Asian Journal of Agriculture and Rural Development

journal homepage: http://aessweb.com/journal-detail.php?id=5005

Acceptance of Climate Change by Rural Farming Communities in Delta State, Nigeria: Effect of Science and Government Credibility

Albert Ukaro Ofuoku and Uche N. Uzokwe
Department of Agricultural Economics and Extension, Delta State University, Asaba Campus, PMB 95074, Asaba, Delta State, Nigeria

Abstract

This study was conducted to examine Delta State rural farming communities' attitude to climate change in relation to science and government credibility. A preparatory assessment of Delta State rural communities' understanding of climate change and insights into potential barriers to communication were given by influences on their attitudes. Average of 60.46% of the farmers reported that climate change was occurring and asserted that climate change was the consequence of human activities. Most (91.23%) were certain that climate change is adversely affecting their farming businesses. Many (mean=1.40) found climate change information not easily comprehensible. However the farmers have negative view about the credibility of science, but had low levels of confidence in government. They reported that lack of information was a barrier to adaptation to climate change. This suggests that such barrier lies with the Delta State extension service. There is also an indication that government through the public extension service, need to wake up to her responsibilities of sending related information the rural farming communities. The government should consider the local socio-cultural economic and biophysical environment of the farmers the information is meant for.

Keywords: Climate change, adoption, rural, farming communities, science and government credibility

Introduction

Rural farmers have direct contact with elements of nature in their environment. Their environment includes physical and biological components. The physical environment consists of all the physio-graphic factors such as soil inorganic elements, natural forces such as wind, radiation, and gravity; while biological environment consists of soil organic matters, insects, parasites, wild plant and animals (Ofuoku, 2011). Man perceives and considers his environment from the way he feels his about it as he interacts with it. He reacts to secure his comfort and future according to the way he perceives the environment. Umar *et al.* (2008) state that climate change refers to change occurring in the climate during a period of time which can range from decades to centuries. The changes noted are attributed to natural and human activities. Human existence is currently facing serious threat as a result of climate change.

Food is a basic requirement for life sustenance and to be made available to man for maintenance of good health and optimal performance. Therefore, food must be provided in enough quality and quantity (Umar *et al.*, 2008). Adetunji *et al.* (2005)

Corresponding author's
Name: Albert Ukaro Ofuoku
Email address: *ofuoku@yahoo.com*

assert that agricultural production depends on weather and climate, despite the impressive advances in recorded only agricultural technology and accumulated wealth of knowledge. Climate change has impacts on agriculture as can be clearly seen.

There is the need to enhance adaptation and resilience capacities of farmers in Delta State, Nigeria. There are adaptation options meant to build resilience into agricultural systems coupled with mitigation strategies to reduce green house gas emissions suggested by various bodies such as the Intergovernmental Panel on Climate Change (IPCC). According to Evans *et al.* (2011), research and development was proposed to support the strategies in enabling the agricultural sector to respond to climate change.

Science's role in transferring information to farming communities to enhance good decision-making processes at the rural community level was made the central factor of the strategies. Evans *et al.* (2011) showed that only 33% of all respondents (N = 411) found climate change information easy to understand. In addition, results indicated that generally respondents had concerns with the credibility of science and low levels of trust in government, which contributed to their attitudes to climate change. Evans *et al*. (2011) opined that National Agricultural and Climate Change Action Plan (NACCAP) of Australia directed that the rural sector's understanding of climate change should be assessed and barriers to communication identified.

For the implementation of the strategy to be successful, farmers' realization of the risk of climate change ought to be relied upon in relation to their need to respond. There is therefore the need to know if farming communities in Delta State are accepting the evidence of climate change provided by science; if farming communities deduce the scientific evidence as significantly meaning threat to their livelihood and if farming communities' attitudes to science and government were being remoted by their perception to science and government.

Objectives

The major objective of this study was to examine the effect of science and government credibility on acceptance of climate change by rural farming communities in Delta State, Nigeria. Specifically this study sought to:

i. determine the socio-demographic characteristics of the farmers,
ii. ascertain their personal perception of climate change
iii. determine their attitude to climate change, which included
- Perception of threat
- responses to climate change threat
-opinions of science and perception of climate science credibility;
- perception of governments' (State and Federal) climate response
iv. unveil of the influence of their perception of science and government credibility on their responses.

Hypothesis (Ho): Farmers' perceptions of science and government credibility do not significantly influence their response to climate change.

Methodology

This study was carried out in Delta State, Nigeria. Delta State is demarcated by the Delta State Agriculture Development Programmer (DTADP) into three agricultural zones-Delta North, Delta Central and Delta South Agricultural Zones. Multi-stage procedure and random sampling technique were used to select the sample size used. First, two local government areas were selected from each of the three agricultural zones resulting in the selection of six local government areas for the study. Secondly, twenty-five farmers comprising of arable crop, only livestock and fish farmers were selected from each local government

area, from the list of registered farmers. This exercise resulted in the selection of one hundred and fifty farmers. At the end nineteen questionnaires could not be retrieved. This reduced the sample size to one hundred and thirty-one.

Data were collected from the farmers using structured interview schedule for the less formally educated farmers and those who had no formal education while questionnaire was used for those who had reasonable level of formal education.

The data were analyzed with the application of descriptive statistics for objectives 'I', and 'ii'. The 5-point and 4-point likert's type scale was used to treat objective 'iii', while Pearson product moment correlation analysis was used to test the hypothesis which was used to address objective 'iv'

Results and discussion

Socio-demographic characteristics of farmers

Most of the farmers (63.36%) were female. This is attributed to the fact that women are more involved in farming them men. Uzokwe and Ofuoku (2006) found that women have taken over almost all agricultural tasks from men. Many of the farmers (44.27%) were in the age range of 41-50 years. This implies that most of them were in their energetic years. Majority of them (84.73%) were married. This is indicative of the fact that they had families which they are responsible to cater for. Most of them had one form of formal education or the other. Education is expected to enhance their comprehensibility of information on climate change as in relates to their farming activities. Most (83.21%) of them owned farms while 16.79% were employees in farms as most (45.80%) of them had 31 and above years of farming experience.

Table 1: Socio-demographic characteristics of farmers

Variables	Frequency	Percentage (%)
Gender		
Male	48	36.64
Female	83	63.36
Age (years)		
20-30	15	11.45
31-40	36	27.48
41-50	58	44.27
>50	22	16.79
Marital status		
Married	111	84.73
Single	20	15.27
Level of education		
No formal education	35	26.72
Primary education	8	6.11
Secondary education	64	48.85
Tertiary education	24	18.32
Contribution to farming		
On a farm	109	83.21
Farm employee	22	16.79
Farming experience (Years)		
1-10	21	16.03
11-20	26	19.85
21-30	24	18.32
31 and above	60	45.80

Personal perceptions of climate change by respondents

Table 2 indicates that farmers experienced delayed onset of raining season, increased flooding, increased temperature, eratic rainfall and longer dry season. Few (16.03%) of them reported that they had not experienced change in climate. The implication is that there is shorter raining season. This means that farmers recognized the changes in climate factors. This finding confirms Ofuoku *et al.* (2011), Ofuoku (2011), Guring and Bhandari (2008) who found that farmers in Edo State, Delta State, and Chituen village in Nepal experience changes in climate factors respectively. Farmers in Ethiopia and South Africa observed increased temperature and decreased rainfall (Bryan *et al.*, 2009). Hageback *et al.* (2005) Maddison (2006), Gbetibouo (2009) reported that farmers perceived long term changes in temperature and decreased precipitation.

According to Gbetibouo (2009), farmers' perceptions are congruent with the statistical record in the Limpopo River Basin. Mertz *et al.* (2009) observed that farmers in Senegal have climate change awareness.

Table 2: personal perceptions of climate change

Perception	Frequency	Percentage (%)
Delay in onset of raining season	75	57.25
Increased incidence of flood	61	46.56
Increased temperature	98	Only
Erratic rainfall	87	66.41
Longer dry season	75	57.25

Farmers' perception of causes of climate change

Farmers reported that climate change was a consequence of deforestation, population explosion, gas flaring, use of chemical fertilizer, increased use of fossil fuel, soil degradation and erosion, intensified agriculture and loss of indigenous knowledge practice by man (Table 3). The study area is vulnerable to effects of climate change. The implication is that the agro-ecosystems have consequently deteriorated in recent times. LEISA (2008) opined that this is the main consequence of change in land use patterns in intensified agriculture coupled with deforestation, soil degradation and erosion prompted by population explosion. As a result of deforestation and erosion, considerable volumes of carbon dioxide are being released into the atmosphere and this is complemented by the production and use of chemical fertilizer.

Table 3: Farmers' perception of the causes of climate change

Cause	Mean	Rank
Population explosion	3.98	2
Intensified agriculture	3.32	7
Deforestation	4.21	1
Use of chemical fertilizer	3.88	4
Soil degradation erosion	3.67	6
Increased use of fossil fuel	3.84	5
Loss of indigenous knowledge practice	3.16	8
Gas flaring	3.94	3

Cut-off score = 3.0 (> 3.0 = important observation, < 30= not important observation)

Farmers' attitude to climate change

Perception of threat

Table 4 shows that the farmers reported that the threats posed by climate change included reduced yield, reduced egg production, stunted growth of crops, livestock and fish, decreased feed intake by livestock and fish, reduced growth rate, changes in timing and length of cropping season, increased rate of post and disease outbreak and loss of fish to flood. These effects of climate change are a big threat to agricultural rural productivity. Shah and Ameta (2008) asserted that rising temperature and reduced period of rains, leading to drought are directly linked to reduced soil productivity and high level of pest and disease incidence. This scenario is also directly linked to the poor performance of livestock and fish. These effects have serious implications for food security in the study area, especially the rural communities which rely on agriculture to meet their subsistence needs (Ofuoku, 2011) and have ripple effect on urban food security.

Table 4: Perception of climate change threat

Threat	Mean	Rank
Increase post and disease outbreak	3.86	7
Reduction in yield	4.43	1
Changes in timing and length of cropping season	4.06	5
Stinted growth of crop livestock and fish	4.25	3
Decreased feed Intake by livestock and fish	4.18	4
Reduced egg production	4.34	2
Reduce birth rate and size	3.06	9
Loss of fish to flood	3.37	8
Growth rate of livestock & fish	4.18	4

Cut – off score = 3.0(>3.0 = important threat, < 3.0 = not import and threat) on 5-point Likert's scale

Farmers' responses to climate change threat

Table 5 indicates that many farmers highly responded by adopting some adaptive measures such as planting of trees around livestock pens and fish ponds; adopting soil conservation methods; raising of dykes to prevent loss of fish to flood and planting different varieties of crops to manage the risks of pests and diseases. Their responses to changing of planting dates, cooling of livestock pen by use of fans, adoption of heat tolerant species of crops and animals, and irrigation as adaptation measures were low. However, some did not respond at all to climate change threat. Most of these reponse/adaptive measures are in consonance with the findings of Bradshaw *et al.* (2004), Maddison (2006), Nhemachena and Hassan (2007), Hassan and Nhemachena (2008), Kurukulariya and Mendlesohn (2008), Deressa *et al.* (2009), Ofuoku *et al.* (2011) in their earlier studies.

Table 5: Farmers' responses to climate change threat

Response	Mean	Rank
No response	1.85	7
Planting of trees	2.94	1
Application of soil conservation methods	2.66	2
Irrigation	1.32	9
Changing planting date	2.48	5
Using heat tolerant species	1.68	8
Cooling of livestock pens	2.13	6

Planting of various crop varieties	2.52	4
Raising of dikes	2.59	3

Cut-off score = 2.50 (>2.50= high response; <2.50=low response on 4-point Likert's type scale

Credibility of science and climate science

Table 6 indicates that the people perceived that scientific information are useful (mean = 2.70) and the source are important (mean = 2.51). They agreed that science is unable to solve climate change (mean = 3.36) and that scientists had not as consider all factors (mean 3.23). They also saw science as Being divisive (mean = 2.81) and scientists exaggerated the impact of used climate change (mean = 2.93). Scientists used climate as a means of sourcing for fund (mean = 2.70). The people would contribute to solutions as much as science (mean = 3.11). However, they placed value on science's view on climate change (mean = 2.80), but disagreed that climate change information were easy to understand (mean = 1.40). The people had regard for scientific information and the sources of information. This is attributed to the familiarity with the change agents in the study area who they have become used to but as far as climate change was concerned, science had no credibility. This is prompted by the fact that the farmers' knowledge contextualized within a local socio-cultural framework. This contributed to the peoples' attitude to science credibility. The farmers' attitudes to climate change appeared to be influenced by their attitudes to science and perception of science credibility, but there was evidence of iota of trust (Evans *et al.*, 2011).

Table 6: Values attributed to science and climate science characteristics

Scientific information is useful	2.70	7
Agriculture and science should cooperate	2.33	10
Science is unable to solve climate change	3.36	1
Science is divisive	2.81	5
Scientists are exaggerating impact	2.93	4
Scientists are using climate change as finding sources	2.70	7
People will contribute as much to solutions as science	3.11	3
Science information sources	2.51	9
Value science view on climate change	2.80	5
Climate change information easy to understand	1.40	1
Scientists have not considered all factors	3.23	2

Note: On a scale of 1-4, where 1 = strong disagree and 4 strongly agreed cut- off score = 2.50 (> 2.50 = agree, < 2.50 = disagree

Governments' credibility with rural farmers

Few (19.08%) of the respondents believed government's climate change policy would be fair and sensitive to the needs of farmers and rural communities. Most (80.91%) disagreed that government climate change policy would be fair and sensitive to farmers and rural communities. This implies that the farmers were pessimistic about how future climate change policy would treat them. Their trust and credibility in government decreased from this point (mean = 1.59) as farmers did not believe that policy makers would consider all relevant factors while making future policy on climate change. Only 18.32% of the farmers perceived that all factors were going to be taken into consideration, while most (81.68%) were of the view that this was not going to occur. The most serious indictment of loss of trust in government emerged when the farmers' opined that politicians will use climate change as an election campaign issue. Most (84.73%) of the farmers agreed that this would happen in the future. These findings

are congruent with Evans *et al.* (2011) in an earlier study in Western Australia.

Table 7: Governments' credibility with rural farmers

Perception	SA (4) (%)	A (3) (%)	DA (2) (%)	SD (1) (%)	Score	Mean
Governments' climate change policy will be fair and sensitive	9.16	9.92	39.69	41.22	221	1.69
Policy makers will take all factors into account for future climate change policy	2.29	16.03	19.85	61.83	208	1.59
Politicians will use climate	41.98	42.75	15.27	0	428	3.27

Influence of farmers' perception of science and government credibility on their response to climate change

Only table 8 shows that farmers' responses had significant relationship with science (r = 0.70) and government (r = 0.54) credibility. This means that their perception of science credibility and government credibility influenced their responses to climate change. If science and government credibility are high, their responses to climate change will also be high.

Table 8: Influence of perception of science and government credibility on farmers' response to climate change

Variables	1	2	3
Farmers' response	1.000	0.071*	0.054*
Science credibility	0.071*	1.000	0.038
Government credibility	0.054*	0.038	1.000

Conclusion

The outcome of this study revealed that there was climate change awareness among farmers in rural communities in Delta State. They were of the view that it was human induced and saw it as a threat into their farming businesses. Though they were exposed to various adaptation methods, only less than half had been highly adopted by the farmers. As a result of this, it is pertinent to ask if science is able to communicate relevant and important information on climate change to the rural farmers.

Government had not been found to be credible and not to be trusted. This is not unconnected with government's very low commitment to researches and the plight of rural or farming communities. This is also linked to the poor communication of information on climate change information by science.

Implications

The role of science in research and development of knowledge and adaptation measure to climate change will be essential part of the future of farming in rural communities of Delta State, Nigeria. There is, therefore the need to address the lapses in communication process of climate change. In the future, local socio-cultural, economic and biophysical environment of the rural people should be taken into cognizance when the information on climate change will be designed. These people may understand better, if they are able to translate or interpreter the information provided in relation to what they see around them. The ideas will be translated into action if they are exposed to what can be done to mitigate or adapt to climate change. There is need to carry out further study on how best to communicate with farming communities so that it can be understood and can be compared to the existing knowledge of the rural dwellers. In addition, this study needs

to be replicated in a large geographical area if similar results will be observed.

References

Adetunji, L. A., Olaniyi, Peer, J. O., Aremy, E.O., & Kolawala, E. O. (2005). *Agro-climatology: A textbook of agronomy*. Department of Agronomy, Ladoke Akintola University of Technology Ogbomoso, Nigeria

Bradshaw, B., Dolan, H., & Smith, B. (2004). Farm level adaptation to climate variability and change: Crop diversification in Canadian prairies. *Climate Change Review*, 67(1), 119-141.

Bryan, E., Deressa, T., Gbetibowo, G., & Ringler, C. (2009). *Determinants of adaptation to climate change in Ethiopia and South Africa*. South Africa Centre in Ethiopia and South Africa. South Africa center for Environmental Economics and policy. International food policy Research institute.

Deressa, T. T., Hassan, R. M., Ringler, C., Alamu, T., & Yusuf, M. (2009). Determinants of farmers' choice of adaptation methods of climate change in the Nile Basin of Ethiopia. *Global Environmental Change*, 19, 248–255.

Evans V., Storer, C., & Wardell-Johnson, A. (2011). Rural Only farming community climate change acceptance. Impact of science and government credibility. *International Journal of sociology of Agriculture and food*, 18(3), 217-235.

Gbetibouo, G. A. (2009). *Understanding farmers' perceptions and adaptations to climate change and variability: The case of the Limpopo basin, South Africa*. Discussion paper No. 00849. South Africa Environment and Production Technology Division, IFPRI.

Gurung, G. B., & Bhandari, D. (2008). An integrated approach to climate change adaptation. *LEISA*, 24(4), 6-8.

Hassan, R., & Nhemachena, C. (2008). Determinants of African farmers' strategies for adapting to climate change multinomial choice analysis. *African Journal of Resource Economics*, 2(1), 83-94.

Hageback, J., Sundbery, M., Ostroald, D., Chen, X., & Kuntsson, P. (2005). Climate variability and land use change in Damagou water shed, China-examples of small scale farmers' adaptation. *Climate Change*, 72, 189-212.

Kurukuraliya, P., & Mendelsohn, R. (2008). Richardian analysis of impact of climate change on African crop land. *African Agricultural Resource Economics*, 2(1), 1-23.

LEISA (2008). Dealing with climate change. *LEISA*, 24(4), 4-5.

Maddison, D. (2006). *The perception of an adaptation to climate change in Africa*. Discussion paper No. 10. Centre for Environmental Economics and Policy in Africa, University of Pretoria, South Africa.

Mertz, O. C., Reenberg, A., & Diouf, A (2009). Farmers' perception of climate change and agricultural adaptation strategies in Rural Sahel. *Environmental Management*, 43(5), 804-816.

Nhemachena, C., & Hassan, R. (2007). *Micro-level analysis of farmers' adaptation to climate change in South Africa*. IFPRI discussion paper No. 00714. International Food Policy Research Institute, Washington, D.C.

Ofuoku, A. U. (2011). Rural farmers' Review perception of climate change in central Agricultural Zone of Delta State, Nigeria. *Indonesian Journal of Agricultural Science*, 12(2), 63-69.

Ofuoku, A. U., Okoh, R. N., & Saiki, P. K. (2011). Determinants of adaptation to climate change among arable crop farmers in Edo State, Nigeria and its implications for extension service. *Agriculture-Science and Practice Journal*, 3-4(79-80), 129-140.

Shah, R., & Ameta, N. (2008). Adaptation to climate change with a blend of traditional and improved practices. *LEISA*, 24(4), 9-11.

Umar, A. G., Omoayena, B. O., & Okonkwo, M. C. (2008). The climate scourge and implications for natural food security in Nigeria, issue and challenges for extension service delivery. Proceedings of *3rd annual conference of Forestry Association of Nigeria* (FAN) held in Umuahia, Abia State, Nigeria pp. 29-31.

Uzokwe, U. N., & Ofuoku, A. U. (2006). Gender division of agricultural tasks in Delta State, Nigeria and implications for agricultural extension services. *Extension Farming Systems Journal*, 2(1), 91-96.