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**An Analysis of the Perceived Effects of Climate Change on the Health of Rural Farmers
in Okigwe Agricultural Zone of Imo State, Nigeria**

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An Analysis of the Perceived Effects of Climate Change on the Health of Rural Farmers in Okigwe Agricultural Zone of Imo State, Nigeria

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Abstract

This study analysed the effects climate change on the health of rural farmers in Okigwe Agricultural zone of Imo state, Nigeria. The specific objectives were to; describe the socioeconomic characteristics of the rural farmers; examine the evidence of climate change by rural farmers; determine the farmers' perception of the common ailments/medical conditions associated with climate change; and identify strategies for managing climate change related health risks. The data was collected with questionnaire from 170 respondents and were analysed using descriptive statistics. Result showed that the mean age of the respondents was 49.9 years and a mean household size of 4.4 persons and small farm size with a mean of 1.49ha. Climate change evidence observed included crop failures, flooding, heavy rainfall, death of crops, and pests/diseases increase among others. The result further indicated that farmers perceived climate change to lead to hunger, injury/death, sicknesses such as stress, skin damage, malaria diarrhoea, typhoid fever and others. Government at all levels should provide access to clean drinking water, efficient energy source, and early warning information to rural dwellers to enable them cope.

Keywords: Farmers' health, Farmers, Climate change, Perception, Diseases,

Introduction

Agriculture primarily provides food, raw materials, employment, and income/foreign exchange for a nation while on the other hand helps in rural community development. In the course of providing these goods and services, agriculture places a heavy burden on the environment through the emission of greenhouse gases as a by-product with negative importance. The greenhouse gases from agricultural and other human activities trapped in the environment cause the atmospheric temperature to rise to an extent that the world climate pattern is altered (IPCC 2007). The effect of the abnormal rise in atmospheric temperature as a result of the trapped carbon pollution from human activities is referred to as climate change.

Given the fundamental role of agriculture in human affairs and the importance of combating climate change, concern is been expressed by various national government and other agencies regarding the potential interfering relationships between climate change and agriculture and its productivity. Various studies have investigated how climate change impact agriculture and how agriculture have been implicated in global warming that leads to climate change (Lobell et al, 2008; Wolfe et al, 2005; Fischer et al, 2002; IPCC 2007). In Nigeria as in other Sub-Saharan countries, evidence exists of climate change impact particularly on agriculture; land use, energy, biodiversity, health and water resources (IPCC 2007; Nigerian Environmental Study Team - NEST 2004). The climate change impact is a concern for Nigeria considering the vulnerability of the 800km coastline that is prone to the risk of rise in sea-level and fierce storms in the southern part and increasing drought and desertification in the northern part of the country (IPCC 2007; NEST 2004).

Studies have reported the effects of climate change on humanity. According to the California Department of Public Health (2007); Karl et al., (2009), the unsustainable agricultural production systems and other human practices have implication for human and the environment as a result of their effect on climate variability. Impacts such as heat-related illness and diseases, increased risk of drought, fire and flood, stronger storms and increased storm damage, risk to wildlife, rising sea level and economic losses have been reported generally about climate change (California Department of Public Health 2007; Karl et al. 2009; Boko et al. 2007; Tasmania Government n.d.; IPCC 2007).

Climate change impacts and severity on farmers' health and agriculture will vary from location to location depending on the level of susceptibility and how prepared are the rural farmers in the affected area to deal with it. Therefore from a health perspective, this paper investigates how farmers in South-Eastern Nigeria perceive the effect of climate change on their health and wellbeing. This paper sets out to accomplish the following objectives: (a). To describe the socioeconomic characteristics of the rural farmers; (b). Examine the evidence of climate change by rural farmers; (c). Determine the farmers' perception of the common ailments/medical conditions associated with climate change; and (d). Identify strategies for managing climate change related health risks.

The effect of climate change on the health of rural people cannot be taken for granted and there is no doubt that this study requires the desired attention. The study result will form a platform for the generation of recommendations that will be useful for managing health risk to farmers.

This study is important not just for contributing to the body of knowledge on climate change and farmers' health, but to see how a group of farmers in an agricultural zone feel and respond to the health challenges associated with climate change. It will also contribute knowledge on how the farmers should practice their agriculture in a way that they achieve maximum productivity without undue compromise to their health and the environment. It will also provide information/materials for government to formulate policies to address climate change and agriculture challenges. Furthermore the study will fill some research gaps particularly as similar investigations have not been carried out in the study area.

Literature review

Agriculture, climate change and farmers' health

The vulnerability of agriculture and its practitioners to climate change impact cannot be overstated (Falaki et al. 2013). In Nigeria just as in other developing countries in the sub-tropical region, despite the vulnerability to climate change, landless farmers, livestock keepers, people with poor health, those with low level of education are more exposed to risk of climate change (Ishaya, & Abaje 2008; Adefolalu, 2007; Ayoade, 2004). Corroborating other studies on the effects of climate change, Nwafor (2007), stated that evidences indicate that climate change will affect not only the developing nations but globally, likewise its impacts, but the biting effects will be felt more by the developing countries especially those in Africa due to their low level of coping capabilities (ASARECA, 2009; Kisoyan, 2011; Nordas and Gleditsch, 2007; Evans, 2011; Kisoyan, 2011).

California Department of Public Health (2007) and Karl et al., (2009) reported that climate change played a fundamental role in shaping natural ecosystems, human economies and cultures that depends on them. So many systems are tied to climate and a change in it

affects many related aspects of where and how humans and animal live, food production, availability and use of water, and health risks.

Climate change is projected to be serious threats to human health. The effect of climate change is and will impact on most population into the coming decades and put the health and wellbeing of billions of people at increase risks. Accordingly, Global Landscape Forum (2014) noted that agriculture is arguably the sector most affected by climate change, but impact assessments differ within and between countries and thus are difficult to compare. Therefore understanding which farmers, crop types, regions, farming practices and policies will be negatively affected by climate change may make the difference between adequate food supply, food insecurity and the farmers' wellbeing. In the same way, Karl, et al. (2008) argued that there will be an increase in climate change related adversity in the future as the atmosphere becomes warmer.

Despite the difficulty of comparing impacts of climate change between locations, Ikeme (2009) argued that Nigeria is currently experiencing increasing incident of diseases, declining agricultural productivity and increased number of heat waves due to climate change. Also noted was unreliable or erratic weather patterns such as flooding in southern Nigeria, declined rainfall in already desert-prone area in the north causing accelerated desertification and decreased food production in central region.

Research had focused on regional and national assessments of the potential effects of climate change on agriculture e.g. Lobell, et al, (2008); Hassan and Nhemachem, (2008) and Fischer et al. (2002). Interestingly most studies mainly investigated a region/nation or one variable at a time and in isolation. Overseas Development Institute, (2007) and Segerson and Dixon, (1998) unveiled an integrated approach of combined use of biophysical and economic assessment of the potential effects of climate change on grassroots farmers.

Perception of situation have been used in many studies including climate change, based on personal knowledge and judgement. Slovic (1987) indicated that people use their intuitive judgments to perceive real or potential risk or hazards and these judgments are commonly known as one's risk perceptions. According to Raden-Fessenden and Heath (1987), people base their perceptions upon their personal experiences, knowledge and character. Slovic, (2000) reverberated the assertion from a public risk perspective that public perceptions are influenced by scientific and technical descriptions of risk factors on one hand and by a variety of psychological and social factors that include personal experience, affect and emotion, imagery, trust, values and worldviews.

Methodology

This study was carried out in Imo state, Eastern Nigeria. Imo State, made up of 27 Local Government Areas is situated east of River Niger. The study area lies within longitude 6°50E to 3.35E and latitude 4°30N to 6°30N. Imo State situates in the tropical rain and evergreen forest, therefore has a humid tropical climate all year round. The rainy season spans from March to October with a dry spell of two-week usually in August. The annual rainfall in the state is approximately 2000mm and the annual temperature is between 25°C and 28°C with a relative humidity of about 98% during the rainy season and 50% to 60% during the dry season.

The survey area used for the study was Okigwe Agricultural zone, made up of Ihitte-Uboma, Isiala-Mbano, Ehime-Mbano, Okigwe, Onuimo and Obowo Local Government Areas. Okigwe Agricultural zone has 10 extension blocks and 80 extension circles. All the farmers in the zone constituted the population of the study. From the circles, a list of all the registered

farmers was obtained from the Extension Agent covering the area. The list has a total number of 1,700 farmers and 10% of them was randomly selected resulting in a sample size of 170 respondents.

The primary instrument used to conduct the survey was a questionnaire. A questionnaire was administered to every selected farmer by the survey administrators. The data collected was assessed for correctness and missing data. Simple statistical tools such as mean, percentages and frequency distribution tables were used to analyse objectives 1, 2 and 4 of the study. Mean score of responses to variables designed as 4-point Likert scale items was used to analyse objective 3 of the study. The scale ranged from Strongly agree, Agree, Disagree to Strongly Disagree with assigned scores of 4, 3, 2 and 1 respectively. The mean cut-off point was 2.50 and any mean response below 2.50 was not considered an effect of climate change on farmers' health in the study area.

Results and Discussions

Socio economic Characteristics of Respondents

Table 1 shows that 45.9% of the respondents were in the age bracket of 51-60 years, followed by 29.4% of the respondents who were in 41-50 years age group.

Table 1: Socioeconomic Characteristics of Respondents. Sample size = 170

Attribute	Attribute classification	Frequency	Percentage
Age	31-40 years	32	18.8
	41-50 years	50	29.4
	51-60 years	78	45.9
	61 years & above	10	5.9
Marital status	Single	10	5.9
	Married	124	72.9
	Divorce	8	4.7
	Widow	28	16.5
Household size	1-4	105	61.8
	5-8	47	27.6
	9 & above	18	10.6
Education level	No formal education	7	4.1
	Primary	54	31.7
	Secondary	97	57.1
	Tertiary	12	7.1
Farming experience	1-20 years	32	18.8
	21-40 years	51	30
	41 years & above	87	51.2
Farm size	0.5-1 Hectare	101	59.4
	1.5-2 Hectare	37	21.7
	2.5-3 Hectare	22	12.9
	3.5 & above	10	5.8
Extension visit	Not at all	104	61.2
	One monthly	45	26.5
	Twice monthly	21	12.3

Field survey data, 2016

Furthermore, 18.8% and 5.9% were in the 31-40 and above 61 years age group respectively. The mean age of the respondents was 49.9 years. While 72.9% of the respondents were married, 16.5% were widows, 5.8% were single and 4.7% were divorced. The mean household size was 4.4 members and 1.49 hectares of land represented the average farm size own by the farmers. The farm size indicated that production is mainly at small scale and the distribution of farm land asset is skewed to the many small scale farmers.

From the result, it was noted that majority - 57.1% of the respondents attained secondary school education, 31.7% had primary school education, while only 7.1% attended tertiary institution. However 4.1% of the sample had no formal education. In terms of extension service contact, 61.2% of the respondents had not received the visit of an extension agent, while 26.5% claimed to have received extension visits once in a month, 12.3% of the respondents received such visit twice monthly. The extension agent is supposed to be a vehicle for learning and information dissemination, in this regard providing information about climate change and how the farmers can maximise productivity without compromising their health and the environment. If the number of farmers that have access to extension contact/visit is less than 50% of the sample, the tendency is that the farmers though could see the effects of climate change are not able to apply the necessary strategies to protect their health against the effects due to lack of adequate and appropriate information.

Climate change Evidence in Study Area

Table 2 below reveals the reality of the climate change issue in the study area. All the respondents -100% indicated that there were heavy rainfall and reduction in crop yield in the area. Other evidence of climate change indicated by the respondents included change in rainfall pattern which was supported by 94.79% of the respondents and 90% of the sample supported the presence of high temperature due to the extreme hotness of the weather from the intense heat of the sun.

Table 2: Climate Change Evidence in Study Area. Sample size = 170

Evidence of Climate Change	Frequency	Percentage
Prolonged dry season	142	83.5
Change in rainfall pattern	161	94.7
High temperature	153	90
Reduced rainfall	109	64.1
Heavy rainfall	170	100
Flooding	163	95.8
Crop failures	170	100
Drying of streams/rivers	127	74.7
Crop yield reduction	170	100
Scarcity of wild fruits	128	75.3
Untimely death of crops in field	153	90
Heavy winds/storm	142	83.5
Rotening of stored produce	117	68.8
Fast weed growth	159	93.5
Pests and diseases increase	167	59.4
Premature fruit ripening	106	62.3
Premature fruit ripening	106	62.3

Field survey data, 2016

The table also revealed that 95.8% of the respondents indicated that climate change has caused excessive flooding while 90% and 93.5%, of them claimed that climate change cause premature loss of crops in the field and fast weed growth respectively. For all other variables and sample responses, refer to Table 2. The farmers’ response are indication that climate change is a serious threat to agricultural productivity and farmers’ wellbeing. It can reduce crop yield and the income of farmers. High farm investment and low return due to climate change effect can create psychological trauma to farmers. This result supports the works of Evans, (2011); Kisoyan, (2011); ASARECA, (2009); Nordas and Gleditsch, (2007). Also from the result, it can be inferred that climate change indirectly encourage over-exploitation and mismanagement of natural resources in an attempt to meet production volume.

Perceived Health Effect on Rural Farmers

The menace of climate change variably goes with attendant effects on the health of the farmers. The variables used to determine these effects were assessed using their mean values (M). Result in Table 3 showed that climate change could increase hunger as indicated by the respondents’ high mean of 3.51. Climate change could lead to increased risk of respiratory disease (M=3.17), leads to injury and even death (M=2.91), causes malnutrition (M=2.98), increased risk of diarrhea and cholera (M=2.78), increased risk of emotional/mental stress (M=2.74), skin damage (M=2.52), owing to the intense heat of the sun on the human body. Other health effects were increase infestations of mosquitoes causing malaria (M=2.69), leads to exhaustion/spinal/bone damage (M=2.53) due to farmers carrying of heavy load on their heads from the farm to their home or market over a long distance. The farmers perceived climate change to cause high fever (M=2.61), leads to accidental exposure to cold (M=2.56), increase body pain (M=2.68) and leads to increase infestation of salmonella typhii from use of contamination water (M=2.56). The mean response agrees with the standard deviation which is not far or did not deviate much from the mean.

Table 3: Health Effects of Climate Change on Rural Farmers. Sample size = 170

Statement/variable	Strongly Agree (%)	Agree (%)	Disagree (%)	Strongly Disagree	Mean	SD
Causes high fever	86 (50.6)	63 (37.1)	5(2.9)	16 (9.4)	2.61	0.81
Climate change can increase hunger	118 (69.4)	35 (20.6)	4 (2.4)	13 (7.6)	3.51	0.87
Climate change causes malnutrition	71 (41.8)	42 (24.7)	40 (23.5)	17 (10.0)	2.98	1.02
Climate change leads to injury or death	51 (30.0)	69 (40.6)	34 (20.0)	16 (9.4)	2.91	0.93
Increase body pain	10 (5.9)	32 (18.8)	90 (52.9)	38 (22.4)	2.68	0.8
Increase emotional/mental stress	19 (11.2)	103 (60.6)	33 (19.4)	15 (8.8)	2.74	0.77
Increase in infestations of mosquitoes	36 (21.2)	82 (48.2)	16 (9.4)	36 (21.2)	2.69	1.03
Increase incidence of diarrhea/cholera	36 (21.2)	89 (52.3)	17 (10.0)	28 (16.5)	2.78	0.96
Increase risk of respiratory diseases	101 (51.4)	17 (10.0)	32 (18.8)	20 (11.8)	3.17	1.1
Leads to accidental exposure to cold	10 (9.4)	50 (29.4)	68 (40.0)	36 (21.2)	2.56	0.86
Leads to exhaustion/bone/spine	29 (17.0)	20 (11.8)	83 (48.8)	38 (22.4)	2.53	0.98
Leads to salmonella infections	17 (10.0)	81 (47.6)	53 (31.2)	19 (11.2)	2.56	0.82
Leads to skin damage	34 (20.0)	4 (2.4)	99 (58.2)	33 (19.4)	2.52	0.98

SD = Standard deviation
 Field survey data, 2016

Scientific evidence shows that carbon pollution have contributed to the destructive potential of Atlantic hurricanes and tropical storms in recent decades. Hurricane wind and heavy rainfall are now prevalent as the temperature becomes warmer. The health impacts included drowning from flooding, injuries, outbreaks of infectious disease, contamination of table water sources and community displacement. Storm damage to basic infrastructure results in additional health risks such as moisture induced mould growth that can exacerbate allergies and respiratory illnesses. Outbreaks of water-borne diarrheal diseases caused by parasites like *Giardia* and *Cryptosporidium* have been associated with heavy rainfall events and flooding, which have become more frequent due to climate change. Furthermore, warming ocean temperatures bring shifts in the geographic range of fish populations that can severely impact local food supplies. Hence this study result also supports Karl, et al. (2009); California Department of Public Health (2007); McMichael, et al. (2006) and Karl, et al. (2008).

Managing Climate Change Health Effects.

This study explored how best the health impacts of climate change can be managed by farmers. Some management variables were presented to the farmers and their agreement with the variables were assessed and summarised in Table 4.

Table 4 Strategies for Managing Climate Change Health Impacts. Sample size = 170

Strategies For Managing Health Effects	Frequency	Percentage
Provision of access to secured clean water	170	100
Regular sanitation/cleaning of environment	151	88.8
Access to sustainable source of clean energy	152	89.4
Provision of better health facilities	170	100
Avoiding residence in high risk areas	133	78.2
Improving social awareness and disaster preparedness	170	100
Provision of early warning information system	170	100
Promotion of energy saving/efficient facilities	115	67.6
Training and re-training of medical professionals	170	100
Quick response to emergency situations	170	100

Field survey data, 2016

The result in Table 4 indicates that all the surveyed respondents agreed that the provision of access to secured clean water, provision of better health facilities, improving social awareness and disaster preparedness and provision of early warning information system are effective management strategies for mitigating the health impact of climate change. Similarly all the respondents also indicated that quick response to emergency health situation, training and re-training of medical professionals are good mitigating approach to combating the health hazard of climate change. Despite the absolute agreement with the previous variables, 88.8% of the sample supported regular sanitation/cleaning of the environment, 89.4% agreed with access to sustainable source of clean energy, 78.2% supported avoidance of residents/farmers in high risk areas while 67.6% encouraged the promotion of energy saving/efficient facilities as good management factors.

The implication of this result is that the role of managing the health impacts of climate change rest in the hand of the farmers and government at all levels. It is the responsibility of the farmers to promote and use energy efficient equipment/appliances at home and on the farm;

carry out their agricultural practices in ways and manner that minimise the emission of greenhouse gases. Agroforestry is a highly recommended agricultural practice for managing the climate change. While crop production is been carried out, the trees provided sufficient leaf surface to absorb the carbon dioxide and other gases produced.

The government at all levels must through their various agencies ensure relevant infrastructure are provided and the training of staff to provide medical, engineering and other relevant services that mitigate the health impacts. Continuous creation of awareness and enlightenment campaign about climate change, the hazard and risk associated with it must be on-going. Local mass media like radio and television are important for such awareness and enlightenment campaigns.

Conclusion

Climate change is not just an environmental issue; it is also has health concerns. The major health threats due to climate change include new disease outbreak and pathogen resistance, water and food insecurity, vulnerable shelter and human settlements, extreme climatic events, and population dislocation and migration. Considering all of these problems, the role of the individual farmers, communities and government are important and interdependent. The farmers must conduct their business and living in a way that is minimally adverse to the environment. Efficiency in input utilisation must be stressed. It will be the role of government to encourage/ensure that the climate change research outcomes are cascaded to the farmers through the extension agents.

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