Journal of Science of Agriculture, Food Technology and the Environment Vol. 21, No. 1, 2023 & 2024 73-87
Available online: jsafeacademicjournal.com

EVALUATING AGRIBUSINESS INVESTORS' CLIMATE CHANGE AWARENESS AND ADAPTATION STRATEGIES IN SOUTHEAST NIGERIA

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ABSTRACT

The assessment of climate change adaptation has been widely researched but the assessment of agribusiness investor's awareness and adaptation to climate change effects in southeast Nigeria seems not to be fully explored. A multistage sampling procedure was adopted in the collection of data from three hundred and sixty (360) agribusiness investors using structured questionnaires. Both descriptive and inferential statistics were employed to realize the objectives of the study. Result revealed that agribusiness investors are generally aware of climate change in the area and source their climate information through personal experience, radio, television, fellow investors, extension agent and social media. The result revealed that diversification, risk management and insurance, enhanced infrastructure and storage facilities, climate-smart technologies, supply of heat during cold weather, improve soil management, improve water management, changing the breeds of livestock and planting of flood resistant/tolerant crop were the adaptation strategies in the area. With P-value of 0.0000 and the Bartlett's Test of Sphericity at 0.05 level of probability, it is posited that climate change effects significantly affected agribusiness investment in Southeast, Nigeria. The result showed further that production factor, economic factor, equipment factor and threat to human life factor were the major factors affecting agribusiness investment. Based on the findings, it is recommended programs on how to adapt effectively to climate change variability should be embarked upon by relevant authorities for agribusiness investors.

Key words: Agribusiness Investors, Awareness, Adaptation Strategy, Climate Change

INTRODUCTION

Climate change is the variation in the statistical distribution of average weather conditions over a long period of time from 30-35 years and above in any part of the world (Ikehi, 2014). It shows abnormal variations to the expected climate within the earth's atmosphere and subsequent effects on other parts of the earth. The earth therefore, is surrounded by a layer of gases that act like the glass wall (earth's blanket) and ceiling of a green house. These greenhouse gases are necessary to sustain life on earth. They let the sun's rays enter but stop much of the heat

from escaping, keeping the planet warm enough to sustain life. However, activities of man have resulted to change in the earth environment. The change is rapidly emerging as a global critical development issue affecting many sectors in the world and is considered to be one of the most serious threat to sustainable development. Globally, an unprecedented increase in greenhouse emissions has led to increased climate change impact. Climate change therefore, refers to all changes in climate be it as a result of human activities or natural variations (Intergovernmental Panel on Climate Change [IPCC], 2001).

The problem that we face today is that the blanket of greenhouse gases that occurs naturally in the troposphere is quickly getting thicker as a result of increase emissions of greenhouse gases and this result in the rapid warming of the world's climate. Over the past 100 years, the earth's average surface temperature has risen by around 0.74^{o}C Most scientists agree that global temperature will rise further (by how much, depends on future emissions of greenhouse gases) and if the temperature rise is high, changes are likely to be so extreme that it will be difficult to cope with them. There are likely to be more instance and frequent extreme weather events, like floods and hurricanes, and sea levels could rise further (Ifeanyi-obi, Etuk, and Jike-wai, 2012)

Climate change is a long-term change in the average weather patterns that have come to define the earth's global climate (Shaftel, 2016). The change in climate and temperature prevalent today are either caused by human factors or natural factors (Shahzad, 2017). Research conducted by Poschumus (2019), showed that most of these changes in the global climate are connected with a little variation in the earth's orbit that changes the level of energy coming from the sun to the earth. According to Papass (2020), climate change and global warming that occurred in the past century until now are caused by humans.

Climate is crucial to the Nigerian agribusiness investors. If action is not taken, the impact of the change will continue to cause severe effects on livelihoods in Nigeria. Poschumus, (2019), posited that temperature will continue to rise in the northern part of Nigeria, thereby causing variability in the increase in rainfall. The north will have less and erratic rainfall, which will lead to drought, whereas in the south, they will have more intense rainfall, which will result in floods. According to IPCC (2001), global climate is fast changing in the

history of modern civilization because of human activities.

According to Food and Agriculture Organization [FAO], (2019), many sectors will suffer from the change in climate, but agribusiness sector will face the deadliest. The researcher maintained that agricultural industry is threatened by droughts, floods, land degradation, and soil salinity. The change in temperature and precipitation patterns is seriously affecting agribusiness activities in Nigeria as well as damaging non drought tolerant or heat tolerant crops. Change in climate affect the yield of agricultural production, the earnings from production, the quality of food, the storage, processing and distribution of the produce, the food price, as well as food security (Chukwuezie 2017; Smith 2012; and Siwar 2009). According to World Bank (2019), the continuous increase in global temperature and the increase in rainfall have a significant effect on the food production value chain. The bank also noted that, given the prediction of early cessation of rainfall in northern Nigeria, it will cause short planting season which will result in food scarcity. To address this seeming gap, agribusiness investors should critically look into the causes of climate change with the hope of determining its effects on agribusiness investments.

Awareness which is often considered necessary in the first stages of the adaptation process to manage climate change impacts and reduce overall vulnerability, because the degree of awareness tends to reflect the level of exposure to climate risks of a farming community (Ado *et al*. 2019). Consequently, being aware requires recognizing that climate change is a threat and understanding the risks and impacts associated with it that must be dealt with accordingly.

Investment into agribusiness can be categorized into three components generally known as agribusiness tri-aggregates. The tri-aggregate include: farm input supply, farm production and agro-processing/distribution. Hence, Ezike, Nwibo and Odoh (2009), posited that agribusiness connotes the process by which agricultural inputs are supplied or purchased and processed for eventual distribution to the target markets, as one fully integrated business concern, which is simultaneously adjusting to the changes that are constantly occurring in the global business environment. This is similar to the view of Wills (2009), who considered agribusiness as the off-farm link in agro-food value chain, which provides input to the farm sector, and it links the farm sector to consumers through the handling, processing, transportation, marketing and distribution of

food and other agricultural products. It therefore, plays an important role in economic development in Nigeria. Pawa (2013) revealed that agribusiness concerns in Nigeria constitute 70% of businesses operating in the country.

Agribusiness investors also known as agripreneurs are those that undertake a variety of activities in agricultural sector, they represent the innovators who drive change in the economy by serving new agricultural markets or creating new ways of doing things, and as such should be proactive, curious, determined, persistence, visionary, hardworking, honest; and have integrity with strong management and organizational skills (Bairwa, Lakra, Kushwaha, Meena and Kumar, 2014). An agribusiness investor, recognizes agricultural opportunities or unmet needs and takes the risk to pursue it. Gray (2002), on the other hand defines an agribusiness investor as an individual who manages an agribusiness with the intention of expanding the business and with the leadership and managerial skills necessary for actualizing those goals.

In Nigeria, like many other developing countries of Africa, agribusiness sector is more vulnerable and adversely affected by change in climate conditions (Barber *et al*. 2003; Nigerian Environmental Study Action Team, 2004) However, it seems nothing have been established on whether agribusiness investors are aware of the effect of climate and its adaptation measures in southeast Nigeria. This therefore, justifies the need for this study to also assess these issues to the fore in southeast Nigeria, as a criterion for developing climate adaptation strategies to ameliorate the effects.

The Southeast region of Nigeria is known for its agricultural potential, contributing significantly to the nation's food production and economic growth. However, agribusiness investors in this region are facing significant challenges and uncertainties due to the impacts of climate change.

In order to address the problem, the study:

(i) analyzed the awareness and availability of climate change information sources among agribusiness investors;

(ii) identified adaptation measures applied by agribusiness investors in coping with the climate change effects in southeast, Nigeria;

(iii) determined the effects of climate change affecting agribusiness investment in southeast, Nigeria;

Hypothesis

Ho: Climate change effects do not significantly affect agribusiness investment in southeast Nigeria.

METHODOLOGY

The study area.

The study area is Southeast, Nigeria. The area is one of the six geopolitical zones in Nigeria and consists of five States namely: Abia, Anambra, Ebonyi, Enugu and Imo States. The area lies by latitude $05^0 55'$ and $07^0 10'$ North and longitude $06^0 50'$ and $08^0 30'$East. With a projected population of over 28.4 million people (National Population Commission, 2020) situated in a land area of approximately 58,214.7 km^2. The area is bounded in the south by AkwaIbom and Rivers states, in the North by Benue and Kogi States, west by Delta State and east by Cross River State. The area has Ibo as the predominant ethnic group and Igbo language as the main language of the people, although there exist many dialects peculiar to the people.

The area is located within the humid tropical rain forest and derived savannah belt of Nigeria with two main seasons: the rainy season which begins from April to October and the dry season begins in November and ends in March. The mean annual rainfall ranges from 1520mm to 2030mm. It has a warm and humid climate. The area is traversed with several major and minor rivers such as river Niger, Anambra river, Imo river, Adada river and Ebonyi river. Oguta and Nike lakes are the major lakes present in the area.

The area is also known for its endowment with abundant natural resources such as coal, limestone, iron-ore, crude oil, lead, zinc and natural gas (Ojiako and Nwode 2014). Agriculture is the mainstay of her economy and has a vast agricultural land that supports the growth of crops such as rice, yam, cassava, maize, bambara nut as well as various varieties of fruits and vegetables. The agricultural activities conform to the tri-aggregate of agribusiness which include; farm input supply, farm production and farm processing and distribution/marketing of processed products.

Sampling Technique

A multistage sampling procedure was used in the selection of agribusiness investors in the study area.

Stage 1: From the five States of the Southeast geo-political zone (Abia, Anambra, Ebonyi, Enugu and Imo), three States (Ebonyi, Anambra and Abia), were purposively

selected based on the high level of agribusiness activities in those States.

Stage 2: From the three selected States, two agricultural zones were randomly selected.

Stage 3: Then two Local Government Areas (LGAs) were purposively selected from the randomly selected six agricultural zones of the States, which gave a total of 12 LGAs. The choice of purposive sampling here was based on the level of agribusiness activities going on in the area.

Stage 4: From each of the purposively selected 12 LGAs, thirty (30) agribusiness investors were purposively selected to give a total of three hundred and sixty (360) respondents which constituted the sample size.

Model Specification

Factor Analysis

Based on the factors considered, the Principal Component Analysis (PCA) or Factor Loading was adopted for the study and by the application of Kaiser's rule of thumb. (Kaiser developed a rule of thumb of 0.4 as a minimum loading weight which a factor can have before it can be isolated as being positive to the attribute in question), the factor model was expressed mathematically as:

$Yi = \beta io + \beta i_1F_1 + \beta i_2F_2 + \beta i_3F_3 + ...+ \beta inFn + ei$ ……..... 1

Where, Yi= dependent variable, Bi = parameters or loadings. Hence, $B_1 – Bn$ is the loading of variable Yi on factors, Fn., $F_1 – Fn$ = intending variables

Test of Hypothesis

The null hypothesis which states that climate change effects do not significantly affect agribusiness investment in southeast Nigeria was tested using KMO and Bartlett's test of sphericity at 0.05 level of probability.

Kaiser-Meyer-Olkin (KMO) Test

The formula for the KMO test is:

$$= \frac{\sum_{i=j} r_{ij}^2}{\sum_{i=j} r_{ij}^2 + \sum_{i=j} u} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 2$$

where,

R = $[r_{ij}]$ is the correlation matrix and

U = $[u_{ij}]$ is the partial covariance matrix

RESULTS AND DISCUSSION

Awareness and availability of climate change information sources

Awareness to climate change is the precondition for agribusiness investors to recognize the threat posed by climate change and then adopt the adaptation strategies to mitigate its effects.

Table 1 Results revealed that the agribusiness investors are generally aware (100%) of

climate change in the area. This implied that investors in southeast Nigeria are already aware of climate change and its far reaching consequences. This finding is slightly higher than the findings of Ikpe (2014) where 98% of the sampled farmers claimed that they are aware of climate change. This is probably because investors in southeast Nigeria are more informed hence, more aware of climate change.

Again, result showed that the sources of climate change information in Southeast Nigeria were through: personal experience (77.8%), radio (55.6%), television (33.3%), fellow investors (30.6%), extension agent (16.7%) and social media (13.9%). This implied that mass media collectively is the major information sources of climate change by agribusiness investors in southeast Nigeria. This finding is in line with the finding of Ajayi (2015), where he opined that mass media is the major sources of information about climate change by farmers.

Table 1: Percentage Distribution of Respondents according to Awareness and Availability of Climate Change Information Sources in the Study Area

Variables	Frequency* (n = 360)	Percentage (%)
Awareness	360	100
Climate Change Information Sources		
Radio	200	55.6
Television	120	33.3
Personal experience	280	
Fellow investors	110	30.6
Extension agent	60	16.7
Social media	50	13.9

Source: Field Survey, 2024; * = Multiple response

Adaptation Measures applied by Agribusiness Investors in coping with the climate change effects in Southeast Nigeria

Agribusiness investors adopt various measures to cope with climate change effects as analysed and presented in table 2. The result revealed that the adaptation measures to climate change applied by the farm input suppliers are: diversification (33.3%), risk management and insurance (4.2%), enhanced infrastructure and storage facilities (33.3%), climate-smart technologies (5.6%) and supply of heat during cold weather (2.8%). Combination of different adaptation

measures to cope with climate change effects is very vital to combat climate change by investors in southeast Nigeria. This finding is in consonance with the finding of Fadina and Barjolle (2018), who revealed that farmers combine diversification of income generating activities with other adaptation strategies in response to climate change.

Under farm production component, the adaption measures applied by the producers were: diversification (33.3%), risk management and insurance (0.8%), improve soil management (25%), improve water management (19.4%), changing the breeds of livestock (5.6%) and planting of flood resistant/tolerant crop (13.9%).

On the other hand, agro-processors applied the following adaptation measures: diversification ((33.3%), risk management and insurance (1.4%), enhanced infrastructure and storage facilities (27.8%), climate-smart technologies (1.9%) and supply of heat during cold weather (11.1%). Most of the investors combine two or more options to adapt. This is in line with findings of Ifeanyi-Obi *et al.*, (2012), who reported that adaptation options/strategies must not be used in isolation. Agribusiness investors combine two options where necessary in order to achieve the desired result.

Table 2: Percentage Distribution of Adaptation Measures applied by Agribusiness Investors in coping with the climate change effects in Southeast Nigeria

Adaptation measures to climate change	**Agribusiness investors**		
	Input suppliers	**Producers**	**Agro-processors**
Diversification	120 (33.3)*	120(33.3)*	120(33.3)*
Risk management and insurance	15(4.2)	3(0.8)	5(1.4)
Enhanced infrastructure and storage facilities	120 (33.3)	-	100 (27.8)
Climate-smart technologies	20(5.6)	-	7(1.9)

Supply of heat during cold weather	10(2.8)	-	40 (11.1)
Improve soil management	-	90(25)	-
Improve water management	-	70(19.4)	-
Changing the breeds of livestock	-	20(5.6)	-
Planting of flood resistant/tolerant crop	-	50(13.9)	-

Source: Field Survey, 2024; Figures in parenthesis are percentage; * = multiple response

Climate change effects affecting agribusiness investment in Southeast Nigeria

Climate change effects have highly affected agribusiness investment in southeast Nigeria as analysed and presented in Table 3. The result of the varimax rotated component matrix on climate change effects affecting agribusiness investment in Southeast Nigeria. Applying Kaiser's rule of thumb, that variables with 0.40 or more coefficient have high loading and may be used in the naming a factor (Nwibo and Okorie 2013). Based on items that clustered and loaded high, four (4) factors were identified and extracted, namely; production, economic, equipment and threat to human life.

Production factors:

Production effects of climate change, the following were identified: crop/livestock failure (0.417), famine (0.403) malnutrition (0.745), diseases (0.892) and food insecurity (0.660).

Crop/livestock failure

This study has shown that crop/livestock failure is one of the effects of climate change among agribusiness investors, specifically investors under production components of agribusiness in southeast Nigeria. This finding is in line with the report of Rudolf and Hermann (2009), who revealed that change in climate gives rise to a significant drop in crop yield.

Famine

The study revealed that famine is one of the effects of climate change among agribusiness investors. This is justified on the basis that climate change will bring about decline in production output, which will consequently cause famine.

Malnutrition

The finding showed that malnutrition is an effects of climate change. This is evidence on the ground that climate change will bring about reduction in qualities of food products, which will consequently bring about malnutrition among consumers. This finding is corroborated by Loladze (2014), who opined that nutritional quality of plants such as wheat, oats, and rice are mostly at risk of lower level of protein as well as minerals, which arises as a result of climate change.

Diseases

The study revealed that climate change brings about pest and diseases infestation among crops and animals, which gives rise to disease spread. The finding is in line with the report of Okhimambe (2009), who revealed that climate change induces health problems directly or indirectly. The researcher maintained that about thirty years ago, people rely on local herbs for treating illness but now, most of the herbs used are no longer available as a result of climate change.

Food insecurity

The finding showed that climate change causes food insecurity. This is justified on the basis that climate brings about food shortage, which at the long run causes food insecurity. The finding is in line with the report of World Bank (2019), who revealed that continuous increase in global temperature as a result of climate change has a significant effect on food security.

Economic factor:

The economic effects include income loss (0.973) and unemployment (0.330).

Income loss

The result showed that income loss is an effects of climate change. This is evidence on the ground that climate change will bring low return on investment, which will consequently bring about loss of income among investors.

Unemployment

The finding showed that unemployment is an effects of climate change. This is evidence on the ground that climate change will bring about destruction of agribusiness investments, which will consequently create unemployment among the employees. Its worthy of note that employment generation is one of the cardinal objectives of agribusiness. This assertion is supported by FAO (2020), who opined that agribusiness plays a vital role in job creation.

Equipment factor:

Damage of processing equipment

The finding showed that damage of processing equipment is an effects of climate change. This is evidence on the ground that storm and other weather elements causes destruction of processing equipment and other infrastructure which will consequently bring about reduction in agribusiness output.

Threat to human life factor:

Loss of lives and property

The result showed that loss of lives and property is an effects of climate change. This is evidence on the devastating flooding and increase in intensity of atmospheric disturbances such as thunderstorms, which has caused the death of so many people. This agreed with the findings of Ozor (2009), who revealed that climate change effect will manifest through loss of lives and livelihoods.

Table 3: Varimax Rotated Matrix Result on Climate change effects affecting agribusiness investment in Southeast Nigeria

Effects	Production	Economic	Equipment	Threat to human life
Crop/Livestock failure	**0.417**	-0.227	0.149	-0.048
Income Loss	0.012	**0.973**	-0.182	0.011

Damage of input	0.296	-0.195	0.778	0.418
Damage of processing equipment	-0.201	-0.042	**0.847**	0.387
Loss of lives and Property	-0.130	0.026	0.374	**0.837**
Famine	**0.403**	0.171	-0.135	-0.018
Malnutrition	**0.745**	-0.116	0.311	-0.380
Diseases	**0.892**	-0.178	-0.102	0.091
Food insecurity	**0.660**	0.070	-0.129	0.056
Unemployment	0.330	**0.578**	-0.002	0.280

Source: Field Survey, 2024

Test of Hypothesis

Ho2: Climate change effects do not significantly affect agribusiness investment in southeast

Nigeria.

The null hypothesis which stated that climate change effects do not significantly affect agribusiness investment in Southeast Nigeria was tested using Bartlett's Test of Sphericity at 0.05 level of probability.The test result presented in table 4 indicated the approximate chi-square value of 2280.925 which is high enough to attest to the good fit of the model. The Kaiser-Meyer-Olkin Measure of sampling adequacy was 0.715, suggesting that the variables included in the model were adequate. The overall model was statistically significant (P < 0.000). Based on this, the null hypothesis was rejected and the alternative hypothesis was accepted that climate change effects significantly affected agribusiness investment in Southeast, Nigeria.

Table 4: KMO and Bartlett's Test

Test		Value
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.715
Bartlett's Test of Sphericity	Approx. Chi-Square	2280.925
	Df	136
	Sig.	0.000

Source: Field Survey, 2024

CONCLUSION

Conclusively, the study confirmed the awareness of climate change in the area. It was revealed that the major climate change information sources are personal experience, radio, television, fellow investors, extension agents and social media. Investors adapt in various ways to climate change. The widespread adaptation strategies used by the agribusiness investors in the area are diversification, risk management and insurance, enhanced infrastructure and storage facilities, climate-smart technologies and supply of heat during cold weather improve soil management, improve water management, changing the breeds of livestock and planting of flood resistant/tolerant crop. It was established that the climate change effects affecting agribusiness investment in southeast Nigeria, were identified and classified under the four principal component factors which include: production factor, economic factor, equipment factor and threat to human life factor.Based on the findings, it is concluded that climate change effects significantly affected agribusiness investment in Southeast, Nigeria.

RECOMMENDATIONS

Based on the findings of the research, the study recommended that programs on how to adapt effectively to climate change variability should be embarked upon by relevant authorities for agribusiness investors.

REFERENCES

Ado, A.M., Leshan, J., Savadogo, P., Bo, L and Shah, A. A. (2019). Farmers awareness and perception of climate change impacts: case study of Aguie district in Niger. *Journal of Environment and Sustainable Development.* 21(3):263–277.

Bairwa, S.L., Lakra, K., Kushwaha, S., Meena, L.K and Kumar, P (2014), Agripreneurship Development as a tools to upliftment of Agriculture. *International Journal of Scientific and Research Publications (IJSR),* 4(3):1-8

Barber, H., Jennifer, S., Ann, E.B. and William, G.A. (2003). Neighborhood Social Change and Perception of Environmental Degradation. *Journal of Population and Environment.* 25:7-108.

Chukwuezie, O.C N., Nwakuba,N., Nwaigwe,K.N. and Asoegwu,S. (2017). The impact of climate change on Nigerian agricultural sector and economy. *Journal of Environmental Sustainability.* 9(4): 498–507

Dias, C.S.L. (2016). A Status Quo Review of Climate Change and the Agriculture Sector of the Western Cape Province. Retrieved online :

https://www.greenagri.org. (21/01/2024)

Ezike, K.N.N., Nwibo, S.U and Odoh, N.E (2009). Agribusiness and Finance. John Jacob's Classic Publishers Ltd, Enugu, Nigeria.

Fadina, A.M.R and Barjolle, D. (2018). Farmers' Adaptation Strategies to Climate Change and Their Implications in the Zou Department of South Benin. Department of Environmental Systems Science, ETH Zurich, 8092 Zurich, Switzerland.

Food and Agricultural Organization (2019). Agricultural Outlook. Special focus on Latin America.

Food and Agricultural Organization (2020), The state of food and agriculture of the united nation. Rome.

Gray, C. (2002) Entrepreneurship, Resistance to change and Growth in Small Firms. *Journal of Small Business and Enterprise Development,* 9 (1): 61-72.

Ifeanyi-obi C.C., Etuk U.R. and Jike-wai O. (2012). Climate Change, Effects and Adaptation Strategies; Implication for Agricultural Extension System in Nigeria. *Greener Journal of Agricultural Sciences*, 2(2): 053-060.

Ikehi, M.E. (2014). Impacts of climate change on animal and crop production in Niger Delta Region of Nigeria. *Research Journal of Agricultural and Environmental Management.* 3(10):528-537.

Ikpe, E. (2014). Adaptation strategies to climate change among grain farmers in Goronyo Local Government Area of Sokoto state. Unpublished Master 's thesis, department of Geography, Ahmadu Bello University, Zaria.

Intergovernmental panel on climate change (IPCC) (2001). *Impact, Adaptation and vulnerability*. Contribution of Working Group 11 of the intergovernmental panel on climate change to the Third Assessment Report of IPCC. London: Cambridge University Press.

Intergovernmental Panel on Climate Change IPCC. (2007). Climate Change 2007: Impacts, Vulnerability and Adaptation. Geneva: WMO

Loladze, I. (2014). Hidden shift of the ionone of plants exposed to elevated CO2 depletes minerals at the base of human nutrition. Baldwin, I.T., reviewing editor, eLife Sciences Publications Ltd.

Nigerian Environmental Study Action Team (2004). Regional Climate Modeling and Climate Scenarios Development in Support of Vulnerability and Adaptation Studies. Report of Regional Modeling Efforts over Nigeria. NEST, Ibadan, Nigeria. 2004.

Nwibo, S.U and Okorie, A (2013), Determinants of Entrepreneurship Among Agribusiness Investors in South-East, Nigeria, *European Journal of Business and Management.5(10): 23-30*

Ozor, N. (2009). Understanding climate change: Implications for Nigerian Agriculture, policy and Extension. Paper presented at the National Conference on Climate Change and the Nigeria Environment. Organized by the Department of geography, University of Nigeria, Nsukka.

Pappas,S (2020). "What is climate change, and how is it affecting Earth? " *NASA, 2020.* [Online]. Available*:*

https://www.livescience.com/climate-change.html. (08/01/2024)

Pawa, T (2013). Agribusiness as a veritable tool for rural development in Nigeria; International Letters of Social and Humanistic Sciences. *Journal of Culture, Society and Development*, 14 (27): 26-36

Posthumus, H., Dengerink,J., Hamankar, M., Plaisier,C., and Baltissen,G. (2019). *Enhancing Food Systems in Nigeria; Scope and perspective for Dutch policy interventions*.Netherlands Ministry. Foreign Affair 2019. Publishers Danville.

Rudolf, W. and Hermann, W. (2009). *Climate risk and farming Systems in Rural Cameroon. Institute of Development and Agricultural Economics.* University of Hannover, Germany Self-help and rural development Association (SHERDA) 2009.*community needs framework document.* Sponsored by the Rivers state sustainable development agency (RSSDA). Pp. 21-24.

Shaftel, H. (2016). "Climate Change: Vital Signs of the Planet: Causes," *Nasa. 2016*.

Shahzad, U. (2017). "Global Warming: Causes, Effects and Solutions," *Durreesamin Journal 1(4): 1-8*

Siwar,C., Alam,M., Murad,W and Al-,A.Q (2009). "Impacts of Climate Change on Agricultural Sustainability and Poverty in Malaysia," *World Applied Sciences Journal*, 14(3): 431-442

Smit, B and Skinner, M. (2002). Adaptation options in agriculture to climate change: A typology. Mitigation and Adaptation Strategies for Global Change. *Journal of Environmental Science*.7(1): 85-114.

World Bank (2019). "*The World Bank in Nigeria*," The World Bank Research Observer, Retrieved online*:* https://www.worldbank.org.(10/02/2024)