Journal of Current Trends in Agriculture, Environment and Sustainability

Katalyst Publishing Group

Open Access

Research Article

Rural Farm Management Decision for Climate Change Adaptation among Farm-families in Onitsha Agricultural Zone of Anambra State, Nigeria

Chikaire J.U[1], Ohagwam J.N[2], Godson Ibeji C.C[1], Aminu G.O[1]

[1]Dept. of Agricultural Extension, Federal University of Technology, Owerri

[2]Dept. of Cooperative Economics and Management, Imo State Polytechnic, Mbano Campus; Imo State, Nigeria

***Corresponding Author:**

Chikaire J.U, Dept. of Agricultural Extension, Federal University of Technology, Owerri; Tel: 08065928862; E-Mail: futoedu23@gmail.com

Received Date: 05 Oct, 2023
Accepted Date: 12 Oct, 2023
Published Date: 19 Oct, 2023

Abstract

Good farm decision is a prerequisite for adapting to climate change. The study examined the rural farm management decision for climate change adaptation among farm-families in Onitsha Agricultural Zone of Anambra State, Nigeria. This study ascertained climate change awareness of farmers; ascertained the perceived effect of climate change on their farming business, identify farm management decisions of farmers for climate change adaptation in the study area. A total number of 120 farmers was randomly selected out of 1200 farmers for the study. Data were analyzed using descriptive statistical tools. The result showed that majority (82%) of the farmers obtained information on climate change from neighbours and friends. Result showed that the farmers are aware of climate change menace as seen in the high percentage response of 93% for temperature increase, unpredictable heavy rainfall (84%) among others. Most prominent effects of climate change are an excess or shortage of water ($\overline{X}$=2.87), and reduced quantity of planting, drought tolerant crops (88%), water storage and/or conservation (83%), and planting short-maturing crop variety (82%).

Keywords: Farm Management, Climate Change, Farmers, Adaptat

Introduction

The Intergovernmental Panel on Climate Change (IPCC) of the United Nations defines climate change (CC) as any change in climate over time, whether as a result of natural variability or human action. According to the IPCC, climate variability is the term used to describe variations in the average state and other statistical measurements of the climate (such as standard deviations and statistics of extremes) [1]. Because all natural change is essentially a reflection of variability on the appropriate time scale, CC itself becomes impossible to describe without formal distinctions being made between it and climatic variability [2]. CC and climate variability are not conveniently separated processes, but are instead closely coupled in the complicated evolution of the climate system.

Because domestic welfare in West Africa primarily depends on the primary sector of the economy, the impact of CC is anticipated to be extremely severe in that region [3]. The Sahara desert has grown into the Sahelian zone, for example, as a result of CC, which has been highly noticeable during the past few decades [4]. Since the end of the 1960s, there has been a decrease in yearly rainfall, with a 20–40% decrease documented between the decades of 1931–1960 and 1968–1990 [5,6]. Crop yields are anticipated to suffer, and there will be an increase in the frequency of extreme weather events (Collier). The projected reductions in yield could rise up to 50 % by2020, and net crop revenues could fall down to 90 % by 2100, with small-scale farmers being the most affected [7].

According to the IPCC, adaptation is the modification of natural or human systems in response to present or anticipated climatic stimuli or their effects, which mitigates harm or takes advantage of advantageous chances [1]. Farmers in Sub-Saharan Africa are fully aware of CC, notwithstanding the claim made by certain authors, that it is a difficult occurrence to detect. Due to their extensive farming expertise, subsistence farmers in particular are much more likely than other farmers to observe changes in the climate [8-10]. A fundamental prerequisite for adaptation is farmers' excellent

CC detection skills [10]. Nevertheless, few African farmers have taken any action to combat CC [11]. To overcome this gap in implementing adaptation strategies, it is essential to understand farmers behavior in their decision-making with regard to climate risks, in order to establish efficient and acceptable adaptation strategies for CC.

Smallholder farmers, in particular, require assistance and support to make wiser decisions in the face of climate change. Making better decisions can be aided by an awareness of why particular groups of people develop certain habits of behavior [12]. We can foresee behavioral trends and cognitive challenges with the aid of decision-making theories [13]. Although a portion of the research is focused on answering research questions, such as what are the causes and indicators of climate change regarding farmers' perceptions of climate change, farmers' perceptions of climate change uncertainties and beliefs regarding climate change and perceived agricultural risks the majority of the research is focused on understanding how farmers perceive climate change [14-16]. A small body of data shows how farmers choose their adaption strategies. However, this paper was intended to fill this gap by investigating not only explaining the smallholder farmers' adaptation to climate change but also determining farmers' adaptation decision making.

Objectives of the Study

The study examines the rural farm management decision for climate change adaptation among farm-families in Onitsha Agricultural Zone of Anambra State. Specifically, it;

i. ascertain the climate change awareness of the farmers

ii. ascertain the perceived effects of climate change on farming business

iii. identify the farm management decisions for climate change adaptation amongst the farmers

Methodology

The study was conducted in Onitsha Agricultural Zone of Anambra State, Nigeria. Anambra State has a total land area of 4,416 sq kilometers with an estimated population of 6,358,311 million people [17]. Anambra State has 21 local government areas (LGAs) and four agricultural zones (AZs) of Aguata, Awka, Anambra East, and Onitsha. This study was carried out in Onitsha Agricultural Zone of Anambra State, Nigeria. The zone is made up of 7 Local Government Areas (L.G.As) - Onitsha North and South L.G.As, Idemili North and South L.G.As, Ihiala L.G.A, Ekwusigo L.G.A and Ogbaru L.G.A. The Anambra River is the largest of all the tributaries of the Niger south of Lokoja, the confluence of Benue River with the Niger [18]. The temperature, are generally high, between 25 and 27 degrees Celsius, with maximum temperatures experienced in the December–March period and minimum temperatures in the June–September period. Annual rainfall averages about 1,850 millimetres (74 inches) per annum, which is reasonably high. Most of the rain falls between mid-March and mid–November; rain in the dry season is infrequent. Relative humidity is generally high throughout the year, between 70 percent and 80 percent [17]. The highest figures are experienced during the wet season and the lowest during the dry. The two main sources of data used for analysis in this study were; Primary and secondary data. The secondary data was to corroborate the research findings. Primary data were obtained from the field investigation while secondary data were obtained from textbook, internet, journals, information from library etc. A multi stage technique was used for the study. Firstly, is the purposive selection of Four Local Government out of seven. The second stage involves a random selection of 2 Communities from each of the local government areas. This gave rise to a total selection of 8 communities. Finally, the third stage involved the use of different farmer registers in the various communities to select 10% of the farmers randomly from each village for the study giving rise to total of 120 households. Descriptive Statistics such as mean, frequency distribution table and percentage were used to weigh the variables in objectives. Objectives 1, 2 and 3 were analyzed using percentages presented in tabular forms. Objective 3 which assesses the perceived effect of climate change on their farm business was achieved using a-4 point likert type rating of Strongly Agree = 4, Agree = 3, Disagree = 2 and Strongly Disagree = 1.

Mathematically, it is represented as follows:
The mean of the scaling for the 4-point Likert type scale computed thus:

$$X = \frac{SA+A+D+SD}{4} = \frac{4+3+2+1}{4} = 2.50$$

Decision Rule

Hence, a mean score $\bar{X}$>2.50 is adjudged OK.

Results and Discussion

Awareness of Climate Change

Table 1 shows the distribution of farmers in the study area according to their awareness of climate change. The result shows that 93.3% of the farmers are aware that increase in temperature is a sign of climate change, 84.1% are aware of unpredictable heavy rainfall, 75% increased drought or dryness is as a result of climate change, 85.% are aware that delayed rainfall is a sign of climate change, 65% are aware that heavy flooding/erosion exist, 56.6% are aware that soil degradation happen regularly, 58.3% are aware of reduced crop yields are as a result of climate change, 70.8% are aware of unexpected death of crops in the field due to climate change, 76.6% are aware of loss of harvest is also as evidence of climate change, 58.3% are aware that increased diseases/pest outbreak is a attributed to climate change and finally, 77.6% are aware that unpredictable heavy winds is a sign of climate change. Researches has proven that information has improved decision making, enhanced efficiency and provided a competitive edge to knowledge. Information has also been observed to be the most vital aspect of communication thus a vital aspect of knowledge. From the analysis above, we can deduce that a good percentage of the farmers in the study area are aware of climatic change and its signs thus improving their farm management decisions for climate change adaptation.

Awareness of climate change signs	Frequency	Percentage
Increase in temperature	112	93.3
Unpredictable heavy rainfall	101	84.1
Increased drought/dryness	90	75.0
Delayed rainfall	103	85.8
Heavy flooding/soil erosion	78	65.0
Soil degradation	68	56.6
Reduced crop yields	70	58.3
Unexpected death of crops in field	85	70.8
Loss of harvest	92	76.6
Increased diseases/pests outbreak	70	58.3
Unpredictable heavy winds	71	59.1

Table 2: Distribution of farmers according to their perceived effect of climate change

Effect of climate change	Strongly Agree		Agree		Disagree		Strongly disagree		Mean score
	F	P	F	P	F	P	F	P	
Decrease in crop yield	42	35	30	25	15	13	33	28	2.68
Loss of livestock	35	29	26	22	25	21	34	28	2.52
Damage to fisheries and forests	12	10	15	13	24	20	69	58	1.75
Either an excess or shortage of water	35	29	39	33	41	34	5	4	2.87
Increased evapo-transpiration,	28	23	26	22	51	43	15	13	2.56
Greater destruction of crops by pests	12	10	10	8	56	47	42	35	1.93
Greater threats to livestock health	25	21	45	38	32	27	18	15	2.64
Reduced quantity of agricultural yields	52	43	24	20	15	13	29	24	2.83
Greater need for cooling	42	35	69	58	25	21	14	11	2.74
Greater threat to wildfires	8	7	13	11	24	20	75	63	1.62
Reduced quality of agricultural yields	16	13	15	13	30	25	59	49	1.90

Table 1: Distribution of farmers according to awareness of climate change

Farmers Perceived Effect of Climate Change

Table 2 shows the distribution of farmers in the study area according to their perceived effect of climate change. The result shows that decrease in crop yield ($\bar{X}$=2.68), loss of livestock ($\bar{X}$=2.52), either excess or shortage of water ($\bar{X}$=2.87), increased evapo-transpiration, resulting in reduced soil moisture (land degradation and desertification) ($\bar{X}$=2.56), greater threats to livestock health ($\bar{X}$=2.64) and reduced quantity of agricultural yields ($\bar{X}$=2.83), were accepted (ranked high) to be the possible effect of climate change. While other factors like damage to fisheries and forests ($\bar{X}$=1.75), greater destruction of crops by pests ($\bar{X}$=1.93), greater need for cooling/refrigeration to maintain food quality and safety ($\bar{X}$=1.74), greater threat to wildfires ($\bar{X}$=1.62) and reduced quality of agricultural yields ($\bar{X}$ =1.90) were ranked low as the possible effect of climate change.

The effect of climate change on farm production has been noted by literatures. Some of the core effects identified in literatures are pest and disease infestation, lowered production, threatened health of crop and livestock and excessive dryness (Ureta et al., 2020).

Farm Management Decisions for Climate Change Adaptation

Decision making is the life wire of any agribusiness enterprise. The decisions are adaptation measures for farm and family survival. Table 3 showed the farm management decisions taken by the farmers. The result shows that 71% of the farmers undertook repairing and/or construction of terraces, 76% undertook tree planting, 49% repairing farm structures (house, stores, etc.), 51% planting of long-maturing/high-yielding crops, 74% increasing the use of manure and fertilizers, 74% double plantings within same season, 88% planting drought tolerant crops, 83% water storage and/or conservation, 54% food storage and/or conservation, 59% fodder conservation, 71% reduction in cutting of trees, 74% reduction of farm labour, 76% early planting, 82% planting of short-maturing crop variety, 83% Irrigation, 71% early land preparation, 64% early planting, 68% early planting with manure, 57% early procurement of seeds, 54% planting normal crop varieties, 65% crop diversification, 68% the repair of houses and other farm structures, 55%, the hiring of more farm labour, 62% planting of short-maturing crop varieties, and finally, 64% the preservation of fodder (Nappier grass).

From the above analysis, we observe that a good percentage of the farmers were able to make management decisions for climate change adaptation. This is as a result of the relevant regarding information climate change obtained from different sources by these farmers. During oral discussion with the farmers, it was revealed that decisions related to soil conservation such as repair and/or construction of terraces receives much attention. However,. other important decisions included selection of long-maturing crop varieties (hybrid maize varieties) and planting of trees, including fruit trees. The farmers indicated that they would do double planting if the rains were expected to be above normal. The practice involves planting two crops within the same season. The second crop, normally a shorter-maturing variety than the first, is planted just before the first one is harvested. The idea is to take maximum advantage of the excess soil moisture. Double planting is not very popular as the risk is quite high.

Conclusion

The respondents are aware that increase in temperature, unpredictable heavy rainfall, increased drought/dryness, delayed rainfall, heavy flooding/soil erosion (65%), unexpected death of crops in field, loss of harvest are signs of climate change. The perceived effects includes decrease in crop yield, loss of livestock, either an excess or shortage of water, increased evapo-transpiration, resulting in reduced soil moisture (land degradation and desertification) among others are the effect of climate change on agricultural productivity. Farm management decisions on climate change adaptation includes; repair and/or construction of terraces, planting of trees, planting of long-maturing/high-yielding crops, increased use of manure and fertilizers, planting drought tolerant crops, water storage and/or conservation among others.

Table 3: Distribution of farmers according to their farm management decisions

Farm management decisions	Frequency	Percentage
Repair and/or construction of terraces	85	70.8
Planting of trees	91	75.8
Repair of farm structures (house, stores, etc.)	110	91.6
Planting of long-maturing/high-yielding crops	61	50.8
Increased use of manure and fertilizers	89	74.1
Double plantings within same season	87	72.5
Planting drought tolerant crops	105	87.5
Water storage and/or conservation	99	82.5
Food storage and/or conservation	65	54.1
Fodder conservation	71	59.1
Reducing cutting of trees	85	70.8
Reducing farm labour	106	88.3
Planting early	91	75.8
Planting short-maturing crop variety	98	81.6
Irrigation	100	83.3
Early land preparation	85	70.8
Early planting	77	64.1
Early planting with manure	81	67.5
Early procurement of seeds	68	56.6
Plant normal crop varieties	65	54.1
Diversify crops	78	65.0
Repair houses and other farm structures	82	68.3
Hire more farm labour	66	55.0
Plant short-maturing crop varieties	74	62.6
Preserving fodder (Nappier grass)	74	65.0

References

1. IPCC (2007) Summary for policymakers. In: Parry ML, Canziani OF, Palutikof JP, van der Linden PJ, HansonCE (eds) Climate change 2007: impacts, adaptation and vulnerability. Contribution of working group II tothe fourth assessment report of the intergovernmental panel on climate change. Cambridge University Press, Cambridge 7– 22I.
2. Washington R, Harrison M, Conway D, et al. (2006) African climate change – taking the shorter route. B AmMeteorol Soc 87: 1355-1366.
3. Mendelsohn R, Dinar A, Dalfelt A (2000) Climate change impacts on African agriculture. World Bank,Washington DCMorgan DL (ed) (1997) Focus groups as qualitative research. In: Qualitative research methods series. Sage, London 16.
4. Wittig R, König K, Schmidt M, et al. (2007) A study of climate change and anthropogenic impacts in West Africa. Environ Sci Pollut Res 14: 182-189.
5. Nicholson SE (2000) The nature of rainfall variability over Africa on time scales of decades to millennia. GlobPlanet Chang 26: 137-158.
6. Chappell A, Agnew CT (2004) Modelling west African Sahel rainfall (1931 – 1990) as an artifact of changingstation networks. Int J Climatol 24: 547-554.
7. Boko M, Niang I, Nyong A, et al. (2007) In: Parry ML, Canziani OF, Palutikof JP, van der Linden PJ, HansonCE (eds) Climate change 2007: impacts, adaptation and vulnerability. Contribution of working group II to the fourth assessment report of the intergovernmental panel on climate change. Cambridge UniversityPress, Cambridge, 433-467.
8. Blennow K, Persson J (2009) Climate change: motivation for taking measure to adapt. Glob Environ Chang 19: 100-104.
9. Elke UW (2010) What shapes perceptions of climate change? WIREs Clim Chang 1: 332-342.
10. De Wit M (2006) Climate change and African agriculture. Policy Note No. 10. CEEPA, based on Maddison (2006). The perception of and adaptation to climate change in Africa. CEEPA Discussion Paper No.10,CEEPA, University of Pretoria, Pretoria.
11. Ringler C (2010) Climate change and hunger: Africa's smallholder farmers struggle to adapt. T h e agriculturaleconomics society and the European association of agricultural economists. EuroChoices 9: 16-21.
12. Fountas S, Wulfsohn D, Blackmore BS, Jacobsen HL, Pedersen SM (2006) A model of decision-making and information flows for information-intensive agriculture. Agricultural Systems 87: 192-210.
13. Suarez P (2005) Decision making for reducing vulnerability given new climate predictions: Case studies from metro Boston and rural Zimbabwe. Unpublished dissertation, College of Communication, Boston University, United States — Massachusetts.
14. Tesfahunegn GB, Mekonen K, Tekle A (2016) Farmers' perception on causes, indicators and determinants of climate change in northern Ethiopia: Implication for developing adaptation strategies. Applied Geography 73: 1-12.
15. Nguyen TPL, Seddaiu G, Virdis SGP, Tidore C, Pasqui M, Roggero PP (2016) Perceiving to learn or learning to perceive? Understanding farmers' perceptions and adaptation to climate uncertainties. Agricultural Systems, 143: 205-216.
16. Menapace L, Colson G, Raffaelli R (2015) Climate change beliefs and perceptions of agricultural risks: An applicationof the exchangeability method. Global Environmental Change 35: 70-81.
17. National Population Commission (2006) National Census Figure, 2006. National Population Commission, Abuja.
18. Iwuchukwu JC, Onyeme FN (2012) Awareness and perceptions of climate change among extension workers of Agricultural Development Programme (ADP) in Anambra State, Nigeria. Journal of Agricultural Extension, 16: 104-118.