efficient wealth creation and income generation therefore, become important. Farmers' productivity according to Garba (2019) refers to the improvement in terms of significance output that incorporates but not limited to horticulture, crop production, livestock production and fish production. Increased productivity can translate into increased farm income, at least in the short run as well as in the long run. The author further stated that agricultural productivity is the life wire of the rural economy but in the recent years this has drastically been declining years after years due to gap on the weakness in the dissemination of this information to the rural farmers by extension agent, these has seriously contributed to

higher level of poverty, food insecurity among farmers in the rural areas (Ajayi, 2018). Sabo (2017) pointed out that weak system of extension disseminations among farmers in Nigeria make agricultural policy transition to farmers very difficult. Therefore, this menace can only be minimized through an effective and efficient effort of extension dissemination of information on technology and modern system of agriculture (Mohammed, Olaleye, Umar, Ndanitsa and Jubrin, 2018).

Training system of agricultural extension is an agricultural development extension approach that is expected to improve productivity and income. The training and visit system was first adopted by the enclave projects at Funtua, in 1975, in Gusau, 1975, Gombe in 1975 and later the other Agricultural Development Projects (ADPs) in the country. It is field and farmer oriented that places more emphasis on fieldwork in close association with farmers. Training system has a means of continuous training and upgrading of professional skills of resource scientists and extension agents by Monthly Technology Review Meetings (MTRMs) and Fortnightly Training Session (FNTS) for extension agents that are in constant. This has made training extension system more suitable in most countries including Nigeria as the most commonly use approach (Garba, 2019). According to Uzunlu (2018), training extension system has been in place in Nigeria for about 40years, it is expected to help get useful agricultural information to farmers and assist in acquiring the necessary knowledge, skill and attitude to effectively utilize this information to improve general production level. Despite the adoption of the training system, approach in the field of extension work in Nigeria it influences on farmer's productivity is yet to be established. Hence, this study proposes to assess the training needs and effectiveness of Agricultural extension agents in Delta State.

Training extension model was introduced by the World Bank. Agricultural Development Projects (ADPs) was developed to solve the problem of inadequacy of training, inappropriateness and timeliness of messages inherent in the conventional extension system. The training and visit system is based on the premise that a combination of factors, such as the right technology, effective and timely delivery of messages, regular extension farmer's contact and regular training are pre-requisites for an effective agricultural development programmes has made the training and visit more relevant and useful in Nigeria. Results of recent evaluation of the effectiveness of the training and visit extension have been mixed, for instance. Atala (2018) found that in Sabon-gari Zaria, Kaduna State, two years after the introduction of training and visit extension, their effectiveness declined whereas in KaKau-Daji reverse was the case.

Accordingly, Garba (2019) observed that there is a gap between agricultural performance and available research information in developing countries and attributed this to poor agricultural extension services delivery and limited interaction between researchers and extension agents. These agents are known to be the link between researchers and farmers. Sustained high levels of agricultural production and income are possible with an effective agricultural extension system supported by agricultural research that is relevant to farmers' needs (Ogebe & Adanu, 2018). Over the years, small-scale farmers have failed to meet food and agricultural needs of the country due to large use of traditional methods of production.

Basically, this study is undertaken to provide data and analytical guidelines for understanding and improving the training needs and effectiveness of agricultural extension in Delta State. The research will pinpoint skills where extension agents are competent and those they lack competence. This will assist in designing future training programmes for extension personnel. The study will thus have implications for Nigeria In general. Research Information on these aspects would help in understanding some of the problems and challenges faced by agents. Such information is essential for a proper assessment of the needs and potential of the extension agents and the farmers they serve. It will also form the basis for improving the quality of extension work and agricultural communication and subsequently, farmers' adoption of improved technology and agricultural development.

Objectives of the Study

The general objective is to determine the training needs and effectiveness of agricultural extension agents in Delta State, while the specific objectives were to:

- determine the socio-economic characteristics of the respondents;
- determine the effectiveness of agricultural extension agents with regards to some specific tasks;
- Determine the competency and training needs of agricultural extension agents in various skills in Delta State.

2. Research Hypotheses

The following hypotheses presented in their null forms, were developed and tested:

- Ho_1: There is no significant relationship between training needs and the effectiveness of agricultural extension agents in Delta State
- Ho_2 There is no significant relationship between the socioeconomic variables and the effectiveness of agricultural extension agents in Delta State.

2.1. Study Area

The study area is Delta State. Delta State has three agricultural zones, namely Delta South, Delta Central and Delta North. Delta State is located in the South-South geopolitical zone of Nigeria, with population of 5,636,300 (National Population Forecast, 2024). The State lies approximately between longitude 5º00 and 6º45[1] East and latitude 5º00 and 6º30[1] North of the equator. It is bounded in the North and West by Edo State, to east by Anambra, Imo and River State, Southeast by Bayelsa State and on the South by Bight of Benin which covers about 160 kilometers of the State's coastline. It has a total square meter of 17,698km^2. The State is made up of 25 Local Government Areas namely; Aniocha North, Aniocha South, Bomadi, BurutuEthiope West, Ethiope East, Ika North East, Ika South, Isoko North, Isoko South, Ndokwa East, Ndokwa West, Okpe, Oshimili North, Oshimili South, Patani, Sapele, Udu, Ughelli North, Ughelli South, Ukwuani, Uvwie, Warri North, Warri South and Warri South West. The state has a tropical climate marked by two distinct seasons, the dry and rainy season. The dry season occurs between November and March. The rainy season begins in April and last till October. Arable and permanent crops are cultivated in the various farming communities in the state. Fish and livestock production are also farmed in the agricultural zones (NPF, 2024).

2.2. Research Design

The design of the study was the descriptive survey and quantitative because it made use of data collected from respondents. The rationale behind this according to Kerlinger (2015) is a "useful scientific tool to employ when a researcher is interested in the attitudes and opinions of people as well as the relationship of these attitudes to respondents' over behaviour." Thus, it helped in the analyzing the data necessary for the study problem like the levels of accuracy and the expected value of information associated was maximized.

2.3. Population of the study

The population of this research work constituted all the agricultural extension agents in Delta State, being 262. The population also included the farmers who are beneficiaries of agricultural extension services. These agricultural extension agents and farmers were drawn from all the 25 local government areas of Delta State. The local government areas are divided into Three (3) agricultural zones, namely, Delta North, Delta Central and Delta South (National Population Forecast, 2024)

2.4. Sampling Techniques and Sample size

Sampling techniques employed were both the census and sample. Since the number of agricultural extension agents are small, all of them were surveyed and used for the research. However, only 237respondents filled and return their questionnaire which was used for data analysis. A multi stage sampling procedure was employed to compose a sample size of 226 farmers from all the three agricultural zones of the study which was used for the study. Their perception of the skills and effectiveness of extension agents was aggregated with those of the agents and the weighted means were computed for analysis.

2.5. Research Instruments

The instrument used in this research work was questionnaire method. Questionnaire instrument was administered to the sampled respondents for the study. The sections of the questionnaire assessing the training needs of extension agents and effectiveness were administered to both the farmers and the agricultural extension agents.

2.6. Validation of Instruments

To ensure content and face validity of the instrument the questionnaire were given to experts in agricultural extension, Educational Psychology, measurement and Evaluation. The experts analyzed the instrument and made corrections to strengthen it. The supervisor also made input before final approval.

2.7. Reliability of Instrument

The test-retest method was used to establish the reliability of the instrument. The researcher adminitered the instrument on fifty (50) respondents used in the study. Three weeks later, the same instrument was administered to the same set of people who were selected on purpose. The obtained data subjected to the cronbach Alpha test which yielded 0.78 reliability value. This was adjudged satisfactory for the study (see appendix II).

2.8. Method of Data Collection

The specific data gathering method used in this study was primary data collection, which came from questionnaires given to respondents at their respective locations. In other words, the researcher administered the study's instruments with the aid of three skilled research assistants situated in the three Delta State agricultural zones. The respondents received the appropriate guidance to enable them to answer the questions honestly. The questionnaires were given to the respondents, who were then asked to fill them out, thereafter, retrievals were made immediately.

2.9. Measurement of Variables

Age of the respondents was measured in years, sex was determined by categorizing the respondents as either male or female. As for marital status respondents were categorized as either married (1) or never married (0). Household size was measured as the total number of people living and cooking together in a home. Educational level was measured as the total number of years spent in schooling by the respondent, while work experience was determined by the total number of years the respondent has served as an agricultural extension agent. Income of the respondent was determined in naira earned. Finally access to training or workshop was determined by asking respondents to indicate whether they had attended one or not.

Training Needs. This was measured by determining the competent of the extension agent which was measured on a 4point likert-type scale of not competent (1), not very competent (2), competent (3) and very competent (4). The cut-off point was 2.5, which implies that scores of 2.5 and above in any of the extension skills by agents was regarded as competent. This means that the extension agent does not need training in those skills.

In fact, Agbamu (2004) assessed training need through perceived level of competence placed on selected professional skills of agricultural media practitioners. To achieve this, he developed a four category Likert-type scale with values: not competent = 1, little competent = 2, competent = 3 and very competent = 4 to measure level of competence . From this it is obvious that there is a relationship between training need and the level of competence. In fact the need for training arises when the extension agent is assumed to be incompetent constraints to training were measured on a 4ponit likert type scale of 1 = not serious, 2 = not very serious, 3 = serious and 4 = very serious.

Effectiveness was also measured on a 4point likert-type scale of not effective (1), not very effective (2), effective (3) and very effective (4)

2.10. Method of Data Analysis

From the data collected, the demographic variable data were analyses using frequency distribution and percentage and bar charts were plotted, whereas the respondent responses to the question items in the questionnaire as it affected the research questions were presented and analyzed using the mean and standard deviation where aggregate measurement bench mark is 2.5, derived from a 4 point likert type scale of 1 = strongly disagree, 2 = disagree, 3 = agree and 4 = strongly agree. The hypotheses were tested using the multivariate statistics this is because there were more than more predictor variables with multiple values for each unit of observation. Thus it was more appropriate. Where the F-statistics p-value < than 0.05, the were rejected otherwise accept. The binary logit regression was also used to test the relationship between the socioeconomic variables and the training needs/effectiveness of the extension agents. The analysis was aided by SPSS.

3. Results

3.1. Socioeconomic characteristics of respondents

Table 4.1 shows the demographic features of the respondents in frequency and percentage. On Age Group, the age distribution of the respondents indicates a diverse age range. The largest group is those aged 31-40 years, which accounts for 33.76% of the total. This is followed by the 21-30 years age group which constitutes 25.32%. The 41-50 years group comprises23.21% and the 51-60 years constitutes 17.71% of the respondents. This distribution suggests

that the majority of agricultural extension agents are relatively young, with a significant proportion in the early to mid-career stages. The mean age was 39.5 years.

There is a notable gender disparity among the respondents, with 140 males (59.07%) and 97 females (40.93%). This indicates a male-dominated workforce in the agricultural extension sector in Delta State. The gender distribution could reflect broader socio-cultural dynamics and occupational trends within the region, possibly affecting the approach to extension services and interaction with the farming community. Regarding marital status, about 42.18% the respondents are single, with majority of them (50.63%) married, and 7.19% separated. The high number of married respondents might influence their availability and flexibility for training and fieldwork, as they may have family obligations compared to their other counterparts.

The household size distribution shows that a significant portion of respondents have medium to large families. Specifically, about 33.76% of the respondents have families with 2-4 members, about 54.85%) have 5-10 members, and 11.39% have more than 10 members in their household. The mean household size was 6. This suggests that many agricultural extension agents have considerable family responsibilities, which could impact their participation in training programs and field activities as opined by Amafade, (2022) in Amafade, (2024).

Table 1 The socioeconomic characteristics of the respondents

Demographic Characteristics	**Frequency(n = 237)**	**Percentage (100)**	**Mean/Mode**
Age(Years)			
21 – 30 years	60	25.32	
31 – 40 years	80	33.76	39.5
41 – 50 years	55	23.21	
51 – 60 years	42	17.71	
Gender			
Male	140	59.07	Male
Female	97	40.93	
Marital Status			
Single	100	42.19	
Married	120	50.63	Married
Separated	17	7.18	
Household Size			
2-4 members	80	33.76	
5-10 members	130	54.85	6
>10 members	27	11.39	
Highest Academic Qualification			
NCE	34	14.35	
B.Sc	120	50.63	B.Sc
Post-Graduate	22	9.28	
Others	61	25.74	
Work Experience			
5 – 10 years	90	37.98	
10 – 20 years	100	42.19	16

20 years and above	47	19.83	
Income Level			
<N50,000	70	29,54	
N50,000 - N100,000	90	37.98	98,000
>N100,000 - N200,000	50	21.09.	
>N200,000	27	11.39	
Access to Agricultural Training and Workshop			
Yes	77	32.49	
No	160	67.51	

The educational qualifications of respondents vary, with the majority (50.63%) holding a Bachelor's degree (B.Sc). Those with an NCE (National Certificate in Education) constitutes about 14.35%, while 9.28% have Post-Graduate degrees. Additionally, about 25.74% of the respondents fall under the 'Others' category, which might include diplomas or other certifications. The high percentage of B.Sc holders indicates a well-educated workforce, which is beneficial for the effectiveness of extension services. The educational level also indicates that these agents can undergo other training to fill their needs. Meanwhile, the respondents' work experience is predominantly within the 11-20 years range, comprising 100 respondents (42.19%). Those with 5-10 years of experience account for 37.98%, and those with over 20 years of experience make up 19.83% of the respondents. This distribution suggests a mix of relatively new and seasoned extension agents, providing a balance of fresh perspectives and extensive field experience.

The income distribution reveals that about 37.98% of respondents earn between N50,000 - N100,000. 29.54% earn less than N50,000, 21.09% earn between N100,000 - N200,000, and only about 11.35% earn above N200,000. This range of income levels may reflect the varying positions and responsibilities of the agricultural extension agents.

The finding in Table 4.1 indicated that 67.51% of the respondents do not have access to agricultural training and workshops, while only about 32.49% do. This highlights a significant gap in the availability and participation in training programs, which could affect the overall effectiveness and performance of agricultural extension services.

The socioeconomic analysis of agricultural extension agents in Delta State provides valuable insights into their age, gender, marital status, household size, education, work experience, income level, and access to training. The findings suggest a predominantly young, male workforce with significant family responsibilities and varying levels of education and experience. However, the limited access to training programs is a critical issue that needs to be addressed to enhance the effectiveness of agricultural extension services.

3.2. Perceived Effectiveness of Agricultural Extension Agents

The survey results in Table 4.8 provide a comprehensive evaluation of the perceived effectiveness of agricultural extension agents in Delta State. The data, represented through mean scores, standard deviations, remarks, and rankings, offer insights into the respondents' views on various aspects of the agents' performance.

The mean score of 2.44 indicates that respondents agree that agricultural extension agents do not meet the needs of farmers in Delta State. Highlighting the crucial role these agents play in advancing agriculture within the region, this role should be honed. The low score demonstrates the agricultural extension agents' efforts in addressing felt needs of farmers, which is essential for the overall growth of the sector is undermined. This is in agreement with Eromedoghene, (2024). With a mean score of 2.32, respondents disagree that extension services positively helped improve agricultural practices among farmers. This indicates that the importance of extension agents in improving agricultural practices among farmersis not encouraging. The ability of extension agents to introduce and promote improved farming techniques is vital for modernizing agricultural practices and improving productivity.

With a mean score of 2.60, respondents agree that the communication skills of the extension agents are satisfactory. This suggests that effective communication is recognized as a vital component of successful extension services, though there might be room for further improvement. Good communication skills are necessary for effectively conveying information, providing training, and supporting farmers in adopting new practices. The mean score of 2.39, although still in the 'agree' category, indicates that respondents feel the agents did not effectively address the specific needs of

farmers. This may point to a need for more tailored approaches to meet diverse agricultural needs more precisely. Addressing specific needs requires a deep understanding of local conditions, challenges, and farmer preferences, which can enhance the relevance and impact of extension services.

The aggregate mean of 2.45 indicates a general disagreement among respondents onthe impact of agricultural extension services on the adoption of new agricultural technologies by farmers. On the whole the agricultural extension agents were incompetent in the remaining areas assessed, namely, Overall contribution of agricultural extension agents to the development of the agricultural sector in Delta State (2.53), Adoption of Innovation by farmers (mean = 2.31), Extension contact with farmers (mean = 2.29), Agricultural message condition (mean = 2.27), Provision of logistics and others (mean = 2.22)

The responses highlight key areas where the agents are not performing well, as well as aspects that may benefit from further enhancement to optimize their impact on agricultural development.

Table 2 Responses on Effectiveness of Agricultural Extension Agents

S/N	Question items	Mean	Std. Dev	Remarks
1	Rate the overall effectiveness of agricultural extension services in Delta State in meeting the needs of farmers	2.44	1.00	Not effective
2	Agricultural extension agents in Delta State have helped improve agricultural practices among farmers	2.32	0.99	Not effective
3	Satisfied with the communication skills of agricultural extension agents in Delta State	2.60	0.98	Effective
4	Agricultural extension agents in Delta State are Effective in addressing the specific needs of farmers	2.39	0.99	Not effective
5	Please rate the impact of agricultural extension services on the adoption of new agricultural technologies by farmers in Delta State.	2.45	0.99	Not effective
6	Overall contribution of agricultural extension agents to the development of the agricultural sector in Delta State	2.53	1.00	Effective
7	Adoption of Innovation by farmers	2.31	0.88	Effective
8.	Extension contact with farmers	2.29	0.79	Not effective
	Agricultural message condition	2.27	0.95	Not effective
10.	Provision of logistics and others	2.22	0.76	Not effective
	Aggregate Mean	2.35	0.04	Not effective

Fieldwork 2024

3.3. Competency and Training Needs of Respondents

The results in Table 4.2 shows the competency and areas or skills were the extension agents needed training. The results indicate that the respondents needed training in the following: Skills since they were incompetent in them: problem solving (X =2.33), critical reasoning (X =2.13), management of time (X =2.18), creativity (X=2.43), focus (X=1.99), statistical analysis (X=2.38), empathy (X=2.11), adaptability (X= 2.13), abstract thinking (X=2.15), scientific knowledge (X=2.33), persuasion (X=2.22), Modern technology (X=1.91) and scientific knowledge (mean =2.33). The extension agents were only competent in communication (mean = 2.85) and interpersonal relations (mean= 3.23) and economic (mean = 2.66). These findings show that the skills in which respondents expressed training needs are very relevant to knowledge and skills required for executing extension activities as well as responding to farmers' felt needs. This finding corroborates the view of Androulitakis and Siardos (2005) that extension agents' competence should be in accordance with the skills they needed to operate in order to perform successfully. Hence, the need for training to make the agricultural extension agents more competent.

The incompetency of agents in skills observed in Table 4.2 could be as a result of inadequate training of the respondents. Van Crowder (1996), opined that extension methodology is mainly by-passed in many intermediate levels whose

primary function is to train students to work as field extension agents in an effort to insert specialized technical agriculture in the curriculum.

Table 3 Competency and training needs of agricultural extension agents

Skills of extension agent	Mean	Standard deviation	Competency	Remark
Communication	2.85	0.82	Competent	No Training required
Problem solving	233	0.55	Not competent	Training required
Critical reasoning	2.13	0.44	Not competent	Training required
Management of time	2.18	0.72	Not competent	Training required
Creativity	2,43	0.55	Not competent	Training required
Focus	1.99	0.61	Not competent	Training required
Interpersonal relation	3.23	0.66	Competent	No Training required
Teaching	2.59	0.41	Not competent	Training required
Statistical Analysis	2.38	0.49	Not competent	Training required
Empathy	2.11	0.77	Not competent	Training required
Adaptability	2.13	0.46	Not competent	Training required
Economics	2.66	0.38	Competent	No Training required
Abstract thinking	2.15	0.99	Not competent	Training required
Scientific knowledge	2.33	0.56	Not Competent	Training required
Persuasion	2.22	0.80	Not competent	Training required
Modern Technology	1.91	0.62	Not competent	Training required

3.4. Relationship between Training Needs and the Effectiveness of Agricultural Extension Agents in Delta State

The relationship between training needs and the effectiveness of agricultural extension agents in Delta State, are presented in Table 4.7. The analysis shows that the corrected model is highly significant, with an R Squared value of 0.987 and an Adjusted R Squared value of 0.986. This indicates that 98.7% of the variance in the effectiveness of agricultural extension agents (EAEA) can be explained by the training needs (TN). Such a high R Squared value suggests a very strong fit between the model and the data, implying that the training needs are a major determinant of the effectiveness of these agents.

The F-statistic for the corrected model is 947.374, with a significance level (Sig.) of .000. This demonstrates that the overall model is statistically significant, and the training needs variables collectively have a significant impact on the effectiveness of agricultural extension agents. The extremely low p-value (<.001) strongly rejects the null hypothesis, which posits that there is no significant relationship between training needs and effectiveness. Further examination of the coefficients for training needs shows that the Type III Sum of Squares is 224.381, with an associated F-value of 947.374 and a significance level of .000. This indicates that the training needs variables significantly influence the effectiveness of agricultural extension agents. The minimal error term, with a sum of squares of 2.868 and a mean square error of .013, suggests that unexplained variance in the model is very low.

Conversely the analysis provides robust evidence that there is a significant relationship between training needs and the effectiveness of agricultural extension agents in Delta State. The null hypothesis (Ho_1), which states that there is no significant relationship between training needs and effectiveness, is rejected. These findings underscore the importance of addressing training needs to enhance the effectiveness of agricultural extension agents. Well-designed and implemented training programs are crucial for improving the performance and impact of these agents in the agricultural sector.

Table 4 Relationship between training needs and the effectiveness of agricultural extension agents in Delta State

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	224.381[a]	18	12.466	947.374	.000
Intercept	784.140	1	784.140	59593.740	.000
TN	224.381	18	12.466	947.374	.000
Error	2.868	218	.013		
Total	2128.889	237			
Corrected Total	227.250	236			

a. R Squared = .987 (Adjusted R Squared = .986) Where EAEA = effectiveness of agricultural extension agents, TN1-6 = Training Need

3.5. Relationship Between Socioeconomic Variables And Effectiveness of Extension Agents

To determine whether the association between the response and each term in the model is statistically significant, the p-value for the term was compared to significance level to assess the null hypothesis. Nagelkerke R^2 0.789 showed that about 79% likelihood of effectiveness was accounted for by socioeconomic variables of the agricultural extension agents. The chi-square value of 189.999 with a p-value less than 0.05 implies that the independent variables were statistically significant in predicting the odd likelihood of effectiveness of agricultural extension agents. Table 4.11 shows the results for the relationship between socioeconomic characteristics of the respondents and their effectiveness. The results for Marital status (0.044), Household size (0.034), Education (0.002), Working experience (0.041) Income (0.022) and Access to training /workshops (0.000) were statistically significant in determining the effectiveness of extension agents in the study area. The odd ratio shows by how effectiveness will change per unit change of the independent variable. For example, for every one percentage change in household size the log odds of effectiveness will increase by 1.234 while for a percentage increase in number of years of schooling (i.e, education), the log odds of effectiveness will increase by 3.741. The other two variables included, that is Age (0.602) and Sex (0.589) were statistically not significant at P = 0.05%.

Table 5 Relationship between some variables and effectiveness of extension agent

Explanatory Variables	Co-efficient	t-value	Sig	Odd Ratio
Constant	-0.882	-0.421	0.821	0.409
Age(Xi)	0.554	4.022	0.602	1.000
Sex(X_2)	0.075	0.744	0.589	0.601
Marital Status(X_3)	-0.411	-3.988	0.044*	2.848
Household size(X_4)	-0.811	4.444	0.034*	1.234
Education(X_5)	-0.702	5.553	0.002*	3.741
Working experience (X_6)	-0.221	-5.427	0.041*	1.972
Income (X_7)	-0.239	-5.276	0.022*	1.349
Access to train/workshop (X_8)	0.744	3.566	0.000*	1.658
Model Chi-Square (X^2)	189.999		0.003	
Nagel Kerke R^2	78.9%			
Overall F% correct classification	86.4			
C° Degree of freedom	7			
Significant Level (5%)	0.000			

Source: Survey Computed from survey data, 2024**Significant at 5% level

4. Conclusion

The findings of this study underscore the critical role that agricultural extension agents play in enhancing agricultural productivity and addressing the pressing challenges faced by farmers in Delta State, Nigeria. The assessment of training needs and the effectiveness of these agents reveals significant gaps in competencies, particularly in essential skills such as problem-solving, critical reasoning, and modern technology application. These deficiencies highlight the urgent need for targeted training programs that can equip extension agents with the necessary skills and knowledge to effectively serve the farming community.

The study demonstrates a strong correlation between the training needs of agricultural extension agents and their effectiveness in delivering services to farmers. The statistical analysis indicates that addressing these training needs is paramount for improving the overall performance of extension services. The socioeconomic characteristics of the agents, including education, work experience, and access to training, further influence their effectiveness, suggesting that a holistic approach is required to enhance their capabilities.

Compliance with ethical standards

Acknowledgments

There is need for training agricultural extension agents in skills such as problem solving, critical reasoning, management of time, creativity, focus, statistical analysis, empathy, adaptability, abstract thinking, scientific knowledge, persuasion and introduction of modern technology. The evaluation of the effectiveness of various training types, including technical, communication, leadership, and climate-smart agriculture, indicated that the extension agents were not effective.

Disclosure of conflict of interest

There is no conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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