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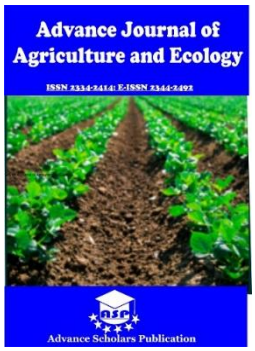

TRAINING STATUS OF EXTENSION AGENTS ON CLIMATE CHANGE ADAPTATION STRATEGIES FOR CROP AND LIVESTOCK PRODUCTION IN SOUTH-EASTERN NIGERIA

[1]Agomuo, C.I., [2]Akubuilo, C.J.C., and [3]Ibeagwa, B.O.

1. *Department of Agricultural Extension, School of Agriculture and Agricultural Technology, Federal University of Technology, Owerri, Imo State, Nigeria.*
2. *Department of Agricultural Economics, Extension and Rural Development, Faculty of Agricultural and Veterinary Medicine, Imo State University, Imo State, Nigeria.*
3. *Department of Agricultural Extension, School of Agriculture and Agricultural Technology, Federal University of Technology, Owerri, Imo State, Nigeria.*

Email: christiana.agomuo@yahoo.com

Key words: *Climate change, Extension agents, Adaptation strategies*

Abstract: *The study investigated the training status of extension agents in climate change adaptation practices for crop production and livestock production in some selected states in South-eastern Nigeria. Specifically the study set out to: i. to describe the socioeconomic characteristics of the extension agents; ascertain the trainings given to extension agents on crop and livestock climate change adaptation; and ascertain the training status of extension agents on climate change adaptation. 210 extension agents and 8 Subject Matter Specialists were selected by proportionate and random sampling techniques for the study. Data were collected from the respondents by means of Focal Group Discussion and structured questionnaire. Data collected were analyzed using descriptive statistics and climate change adaptation training status index. Results showed that the extension agents had an average age of 43 years were mostly female, and majority had acquired post-secondary education. Also the extension agents had been trained in climate change adaptation strategies for crop production as well as climate change adaptation strategies for animal production. The agents were on the average fairly well trained in climate change adaptation strategies. The study recommends that more male extension agents should be encouraged to get involved in the training and dissemination of climate change adaptation practices to farmers. This is especially so seeing that male*

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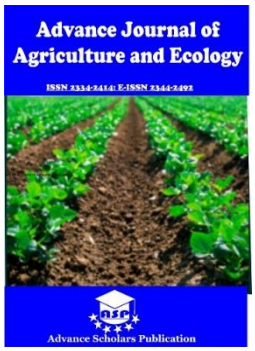

may be more endowed with the ability to access even remote areas than females. Also, there is need for the Agricultural Development Programme (ADP) to adequately train all field extension agents on climate change adaptation measures for crop and livestock production, as they play very key role in solving farmers' problems especially as they relate to climate change as was revealed by the findings that there were training needs of field extension agents in climate change adaptation.

Introduction

The agricultural sector has remained a huge economic contributor and employer of active labour in Nigeria where farming is a primary source of livelihood to a large population of the country. In the third quarter of 2019, the agricultural sector contributed 29.24% to the real GDP in Nigeria (https://www.cbn.gov.ng/rates/RealGDP.asp). Unfortunately, agricultural production in Nigeria and Africa as a whole is still largely dependent on climate related factors, such as sufficient rainfall, sunlight, soil property, evapo-transpiration, humidity (International Fund for Agricultural Development, IFAD, 2020).

Climate related changes, especially when the variation occurs in extreme dimension, will significantly impact on the livelihoods of farmers in these locations. The Intergovernmental Panel on Climate Change (IPCC) (2018) in its assessment on the expected effects of climate change on agriculture in the African region estimated that African countries like Nigeria will be most vulnerable to climate change globally due to the increase by between 1.5- 4.0^{o}C in temperature in the 21st century. Further proof reveals that projections on yield reduction show a drop of up to 50% as at 2015, and crop revenue is forecasted to fall by as much as 90% by 2100 (Connolly-Boutin *et al* 2016).

Climate related changes according to Ofoh (2009) entail any significant change in the measures of climate such as wind, temperature, rainfall, sunlight and humidity lasting for an extended period of time. Often, this situation is orchestrated by human direct or indirect livelihood activities. The United Nations Framework Convention on Climate Change (UNFCCC, 2018) defines it as a change of climate which is attributed directly or indirectly to human activities that alter the composition of global and or regional atmosphere and which is an addition to natural climate variability observed over comparable period. The definitions suggest that climate change is said to exist when validated data collected over time shows variation in climatic index.

In Nigeria, analysis of climatic data collected by the Nigerian Meteorological Institute over several decades reveal that since the 1970s, most parts of Nigeria have experienced some shifts in weather patterns which have adversely affected crop yields while promoting the development and spread of pests (Umunnakwe *et al.*, 2014). This is compounded by rising poor land use and degradation activities that undermine farmers' income generation potentials and food security

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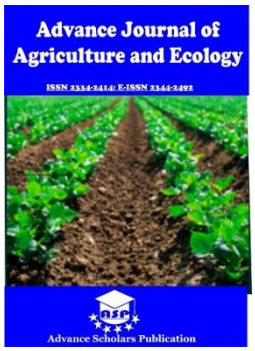

(Nwajiuba and Onyeneke, 2010; Apata, 2010; Adejuwon, 2010). However, while the phenomenon of climate change subsists, farmers and community members out of survival instincts have continued to use strategies/practices and materials that enable them to adapt to the unending effects of climate related changes.

Climate change adaptation strategies are deliberate steps taken in anticipation of, or in reaction to, external phenomenon like changes in temperature, wind, rainfall, humidity, or other climate related changes (Pelling, 2011). They are adjustments made immediately or beforehand in response to climatic stimuli to moderate harm or exploit beneficial opportunities (IPCC, 2007b). These include improved livestock management practices and mixed farming, soil fertility improvement measures, use of improved crop varieties and farm animal species, multiple livelihood activities, change in planting/harvesting date, use of irrigation facilities/insurance, use of cover crops, increase farm size and reliance on labour, use of agrochemicals (Ifeanyi-Obi, 2013).

Extension agents are the field extension workers who take innovations or technologies to farmers and other users of agricultural information and technologies (Asiabaka, 2002). Extension agents are trained by Subject Matter Specialists (SMSs) during Forth Night Trainings (FNT). Extension agents utilize educational means to improve the knowledge, skills and attitudes of farmers regarding climate change adaptation. They accomplish this through farm visit, method and result demonstration, Television and radio broadcast, exhibitions (Nwachukwu, 2003).

The effectiveness of extension agents in disseminating climate change adaptation strategies largely depends on their technical proficiency vis-à-vis in-service trainings. Specific areas of technical knowledge and skills gaps of extension agents where trainings are required constitute the training needs of extension agents (Halim and Ali, 1998). The difference between the actual level of job performance and the expected level of job performance indicates a need for training. A training need exists when a certain weakness can be overcome by the application of systematic training. The deficit is normally a gap between the desired level of performance and the actual level of performance (Caruso, 2011). In extension service delivery, it can be deduced that training needs in disseminating innovations on climate change adaptation strategies exist when the extension agent is technically incapacitated in assisting farmers to adapt to climate change.

Globally, records show that the impact of climate change on agricultural production has remained devastating particularly on small scale farmers in developing countries who produce bulk of the food (Food and Agriculture Organization, FAO, 2019). This is as current farming technologies and economic status of farmers in developing countries across the world presents to farmers few options of adaptation to climate change. Battisti (2009) noted that while the population of three billion people is expected to double by 2100, rice and maize yields in the tropics are expected to decrease by 20-40% because of

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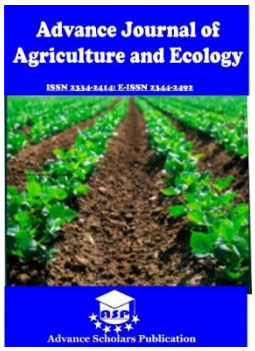

higher temperatures as a result of soil moisture and water supplies stressed by rising temperatures. Lobell *et al.* (2008) added that by 2080, yields in developing countries could decrease by 10% to 25% on average. To worsen this scenario, public infrastructure in developing economies, such as roads, long-term weather forecasts, and agricultural extension are inadequate to secure appropriate adaptation (Battisti, 2009).

Climate change has affected farmers' productivity, agricultural practices, environmental effects and distribution of rural space in Sub-Saharan Africa (Abegunde *et al.,* 2019; Juana *et al*., 2013). Evidences in Nigeria shows that climate change effects are diverse and are experienced in crop and livestock production. These effects include pest and disease infestation of crops and livestock; irregular rainfall pattern; land degradation; increased bio-diversity loss; loss of wildlife and natural resource base, erosion, etc (Ifeanyi-Obi *et al,* 2012; Choko *et al*., 2019). In the South-east region, the scourging effects of climate change have continued unabated. Most adaptation measures like use of irrigation to complement soil water deficit, use of fertilizer to boost yield, use of improved crop varieties and animal species to resist pests and disease attacks and use of agrochemicals for control purposes are considered by resource poor farmers who constitute the majority as expensive options (Onyeneke and Madukwe, 2010). Many farmers in Nigeria are still trapped in rain fed agriculture with use of crude methods and tools which make them vulnerable in the face of climate change (Ejiogu and Ejiogu, 2010; Onyeneke and Madukwe, 2010).

Unfortunately, extension agents who are statutorily meant to assist these farmers leverage available adaptation strategies to absorb the resultant shock are technically incapacitated to help (National Agricultural Extension and Research Liaison Services (NAERLS) and National Programme on Agriculture and Food Security (NPAFS), 2011). This training gap is partly blamed on the failure of State governments, particularly in South-East Nigeria to articulate and gazette adaptation practices and materials that are best suited for the region with the help of statutory agencies. Training gaps have potentials to technically incapacitate extension agents to disseminate climate change adaptation innovations. This failure on the part of the government negates the principle and essence of location specific adaptation strategies. This study therefore set out to: i. to describe the socioeconomic characteristics of the extension agents; ii. ascertain the trainings given to extension agents on crop and livestock climate change adaptation; iv. ascertain the training status of extension agents on climate change adaptation

Methodology

The study was conducted in South-east agro-ecological zone of Nigeria characterized by tropical rainforest. The Southeast agro-ecological zone lies within latitudes 5°N to 6°N of the equator and longitudes 6°E and 8° E of the Greenwich meridian. Southeast Nigeria is made up of five (5) States of Abia, Anambra, Ebonyi, Enugu and Imo. The zone occupies a total land mass of about 10, 952, 400 hectares

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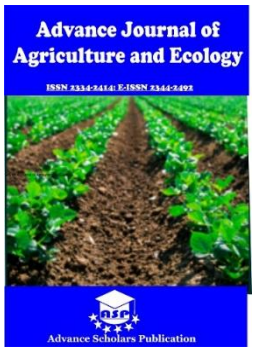

with a projected population figure of 21,381,729 persons (National Population Commission (NPC), 2018).

There are two major seasons experienced in this zone. These are dry and rainy seasons. The dry season lasts between November and March, while the rainy season occurs between April and October. However, the increasing variation of climatic conditions in recent decades makes it difficult to create a clear-cut distinction between the rainy season and dry season, especially between March and April. This is epitomized by heavy rainfall during the supposed dry spells and obvious dry spells during the season that heavy rains are expected. Despite this observed erratic nature of both rainfall and dry spells, the location of the zone within the tropical rain forest belt of the country encourages and allows the growth and survival of most tropical food crops like yam, cassava, vegetables, rice etc. and livestock production. Again, there is also the growth of ever green succulent grasses for fodder and forage.

Most of the inhabitants of the zone are engaged in agriculture, mainly crop farming and animal rearing.

From the five States that make up the South east geopolitical zone, three States, namely: Anambra, Enugu and Imo were randomly selected for the study. Extension agents and SMS's in Imo, Anambra and Enugu States constitute the study population. Proportionate sampling technique was used in determining the sample size of the extension agents due to their uneven distribution across the three selected States. The selection was based on 85% of the total number of field extension agents in each State (ADP Records). The proportionate sampling was achieved with the formula $P = N_n (n/N)$ (Nwachukwu, 2006):

Where:

P = The proportion to be sampled from the population

N = Total population of extension agents in the three States

N_n = Population of extension agents in location xyz

n = Sample size

Table 3.1: Population distribution by extension agents in sample States

State	Extension agents population
Anambra	78
Enugu	49
Imo	120
Total	**247**

Source: ADP Anambra, Enugu and Imo States, 2019

Proportionate sampling is applied thus:

Anambra State 78 (210/247) = 64

Enugu 49 (210/247) = 43

Imo 120 (210/247) = 103

Total = 210

The Subject Matter Specialists (SMSs) for crop and livestock gotten from the ADPs were few in number, 4, 2 and 2 for Imo, Anambra and Enugu respectively. As such all of them were interviewed. The Focus Group Discussion (FGD) was carried out one-on-one with the SMSs as a group.

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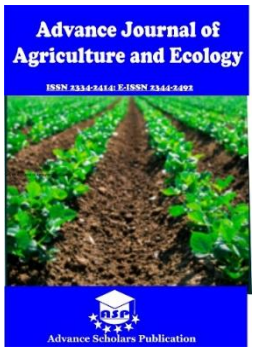

The study used both primary and secondary data. The primary data were collected from field extension agents in the three States using structured questionnaire to collect quantitative data. Qualitative data were collected from Subject Matter Specialists using a Focus Group Discussion (FGD) interview. The data collected from them were based on the objectives of the study. The respondents were spread across different zones, blocks and circles of the ADPs. The secondary data were the cost of training extension agents obtained from ADPs financial records.

Objectives i and ii were achieve using descriptive statistics. Objective iii was achieved using a climate change adaptation training status index. The extension agents were asked to indicate from a list of 19 climate change adaptation indicators as enumerated by extant literature those they have been trained on in the past 10 years (2009-2019). Their responses were measured as a dummy variable Yes = 1, No = 0. The total score was then used to specify the training status as; Well trained (15-19), Fairly trained (10-14), Poorly trained (5-9), and Not trained (0-4) (Table 3.2).

The qualitative data collected from the SMSs was used to buttress the findings, and to find out if they conformed or contradicted the training status index of McCaslin and Tibezinda (1998).

Table 1: Training status

Training status	Total score
Well trained	15 -19
Fairly trained	10 – 14
Poorly trained	5 -9
Not trained	0- 4

Source: Adapted from McCaslin and Tibezinda (1998)

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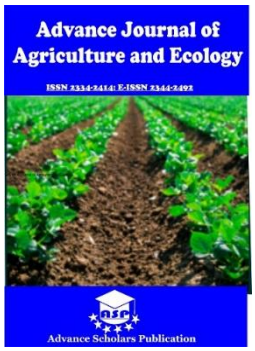

Results and Discussion

Table 2: Socio-economic characteristics of the Field Extension Agents

Variables	Frequency	Percentage	Mean
Age (Years)			
26- 32	18	8.57	43.3
33- 39	35	16.67	
40- 46	78	37.14	
47- 63	64	30.48	
54- 70	15	7.14	
Total	210	100.00	
Gender			
Male	76	36.00	
Female	134	64.00	
Total	**210**	**100**	
Household Size (No. of Persons)			
1-4	78	37.14	6
5-8	119	56.67	
9-12	13	6.19	
Total	210	100.00	
Educational Level of qualification			
OND/HND	92	43.81	
B.Sc	80	38.09	
M.Sc	37	17.62	
Ph.D	1	0.48	
Total	210	100.00	
Experience (Years)			
3-9	42	20.00	14.8
10-16	85	40.48	
17-23	63	30.00	
24-30	20	9.52	
Total	**210**	**100.00**	

Source: Field survey data, 2019

The distribution according to age of respondent is shown in Table 2. The result showed that 37.14% of the respondents were within the age bracket of 40-46 years old. The

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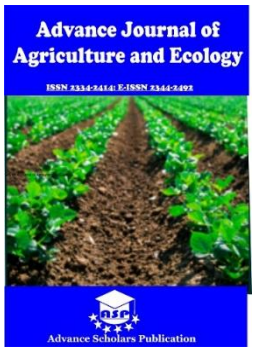

mean age of the field extension agents was 43.4 years implying that the field extension agents were in their mid-age and able to take up responsibility of extending extension information. Omoregbee and Ajayi (2009) in their study found that majority of the field extension agents were between the ages of 40-49 years, and opined that skills acquired through training and retraining programmes could be utilised in the organization for a long period.

The distribution of the field Extension Agents by gender is also presented in Table 1. The results showed that majority (64.00%) of the field extension agents were female while 36% were male. This implied a predominance of the female gender in field extension activities. Extension service is culturally perceived as a job for females. Also, an increased advocacy for gender equality in job opportunities may have tilted the tide in favour of female extension workers. Hence, female extension agents should be adequately trained in order to reach out to female farmers. The result was contrary to the findings of Ejiogu-Okereke, *et al.,* (2008), who found a higher predominance of male extension workers than female.

The distribution of the Field Extension Agents by household size is presented in Table 2. The result showed that the field extension agents have a mean household size of 6 persons. This was a moderate family size and may avail the extension agents enough time to effectively discharge their duties in their chosen field. In a similar study by Ezeh (2013) in South East Nigeria, it was found that a majority of the extension agents had a moderate household size of between 5-8 persons.

Table 2 showed the result of the distribution of the field extension agents by educational level. The result showed that 43.81% of the extension agents had the Ordinary National Diploma (OND) or the Higher National Diploma (HND) qualifications, and 38% had the Bachelor of Science (B.Sc) qualification. Only 18% of the field extension agents had a postgraduate degree. This indicated that formal education/training equipped the field extension agents to work effectively in disseminating research. It was expected that the field extension agents with higher educational qualifications may be better trained in climate change adaptation during the course of their higher education than those with lower qualifications. Chakeredza *et al.,* (2009) advocates the need for climate change to be integrated in the curricula of higher institutions for graduating students that they may be well versed with the challenges posed by climate change, in other to be in a better position to advise communities they would be working with appropriately. The result is similar to the findings of Omoregbee and Ajayi (2009) who observed that 55.3% and 27.6% of the field extension agents possessed OND and HND qualifications respectively. They further asserted that Agricultural extension staff needs to be trained and retrained to respond well to their functions of communicating and assisting farmers to make decisions on new technologies.

The distribution of the Field Extension Agents by extension experience is presented in Table 2. The result showed that 80% of the field extension agents had experience of about 10 years and above with a mean year of experience of 14.8 years. Only about 20% of

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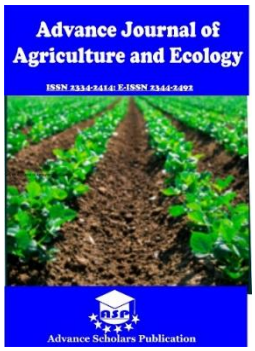

the field extension agents had experience of 3-9 years. This showed that the extension agents had spent a good number of years in extension service which is expected to have enhanced their capacity to extend extension services on various agricultural practices including climate change.

Trainings Given to Extension Agents on Climate Change Adaptation in Crop and Livestock Production

The trainings given to the field extension agents on climate change adaptation in crop and livestock production is presented and discussed under the following sub-headings:

Training given to extension agents on climate change adaptation in crop production

The result of the trainings given to field extension agents for 10 years (2009-2019) on climate change adaptation in crop production is presented in Table 3. The results revealed that the field extension agents had received trainings on climate change adaptation practices like inter cropping/mixed cropping (96.50%), use of early maturing varieties and high yielding crops (96.50%), ridging across the slope (77.62%), adjustment of planting/stocking/ harvesting time (77.14%), agricultural diversification (73.33%) etc. The effects of climate change on crop productivity are very significant and cannot be neglected. Hence field extension agents need to be well informed on climate change adaptation practices for crop production in other to educate the farmers on adaptive ways to mitigate the effect of climate change, improve their coping capacity and resilience.

Based on the Focus Group Discussion with the Subject Matter Specialists (SMSs) in the study area, the SMSs agreed that "*field extension agents were trained on climate change adaptations. The SMSs said that ADP services did not have exclusive template on climate change adaptation for the training of FEAs although they were also trained and taught climate change adaptation strategies like erosion, weather changes, excessive rainfall, flooding, loss of soil fertility and soil conservation, free range poultry system, mixed livestock farming, rearing of early maturing livestock, importance and use of animal dungs in crop farms etc..*

The SMSs further said that the FEAs could adequately handle problem that emerged in any aspect of agriculture because of the Unified Agricultural Extension System (UAES) which entailed having both adequate knowledge of both crop and livestock production and general knowledge of all aspect of agriculture."

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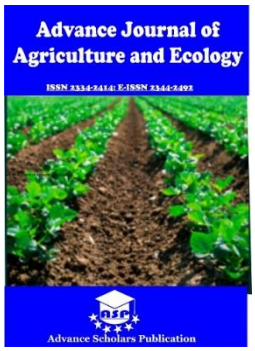

Table 3: Trainings given to extension agents on climate change adaptation in crop production

S/N	Adaptation in crop production	Frequency*	Percentage
1	Inter cropping/mixed cropping	193	96.50
2	Use of early maturing varieties and higher yielding crops	193	96.50
3	Adjusting planting/stocking/harvesting time	162	77.14
4	Creation of water channel	149	70.95
5	Early planting	153	72.86
6	Dry season irrigation farming	104	49.52
7	Ridging across the slope	163	77.62
8	Changing tillage operations	125	59.52
9	Agricultural diversification	154	73.33
10	Terracing	87	41.43
11	Use of meteorological information	138	65.71

Source: Field survey data, 2019; *Multiple responses recorded

Training given to extension agents on climate change adaptation in livestock production

The result of the trainings received by the field extension agents for 10 years (2009-2019) on climate change adaptation in livestock production is presented in Table 4. The results revealed that the field extension agents received trainings on various activities which aimed to raise their competency in training farmers on climate change adaptation practices for livestock production. The field extension agents received specific trainings on; mixed livestock farming (91.43%), use of improved breeds of animal (90.95%) and use of early maturing species (81.90%), rain water harvesting for animal feeding (69.52%), use of free-range system (62.86%), and use of water sprinklers (50.48%), variation in breeding (50.48%). This implies that a majority of the field extension agents received trainings on the specific activities identified except use of ranching system which only 45.71% of the field extension agents identified having such trainings. The training of field extension agents raises their competency as farmers rely on them for information. Nwaiwu *et al.* (2014) in their work on extension service needs of livestock farmers found that the farmers needed information on sources of hybrid livestock from extension agents.

The SMS said "*extension agents received training on poultry farming using the early maturing breeds, different types of poultry raises, free range, cage or battery system, mixed livestock farming like goats and sheep, use of rainwater as an improvise during dry weather etc.*"

This is in line with the highlights of the training status index of McCaslin and Tibezinda (1998).

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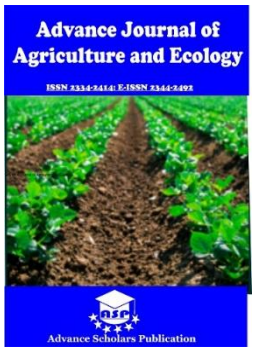

Table 4: Trainings given to extension agents on climate change adaptation in livestock production

Training on climate change adaptation in livestock production	Frequency*	Percentage
Use of improved breeds of animal	191	90.95
Use of ranching system	96	45.71
Use of early maturing species	172	81.90
Mixed livestock farming	192	91.43
Use of water sprinklers	130	61.90
Variation in breeding dates	106	50.48
Rain water harvesting for animal feeding	146	69.52
Use of free-range system	132	62.86

Source: Field survey data, 2019; *Multiple responses recorded

Training status of extension agents on climate change adaptation

The training status of the field extension agents is presented and discussed in Table 4. The training status represents the trainings received in the nineteen indicators of climate change adaptation in crop and livestock production. The results showed that 45.24% of the field extension agents were trained in 10-14 items of the climate change training indicator in crop and livestock adaptation strategies and were categorized as 'fairly trained' while 38.57% were trained in 15 -19 climate change indicators and were hence categorized as 'well trained'. The field extension agents that were poorly trained constitute 16.19% of the total, having received only 5-9 of the specific trainings of the climate change training indicator. The mean training status of the field extension agents was 13 which falls within the categorization of 'fairly trained' indicating that the field extension agents had trainings in some specific climate change adaptation strategies for crop and livestock production.

Table 5: Training status

Training Status	Frequency	Percentage
Poorly trained (5-9)	34	16.19
Fairly trained (10-14)	95	45.24
Well trained (15-19)	81	38.57
Total	210	100.00
Mean	**13**	
Std. Deviation	**3.12061**	

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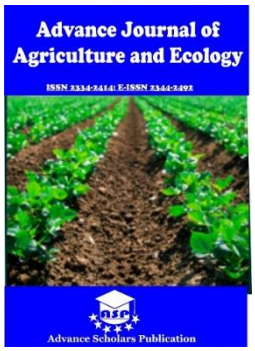

Range	**14.00**
Minimum	**5.00**
Maximum	**19.00**

Source: Field survey data, 2019; *Multiple responses recorded

Conclusion and Recommendations

The study investigated the training status of extension agents in climate change practices. It established that female extension agents dominate in the area. Also, the extension agents in the area are educated and have garnered reasonable number of years of experience. Furthermore, the extension agents had received specific trainings in climate change adaptation in crop and livestock production. Majority of the extension agents in the area may be considered fairly well trained. The study makes the following recommendations:

i. There is need to encourage more male extension agents to get involved in the training and dissemination of climate change adaptation practices to farmers. This is especially so seeing that male may be more endowed with the ability to access even remote areas than females

ii. There is need for the Agricultural Development Programme (ADP) to adequately train all field extension agents on climate change adaptation measures for crop and livestock production, as they play very key role in solving farmers' problems especially as they relate to climate change as was revealed by the findings that there were training needs of field extension agents in climate change adaptation.

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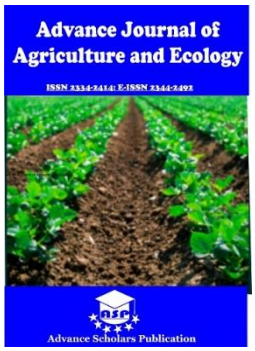

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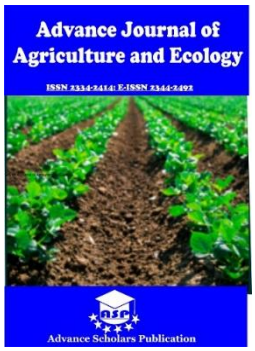

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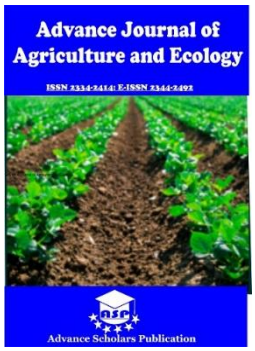

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