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Challenges In Building Climate Change Mitigation and Adaptation Capacity of Extension Professionals In Nigeria.

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Abstract
Adapting and mitigating climate change is a global concern. Policy makers appreciate and emphasize the need to build capacity of stakeholders; research, education, extension, farmers and others for adaptation and mitigation.. The study highlights on the relevant skills, knowledge and attitude required by extension professionals for climate change adaptation and mitigation, and examined key challenges in building the requisite capacities. Extension professionals need technical knowledge, skills and information, capacity to use information communication technology, mobilize communities, foster linkages, and so forth. However issues about funding, collaboration among actors, infrastructural and institutional supports in developing relevant capacities should be addressed.
***Keywords**: climate, mitigation, adaptation, capacity, extension, professionals and vulnerability*

Introduction

Climate change is the average weather condition (temperature, relative humidity, solar radiation, and rainfall) of an area monitored over a protracted period of time (at least 30 years). (Unanaonwi 2010). It is a constant deviation from the monitored average values of these parameters, indicating a change in what is known to be the existing pattern (Nnodu, 2009). The consequent of these changes include global warming, frequent hurricanes, droughts and floods of varying intensities (Uguru, *et al*., 2011). Climate change is the result of many factors including the dynamic processes of the earth itself, external forces and human activities (anthropogenic factors) (IPCC, 2007). The most concern of the anthropogenic factors are the increase in the carbon dioxide (CO_2), Chlorofluoro carbon (CFC), Nitrous oxide (N_2O) and water vapour level due to emission from fossil fuels, cement manufacture, agriculture, deforestation, land use, processing and others. (Oyebade, 2009 Uguru, *et al.*, 2011). Agricultural land use was responsible for approximately 15% - 20% of all anthropogenic green house gas (GHG) emissions (Organic Consumer Association, 2008; FAO, 2008). Invariably, agriculture significantly contributes to climate change and in turn is affected by climate change.

According to Urama and Ozor (2011) global climatic change adversely affects agriculture through long-term alteration in weather patterns, especially increases in temperature and storm activity. It alters planting pattern, reduces yield of crops and

animals, affect flowering periods of crops, gestation and reproduction in wild life (Akpan, *et al.*, 2010). In some African countries yields from rain-fed agriculture will be reduced by up to 50% (IPCC, 2007). The FAO (2007) also reported that up to 11% of arable land could be highly affected by climate change in the developing world. Generally, IPCC (2007) predicted a decrease of up to 30% in world food production and between 75 and 250 million people will be exposed to water stress due to climate change in Africa and this will adversely affect livelihood in the region.

In Nigeria, climate change is seriously threatening rural communities and farmers. Agwu and Okimanhe (2009) reported that the evidence of the unpleasant impact of climate change abound in the southeast of Nigeria. These include increased cases of flooding and numerous gully erosion sites which have resulted to loss of arable farmlands, farm stead, economic tree, biodiversity and others. In the southern ecological zone of Nigeria largely known for high rainfall, Bello, *et al.* (2012) observed that the area is currently confronted by irregularity in the rainfall pattern, while Guinea savannah experiencing gradually increasing temperature. Higher rainfall observed in some southern part of the country coupled with rise in sea level also resulted to crop losses due to water logging, loss of arable land and increased pest infestation (Nigeria First Communication Commission (NFCN), 2003). Kalejaite-Matti, *et al.* (2010) observed that signs of desertification and savanalization are now becoming evident in Oyo, Osun, Ondo and some other parts of the south-western states of Nigeria which hitherto fell within rainforest. In the Sahel zone of northern Nigeria, the most pronounced climate change-related forms of land degradation are wind erosion and related sand dune formation, drought and desertification (Farauta, *et al.*, 2012).

In view of the above scenario, building capacity for adaptation and mitigation of climate change among major stakeholders (especially farmers) becomes pertinent. Adaptation refers to adjustments in practices, processes or structures in response to projected or actual changes in climate (Ifeanyi-Obi, *et al*, 2012), with the goal of maintaining the capacity to deal with current and future changes. The IPCC (2007), stated that adaptation is an adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects which moderates harm or exploits beneficial opportunities. On another hand, climate change mitigation refers to actions taken by man to reduce climate change or green house effects. Therefore, building adaptive and mitigation capacity involves developing skills, knowledge, attitude, resources and measures that reduce vulnerability and increase the resilience of farmers, farming communities and the ecosystem.

Studies have shown that the level of awareness of climate change phenomenon is still low in developing countries like Nigeria (Nzeadibe, *et al*. 2010; Nzeh and Eboh, 2010). Empirical studies carried out in many part of the country showed that farmers have low knowledge of climate change related issues (Obiora and Onwubuya, 2011;

Igbonazobi, 2011) and lack investment capability in terms of equipment and human resources to enable them tackle the negative effects of climate change. (Obiora, 2012). Consequently, most farmers still employ conservation and farming practices reported to exacerbate the variability of climate and increase vulnerability of the ecosystem. This suggests gap in extension role and need for capacity/training in extension system.

Farmers' ability to effectively respond to climate change challenges is determined by level of knowledge and quality of information available to them and how easily they access the information (Ozor and Nnaji, 2011). Davis (2009) opined that mitigation and adaptation efforts will require information, education, and technology transfer. The author further reiterated that extension should play crucial role in technologies and management of information`, capacity development, facilitating and implementing policies. The extension professionals are in this context expected to facilitate generation of knowledge/technologies, build awareness, transfer knowledge/technologies and implement actions for effective management of climate change risks (FAO, 2008) and programs. This calls for capacity building for extension professionals across the globe in general and Nigeria extension system in particular. The study therefore aimed to;

- highlight the capacity needs of extension professions for agricultural adaptation and mitigation to climate change and
- examine the challenges in building requisite capacities for extension professionals in Nigeria.

Capacity Needs of Extension Professionals for Climate Change Mitigation and Adaptation

The capability to identify, collect and share data, use information and methods and build knowledge relevant for climate change adaptation, mitigation and food security is critical because of the rapidly changing climate, environmental and socio-economic conditions (FAO 2008). These capabilities can be acquired through capacity building of stakeholders, particularly extension professionals. Capacity building (CB) in a broad development context implies a dynamic process which enables individuals and agencies to develop the critical social/technical capabilities to identify and analyze problems and proffer solutions to them. In Nigeria and other developing nations of the world, the benefit of capacity building for climate change adaptation, mitigation and poverty reduction are some of the major policy thrusts of governments and nongovernmental organizations. The antecedent of climate change leaves new and/or additional roles for extension professionals in the country. Therefore rising to the challenges of the expected roles in climate change adaptation and mitigation requires adequate capacity building. Capacities are needed in the following areas;

Technology, Knowledge and information management skill in agriculture- related climate change phenomenon:

In Nigeria, the concern to increase awareness, understanding, information and technical capacity on climate change phenomenon, adaptation and mitigation among farmers and rural communities, is not matched with a corresponding capacity building(improved knowledge/skill or information and responsive attitude) for extension professionals. Adapting and mitigating climate change requires that farmers should be equipped with sufficient knowledge, skills and information on climate change, causes, effect and impacts, the possible adaptive and mitigation measures and strategies practically feasible in the locality. In another hand, farmers should be informed and made to understand the consequences of some of their farming practices such as mono cropping, bush burning, indiscriminate use of synthetic agrochemicals and felling of trees etc. in exacerbating ecological problems. Farmers need to have access to relevant information such as climatic information, forecasts, adaptive technology and innovations, or markets—through extension and information systems. Invariably this means training of extension professionals as educators, information/service providers to acquire relevant competence in terms of technical knowledge,/skills, attitude and information management skill relevant to climate change adaptation and mitigation.

Documentation of indigenous knowledge:

There is a growing awareness of the need of indigenous knowledge and it's value for environmental management and sustainable development. Various adaptive practices in agriculture have a strong element of indigenous knowledge. Appreciating the importance of indigenous knowledge and perhaps the need for it's documentation, Davis (2009) reiterated that to improve outcomes in rural development, farmers and extension agents need new skills that will require agricultural education and extension curriculums to include valuing and understanding the knowledge and experiences of rural people and co-learning (that is, farmers and extension agents learning together rather than extension agents training farmers in a one-way information transfer.

Das-Gupta and Saha (2009) however, observed that several valuable indigenous knowledge (IK) is now gradually disappearing and remains only in the memory of some aged people who live in remote rural areas and constitute the majority of the farming population. Beside, the characteristic features of indigenous knowledge in terms of scope, practicability, location specificity and the need for wide application and integration into modern research, further explain the importance of documentation. Above all, FAO (2008) posited that although there is a large body of knowledge within local communities on coping with climatic variability and extreme weather events, rapidly changing climate conditions will require upgrading local knowledge with more scientific observations and establishing collaboration among neighbours and neighbouring countries to transfer knowledge from areas already experiencing these

changes Thus, as brokers and critical actor in agriculture knowledge and information system, capacity building/training of extension professionals to value/appreciate, understand, collate, synthesize, and document indigenous adaptation and mitigation strategies for diffusion and wide application is pertinent.

Social/ Community mobilization for change:

Community mobilization is apt for increase awareness, change of attitude and functional participation of farmers, groups and community in promoting adaptation and mitigation actions and environmental sustainability. Countries including Nigeria are responsively initiating programmes and policies that targets reduced vulnerability and increased resilience of farming communities and the ecosystem. Also actions for responding and managing disaster and risks associated with climate vagaries are being promoted as a priority in policy discourse. Extension professionals need to mobilize and assist farmers and communities in implementing such policies and programs and managing disaster challenges. In essence they need to build farmers' abilities for planning, problem solving, critical thinking, prioritizing, negotiating, building consensus and leadership skills, working with multiple stakeholders, and, finally, being proactive (Davis 2009). To perform the above functions, extension professionals need to acquire ability to organize, legitimize, understand local power structure, and harness human and material resources for effective social mobilization. Other relevant skills include identification of societal problem, analytical/diagnostic skill, mobilization of groups and knowledge of group dynamics and processes, skill to manipulate peoples' behaviour through their own feedback, and ability to handle conflict effectively.

Capacity for linkage and facilitation*:*

Establishing linkage and collaborations among major actors (farmers, research, education, extension, private and non-governmental organizations and other relevant agencies) is pertinent for multi-stakeholder approach to adapting and mitigating climate change in Nigeria.. According to Morse, *et al.,* (2006) the programme-driven leadership model of extension must be replaced with one of activating and convening stakeholders and facilitating problem-solving processes that address issues collaboratively, especially climate-related challenges. Since evidence is emerging that the biggest impacts will be in the form of small droughts, floods, and other events that cause severe hardship which do not attract the attention of the international community (Davis 2009); there is need for capacities to engage new sets of actors, including humanitarian agencies (Mustapha, *et al*, 2012).

Further, highlighting on the role of extension in addressing the problem of climate change, Davis (2009) opined that with climate change, it will be increasingly important for the extension system to collate the concern of farmers and other actors in rural communities and link them directly with voluntary and regulated carbon markets, private and public institutions that disseminate mitigation technologies, and

funding programs for adaptation investments. This all points to the facilitating role of extension and the corresponding capacity need among professionals in the system.

Training in information and communication technologies (ICTs):

Bridging digital divide through building requisite ICTs capacity is paramount in effectively addressing the effects of climate change on human life, ecosystem and biodiversity. According to Jacs, *et al.* (2007), the role of ICTs in addressing the effects of climate change, food security and support rural livelihoods is increasingly recognized and was officially endorsed at the World Summit on the Information Society (WSIS) 2003-2005. Information communication technology could be used effectively not only for normal weather forecast but also as an early warning system for disease/pests out breaks and other disasters before they occur and also for the provision of timely and sensitive market information (Arokoyo, 2005)..

Also emphasizing on the important ICTs in providing farmers with access to relevant and reliable information, Bertolini (2004) reiterated that ICTs provide easily accessible information on warning system or relief activities and generating networking among people thereby reducing cost of transaction or finding information. Sadly, most small-scale farmers and extension professionals in developing countries have little knowledge about the use of ICTs to address the problems of climate change and improved productivity (Jac, et al., 2007). Therefore the need for capacity building is apparent. This means training on use of the most common and traditional ones like radio, television and print media etc. to capacity in general computer literacy, specialized software, internet facilities, mobile phony facilities and others. They need to develop skill to operate computers for knowledge acquisition, documentation and exchange, skill to explore the potential of internet to access, disseminate/exchange information, interact and network with farmers and other stakeholders..

Participatory methods/innovation strategies in extension:

Participation is a process through which stakeholders influence and share control over development initiatives and the decisions and resources which affect them (United Nations Economic and Social Commission for Africa and Pacific (UNESCAP), 2009). Decisions about climate change mitigation and adaptation programmes in a given locality should be people oriented and participatory. Studies have shown that farmers are often not involved in indentifying most climate change adaptation strategies which can lead to poor adoption of such strategies by rural people (UNESCAP 2009). To evolve community and/or farmer participation, extension professionals need to be competent in group mobilization and dynamics, situation analysis to collate climatic problems that need immediate response, and ability to draw plan of action to address the identified climatic issues. In other words they require skill to facilitate functional,

interactive and collaborative participation of farmers for climate change adaptation and mitigation.

Moreover the low knowledge and information about climate change phenomenon among rural farmers require increase awareness campaign and provision of information through use of varieties of extension methods ranging from slide show, audio visuals, flyers, demonstration, group discussion to the use of emerging interactive, experiential learning methods (eg. farmer field school, farmer- farmer extension). Information materials on climate change and on its global and local impacts, such as booklets and posters have to be produced and disseminated to rural households (LEISA, 2008). Training is expedient for efficient use of these methods by extension professionals in public and private extension organizations.

Challenges in Building Climate Change Adaptation and Mitigation Capacity of Extension Professionals in Nigeria.

According to Oruwari, *et al*, (2002), it is crucial to acquire and strengthen capacity (skills, knowledge, information, competence etc.) to produce/disseminate technologies and synergies needed to effectively address climate change threats. Developing these capacities for extension professionals in Nigeria is faced with these challenges;

Funding:

Challenges in the area of funding remain the bane of research- extension efforts in Nigeria. According to Mustapha, et al., (2012) the funding pattern of agricultural sector in Nigeria does not befit the sector that is acknowledged to be prime driver of growth and poverty reduction in the country. This is because, while some African countries such as Ghana, Uganda and Malawi have stabilized their budget expenditures on agriculture around 10%, Nigeria has consistently spent less than 5% of its annual budget on agriculture (Anselm and Taofeeq 2010).

In Nigeria and other developing countries, the extension outfit is grossly underfunded due to lack of political will, exacerbated by the withdrawal of World Bank (in 1994) assistance for funding the Agricultural Development Projects (ADPs). The resultant effects of this on agricultural extension have been mass retrenchment of field extension workers, high staff mobility, poor/inadequate training, stagnation of field and supervisory work, low morale of staff, poor performance of the sector; and invariably decreased agricultural production, among others.

Highlighting on the place of funding in combating the enormous challenges of climate change, Mustapha, *et al*., (2012) posited that the continued reduction in government expenditure on extension and agricultural training has reduced the access of farmers to technology and market information, and consequently climate change adaptation. Agricultural extension requires adequate funding to ensure successful extension service delivery (Agbamu, 2011) and dwindling or poor financial status of

the extension outfits could impede implementation of most climate change adaptation and mitigation programmes.

Poor research- education-extension-farmer-linkage/collaboration:

Development of integrated strategies to tackle climate change adaptation and mitigation, food security and rural development, and the sustainable management of biodiversity has been identified as a strong measure to respond to climate change risks (FAO, 2008). In other words, tackling climate change, current and future phenomenon need a multi-disciplinary/trans-disciplinary and innovation system perspective as climate change cut across all sectors, discipline and regions of the world. This calls for effective linkage, partnership, alliance and interaction within and/or between sectors/ discipline, regions and systems. Unfortunately in Nigeria, linkage/ interaction, exchange of information and resources within agricultural research-education-extension-farmer-input/private system (agricultural innovation system) have been generally weak (Dimelu and Anyanwu, 2008). Above all, Agwu, *et al*., (2008) observed that the agricultural research system in Nigeria is characterized by a top-down, centralized, monolithic and isolated structures. According to Farauta *et al.*, (2011) there are many climate actors in the country but there is no platform or framework within which they can operate in a coordinated manner for meaningful impact. Consequently, their initiatives remain largely uncoordinated. Hence, generation/dissemination of inappropriate technologies and poor exchange of ecological safe techniques and practices are common.

Poor documentation of Indigenous knowledge on climate change adaptation and mitigation technologies:

Generally, documentation appears to be one of the major problems in knowledge information system in Nigeria. Often efforts on documentation emphasizes and concentrate on technical knowledge and information generated in formal institutions to the neglect of many relevant and adaptable knowledge in the local environment. According to Padaria, *et al.*, (2003) most of the proven local adaptation and mitigation technologies adopted by rural farmers over the years were not documented. Concern for documentation is even more pertinent as the nation witness increasing threat due to loss of the indigenous people's territorial base through the destruction of the rainforests; and displacement by government projects through commercial utilization of natural resources. Extinct of valuable, proven and adaptable indigenous knowledge limit scope of capacity building and subsequently adaptation capacity of farmers.

Poor Policy Framework, inconsistency and reversals:

The actions and inactions of government to achieve sustainable development of a sector like agriculture is deep rooted in the policy context (Ayoola, 2001). Over the

last 100 years (1912-2012) of government presence in agricultural extension in Nigeria, policy, institutional and programme instabilities/inconsistency have bedeviled its operations (Agbamu, 2011). The Nigerian governments have initiated several agricultural and ecological policies or programmes, but due to political instability and corruption, most of these policies were either reversed or abandoned. This has significantly and negatively affected not only the overall growth of the agricultural sector, but also the extension system. Besides, most agricultural policy document did not address issues related to the impact of climate change, rather focused is on increase food production (Obiora, 2012). Though Nigeria government has accelerated efforts to formulate climate change policy which is expected to provide guide for capacity building at all level, the implementation is likely to face the problems administration/bureaucracy, instability in government etc. Farauta, *et al*., (2011) opined that Nigeria has many policies, strategies and plans that can help address general adaptation measures in some climate change vulnerable sectors such as agriculture, water resources, forest, and ecosystems, and coastal marine environment. The policy framework according to the authors is largely undeveloped when aligned to human development and climate response efforts through adaptation.

Availability and access to climate change adaptation and mitigation technologies/information:

Availability and access to adequate and appropriate agricultural and climate change adaptation and mitigation technologies and information is a priority in building the capacity of extension professionals, and subsequently the farmers to respond to the impact of climate change. Though researches are going on in many research centers and institutions, it is obvious that much is expected in terms of generation of technologies, innovative practices and strategies to combat the enormous environmental challenges of the time. There is need for increase government and private sector supports for research on climate change related issues. This is because technical knowledge and information from research are essential input for extension intervention in reducing vulnerability and increasing resilience of rural communities and farmers.

Unavailability/poor infrastructure and institutional support:

According to Inobeme and Ayanwole (2010) infrastructural facilities are vital resources that facilitate all-round development of man and his environment. Building capacity of stakeholders for climate change adaptation and mitigation require infrastructures like telecommunication network, computer, internet facilities, functional office equipment, print materials, weather forecast equipment, electricity etc. Institutional supports in terms of availability of training institutions and centers, provision for workshop, seminars and conferences is vital for capacity acquisition by

professionals. Unfortunately these resources are yet to be adequately put in place, particularly in the public extension system. Most of the existing ones are not functional. For instance most of the meteorological centers cited mainly in mega cities to the neglect of rural areas where the information are most needed are ill-equipped to perform their functions of weather forecast and early warning.

Conclusion

Capacity building for extension professionals is critical to national efforts to mitigate and adapt to climate change. However, developing these capacities might be constrained by some critical factors such as poor funding, policy environment, poor linkage, unavailability of infrastructure and institutional supports, perception and altitude of extension professionals etc. The study therefore recommends that policy makers, and administrators should put in place policy instrument that will provide necessary mechanism to ensure availability of fund, institutional supports, infrastructure, strong linkage and others. Extension professionals need to develop positive attitude and be more responsive to climate change agriculture related issues.

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