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EXTENSION WORKERS' PERCEPTION OF EFFECTIVENESS IN CLIMATE CHANGE-RELATED MITIGATION PRACTICES AND INFORMATION DISSEMINATION IN EDO STATE, NIGERIA

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ABSTRACT

The study assessed the perception of extension workers of the relevance and effectiveness in the dissemination of climate change-related mitigation practices and information in Edo State Agricultural Development Programme (ADP). The forty seven (47) Extension workers in the ADP constituted the respondents for the study. Findings show that majority were males (51.06%), 40-49 years of age (55.32%) and had 10-20 years working experience (61.70%). Some of the climate change mitigation practices/information perceived as relevant were early-warning systems (mean=3.98), Fertilizer/soil nutrient enhancement (mean=3.96), produce drying (mean=3.95), resistant crop varieties (mean=3.88), tolerant livestock breeds/fish species (mean=3.63). The respondents perceived that they were effective in most of the practices/information disseminated such as flood control (mean=2.87), enterprise choice/selection (mean=2.81), erosion control (mean=2.83), and fertilizer/soil nutrient enhancement (mean=2.81) but not with the intensity to which they were relevant. Major constraints to the performance of the respondents were irregular work programme implementation (mean=2.68), poor road network (mean=2.68), inadequate official mobility (mean=2.64), insufficient allowance for extension workers (mean=2.55) and shortage of extension materials (mean=2.54). There were significant negative relationships between the respondents' education (r=-0.231; p=0.038), working experience (r=-0.370; p=0.025) and climate change mitigation practices/information dissemination. The study recommends adequate funding of field activities and capacity building and motivation of especially the frontline extension staff by the State Government to enhance their performance.

Keywords: Climate change; mitigation practices; extension; effectiveness; Nigeria

INTRODUCTION

Climate change has been defined as a change that is attributable directly or indirectly to human activities, that alters the atmospheric composition of the earth which leads to global warming, (Nasiru, 2009). Climate change is the change in the statistical distribution of weather over a period of time that ranges from decades to millions of years. This change may be limited to a specific region or may occur across the whole earth (Wikipedia, 2009). The effects of climate change include increase or decrease of the mean air temperature, rainfall, solar radiation, evapo-transpiration and other parameters of weather.

Developing countries are considered to be the ones suffering more from the effects of climate change and African countries are even more vulnerable due to their dependence on natural resources (Bambaige, 2007). Climate change has occupied the front burner in development issues in recent times due to it adverse effects on different sectors of the economy. According to ILRI, (2006) in Bambaige, (2007), the impacts of climate change in Africa are generally manifested in human health and in the agricultural sector, worsening the existing levels of poverty and undermining all development efforts in the continent. Climate change could render proven technologies unviable if the environment is not conducive to maximization of the inherent potentials. There is the need to mitigate the effects of climate change on agricultural activities, assist farmers to adapt practices for them to cope. This will help to achieve the Millennium Development Goals (MDGs) targets of alleviating poverty and extreme hunger, eradicate HIV/AIDS, malaria and other diseases as well as sustain the environment for the benefit of the global community.

According to Speranza *et al*. (2009), the magnitude of the climate change problem, the temporal and spatial uncertainties surrounding its manifestations call for adaptiveness. To adapt means to adjust to new conditions. Mitigation is to make less intense or severe. The essence of both adaptation and mitigation is survival. Speranza *et al*., (2009) states that adaptiveness presupposes adaptive capacity and those actors affected by climate change expect the public administration at various levels of organizations, to facilitate processes and enabling conditions that promote adaptation to climate change. Adaptation and mitigation measures become very relevant because climate change is beyond the immediate control of humans who are usually adversely affected. Speranza *et al*. (2009) identified adaptation strategies such as strengthening the early warning system, strengthening the capacity of the local communities, who mostly depend on agriculture to deal with the effects of climate change and reduce the impacts such as coastal zones erosion and water resources management to respond to the effects of climate change.

Climate change is caused by either natural or and anthropogenic factors. Researches have shown that for the past few decades, anthropogenic factors like urbanization, deforestation, population explosion, industrialization and the release of greenhouse gases are the major contributing factors to the depletion of the ozone layer and its associated global warming and climate change (Deweerdt, 2007; Odjugo, 2007). Measures need to be put in place to mitigate the adverse effects of climate change. These include practices to reduce the impacts of droughts, construction of small dams for multiple uses such as irrigation, fish farming, recreation and ecotourism.

Changes in short-term temperature extreme can be critical, especially if they coincide with key stages of crops and livestock development. Only a few days of extreme temperature (greater than 32^0C) at the flowering stage of many crops can drastically reduce yield (Wheeler *et al*., 2000). Short term high temperature can affect enzymes reaction and

gene expression. Food production can also be affected by excess water. Heavy rainfall events leading to flooding can wipe out entire crops over a wide area, and excess water can also lead to other impacts including soil water logging of soils and anaerobicity and reduced plant growth (Gornall *et al*, 2010). Agricultural machines may simply not be adapted to wet soil conditions. Regarding crop productivity, vulnerability is clearly greatest where sea level rise occurs in conjunction with low-lying coastal agriculture (Gornall *et al*, 2010).

Adaptation measures are crucial considering the fact that most climate parameters cannot be controlled for large area/expanse of land, and the general environment of any farming system. They are basically natural phenomena, the effect of which even advanced countries are experiencing on an increasing basis. Since there is little or no control over nature, Public Agricultural Extension Service (PAES), according to Speranza *et al* (2009), should support farmers in adapting to climate change and that PAES must first improve its own adaptiveness.

Extension agents as the representatives of the extension agency to the target system can introduce locally appropriate and proven technologies and management techniques that enable farmers to adapt to climate change. These include dissemination of technologies/information on cultivars which are drought-tolerant and disease-resistant crop varieties, agro-forestry, intercropping, sequential cropping, and non-tillage agriculture. Types of extension advice to farmers on adaptation to climate change identified by Kiteme, (2009) include enterprise choice, market intelligence, post-harvest management, new crop varieties, drought resistant cultivars, early warning systems, conservation agriculture, afforestation, forage conservation, use of crop residues, urban farming, range improvement, zero grazing, livestock breeds and improved sanitation. A core challenge for extension is to support farmers with skills they need, to choose the best option to deal with the climate uncertainty and variability. Adequate training of farmers will be necessary which could only be achieved through effective extension delivery.

Speranza *et al* (2009) opined that climate change is thus worsening the working conditions for extension services because through farmers' impoverishment by crop failures, it will be difficult to persuade farmers and there will be difficulty in implementation of work programmes. Mutekwa (2009), in line with this, stated that extension officers have real challenges in providing the farmers with knowledge that is location and ecologically specific. This has resulted in limited effectiveness in climate change adaptation strategies amongst the farmers at local level.

The adverse effects of climate change to agriculture and the environment necessitated its being focused in development agenda in recent times. The Edo State Agricultural Development Programme (ADP) has been disseminating agricultural information through various channels on technologies and practices that could enhance farmers' productivity and income. The relevant agricultural information/practices include those related to climate change adaptation or mitigation (Edo ADP, 2009). The relevance of the technologies/practices and the effectiveness of the Extension Workers (EWs) in disseminating them to farmers could not be ascertained. It is based on this that the study assessed the perception of EWs of the relevance and their effectiveness in disseminating climate change mitigation practices/measures in Edo State. The specific objectives were to:

1. examine the personal characteristics of the Extension Workers in Edo State ADP;
2. examine their perception of the relevance of climate mitigation measures/practices disseminated to farmers in the State;

3. ascertain the extension workers' perception of effectiveness in disseminating climate change mitigation measures/practices;
4. identify the extension workers' constraints to effective dissemination of practices/information.

MATERIALS AND METHODS

Edo State is situated in the south-western zone of Nigeria. It is located on latitude $6^{o}3^{o}$N longitude $6^{o}00^{o}$E. It falls within the in the rain forest zone with annual monthly rainfall between May and July averages over 300 mm, while in August and September it is down to 75 mm and in January as low as 35 mm. The main dry season is accompanied by harmattan winds from the Sahara Desert (Wikipedia, 2010 C). The average temperature is about 25^{o}C during wet season and 28^{o}C in dry season. The total population is 3,218,332 (National Population Commission, 2006). The state is divided into three senatorial districts: Edo south, Edo central, and Edo north with seven, five and six Local Government Councils respectively (Wikipedia, 2011). The state covers a land mass of 17,802 $km^2$and is bounded in the north and east by Kogi State, in the south by Delta State and in the west by Ondo State. The total population is 3,218,332 (NPC, 2006).

Agriculture is the predominant occupation of people in the state. Agricultural activities include crops, livestock and fish production, processing and marketing. Major cash crops produced are rubber, cocoa and palm produce while arable crops include yams, cassava; rice, plantains, guinea-corn, and assorted types of fruits and vegetables. Edo State is endowed with abundant natural resources. The principal mineral resources include crude oil, natural gas, clay chalk, marbles and limestone

The study population consists of all the forty seven (47) extension workers in Edo state ADP (Edo State ADP, 2010). Data were obtained using a structured questionnaire which captured the socio-economic characteristics of the extension workers and their perception of the relevance and effectiveness in dissemination of climate change mitigation measures/practices/information to farmers. Descriptive statistics such as frequency count, percentage, mean and standard deviation were used in data analysis. Pearson Product Moment Correlation (PPMC) was used to test the hypotheses.

The extension agents' perception of the relevance of climate-related mitigation measures/information was measured on a 4-point Likert-type scale for 26 items with not relevant =1, somehow relevant=2, relevant=3, highly relevant=4. A mean score that was greater than or equal to 2.50 was considered relevant. The maximum score was 104 while 26 was the minimum. Similarly, the agent' perception on effectiveness in dissemination of climate-related mitigation information and practices was measured on a 4-point Likert scale for 26 items: not effective =1, somehow effective =2, effective =3, highly effective=4. A mean score that was greater than or equal to 2.50 was considered effective. The maximum score was 104 while 26 was the minimum

The constraint to EWs' effectiveness in climate-related mitigation practices/information was measured using 3-point Likert scale with not serious=1, serious=2, very serious=3. A mean score that was greater than or equal to 2.00 was considered serious constraint.

RESULTS AND DISCUSSION

Socio-economic Characteristics of the Extension Workers

Table 1 shows that 51.1% of the extension workers were males and 85.1% were married, 55.3 % were within the age range of 40-49 years which shows that the extension workers were within the productive age and were likely adventurous in the search for information. Most of respondents (87.2%) had Ordinary National Diploma (OND) (46.8%) and Higher National Diploma (HND) (40.4%) while others had B.Sc and M.Sc. About 61.7% of respondents had working experience of between 11-20 years. The low level of education of about 45.8% with OND could limit access climate change information however the long working experience of EWs with 11years and above (80.9%) could have enhanced their access. Majority were Extension Agents (51.1%). The total number of EWs was low, this agrees with Adebayo and Adedoyin, (2005) that there was shortfall in the number of extension workers nationally. This shortfall in the number of EWs in the state brings the ratio of Extension Agent to Block Extension Supervisors (BESs) to 1:3 as against the ideal of about 1: 8 an indication that a BES supervises less than expected or sub optimal span of control which .

Table 1: Distribution of socio-economic characteristics of the extension workers

Variables		Frequency	Percentage %
Sex	Female	23	48.9
	Male	24	51.1
Age (years)	Below 30	1	2.1
	30-39	16	34.0
	40-49	26	55.3
	50 & above	4	8.5
Marital status	Single	5	10.6
	Married	40	85.1
	Widowed	2	4.3
Level of Education	OND	22	46.8
	HND	19	40.4
	B.Sc/B.Agric	3	6.4
	M.Sc	3	6.4
Working experience (years)	10 & below	9	19.2
	11-20	29	61.7
	>20	9	19.2
Job rank	Director of extension	1	2.1
	Chief Ext Officer	1	2.1
	Women-In-Agric officers	4	8.51
	Subject Matter Specialists	2	4.3
	Block Extension Supervisor	7	14.9
	Block Extension Agent	8	17.0
	Extension Agent	24	51.1

Source: Field Survey 2010.

Relevance and Effectiveness of Climate Change Mitigation Measure/Practices/Information

Table 2 shows the mean scores of the relevance of climate change mitigation measures and the effectiveness of Extension workers in the dissemination of climate change mitigation practices/information. Most of the mitigation measures were considered relevant to the clients' farming systems however, the highly relevant measures include early-warning systems (mean=3.98), fertilizer/soil nutrient enhancement (mean=3.96), produce drying (mean=3.95), use of resistant crop varieties (mean=3.88), and use of resistant/tolerant livestock breeds/fish species (mean=3.63). Atungwu and Odedina (2010) found that similar strategies such as adjustment of farming calendar, afforestation, irrigation, fertilizer application and mulching were being adopted by farmers to cope with climate change in south-western Nigeria. Only forage conservation (mean=1.08), range improvement (mean=1.40) and zero grazing (mean=1.34) were rated as not relevant. This is an indication that the extension workers do not consider livestock climate change mitigation measures as highly relevant due to non prevalence of livestock herding in Edo state. This could mean that the EWs do not reach out to the Fulani pasturalists in the State.

The table further shows the effectiveness of Extension workers in the dissemination of climate change mitigation measures. The EWs perceived that they were effective in most of the practices. Flood control (mean=2.87), enterprise choice/selection (mean=2.81), erosion control (mean=2.83), and fertilizer/soil nutrient enhancement (mean=2.81) were some of the measures in which they were very effective. Low effectiveness was recorded for the livestock related practices which could be attributed to the low level of relevance of the practices to farmers in the state. The workers' low effectiveness in early-warning systems (mean=1.76) shows that the measures which could avert/safeguard or adequately mitigate the effect of climate change or make the mitigation measures work were not in place. The lower rating of the EWs' perceived effectiveness than perceived relevance of the mitigation measures is an indication that gaps exist.

Table 2: Mean scores of respondents by perceived relevance and effectiveness in dissemination of climate change mitigation measures

Climate change mitigation measures/ strategies	Perceived Relevance		Perceived Effectiveness	
	Mean	SD	Mean	SD
Resistant livestock breeds/fish species	3.63*	1.070	2.46*	0.853
Resistant crop varieties	3.88*	0.924	2.76*	0.537
Urban farming/ home gardening	3.17*	1.070	2.71*	0.572
Enterprise choice/selection	3.17*	0.868	2.83*	0.461
Use of crop residues/mulching	3.13*	0.969	2.74*	0.514
Drought resistant cultivars	2.62*	1.011	2.65*	0.646
Forage conservation	1.08	1.024	1.78	0.530
Afforestation	2.68*	1.181	2.71*	0.541
Early warning systems	3.98*	0.395	1.76	0.565
Range improvement	1.40	0.825	1.49	0.789
Zero grazing	1.34	0.915	1.58	0.622
Erosion control	3.35*	0.761	2.83*	0.461
Flood control	2.03*	0.851	2.87*	0.849
Temperature control-heating, brooding	3.32*	0.866	2.56*	0.853
Produce drying	3.95*	0.500	2.78*	0.507
Produce storage	3.38*	0.823	2.74*	0.532
Enterprise hygiene against pest and diseases	3.69*	0.782	2.82*	0.431
Avoidance of crop failure/planting dates	3.38*	0.515	2.77*	0.514
Humidity control/shades	3.35*	0.856	2.55*	0.646
Irrigation	3.06*	0.843	2.77*	0.530
Soil moisture control/ mulching	3.81*	0.752	2.71*	0.541
Planting/stocking dates	3.69*	0.403	2.76*	0.565
Planting cover crops	3.24*	0.811	2.67*	0.570
Provision of shelter/shades	3.15*	0.824	1.49	0.742
Zero tillage	2.76*	0.387	2.64*	0.602
Fertilizer/soil nutrient enhancement	3.96*	0.349	2.81*	0.351

Source: Field Survey 2010. *Relevant (mean≥2.50) *Effective (mean≥2.50)

Constraints to Dissemination of Climate-related Adaptation Practices/Information

Table 3 shows constraints to EWs' dissemination of climate change-related mitigation measures or information among the respondents. Almost all the constraints were serious. They include irregular work programme implementation (mean=2.68), poor road network (mean=2.68), inadequate official mobility (mean=2.64), insufficient allowances for extension workers (mean=2.55), shortage of extension materials (mean=2.54), irregular

Extension Workers' training by Subject Matter Specialists (mean=2.38), irregular power supply, poor telephone network (mean=2.36), and irregular contacts with farmers (mean=2.21). In line with Van den Ban (2002) that improvement in road network and social amenities will enhance the contribution of rural communities to the national economy the EWs' constraints could retard development. Other serious constraints were limited access to climate information (mean=2.20), delay in accessing information (mean=2.19) and limited knowledge in climate information (mean=2.17) which could have affected the effectiveness of EWs. The findings are indications that the extension workers were faced with series of problems which consist of administrative, infrastructural and, to some extent, personal problems which could have adversely affected their effectiveness in climate change mitigation measure/practice dissemination.

Table 3: Mean scores of respondents' constraints to dissemination of climate mitigation change/information

Constraints	Mean	SD
irregular work programme implementation	2.68*	0.556
Poor road network	2.68*	0.629
Inadequate official mobility (official vehicles)	2.64*	0.529
Insufficient allowances for extension workers	2.55*	0.583
Shortage of extension materials	2.54*	0.609
Irregular Extension Workers' training	2.38*	0.644
Irregular power supply and poor telephone network	2.36*	0.764
No regular contacts with farmers	2.21*	0.657
Limited access to climate information	2.20*	0.623
Delay in accessing information	2.19*	0.576
Limited knowledge in climate information	2.17*	0.670
Not emphasized in my establishment	2.01*	0.598
Discouragement due to limited feedback from farmers	2.01*	0.721
Farmers are not interested	1.89	0.598
Unconducive environment for information dissemination	1.85	0.659
Poor communication skills	1.85	0.780

Source: Field Survey, 2010 *=Serious constraints

Relationship between Respondents' Personal Characteristics and Effectiveness in Climate Change Mitigation Measures/Information Dissemination

Table 4 shows that sex (r=-0.098; p=0.510), education (r=-0.230; p=0.038), working experience (r=-0.370; p=0.025) were negatively correlated and significant to effectiveness in climate change mitigation practices/ information dissemination while age had positive. However, the perceived effectiveness had no significant with the sex and age of the workers. This implies that EWs who had lower qualifications and less years of working experience were more effective. This could be attributed to the fact that these are the lower

cadre staff that were on the field and actually disseminate the information or in contact with the farmers.

Table 4: Correlation between respondents' personal characteristics and effectiveness in climate change mitigation practices/information dissemination

Variables	Coefficient (r)	Probability level
Sex	-0.098	0.510
Age (years)	0.156	0.329
Education	-0.230*	0.038
Working experience	-0.370*	0.025

Source: Field Survey 2010. * Significant ($p \leq 0.05$).

CONCLUSION

Based on the findings the following conclusions could be drawn: the EWs perceived various climate change mitigation measures (CCMM) as relevant and that they were effective in the dissemination of most of the practices/information but there were gaps. Perception of relevance and effectiveness of EWs in many livestock related practices/information were low. Major constraints to effectiveness in dissemination of climate change mitigation measures/practices by the EWs were organization and infrastructures related. The extension workers with lower qualifications and less years of working experience were more effective in disseminating climate change mitigation measures.

To improve effectiveness in climate mitigation measures/information dissemination among extension workers in the Edo State ADP, the following recommendations are made:

1. Capacity building through regular trainings and workshops for extension workers should include climate change issues and mitigation measures/practices/information with emphasis on livestock and fisheries;
2. The Edo State Government should support and motivate the extension workers with adequate funding, logistics and incentives to reach out to the farmers;
3. The State and Local Governments as well as communities should ensure provision of basic infrastructures like good road network and electricity supply to facilitate ease of information access and dissemination;

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