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# Training Needs on Climate Change Adaptation Measures in Crop and Livestock Production among Field Extension Workers in the Southeast Agro-Ecological Zone of Nigeria

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## ABSTRACT

The study examined the training needs on climate change adaptation measures in crop and livestock production among field extension workers in the Southeast agro-ecological zone of Nigeria. Specifically, the study identified trainings on climate change adaptation in crop and livestock production received by field extension staff, training needs on climate change adaptation on livestock and crop production among the workers and the constraints faced by the workers in disseminating climate change adaptation measures. A sample of 210 field extension workers proportionately selected from three out of five states in the Southeast agro-ecological zone of Nigeria participated in the study. Data were obtained using structured questionnaire and were described using mean score and frequency. Results showed that the field extension staff were still in their economically active ages ($\bar{X}$= 43), mostly female (64%) and well-educated. It was further revealed that the extension staff had worked for an average of 14 years. On the trainings on climate change adaptation measures in crop received by the staff, the result indicated that intercropping/mixed cropping (96.5%), early maturing varieties and higher yielding crops (96.5%) dominated whereas training on mixed livestock faming (91.4%) and use of improved livestock breeds (91.0%) prevailed in the livestock area. It was further indicated that the field extension workers needed training on communication skills ($\bar{X}$= 3.6), erosion detection techniques and preventive & control measures for onward dissemination to farmers ($\bar{X}$ = 3.5). The constraints to the dissemination of climate change adaptation measures included inadequate agricultural information/database/library for easy access to extension workers ($\bar{X}$ = 2.8) and weak linkage system between research and extension for prompt innovation and information exchange ($\bar{X}$ = 2.5). The study recommended the organization of routine training on climate change adaptation for field extension workers in the agro-ecological zone.

***Keywords:*** Climate change, training needs, adaptation measures, agricultural production, southeast agro-ecological zone.

## 1. Introduction

Climate change is considered one of the biggest challenges to natural sustainability globally and has become one of the burning concerns in this 21st century. It impacts both man-made and natural systems with long-term consequences (Omoyajowo *et al.,* 2022). Its negative effects on the ecosystem, manifested in various forms like increases in temperature, irregular rainfall patterns, sea level rise and increasing extreme weather conditions will most likely worsen already existing threats.

The vulnerability to climate change is highest in middle- and low-income countries where the adaptive capacity is low, particularly in Africa (Nd-Gain, 2021). Nigeria is listed among the top ten countries with the greatest effects of climate change globally, with about 6% of its land appraised to be under extreme weather events (World Bank, 2019). Severe consequences of climate change are being experienced in the Southern part of Nigeria where vegetation is presently struggling with irregular

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patterns of rainfall (Okon *et al.,* 2021). Similarly, heat waves are posing serious problems to the savannah vegetation area. There is a risk of losing about 30ha of crop land to desert encroachment in the Sahel region (Obioha, 2008; Ragotoa *et al.,* 2019). Nigeria's water and wetland supplies have also been impacted by climate change. These have directly and indirectly impacted both animal and crop production (Flitton *et al.,* 2019).

According to Okon *et al.* (2021) crop production occupies nearly 94% of Nigeria's agricultural sector. Ebele and Emodi (2016) reported that climate change effects are significant in this sub-sector as a large proportion of the country suffers about 20% reduction in growing day cycle. Rapidly, many forest resources are disappearing as a result of climate change (Onyekuru & Marchant, 2016). Gbenga *et al.,* (2020) reported that the increasing temperature has drastically reduced production in animals with more severe effects in poultry, swine, cattle, sheep and goat. This raises the risk of crop loss and death of livestock (Harvey *et al.,* 2014).

Onokala *et al.,* (2010) argued that farmers' response to climate change is appropriate when they can access quality information. However, Ifeanyi-Obi and Ekere (2021) observed that farmers in Nigeria lack access to the necessary information, knowledge and resources needed for effective adaptation to climate change. Davis (2009) argued that agricultural extension should play significant roles in information technologies and information management, capacity development and facilitating and implementing policies and programmes targeted at increasing local capacity for climate change adaptation. Ifeanyi-Obi and Ekere (2021) hinted that the failure of agricultural extension organizations in Nigeria to perform these functions implies a gap in their primary functions. This however, calls for training and retraining of extension workers in Nigeria so that they can live up to their expectations of providing farmers with climate change adaptation technologies.

In order to maintain competitive advantage and improve peformance, an organization needs to have a highly-skilled, effective and efficient human resources (Mathias & Jackson, 2004). Training is a process of increasing the knowledge and skills of a workforce to enhance their job performance. Training needs is thus the gap between the tasks an employer is currently performing and what they ought to perform (South African Management Development Institute, 2007).

Despite the increasing threat of climate change to agriculture in Nigeria and the corresponding response from extension organizations, empirical evidence is scarce on the training needs of extension personnel on climate change adaptation for crop and livestock production. This study therefore intends to close the gap by assessing the training needs on climate change adaptation measures in crop and livestock production among extension agents in Imo State Agricultural Development Programme.

**Objectives of the study**

The broad objective of the study was to assess the training needs on climate change adaptation measures in crop and livestock production among field extension workers in Southeast, Nigeria. The specific objectives included to:

1. Describe the socioeconomic characteristics of the agricultural extension workers;
2. identify the trainings given to the extension workers on crop and livestock adaptation to climate change;
3. Determine the training needs on climate change adaptation measures in crop and livestock production; and
4. Identify constraints faced by extension workers in dissemination climate change information on crop and livestock production in the study area.

## 2. Methodology

The study was conducted in Southeast, Nigeria. The climate is tropical rainforest, with two separate seasons, rainy season and dry season. The rainy season begins in March and ends in October while the dry season lasts between November and February. The region experiences average rainfall of nearly 1952 mm with a mean temperature of between 27$^{o}$C and 28$^{o}$C (Ifeanyi-Obi & Ekere, 2021). The climate patterns in the zone have experienced significant changes over time.

The zone is comprised of five states namely Abia, Anambra, Ebonyi, Enugu and Imo States. It lies within latitudes 5oN and 6oN and longitudes 6oE and 8oE while occupying a land mass of 10,952,400 hectares and a projected population of 21,281,729 people (National Population Commission, 2018). Agriculture is the major occupation of the people.

The population for the study comprised all field extension workers in the zone. Out of the five states in the zone, three states – Anambra, Enugu and Imo were selected using simple random sampling technique. Proportionate sampling technique (85%) was used to select 43, 64 and 103 field extension agents from Anambra, Enugu and Imo States respectively to give a total of 210 extension workers used for the study. Data for the study were obtained using structured questionnaire and described using percentages and mean scores.

## 3. Results and Discussion

### 3.1. Socioeconomic characteristics of the field extension workers

The socioeconomic characteristics of the field extension workers in southeast zone were summarized in Table 1. The average age of the workers was approximately 43 years implying that the workers are still young and economically active.

**Table 1:** Socioeconomic characteristics of field extension workers

| Socioeconomic characteristics | F | % | $\bar{X}$ |
|---|---|---|---|
| **Age (Years)** | | | |
| 26 - 39 | 53 | 25.3 | |
| 40 – 63 | 142 | 67.6 | 43.3 |
| > 15 | 17 | 7.1 | |
| Sex | | | |
| Male | 76 | 36.0 | |
| Female | 154 | 64.0 | |
| **Household size (Persons)** | | | |
| 1 – 4 | 78 | 37.1 | |
| 5 – 8 | 119 | 56.7 | 6 |
| 9 – 12 | 13 | 6.2 | |
| **Educational qualification** | | | |
| OND/HND | 92 | 43.8 | |
| B.Sc. | 80 | 38.1 | |
| M.Sc. | 37 | 17.6 | |
| Ph.D | 1 | 0.5 | |
| **Working experience (Years)** | | | |
| 3 – 9 | 42 | 20.0 | |
| 10 – 16 | 85 | 40.5 | 14.8 |
| 17 – 23 | 63 | 30.0 | |
| 24 – 30 | 20 | 9.5 | |
| **Frequency of visits weekly** | | | |
| Once | 156 | 74.3 | |
| Twice | 20 | 9.5 | |
| Thrice | 13 | 6.2 | |
| Four time | 21 | 10.0 | |
| **Monthly income (₦)** | | | |
| 10.000 – 60.000 | 104 | 49.5 | |
| 61.000 – 111. 000 | 72 | 34.3 | 69.000 |
| 112.000 – 162.00 | 34 | 16.2 | |
| **No. of farmers reached annually** | | | |
| 1 – 200 | 131 | 62.4 | |
| 201 – 400 | 4 | 1.9 | |
| 401 – 600 | 30 | 14.3 | |
| 601 - 800 | 23 | 11.0 | 198 |
| 800 – 1000 | 12 | 5.7 | |
| > 1000 | 10 | 4.8 | |

**Source:** Field Survey Data, 2021

This is line with Ifeanyi-Obi and Ekere (2021). The result indicated that the field extension workers were dominated This is line with the study of Ifeanyi-Obi and Ekere (2021). The result indicated that the field extension workers were dominated by females (64%). This contradicts the findings of Hassan (2010) and Rad et al., (2011) which found that extension service has historically

been dominated by female staff. The dominance of women in extension service might have negative implications of the coverage of female farmers by extension workers. Adeola and Ayoade (2011) argued that male dominance in extension work may result limit women's access to agricultural information and knowledge. The average household size of the extension personnel was six persons per household suggesting that the workers had large households. The attention required by large households might distract the workers from concentrating on their primary tasks.

All the extension workers received one form of formal education or the other. However, most (43.8%) of them had OND/HND followed by 38.1% that had B.Sc. This suggests that the field extension workers are well-educated and this contradicts the belief that extension is a low-profile job. This finding is consistent with the result of a study by Ifeanyi-Obi and Ekere (2021) which reported that extension workers are well-educated.

The mean working experience of the extension workers was about 14 years. This implies that they have worked for a reasonable length of time. Most (74.3%) of the extension agents visited farmers once a week. This number of visit may not be enough for adequate transfer of knowledge and skills to farmers. The average monthly income of the workers was N69,000. This means that the extension workers' salaries are unattractive considering the present economic realities of the country. This might discourage people from seeking extension job. The result also showed that an average of 198 farmers are visited by the extension personnel per week.

### 3.2. Training given to extension workers on climate change adaptation

Result in Fig. 1 shows that the extension workers were trained on many adaptation technologies on crop production. The major ones were intercropping/mixed cropping (96.5%), early maturing varieties and higher yielding crops (96.5%), ridging across slope (77.6%), adjusting planting/harvesting/stocking time (77.1%), agricultural diversification (73.3%) and creation of water channels (71.0%). The result further shows that comparatively lower proportion of extension workers were trained on crop production adaptation technologies that are emerging like early planting, cry season irrigation farming and use of meteorological information. This might reduce availability of such technologies since a fewer number of field extension personnel were trained on them.

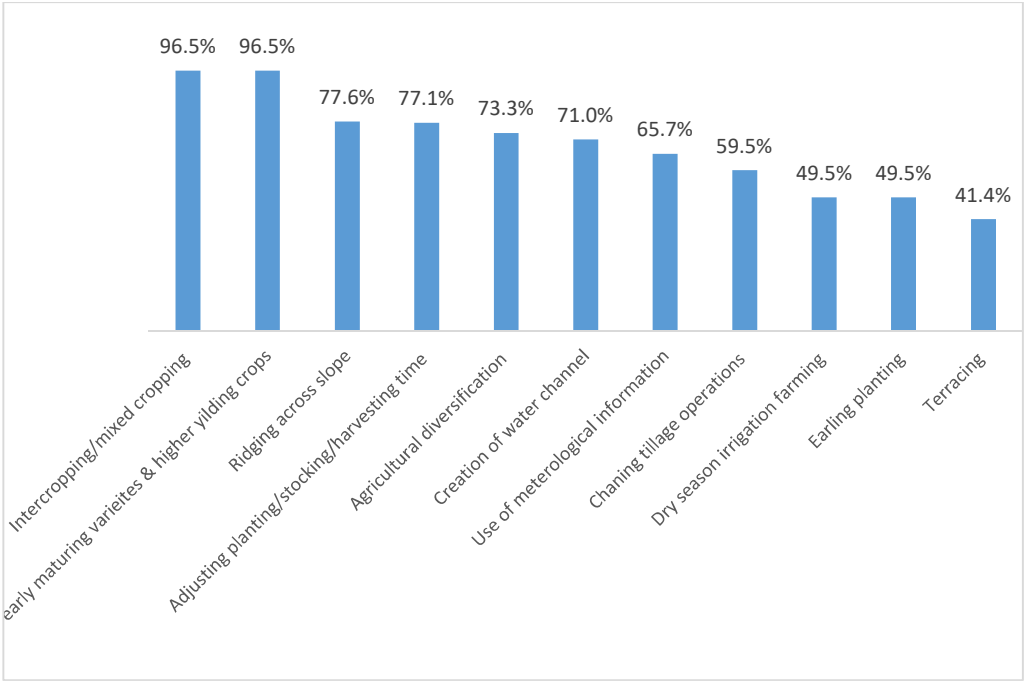


**Fig 1a:** Training on crop production adaptation technologies**.**

Fig. 1b indicates that out of eight adaptation technologies on livestock production, a large proportion of the field extension workers received training on mixed livestock faming (91.4%), use of improved

livestock breeds (91.0%) and use of early maturing species (81.9%). Use of ranching system (45.7%) and variation in breeding dates (50.5%) had the lowest proportion of extension workers trained on them. Eta *et al.,* (2022) reported that extension workers in Nigeria receive trainings on climate change adaptation and hence have the capacity to transfer such technologies to farmers

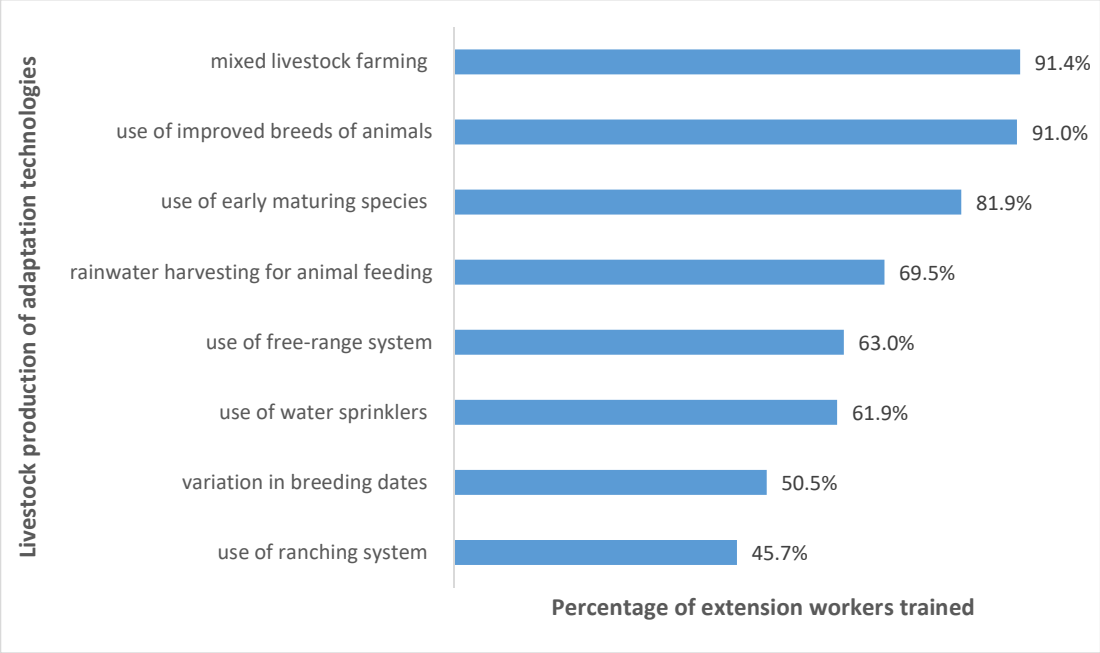


**Fig1b:** Training on livestock production adaptation technologies.

### 3.3. Training needs of field extension workers on climate change adaptation

Result in Table 2 indicate that the field extension workers needed training on communication skills ($\bar{X}$ = 3.6), erosion detection techniques, preventive & control measures for onward dissemination to farmers ($\bar{X}$ = 3.5), recording/collation & reporting of weather information as basis to explain climate change ($\bar{X}$ = 3.4) and improved varieties of crops & livestock species that can withstand climate shocks ($\bar{X}$ = 3.4). Others include pests & diseases detection/control training using organic methods ($\bar{X}$ = 3.3), livelihood diversification strategies ($\bar{X}$ = 2.9) and use of irrigation equipment for all seasons production ($\bar{X}$ = 2.8). Based on the mean scores, the primary training areas as indicated by the extension workers

were communication skills and erosion detection and preventive measures for climate-related disasters. This result suggests that field extension personnel in Nigeria are yet to acquire basic skills necessary for effective adaptation to climate change. This findings agrees with the study by Ashraf *et al.,* (2020) where the extension agents studied where found to be in need of training to boost their adaptive capacity.Poor training of field extension staff often results in wide gaps in their job performance (Koyenikan & Omoregbee, 2015). Similarly, it observed that the withdrawal of World Bank funding from Nigerian extension service has resulted in massive underperformance of the organization (). Ashraf *et al.,* (2020) described agricultural field extension workers in developing countries as generally lacking the competence for climate change adaptation and mitigation. This however necessitates the in-service training of the staff as a way of enhancing their capacity for climate change adaptation. In line with this observation, Ozor (2009) and Adisa and Balogun (2012) clamoured for broadening and upgrading of extension workers' skills on climate change adaptation.

**Table 2:** Climate change adaptation training needs by field extension workers on crop and livestock production.

| Climate change adaptation training needs | $\bar{X}$ | S.D |
|---|---|---|
| Training on communication skills for dissemination of climate change adaptation measures | 3.6* | 0.9 |
| Recording/collation & reporting of weather information as basis to explain climate change | 3.4* | 0.7 |
| Erosion detection techniques, preventive & control measures for onward dissemination to farmers | 3.5* | 0.6 |
| Use of irrigation equipment for all seasons production | 2.8* | 1.1 |
| Pests & diseases detection/control training using organic methods | 3.3* | 0.7 |
| Training on improved varieties of crops & livestock species that can withstand climate shocks | 3.4* | 0.8 |
| Training of diverse livelihood activities adaptation strategies | 2.9* | 0.9 |

**Source:** Field Survey Data, 2021

### 3.4. Constraints to the dissemination of climate change adaptation information

Results in Table 3 indicate that out of the eight constraints outlined that could limit field extension workers 'dissemination of climate change adaptation information, only two – inadequate agricultural information/database/library for easy access to extension workers ($\bar{X}$ = 2.8) and weak linkage system between research and extension for prompt innovation and information exchange ($\bar{X}$ = 2.5). It could be inferred from the finding that the major challenges confronting agricultural field agricultural extension staff to the dissemination of climate adaptation technologies to farmers in the zone are the lack of effective linkage among relevant stakeholders and scarcity of database.

Weak linkages have remained a serious challenges to the generation, dissemination and utilization of climate change adaptation technologies among relevant stakeholders in the agricultural innovation system in developing countries. Weak linkages often lead to poor interaction and consequently the generation of unsuitable technologies. Often times, climate change events are location-specific and thus require the generation of location-specific adaptation technologies. Koyenikan and Omeregbee (2015) reported a poor linkage between farmers and extension staff in Nigeria.

**Table 3:** Constraints to the dissemination of climate change information by field extension personnel.

| Item | $\bar{X}$ | S.D |
|---|---|---|
| Inadequate agricultural information/database/library for easy access to extension workers | **2.8*** | 0.7 |
| Poor research culture towards identifying climate smart agricultural practices & developing location-specific coping practices | 2.3 | 0.8 |
| Weak linkage system between extension & research for prompt innovation/information exchange | **2.5*** | 1.2 |
| Lack of synergy among stakeholders | 2.3 | 0.9 |
| Digital divide | 2.4 | 0.8 |
| Poor extension coverage | 2.3 | 0.9 |
| Lack of location-specific agricultural innovation | 2.3 | 0.8 |
| Poor technical knowledge | 2.3 | 1.0 |
| Inadequate extension organization structure | 2.3 | 0.9 |
| Lack of credible agricultural information source | 2.4 | 0.9 |

**Source:** Field Survey Data, 2021

## 4. Conclusion and recommendations

The study concludes that agricultural field extension staff in the southeast agro-ecological zone of Nigeria lack the necessary skills required for effective adaptation to climate change. This makes training and retraining on climate change adaptation very crucial. Based on the findings of the study, the following recommendations are made:

1. Public agencies concerned with climate change adaptation in the agricultural and other related sectors should organize routine capacity building training/workshops for field extension staff in the zone.
2. Research-extension-farmer linkage systems should be strengthened in order to enhance the active participation of stakeholders in the development of climate change adaptation technologies. The reactivation of fortnightly training (FNT) meetings should be considered so as to achieve this.
3. Agricultural databases should be readily available to field extension staff for easy access and use. This can be achieved through the digitalization of extension service.

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