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CLIMATE CHANGE AND ADAPTATION STRATEGIES: FARMERS PERCEPTION IN OYO STATE, NIGERIA

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ABSTRACT

Climate change and weather variations have been one of the major problems of agricultural productivity most especially among crop farmers in Nigeria. This study therefore assesses farmer's perception and their adaptation strategies to climate change in Ogo-Oluwa local Government area of Oyo State Nigeria. The survey research design was adopted in selecting 113 respondents, while the instrument of data collection was a structured questionnaire. The data collection was analyzed using both descriptive and inferential statistics. Results showed that the majority (65.5%) of the respondents were males while about 69% of them are between the ages of 31 to 50 years old, majorities (76.0%) of the respondents were married and average household size was 6.0 persons, family labour was the major source of labour for the respondents, 57.5 per cent and 32.7 per cent of the respondents had farm size of 3- 4 acres and above 4 acres respectively. It also shows that majority (51.3%) earned less than N10, 000 per month while 20.4 % and 21.2 % earns between N10, 000 - N20, 000 and N21, 000- N30, 000 per month respectively. The study reveals that 39.8% of the farmers had long years of farming experiences between 21-30 years. The study also reveals that the majority (81.0%) of the respondents are aware of the changing climatic conditions in their community. Educational qualification of respondents, farmers income, farming experiences and access to extension services are positively and significantly influenced farmer's perception of climate change in the study area. Majority of the farmers have adapted to climate change through diversification of crop types and varieties, changing planting dates among others also constraints to adaptation of climate change include lack of access to weather forecast information, high cost of improved and resistant varieties, and inadequate knowledge of coping strategies. The study therefore recommends among others a deliberate policy of government to increase farmer's access to weather forecast information in the study area.

1. INTRODUCTION

Agriculture constitutes the principal livelihood of 70 per cent of the world's poor and is the primary means of their food security. The poor, who depend on agriculture for sustenance and livelihoods is currently faced with the challenges of changing climatic conditions. Climate change is a long − term change in the statistical distribution of weather pattern over a periods of time that range from decades to millions of years. It may be a change in the average weather conditions or a change in the distribution of weather events, for example, greater or fewer extreme weather events. Climate change may be limited to a specific region or may occur across the whole earth [1]. Recent

evidence indicates that the world has already warmed by 0.8⁰C since the pre-industrial era [2]. Climate change is now one of the most significant challenges facing human society in the 21st century and constitutes serious threat to sustainable development [3]. Several studies [3, 4] have demonstrated that climate change is a reality and a primary environmental threat to sustainable development. Addressing these challenges posed by climate change is now one of the development priorities of many nations of the world.

Climate change refers to any change in climate overtime, whether due to natural variability or as a result of human activity [5]. It can also be seen as: "a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods. Climate change has become a global issue in recent times manifesting in variations of different climate parameters including cloud cover, precipitation, temperature ranges, sea levels and vapour pressure [6]. The variations in climate parameters affect different sectors of the economy such as health, water resources, energy as well as agriculture. Agricultural sector is one of the most affected especially in developing countries such as Nigeria. Agriculture is one of the most important sectors of the economy; it provides food and livelihood security to most of the population and plays an important role in national security and development. However, in Nigeria and Oyo state to be specific, agricultural production has declined very significantly over the past few decades.

Adaptation helps farmers achieve their food, income and livelihood security objectives in the face of changing climatic and socioeconomic conditions, including climate variability, extreme weather conditions such as droughts and floods, and volatile short-term changes in local and large-scale markets [7]. Farmers can reduce the potential damage by making tactical responses to these changes. Analyzing adaptation is therefore important for finding ways to help farmers adapt in the rural economies of Nigeria [8]. The local farmers in this area are experiencing climate change even though they have not considered its deeper implications .This is evidenced in the late arrival of rain, the drying-up of stream and Small Rivers that usually flows year round. It has been observed that the perception of the local farmers, the way they think and behave in relation to climate change, as well as their values and aspirations have a significant role to play in addressing climate change. The need to fill these gaps is the reason for this study. Therefore the following research objectives are to:

examine the socio-economic characteristics of cassava farmers in the study area

analyse the perceptions of local farmers on climate change in the study area

determine the socio economic factor influences farmer's perception of climate change

examine the major impacts of changing climate on cassava production in local people's view

examine the farmer's adaptation to climate change and their constraints to adaptation in the study

2. RESEARCH METHODOLOGY

The study was carried out in Ogo-Oluwa Local Government Area of Oyo State. Its headquarters is in the town of Ajaawa, it has an area of 369 km² and a population of 65,184 at the 2006 census [9]. It is located between the longitude of 3'51.18' and 3'58.9' East of Greenwich meridian and the Latitude 7'30.3' and 7'40.2' North of the equator with rainfall between 1500 and 2000 mm and temperature between 23'C and 27'C Isotherms in January. It is situated at 233.2 meters above sea level and the general elevation is between 178m and 220m above sea level. The vegetation of the zone is derived savannah. The climatic and soil conditions of the study area favour the extensive production of food crops like cassava, yam, maize, pepper and tomatoes, to mention few. Ogo-Oluwa local government area is an extension block of the Oyo State Agricultural Development Programme (OYSADEP). The study area is located in North East of Oyo state, fall in the forest zone of the state and bordered in the south by Atiba Local government, in the North by Ogbomoso South Local Government, in the South West by Orire Local Government all in Oyo State while bordered in South East by Osun State. Multistage sampling technique was used for the study utilizing the extension cells. The study area is made up of one extension block that consist of eight (8)

extension cells, five cells was randomly selected for the study, in each of the selected cell three villages were randomly selected making 15 villages, 8 cassava farmers were randomly selected for the purpose of questionnaire administration. In all, 120 cassava farmers were interviewed but only 113 were used.

3. DATA ANALYSIS

Both descriptive and inferential statistics were employed in the analysis of the data collected. Descriptive statistics namely, frequency tables, mean, percentages, pie and bar charts were used to present information sought by the study. The inferential statistics used in the study was logit model. This was used to test the hypotheses of the study. Both the descriptive and inferential statistics were performed by the use of Statistical Packages of the Social Sciences (SPSS).   `

3.1. Model Specification

$Y = f(X)$

$Y = b_o + X_1 + X_2 + X_3 + X_4 + X_5 \ldots\ldots\ldots\ldots\ldots\ldots + X_{11}$

Where, Y = Farmer's Perception

X_1 = Sex

X_2 = Age

X_3 = Size

X_4 = Household status

X_5 = Education

X_6 = Source of Labour

X_7 = Income

X_8 = Farm size

X_9 = Source of land

X_{10} = Farming Experience

X_{11} = Access to Extension

b_o = Constant

4. RESULTS AND DISCUSSION

4.1. Socio-Economic Characteristics of the Respondents

The socio-economic characteristics of the respondents examined include sex, sources of Labour, household size, education qualification, farm size, and sources of land. Table 1, indicates that the majority (65.5%) of the respondents were males while 69 per cent of them are between the ages of 31 to 50 years old, 20.4 per cent of them are between 51-60 years of age while only 10.6 per cent of them are between 21 and 30 years old. The low proportion of the respondents within this category is attributed to the design of the study which emphasized on only household heads as the respondents for the study. Generally, the average age of the respondents was 46 years implies that majority (76.0%) of the respondents were married and average household size was 6.0 persons implies that the household are fairly large, 45.1 per cent of the respondents had a household sizes of 4-6 and 16.8 per cent of them had a household sizes of 10-12 persons. With respect to education, the respondents can be described as a fairly literate population. About 44.2 per cent of the respondents had primary education while 27.4 per cent of them had secondary education qualification. Also, 15.8 per cent of the respondents had tertiary education qualification while only 12.4 per cent of them had no formal educational qualification. labour was the main source of labour for the respondents as indicated by over 57 per cent of the respondents. It also showed that 32.7 per cent of the respondents had a farm size of 3-4 acres and above 4 acres respectively. Only 14.2 per cent if the respondents had less than 1 acre as their farm size. In addition, it indicates that there are two main sources of land including

inherited and communal land as indicated by 42.5 per cent and 43.3 per cent respectively. Only 14.2 per cent of the respondents rented their land for farming practices in the study.

Table-1. Socio-Economic Characteristics of the Respondents

Variables	(N=113) No. of Respondents	Percentage
Sex:	74	65.5
Male	39	34.5
Female		
Age in Years:		
21-30	12	10.6
31-40	33	29.2
41-50	45	39.8
51-60	23	20.4
Household Size		
1-3	3	2.7
4.6	51	45.1
7-9	40	35.4
10-12	19	16.8
Education Qualification of Respondents:		
Primary	50	44.2
Secondary	31	27.4
Tertiary	18	15.8
No formal education	14	12.4
Sources of Labour:		
Family labour	65	57.5
Hired Labour	48	42.5
Farm Size:		
Less than 1 Acres	16	14.2
1-2 Acres	23	20.4
3-4 Acres	37	32.7
Above 4 Acres	37	32.7
Sources of Land:		
Inherited	48	42.5
Communal	49	43.3
Rent	16	14.2

Source: Field survey, 2016

Figure 1 on the other hand, showed the income levels of the respondents and it reveals that the majority (51.3%) earned less than ₦10, 000 per month while 20.4 per cent and 21.2 per cent earns between ₦10, 000- ₦20, 000 Naira and ₦21, 000- ₦30, 000 per month respectively.
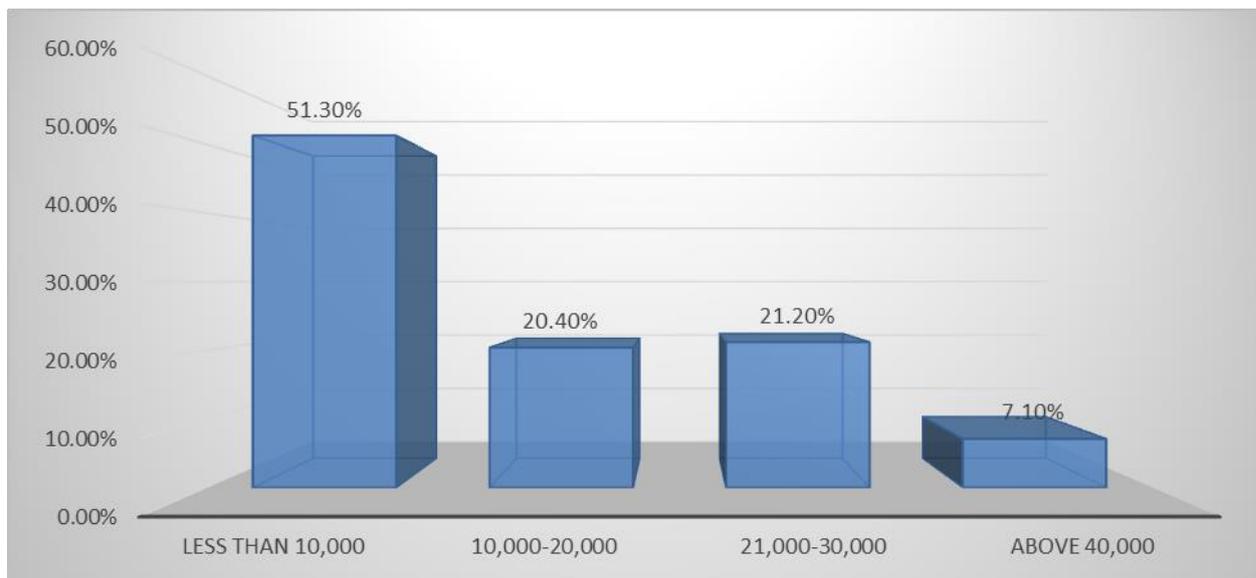
Figure-1. Income of the Respondents per Month

Source: Field survey, 2016

Figure 2 indicates that the farmers have long years of farming experiences. It shows that 39.8 per cent of the respondents had a farming experience of 21-30 years while it also shows that 21.2 per cent had a farming experience of 31-40 years. However, only 7.1 per cent of the respondents had a farming experience of above 40 years.
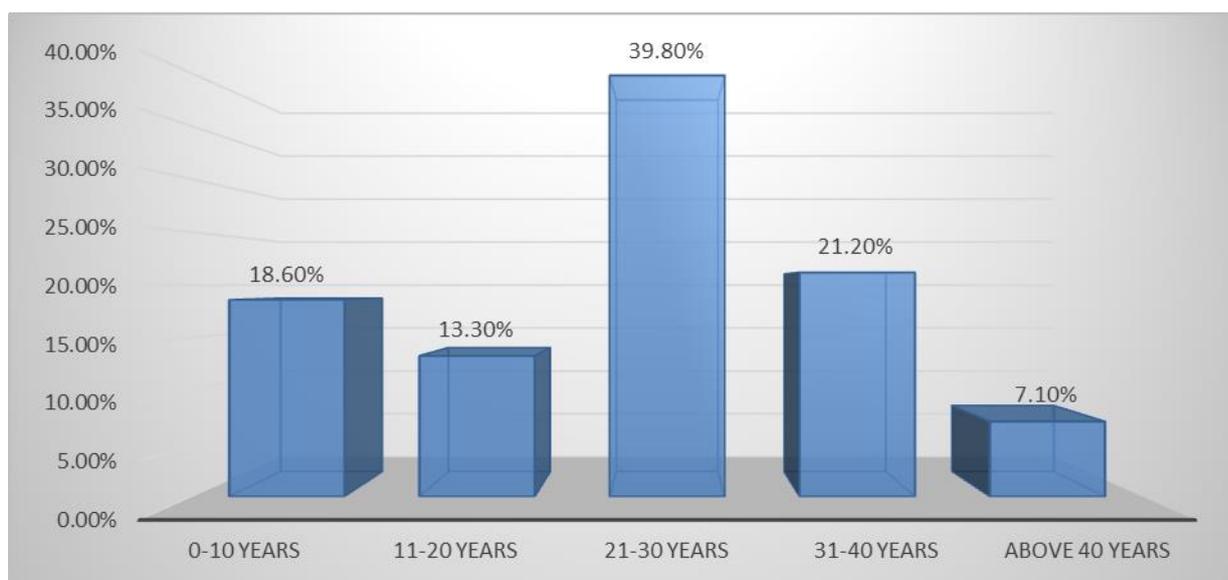

Figure-2. Farming Experiences of the Respondents (Years)

Source: Field survey, 2016

4.2. Perception of Local Farmers on Climate Change in the Study Area

Figure 3 indicates that the majority (81.0%) of the respondents in the study area are aware of the changing climatic conditions in their community. However, it reveals that 19 percent of the respondents are not aware of the existence of climate change in their community.

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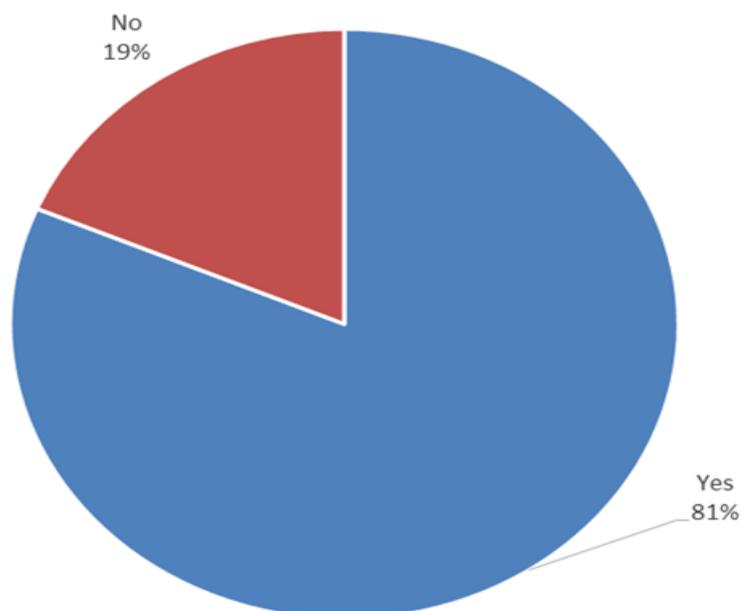
Figure-3. Awareness of Existence of Climate Change in the Community
Source: Field survey, 2016

Table 2 shows that the extent of temperature change in the study area is much as indicated by almost half of the respondents. It is important to state that only 13.2 per cent of the respondents stated that there has not being any temperature change in their community. It further shows that the majority (61.1%) of them stated that rainfall change has been much in the area while the occurrence of drought in the study area was reported to be nil by majority (57.5%) of the respondents. Also, majority (67.3%) of the respondents reported high occurrence of flooding in their community, the changes in rainfall and temperature and the high occurrences of flooding in the study area is a manifestation of climate change phenomenal in the study area.

Table-2. Farmers Observations on Extent of Climate Change in the Community

Variables	No. of Respondents	Percentage
Extent of temperature Change:		
None	14	12.4
Little	45	39.8
Much	54	47.8
Extent of Rainfall Change:		
None	15	13.2
Little	29	25.7
Much	69	61.1
Frequency of Drought Occurrence:		
Nil	65	57.5
Seldom	32	28.3
Often	8	7.1
Very Often	8	7.1
Frequency of Flood Occurrence:		
Nil	3	2.7
Seldom	14	12.4
Often	10	8.8
Very Often	76	67.3

Source: Field survey, 2016

4.3. Socio Economic Factors Influencing Farmer's Perception of Climate Change in the Study Area

The study further examines the socio-economic factors influencing farmer's perception of climate change in the area. The result of the logit regression is presented in Table 3. The estimated values of Education (X_5), Income (X_7), Farming Experience (X_{10}) and Access to extension (X_{11}) significantly influenced farmer's perception of climate

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change. It is of interest to note that age (X$_1$), sex (X$_2$), (X$_3$), household size (X$_6$), farming experiences (X$_{10}$) do not significantly influenced farmer's perception of climate change in the study.

Table-3. Factors Influencing Farmer's Perception of Climate Change in the Study Area

Variables	Coefficient	S.E.	Sig.	Exp(B)
Sex (X$_1$)	-.524	.683	.443	.592
Age (X$_2$)	.026	.368	.944	1.026
Size (X$_3$)	-.073	.539	.892	.930
Household Status (X$_4$)	-.581	.465	.212	.559
Education (X$_5$)	-4.117	.083	.016**	.890
Sources of Labour (X$_6$)	-16.364	4397.976	.997	.000
Income (X$_7$)	-4.875	.239	.048**	1.184
farm size (X$_8$)	-.386	.457	.398	.680
Source of land (X$_9$)	-19.082	3753.700	.996	.000
Farming Experience (X$_{10}$)	1.000	.790	.020**	.484
Access to extension (X$_{11}$)	-2.195	1.125	.051**	.111
Constant	42.500	5782.081	.994	2.863

Source: author computation

4.4. Effect of Climate Change on Cassava Cultivation in the Study Area

Table 4 indicates that almost half (46.9%) of the farmers indicated climate change has significantly affected the cultivation of cassava in the study area. It also shows that 40.7 percent of the farmers stated that there has been a little change in cassava production as a result of climate change in the community. It is pertinent to note that only 12.4 percent of the respondents stated that there is no effect of climate change in the cultivation of cassava in the study area.

Table-4. Effect of Climate change on cassava cultivation

Effect	Frequency	Percent
No change	14	12.4
Little change	46	40.7
Significant Change	53	46.9
Total	113	100.0

Source: Field survey, 2016

Table 5 indicates that the majority (50.4%) of the farmers indicated that there has been a little change in the cropping season of cassava occasioned by climate change. It also shows that 40.7 percent of the farmers stated that there have been a significant change in cropping season of cassava while only 8.8 percent of the respondents stated that there has not being any change. From Table 5, it can be deduced that climate change had impact on the cropping season of cassava in the study area.

Table-5. Impacts of Climate Change on the Cropping Season of Cassava cultivation

Impacts	Frequency	Percent
No change	10	8.8
Little Change	57	50.4
Significant Change	46	40.7
Total	**113**	**100.0**

Source: Field survey, 2016

Table 6 shows that climate change has negligible effect on the general life of farmers in the study area as indicated by 54 percent of the respondents. Table 6 further shows that only 6.2 percent of the respondents noted that climate change has affected their general life conditions in the study area. However, it shows 39.8 per cent of the respondents stated that climate change has no effect on their life.

Table-6. Effect of climate change on General Life Conditions of Respondents

Effect	Frequency	Percent
No effect	45	39.8
Negligible effect	61	54.0
Significantly	7	6.2
Total	**113**	**100.0**

Source: Field survey, 2016

4.5. Farmers Adaptation Strategies to Climate Change

The study examines the adaptation strategies of cassava farmers to climate change adaptation in the study area. Figure 7 shows that 65.5 per cent of the respondents have adapted to changing climatic conditions in the study area. This only explains the fact that a large proportion (34.5%) of the respondents have not adapted to climate change.
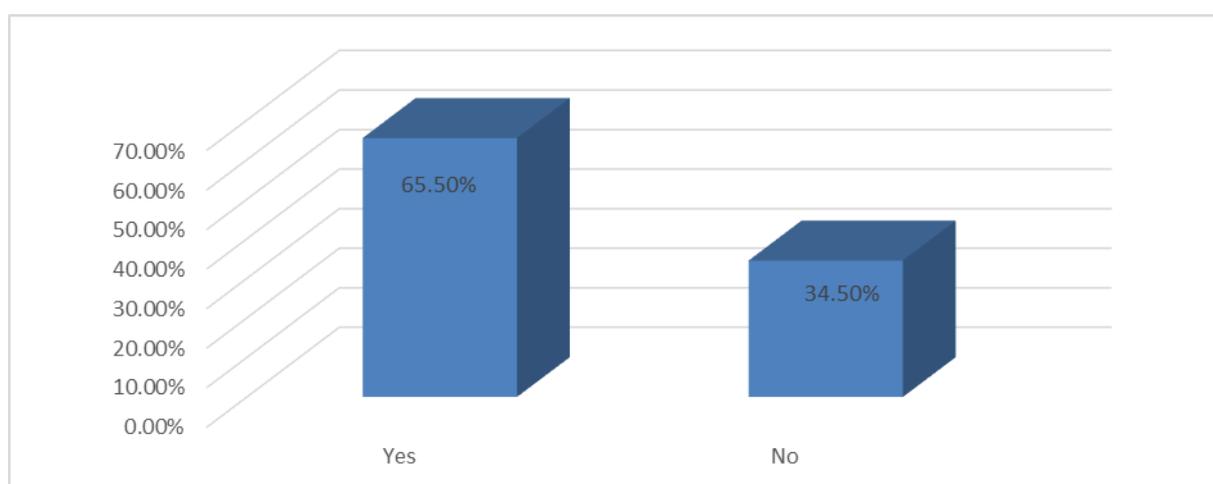
Figure-4. Percentage of Respondents Adapting to Climate Change

Source: Field survey, 2016

Table 4 shows the various coping strategies adapted by cassava farmers to cope with climate change. It indicates that 85.8 per cent of the farmers practice diversification of crop types and varieties while about 75.5 per cent of the farmers change planting dates as their coping strategy. Table 4 also shows that 77 per cent of the respondents utilized early cassava maturing variety while 54.6 per cent change the size of their farms as a way of reducing the impact of the drop in yield. Table 4 shows that only 10.5 per cent of the cassava farmer's practices water harvesting as a coping strategy. This is expected as the occurrence of drought is low as reveals previously in the study.

Table-7. Adaptation Strategies Practice by Cassava farmers

Strategies	Frequency	Percent
Change crop variety	40	35.7
Build water harvesting schemes	12	10.5
Implement soil conservation schemes	52	45.8
Diversification of crop types and varieties	97	85.8
Changing planting dates	85	75.5
Changing size of land under cultivation	62	54.6
Adopt improved variety of crops	97	85.5
Adoption of early maturing crop species	87	77.0

Source: Field survey, 2016

Table 8 identifies the main constraints to cassava farmer's adaptation to climate change in the study area. The table identifies lack of access to weather forecast information, high cost of improved and resistant varieties, and

inadequate knowledge of how to cope or build resilience as indicated by 85.8 per cent, 77.9 per cent and 76.9 per cent respectively. Others constraints include limited income, poor access to the technologies necessary for adaptation and non-availability of credit facilities as indicated by 67.2 per cent, 69.0 per cent and 48.6 per cent of the respondents respectively.

Table-8. Constraints to Cassava farmers Adaptation to Climate Change in the Study

Strategies	Frequency	Percent
Inadequate access to extension service	45	39.8
Poor access to the technologies necessary for adaptation	78	69.0
Poor information on early warning system	55	48.6
Lack of access to weather forecast information	97	85.8
High cost of improved and resistant varieties	88	77.9
Inadequate knowledge of how to cope Or build resilience	87	76.9
Non-availability of credit facilities	55	48.6
Lack of capacity of extension service to Build resilience of farmers	54	47.8
Limited income	76	67.2

Source: Field survey, 2016

5. CONCLUSION

Agriculture is the principal livelihood of 70 per cent of the study area and with the increasing impact of climate change on cassava production, the poverty levels of the community is bound to increase. It is therefore important for appropriate policies to be in place to help in community adaptation.

While several studies have been conducted on farmers perception of climate change and their adaptation strategies, findings from the diverse countries indicates divergent perceptions of farmers and adaptation strategies. This is however expected since adaptation strategies is context specific. It is important to state that none of this study has been carried out in Ogo-Oluwa Local Government Area of Oyo State. Also, none of the studies have focused on cassava farmers. This present study will filled this research gap. In view of this and the findings of the study, the study therefore makes the following recommendation.

6. RECOMMENDATIONS

1. There should be deliberate policy for government to increase farmers access to weather forecast information
2. Government should provide improved cassava varieties to the farmers at subsidized rate
3. Government should create farmers friendly policy that will enhance adaptive capacity of the farmers in the study
4. Government should improve access to formal credit facilities among the cassava farmers by having access to micro credit without interest in the study area.

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