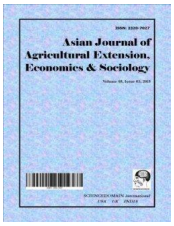

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Analysis of Cashew Farmers Adaptation to Climate Change in South-Western Nigeria

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Authors' contributions

This work was carried out in collaboration between all the authors. Author VIE designed the study, wrote the protocol and managed the logistics. Author MBL managed the literature searches and wrote the first draft of the manuscript. Author IO performed the statistical analysis. All authors read and approved the final manuscript.

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ABSTRACT

Aims: The study employed cross-sectional data obtained from Oyo and Osun state, South-western Nigeria, to explore cashew farmers' awareness and perception of climate change, as well as to ascertain the adaptation strategies they adopt to cope with the effects of climate change.
Methodology: Qualitative approaches were taken to obtain information needed to address each of the specific objectives. The responses were analysed descriptively and presented in the form of tables, bar and pie chart. Chi-square test of independence was employed to test the hypotheses.
Results: Survey results indicated that almost all the respondents were aware of climate change prior to the time this survey was conducted. Moreover, a large proportion of them claimed to have noticed that temperatures were warming, while precipitation was declining. They react to these changes in climate by adopting various climate-adaptive strategies, prominent among which are

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introduction of new cashew varieties and intercropping of cashew alongside other crops. The study further revealed that there was a significant relationship between farmers experience and adoption of at least a single adaptation strategy.
Conclusion: the survey results demonstrated that cashew farmers in the study area were aware of climate change, and they put in place adaptation measures to help them avert its negative consequences.

Keywords: Adaptation; awareness; cashew farmers; climate change; perception.

1. INTRODUCTION

It is no longer news that the climate is changing on a global scale, and to deny this glaring reality will be nothing short of wishing our problems away. If anything, such denial would only help accelerate the "race to the precipice." Climate change is one of the major challenges of the 21st century [1], affecting many sectors in the world. It is considered to be one of the most serious threats to sustainable development. Its effect is being felt in virtually every facet of human life, ranging from environment, human health, food security, economic activities, natural resources, education, regional and inter-regional conflict, to physical infrastructure [2,3]. As [4] puts it, "the impact of climate change challenges every corner of the 21st-century state."

The Agricultural sector being one of the most weather-dependent of all human activities is inherently climate-sensitive, thus, making the sector precariously vulnerable to climate change. [5] predicted that climate change will lead to decreasing crop yields in most tropical and sub-tropical regions, especially in West Africa, due to deviations in temperature and precipitation patterns. According to [6], such changing temperatures and rainfall are likely to shift populations of insect pests and other vectors and change the incidence of existing vector-borne diseases in both humans and crops. These, in effect, will have significant impact on the agricultural sector, with a probable resultant increase in the prevalence of famine in developing countries [7].

Changes in climate have been described as a new security threat for Africa. For instance, it has been projected that by 2020, about 250 million people in Africa could be exposed to greater risk of water stress [5] attributed to changes in climatic variables. This is likely to result in disruption of food and water resources that are critical for livelihoods, considering that much of the population, especially the rural poor, rely on local supply systems that are sensitive to climate variation. This will have devastating implications for development and livelihoods and is expected to add to the challenges climate change already pose to poverty eradication [8].

In a sense, agricultural production and food security in many African regions and countries have the highest likelihood to be severely compromised by climate change and variability [9], making the African continent likely to be hard hit by the ravages of climate change. However, given that the agricultural sector is the major source of livelihood for many people in African rural communities, especially the poor [10], it becomes necessary to protect the livelihoods of farmers in a bid to guarantee food security.

Nigeria is already experiencing a range of climate changes, in the form of more frequent heavy rainfall events, erratic and unpredictable onset/retreat of rain, frequent floods, drought and increasing ambient temperature. The impacts of these changes include increased infestation of crop by pests and diseases, depletion of household assets, increased rural-urban migration, increased biodiversity loss, depletion of wildlife, changes in the vegetation type, decline in forest resources, decline in soil moisture and nutrients, increased health risks and the spread of infectious diseases [11].

Consequently, there arise a need for supportive policies and framework to enhance climate change adaptation processes among farmers. This is very germane, considering that the agriculture sector is the mainstay of the Nigerian economy, which contributes over 40% of the gross domestic product (GDP), accounts for 5 percent of total export, provides 88 percent of non-oil earnings [12] and serves as the employer of labour for the bulk (70-80%) of the labour force [13].

The discourse on impacts of climate change and variability on agriculture is often associated with adaptation and coping mechanisms. Given that efforts to mitigate the sources of climate change

and enhance the sinks of greenhouse gases seem farfetched, adaptation is most critical and of key concern in developing countries. Particularly, in Africa where vulnerability is high because the ability to adapt is low [14], a keen consideration of adaptation is necessary. Although even if efforts to reduce greenhouse gas emissions are successful, some degree of global warming and climate change is inevitable [15]. [4] posited that the politics of adaptation is imperative given that the effects of climate change are already with us and are likely to deepen even if emissions across the world decline, as greenhouse gases going into the atmosphere mostly stay there for a long period. This makes adaptation one of the plausible ways in ameliorating the long-term influence of climate change and variability.

Although adaptation might not be the holy grail of climate change solution, in the interim, it helps farmers achieve their food, income and livelihood security objectives [16]. Moreover, international efforts at finding solutions to climate change have recognized the role of adaptation as a policy option [17]. [18] evinced that adaptation occurs in different forms, these include anticipatory and reactive; private and public; autonomous or spontaneous and planned adaptations. It also varies spatially, among individuals and groups, and also over time depending on the available resources [19].

[20] defined adaptation as the process by which farmers alleviate the adverse impacts of climate on their livelihoods. This is based mainly on indigenous knowledge which embodies a wide variety of skills developed outside the formal education system. It arises out of continuous experimentation, innovation and adaptation, blending many knowledge systems to solve local problems. It may also involve modifications in lifestyle and economic structure in order to reduce the vulnerability of a system to climate change and variability [21], by increasing the capacity of a system to survive external shocks or change [22].

Leveraging on the aforementioned definition, adaptation is viewed in the context of this study as an activity or assortment of activities practiced by cashew farmers in the study area (South-western Nigeria), with the sole aim of utilising such activity(s) as a means of ameliorating the impacts of climate change and by so doing reduce the resultant production risk confronting them (cashew farmers); at the same time, capitalising on new opportunities (if any) brought about by changed climate.

Empirical studies on the impacts of climate change on agriculture in Africa [14,23,13,24,25] has shown that such impacts can be significantly reduced through adaptation and attenuation. However, it is noteworthy that up until now, most of the aforementioned studies lump all crops into one category and all livestock together into another. Evidentially, empirical literature [14,25] has revealed that different crop types and different animal species are affected differently by climate change. As such, disaggregated analyses is very germane, considering that farm-level adaptation is a factor of local circumstances (knowledge, attitudes, practices and belief systems of farmers) and the specifics of the agricultural options practiced (in this case cashew).

Analysing adaptation is therefore important in gaining a better understanding of how cashew farmers in Osun and Oyo state have been able to adapt to the debilitating effects of climate change. This is essential in bolstering the coping strategies of local cashew farmers through better targeting of appropriate public policy and future developmental projects which can help increase the adoption of adaptation measures as a tool for managing the negative consequences associated with changes in climate. Moreover, formulating policies that can help guarantee food security requires adequate insight into farmers' perception of climate change and the resultant adaptation strategies adopted [10]. On the other hand, such perception is fundamentally shaped by experiential and or indigenous knowledge of the climate as well as the impacts of climate change observed over a period of time [25].

This study will further contribute to the wealth of existing information on climate change and mitigation strategies in Nigeria and the African continent at large, by providing current data-based evidence on cashew farmers perception of climate change, as well as the strategies (if any) that they have adopted to cope with the effects of changing climate. Specifically, this study seeks to:

i. Explore cashew farmers' awareness of climate change and sources of awareness,
ii. Examine cashew farmers' perception of climate change,
iii. Ascertain the coping strategies adopted by cashew farmers in the study area.

2. METHODOLOGY

2.1 Sampling Technique and Sample Size

Data for this study was obtained from two South-western States (Osun and Oyo State) in Nigeria, from which Ejigbo local government and Ogo-oluwa local government were selected respectively. Furthermore, three villages (Ife-Odan, Ola-luwa & Ikonifin) were purposively selected from Ejigbo local government, while two villages (Lagbedu-Orile & Ajaawa) were selected from Ogo-oluwa local government.

A multi-stage sampling technique was employed, to arrive at the individual respondents. The first stage involves the purposive selection of Ife-Odan, Ola-luwa & Ikonifin villages from Ejigbo LGA, as well as Lagbedu-Orile and Ajaawa villages from Ogo-Oluwa LGA. The study local governments and the five villages were selected because they are farming communities with vast expanse of cashew plantations, thereby providing an ample number of respondents for the survey. However, the study was restricted to two local government areas owing to resource and time constraint.

Due to lack of a suitable sampling frame which will enable the use of simple random sampling, systematic sampling technique (skip No=3) was employed in the second stage to select the individual cashew farmers from the respective villages. Semi-structured interview was undertaken with a total of 120 cashew farmers through the months of September 2016 to February 2017.

An interview was used as the research instrument of choice, because a direct face-to-face interview provides an avenue for one-on-one interaction with the cashew farmers, thereby leveraging an opportunity to explain questions to respondents with low literacy level. However, 16 interview schedules were dropped due to vague and inconsistent responses, cutting down the number of interview schedule used for analysis to 104.

2.2 Methods of Data Analysis

To explore cashew farmers' awareness of climate change and sources of awareness, a qualitative approach was taken. From interviews with the cashew farmers, it was established whether a particular farmer has prior awareness of climate change or not. If a farmer answered in the affirmative, a follow up question is asked to ascertain how he or she got to know about climate change. Responses obtained are then presented in the form of a bar and pie chart.

To examine cashew farmers' perception of climate change, a two-way question format comprising Agree/Disagree was adopted. This objective was achieved by reviewing empirical literature to identify climate variables. The identified variables (decrease in annual rainfall, increase in annual rainfall, early onset of rainy season, late onset of rainy season, early termination of rainy season, late termination of rainy season, unpredictable rainfall, high temperature, low temperature, long and sharp harmattan, short and less vigorous harmattan) were pre-tested before being presented to the respondents to indicate their agreement or disagreement with the defining statements. The data obtained were analysed using frequency counts and percentages.

The adaptation strategies adopted by cashew farmers in the study area was ascertained using a multi-choice response format. A multi-choice response format was used because it has been observed that the main practices actually followed by farmers are mostly taken in combination with other measures and not alone. To that end, a number of adaptation strategies garnered from empirical literatures (mulching, improved irrigation, soil erosion prevention measures, integrated pest management, selection of appropriate varieties to cultivate, use of fertilizer, use of manure, intercropping, regular weeding) were presented to the respondents to select the strategy(s) that they practice in order to adapt to climate change. In addition an open ended provision was made so as to take care of any adaptation strategy(s) practiced by cashew farmers in Oyo and Osun State but not explicitly captured in the provided options. This is of particular significance because it will lead to discovery of adaptation strategies (if any) that are unique to the crop in question or to the study area. The responses were then analysed to estimate the frequencies and percentages.

A number of hypotheses were specified for the study. The essence of the hypotheses is to test for dependence between cashew farmers' adoption of at least one adaptation strategy and a number of independent socio-economic variables. Towards that end, dependence between cashew farmers' adoption of at least one adaptation strategy and socio-economic

variables including *gender, farm size, age, experience* and *household size* was evaluated. Chi-square (X^2) goodness of fit test was applied to test the significance of hypotheses in relation to the aforementioned variables.

3. RESULTS AND DISCUSSION

3.1 Socio-economic Characteristics of Sampled Farmers

Table 1 illustrates that Majority of the respondents were males (78.8%), and of active age (60.6%), ranging from 25-50 years. Secondary school dominates as the highest level of education attained by the respondents (33.7%), whereas 20.2% of the respondents had no formal education. It is also evident from Table 1 that majority of the respondents (81.7%) were married, with a household size of 5-10 persons (73.1%). About 37.5% of the respondents had farm holdings ranging in size from one to five hectares. Just about half (55.8%) of the respondents have been in the business of cashew farming for a time period ranging from 1-10 years.

Table 1. Socio-economic characteristics of sampled farmers

Socio-economic characteristics	Frequency	Percentage
Gender (categorical)		
Male	82	78.8
Female	22	21.2
Total	104	100
Age (Years)		
<25	7	6.7
25-50	63	60.6
>50	34	32.7
Total	104	100
Mean	44	
Educational Status (Categorical)		
Primary	28	26.9
Secondary	35	33.7
Higher Education	20	19.2
None	21	20.2
Total	104	100
Marital Status (Categorical)		
Married	85	81.7
Single	19	18.3
Total	104	100
Household Size (Integers)		
<5	12	11.5
5-10	76	73.1
>10	16	15.4
Total	104	100
Mean	08	
Land Size (Hectres)		
<1	18	17.3
1-5	39	37.5
6-10	25	24.0
10-15	7	6.7
>15	15	14.4
Total	104	100
Mean	05	
Experience (years)		
1-10	58	55.8
11-20	31	29.8
>20	15	14.4
Total	104	100
Mean	10	

3.2 Farmers Awareness of Climate Change and Source of Awareness

The result of analysis depicted in Fig. 1 shows that a large proportion (96.2%) of the respondents were aware that there has been a change in climate over time. However, it is worthy of mention that just about all the respondents who have noticed such variations in climate did not know it in that coinage "climate change." But, they could give a passive description of it based on their assessment of increases in temperature and changes in the duration and timing of rainfall. This finding is in line with results of a study [13] which indicated that majority (97%) of the respondents observed climate change in one form or the other. Although contrary to our findings, in a study of climate change implications on smallholder farmers in Ghana, distribution of responses showed that majority of the respondents (72%) had no idea of climate change [26].

Unsurprisingly, Fig. 2 demonstrates that majority of the respondent (86%) got to be aware of climate change through their personal observation of changes in certain climate variables (notably temperature and rainfall) over time. Perhaps, this is an indication of the lack of technical support, as well as knowledge transfer between institutions and the populace. This implies that not much is being done to ensure feedback of research findings into the policy communities, thereby neglecting available windows that would have provide ample opportunities for information dissemination. The disconnect between farming communities and institutions have grave consequences, considering that institutions, to a large extent, retain the capacity to both constrain and enable adaptation. Therefore lack of involvement of knowledge-based institutions, as the case may be, hampers information flow, thereby closing options for adaptation. Moreover, viewing adaptation from the vantage point of learning buttresses the significance of institutional modification as valid adaptive strategies [27]. In that sense, questioning of institutional practices is an important aspect of the transformative social, economic, and environmental responses that can facilitate climate change reduction and adaptation [29].

In addition, friends/family, as well as news media prove to be an important source of information for other respondents, accounting for 5% and 9% respectively. This finding is supported by results reported by [13], in which personal experience (37.1%) and radio (32.9%) were the most important sources of awareness of climate change to the respondents. However, [25] reported that farmers in three selected provinces of South Africa mostly got to know about climate change issues through various news media.

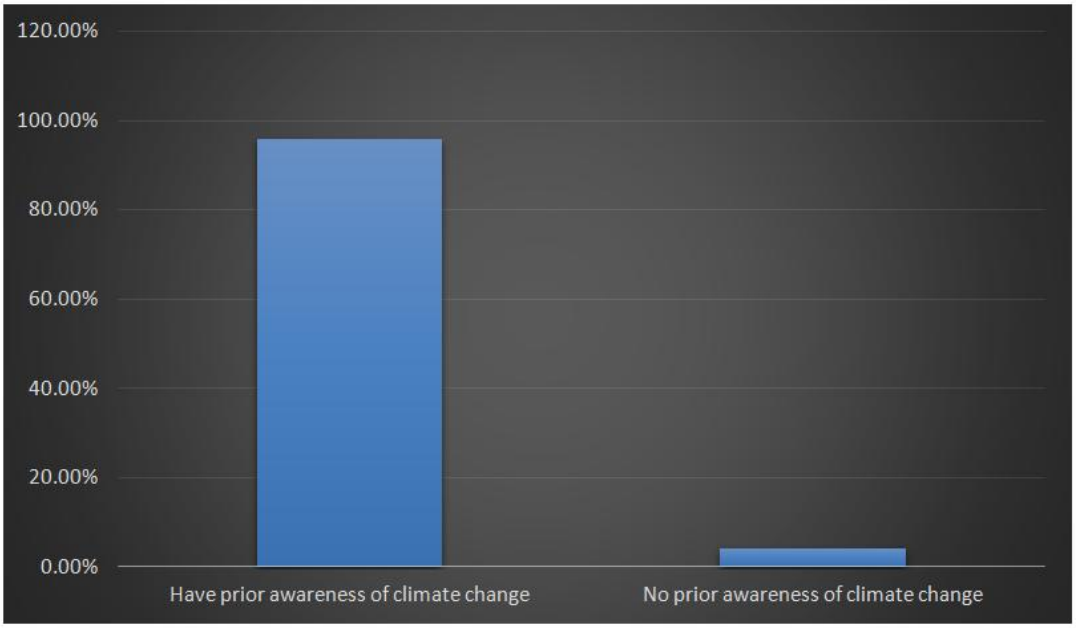

Fig. 1. Farmers' awareness of climate change

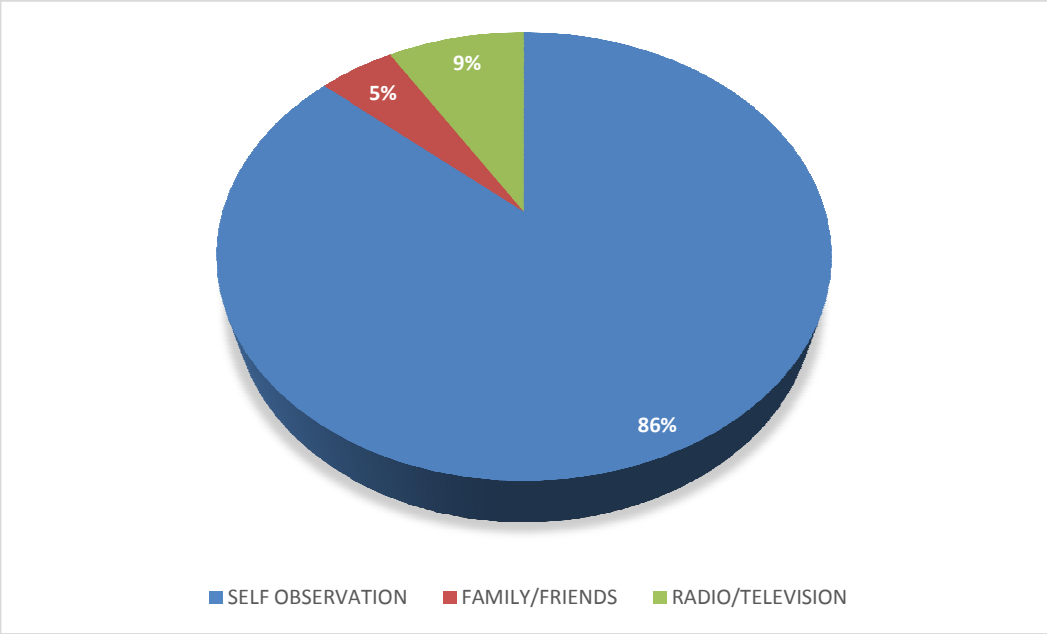

Fig. 2. Source of awareness

3.3 Farmers Perception of Climate Change

Table 2 shows that a vast majority of the farmers (82.7%) perceived that precipitation has declined, while 4.8% were of the notion that there had been an increase in the duration of annual rainfall. Rainfall has also been noted to be unpredictable in terms of its onset (54.8%) and unusual dry spells (53.8%) during the rainy season. Conversely, [11] from their study of smallholder farmers' perception of climate change in the upper and lower Niger River basin areas of Nigeria, showed that majority of the respondents (50.5%) perceived that rainy days with heavy rainfall were increasing. On the other hand, survey participants (76.6%) also claimed to have experienced dry spells during the raining season, as well as (69.2%) experiencing unpredictable and unreliable onset and retreat of rains and shrinking of the growing season. Similarly, report of increase in the amount and intensity of precipitation over a period of ten years was also reported by a cross section of farmers' from six agro-ecological zones of Uganda [23].

However, in a study that utilises cross-sectional data obtained from over 8000 farms across 11 African countries, [14] analysed determinants of farm-level climate adaptation measures in Africa; study results indicated that half of the survey respondents perceived that precipitation has declined. Also one third believe there were pronounced changes in the timing of the rains, and one sixth think droughts are more frequent. The aforementioned perception of the study participants regarding annual rainfall is further consolidated by many other related empirical studies across Africa; South Africa [10], Tanzania [28], Ethiopia [22] and Ghana [24].

Furthermore, a significant proportion of the study participants (73.1%) perceived that temperatures have been increasing over the tracking period of ten years and above, as indicated in Table 2. This perceived temperature increase is in agreement with the believe of a significant proportion (70%) of respondents in a study conducted in the upper and lower Niger River basin areas of Nigeria [11]. There is also a commonality of finding with the survey of [24], in which most farmers (89.5%) interviewed perceived that temperature has increased over the past 30 years in the Vea catchment of Ghana. In a similar vein, across three different provinces in South Africa, 77.3% of potato farmers and 66.7% of cabbage farmers claim to have suffered from high/extreme temperature [25]. In essence, the perception of the study participants regarding temperature resonates with the perception of respondents in many other studies across Africa [14,27,23].

It is worthy of note that this study comes short, in the sense that we were not able to employ actual

weather information from meteorological station in the study area, as regards rainfall and temperature, in order to complement the survey responses obtained from the cashew farmers. This is of utmost significance given that it is not unprecedented [25] for results of perception analysis to contrast with results analysed from actual weather data of the study area. To that end, this comes across as a gap that future research can harness.

3.4 Coping Strategies Adopted by Cashew Farmers

Results of the adaptation strategies adopted by cashew farmers in the study are presented in Table 3. The adaptation strategies practiced by cashew farmers in the study area in order to cope with the deleterious effects of climate change were: Conserving moisture using mulch, introduction of improved seed variety, diversification by growing a variety of crops on the same plantation, maintaining more than one cashew plantation and to a lesser degree, the introduction of irrigation techniques. It is worthy of note that, these adaptation strategies are not mutually exclusive, as such, they are mostly adopted in combination and not necessarily alone. According to [29] considering multiple types of adaptation strategy reduces the probability that climate change mitigation measures targeted at one type of hazard will increase exposure and vulnerability from other hazards, both in the present, intermediate term and the foreseeable future.

Introduction of new cashew variety stands out as the most common adaptation practice of cashew farmers in the study area. The large extant of adoption of these measures as an adaptation strategy may be attributed to the fact that climate change does not affect farmers in isolation, it, therefore, implies that the farmers collectively face similar challenges and would likewise adopt similar response measures. Above 73% of the respondent introduced new varieties, which are basically high yielding and mature within a relatively short period of time. By the same token, [25] revealed that cabbage farmers in South Africa planted drought-tolerant varieties as an adaptation strategy. In a similar vein, in a study involving 1800 farming households in South Africa and Ethiopia, planting of different crops and crops varieties were amongst the commonly adopted adaptation strategies by farmers [10]. Yet still, introduction of new varieties which are often early-maturing, high-yielding and/or drought-tolerant has proven to be a common adaptation strategy by myriads of farmers across various parts of Africa, as in Ethiopia [22], Uganda [23], Ghana [25] and Nigeria [11].

Table 4 further depicts that cashew farmers (35.6%) in the study area intercrop cashew with other crops, basically yam and cassava, at early stage of cashew plantation. This strategy serves as a safety net for the cashew farmers by minimizing risks of total crop failure due to climate change. In a study covering two agro-ecological zones of Nigeria, the adoption of multiple cropping practice was the most important strategy used to alleviate the effects of climate change by both female and male respondents [13]. Our study result is also consistent with findings by [25], which indicated that potato farmers in South Africa laid more emphasis on the planting of different crops as a strategy to mitigate the impact of climate variability. Furthermore, using a mix of crop types as an adaptation strategy was also report by other studies [27,24,11].

Just about half of the respondents (49%) indicated that they maintained more than a single cashew plantation. The farm holdings were usually far apart from one another. The rationale behind such practice is to take advantage of localized variations in rainfall distribution, and by so doing safeguard against total crop loss. This same practice has been shown to be adopted by small holder farmers in the upper and lower Niger River basin areas of Nigeria [11].

Also Cashew farmers adopted other climate-smart agricultural practices such as conserving moisture using mulch (11.5%) and use of irrigation (2.9%). Adoption of similar adaptation strategies was reported by various studies conducted in different parts of Africa [24,11].

3.5 Relationships between Adoption of Adaptation Strategy and Some Socio-economic Variables

Table 4 presents the estimated chi-square values, degree of freedom and the corresponding P-levels from the chi-square test of independence. The results show that most of the explanatory variables are not statistically significant at conventional levels. (1%, 5% or 10%). with the exception of number of years a particular farmer has been producing cashew (*experience*), which was statistically different from zero at P= 0.10.

Table 2. Farmers' perception of climate change

Defining Phrase	Response	Percentage
Decrease in annual rainfall	Yes	82.7
	No	17.3
Increase in annual rainfall	Yes	4.8
	No	95.2
Early onset of rainfall	Yes	9.6
	No	90.4
Late onset of rainfall	Yes	54.8
	No	45.2
Dry spells in the rainy season	Yes	53.8
	No	46.2
Increase in temperature	Yes	73.1
	No	26.9
Decrease in temperature	Yes	3.8
	No	96.2
Long and sharp harmattan	Yes	26.9
	No	73.1
Short and less vigorous harmattan	Yes	50
	No	50

Table 3. Coping strategies adopted by cashew farmers

Coping strategy	Percentage
Conserving moisture using mulch	11.5
Multiple Cashew plantation	49
Introduction of new cashew variety	73.1
Irrigation Farming	2.9
Intercropping of cashew	35.6

Note: Total is more than 100 because of multiple responses. n=104

Table 4. Chi-square test of independence

Variable	Chi-square value	Degree of freedom	P. Value
Age	3.930	2	.140
Experience	5.112	2	.078*
Household size	0.17	2	.992
Farm size	1.062	2	.588

The results revealed that there is a significant relationship between *experience* of cashew farmer and adoption of at least a single adaptation strategy. This implies that more experienced farmers are more likely to adopt at least a single coping strategy than the less experienced. Perhaps this might be because to a certain extent experience is usually associated with better knowledge and information on climate change and by extension better knowledge and information on agronomic practices that cashew farmers can employ to adapt to changes in climate. In another study, experience was found to have a positive and significant relationship with farmers' perception of climate change in north-central Nigeria [13]. In a similar vein, [14] in their studies of farmers' adaptation to climate change in Africa also found experience to be a significant determinant of farmers' adoption of adaptation strategy. By the same token, a study authored by [30] employed multivariate probit model to analyse the determinants of farm level adaptation measures to climate change in southern Africa; result of the analysis revealed that experience increases the probability of uptake of several adaptation options.

On the other hand, result of the study indicates that *age, gender, household size* and *farm size* had no significant influence on cashew farmers' adoption of adaptation strategy. Therefore, aside experience, farmers' choice of whether to adopt at least a

single adaption measure or not, may have been influenced by other numerous factors not captured in this survey.

4. CONCLUSION

This study revealed that cashew farmers in the study area are fairly aware of climate change. Although they do not know of it in the coinage "climate change" they could give a passive description of it based on their assessment of increases in temperature and changes in the duration, intensity, and timing of rainfall. Patently, farmers' awareness of climate change, bulk of which is acquired through self-observation, and to a small extent via news media, as well as friends/family could be relevant in their plans towards adopting adaptation strategies. Furthermore, the study participants alleged that as a result of the perceived variations in climate, there has been a deterioration in the quality of fresh cashew fruit harvested and subsequent decline in crop yield. This implies that cashew farmers in the study area have fair knowledge of the impacts of climate variables, basically temperature and rainfall, on their crop. However, as these farmers interact with their local environment over time, they tend to apply the knowledge they have garnered in combination with locally available resources to bring about agricultural practices such as intercropping, planting of improved cashew variety, keeping multiple cashew plantations, conserving moisture using mulch and irrigation as mechanisms for curbing the effects of climate change and adapting to the changing weather patterns. The study results go to show that cashew farmers in the study area do not accept changes in climate as an indictment on their livelihood, rather majority of them plant different varieties of cashew as an adaptation option. This is an indication that cashew farmers in the study area see this option as an effective measure to ameliorate the uncertainty occasioned by climate change.

5. RECOMMENDATION

Although cashew farmers in the study area adopt a number of adaptation strategies in order to build up resilience and ameliorate the distress caused by the change in climate, their effort is not sufficient. Therefore, there is a genuine need for their efforts to be complemented by adjusting strategies to meet evolving trends and guarantee their sustainability.

First and foremost, there arise a need for urgent attention to be taken by public agencies, private service providers, farmer groups, non-governmental organizations, opinion leaders, community legitimisers and all stakeholders to sensitize the rural public on climate change. This can be achieved through provision of technical assistance in the form of real time weather forecast information, especially regarding rainfall patterns and temperature. This will enable farmers to fully exploit seasonal rainfall distribution to improve and stabilize crop yields, by responding effectively to the impacts of climate change. Towards that end, it makes economic and environmental sense to leverage on already available extension structure as a means of information dissemination. However, these agricultural extension officers should be given the needed training to equip them with knowledge about climate change and other related matters. In addition, to complement the efforts of extension agents, local frequency modulation (FM) radio stations should be used as a conduit to further equip cashew farmers with technical information using the local language (Yoruba). Use of local language will help cashew farmers to better understand the information relayed to them and as a result they are likely to modify their farming activities accordingly.

Secondly, as a proactive approach, there arise a need for accelerated access to improved variety of cashew seeds (at subsidized rates) which are tolerant to drought, and other extreme weather conditions.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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