



AGROFORESTRY FARMERS' PERCEPTION OF CLIMATE CHANGE IN IBADAN, NIGERIA

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ABSTRACT

This study assessed the perception of Agro forestry farmers in Ibadan, Oyo state, Nigeria to climate change (rainfall and temperature) using questionnaires and interviews. Multistage sampling technique was used to draw agroforestry farmers from the population. A total of 120 respondents were selected from eleven (11) communities in Ibadan. Data collected on perception to climate change was coded and analyzed using stata. Result showed that 84% of the Agroforestry farmers perceived a change in rainfall onset with 48% perceived late rainfall onset, 32% early rainfall onset and 4% perceived fluctuation in the onset of rainfall. For rainfall cessation, majority (78%) of the agroforestry farmers perceived a change in rainfall cessation in the last 20 years. About 48% perceived early cessation of rainfall while 30% of them perceived late cessation. As to the duration of rainfall, 83% of the respondents perceived a change, while 8% do not perceive change and 8% do not know if there is any change. It was also revealed that education level and farming experience of the farmers as well as extension visits are significant factors affecting the farmers perception on climate change. This study shows that the agroforestry farmers in Oyo state have a good understanding of the changing climate. There is therefore need for planned adaptation strategies to enhance resilience of the farmers to climate change and variability.

Key words: Climate Change, perception, agroforestry, adaptation

INTRODUCTION

Sustainable agriculture is rooted in the relationship between humans and climate, especially in attitudes towards climate change, the rates of change and the impact of such change on the entire agro ecosystem, including the soils, crops and animals (Franciset al., 2011). Climate change is predicated to have grave environmental, economic, and social impacts on the world, particularly for rural farmers in the developing countries whose livelihoods depend largely on rainfall (Benedictaet al., 2010). Agriculture, primarily small-scale, is the mainstay of Nigeria's economy, contributing about 17% of GDP and employs about 70% of the population (FAO,2009). Despite its high contribution to environmental sustainability, sustainable livelihood and the overall economy, this sector is challenged by many climate-related disasters like drought and floods. There is an increased concern at the highest international policy levels about the sustainability of

agricultural development, in the light of the apparent rapid depletion of the natural resources base, has brought agroforestry even further into the limelight (FAO, 2004a).

Agroforestry simply represents a combination and interrelationships between people, domestic animals, crops and trees, designed to rehabilitate land or to sustain and increase production of certain desired social benefits. Thus, Agroforestry concerns the structure and functioning of human ecosystem and not merely biophysical system (Khot, 1999). This has been reported to contribute to climate change mitigation.

In psychology and the cognitive sciences, perception is the process of attaining awareness or understanding of sensory information. According to Wikipedia dictionary, the word perception comes from the Latin word "perceptio" meaning receiving,

collecting, and action of taking possession apprehension with the mind or senso. The perception of an individual or group is a result of interplays between past experience of one's culture and interpretation given to the perceived (Ofuoku, 2011). According to the National Meteorological Agency, long-term climate change in Nigeria is associated with changes in temperature and rainfall patterns and variability, which could increase the country's frequency of both droughts and floods. These climatic hazards, particularly drought, are becoming the major forces challenging the livelihoods of most farmers. In this light, perception of climate change has recently become a major concern to scientists, policy makers and most importantly, farmers in Nigeria. A study of this nature will reveal the perception as well as the factors affecting the perception of agroforestry farmers in Ibadan, Oyo state, to climate change. The result of this study will be useful as a guide in programme and policy formulation and design while planning climate change adaptation programmes for agroforestry farmers and other rural dwellers.

MATERIALS AND METHODS

Study Area

The study was conducted in Ibadan metropolis, the capital of Oyo State. The metropolis is composed of 11 Local government areas, 6 at the outskirts and 5 at the centre. The latter are: Ibadan South East, Ibadan North East, Ibadan North West, Ibadan South West and Ibadan North Local Government Areas. Ibadan is located between longitude $7^{\circ} 20''$ and $7^{\circ} 40''$ East of the Greenwich meridian and between latitude $3^{\circ} 55''$ and $4^{\circ} 10''$ North of the equator. The city is in the equatorial rain forest belt and has a land area of between 445 and 455 km². The 2006 census put the total population of Ibadan 2,550,593 while the average population density was 828 person per km² (NPC, 2006). Ibadan metropolis is an important commercial centre and it comprises of people of different cultural and socio-economic backgrounds. Predominantly, food crops such as yam, maize, cowpea, okro, melon which reflect the dietary habits of the inhabitants are grown as is clearly seen in the type of meals taken by the people.

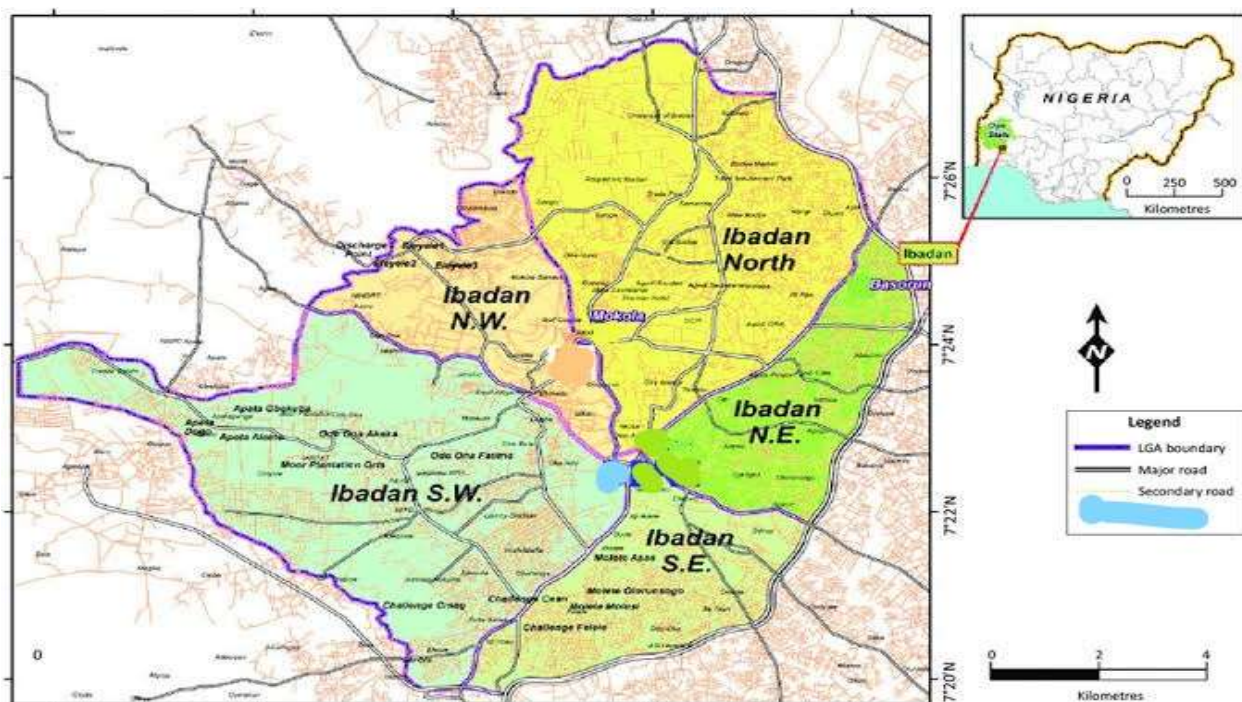


Figure 1: Map of Study Area

Sampling Technique

The study used a multistage sampling technique in selecting the representative agroforestry farmers. The first stage was the selection of two local

government areas in Ibadan city, namely, Ibadan North west and Ibadan Southwest. The second stage involved random sampling of areas within these local government areas. In the third stage, the

agroforestry farming households surveyed were also randomly selected to make them representative of the two Local Governments. A total of hundred and twenty respondents were randomly drawn from whom information such as household socio-economic characteristics, years of farming experience and age of respondent and perception awareness were obtained.

Analytical Technique

The data obtained were analyzed using qualitative and quantitative analyses. The qualitative analysis included descriptive statistics consisting of tables and graphs used specifically to describe the socio-economic characteristics of the farmers, mean, median and mode. The quantitative analysis used was logit regression analysis to determine the driver of agroforestry farmers perception.

RESULTS

Socioeconomic Characteristics

The socioeconomic characteristics of the agroforestry farmers are presented in Table 1. The average age of interviewed farmers was 47 (\pm 20) with the majority between 40-70 years. This implies that most of them are young and energetic and that the young adults are not much involved in arable farming. Most of the farmers have formal

education (89 %), with primary level (21%), secondary education levels (53%) and tertiary (14%). This is expected to influence their perception of climate change. Most of them as implied by the data had responsibility with majority been married (53%) with farming experience of 11-20 years (43%), above 20 years (28%) and less than 10 years (29%). The level of farming experience implies that the farmers have interacted much with the climate in relation to their farming activities. Low extension visit (0-5 times) was mostly (83%) reported by the farmers and about 18% reported 5-10 times extension visits. Cooperative membership was prominent among the farmers as majority (82%) of them are members. This reflects the possibility of sharing climate related knowledge among their members, hence affecting their perception about climate change. Most (36%) of the farmers purchased their lands, 29% rented, 18% inherited and about 10% borrowed theirs. The agroforestry farmers planted arable crops (53%), perishable (36%) and cash crops (11%).

The farm size of majority (54%) of the farmers was 1-3ha while 36% have a farm size of 4-6ha and 10% had above 6ha. This implies that the farmers are small-medium holder farmers and they still depend on the use of crude.

Table 1: Socioeconomics characteristics of Agroforestry farmers in Ibadan, Oyo state

Socio-economic characteristic	Frequency (n=120)	Percentage (%)
Sex		
Male	77	64.3
Female	43	35.7
Age (years)		
0-20		
20-30	12	10.7
30-40	22	17.9
40-50	34	28.5
50-60	30	25.0
60-above	22	17.9
Marital Status		
Single	34	28.6
Married	64	53.6
Divorced	22	17.8
Widowed		

Socio-economic characteristic	Frequency (n=120)	Percentage (%)
Educational status		
Non-formal	13	10.7
Primary	26	21.4
Secondary	64	53.6
Tertiary	17	14.3
Farming Experience		
1-10	34	28.6
11—20	52	42.8
20 – above	34	28.6
Extension Visit		
0-5	99	82.1
5-10	21	17.9
10-above	0	0
Cooperative Membership		
Yes	99	82.1
No	21	17.9
Land Ownership		
Borrowed	13	10.7
Purchased	43	35.7
Gifted	09	7.1
Rented	34	28.6
Inherited	21	17.9
Others	0	0
Land size (ha)		
1-3	64	53.6
4-6	43	35.7
6-above	13	10.7

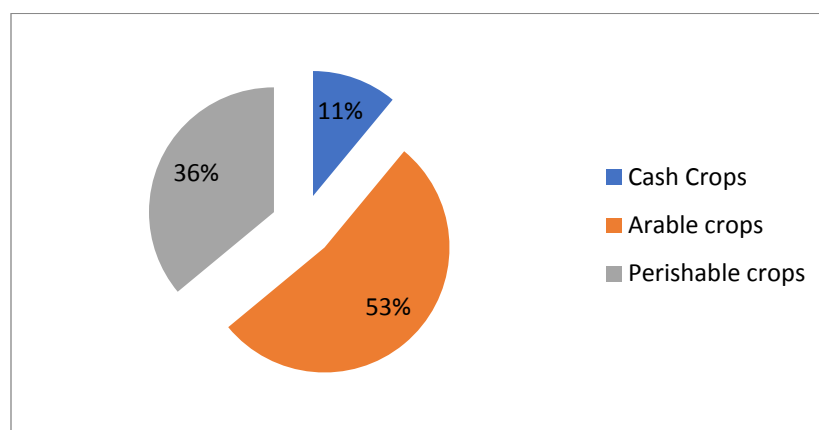


Figure 2: Types of Crops planted by the Agroforestry farmers in Ibadan, Oyo state

Perception Of Changes In Rainfall Among Agroforestry Farmers

Perception of changes in rainfall was observed from three perspectives; rainfall onset, cessation and duration. This is represented in figure 3, 4 and 5 respectively. Figure 3 shows that 84% of the agroforestry farmers perceived a change in rainfall onset with 48% perceived late rainfall onset, 32% early rainfall onset and 4% perceived fluctuation in the onset of rainfall. For rainfall cessation, majority

(78%) of the agroforestry farmers perceived a change in rainfall cessation in the last 20 years. About 48% perceived early cessation of rainfall while 30% of them perceived late cessation. As to the duration of rainfall, 83% of the respondents perceived a change, while 8% do not perceive change and 8% do not know if there is any change. About 54% of the agroforestry farmers perceived decreasing rainfall duration while 29% were contrary to this opinion.

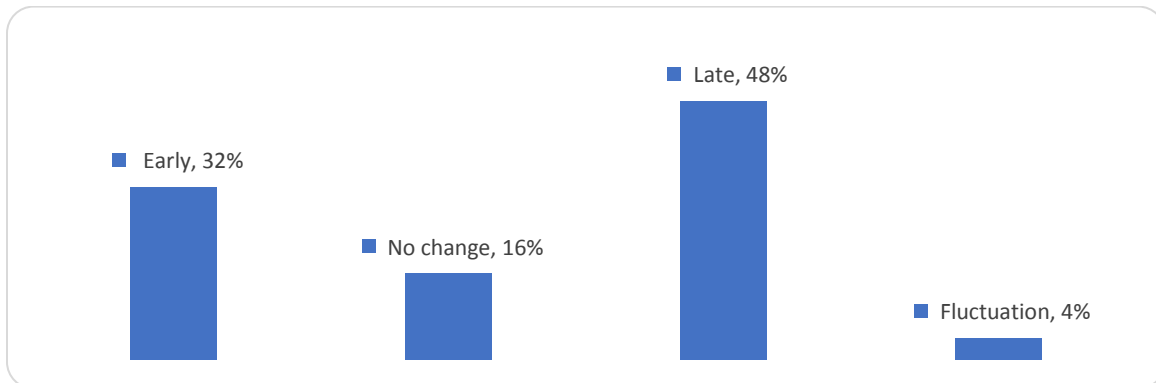


Figure 3: Perceived Rainfall Onset among Agroforestry farmers in Ibadan, Oyo state

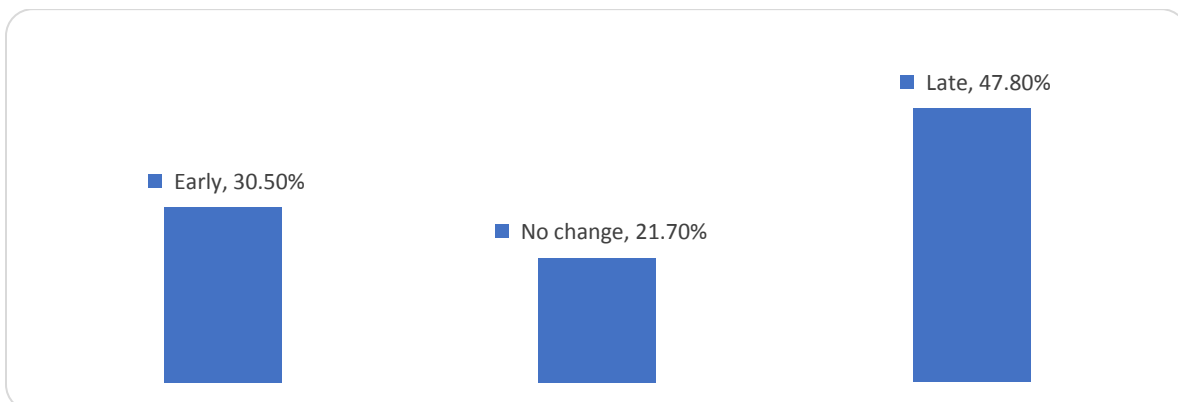


Figure 4: Perceived Rainfall Cessation among Agroforestry farmers in Ibadan, Oyo state

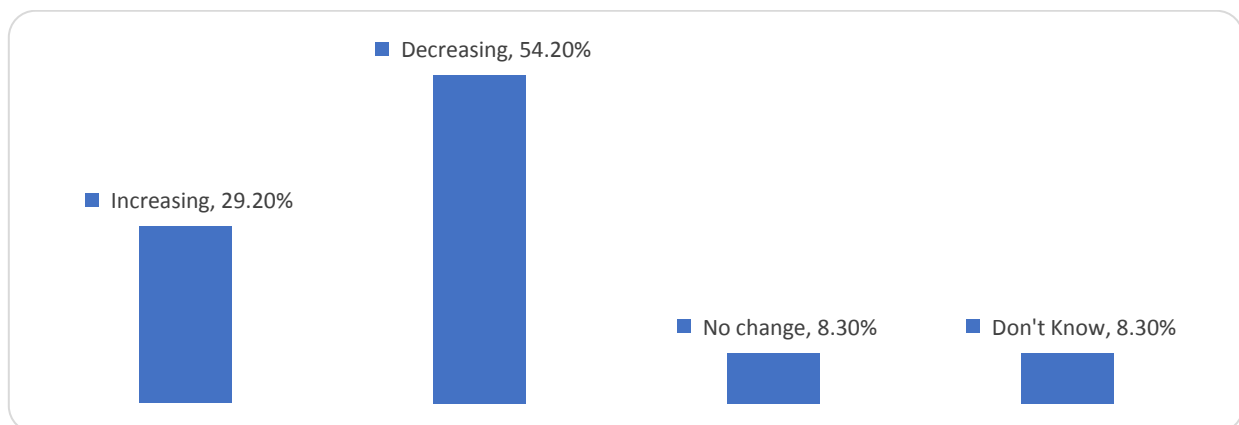


Figure 5: Perceived Rainfall Duration among Agroforestry farmers in Ibadan, Oyo state

Perception of Changes In Temperature Among Agroforestry Farmers

The perception of the agroforestry farmers to change in temperature was viewed in relation to the change in number of hot and cold days. For the number of hot days, 78% of the agroforestry farmers perceived a change in the number of hot days where 75% of them perceived increase and

4% perceived decrease. Only 10% have no idea. For the number of cold days, 80% of the respondents perceived change, 8% no change and 12 % has no idea. Out of those who perceived change in the number of cold days in the last 20 years, majority (72%) perceived decrease in the number of cold days while about 8% perceived increase.

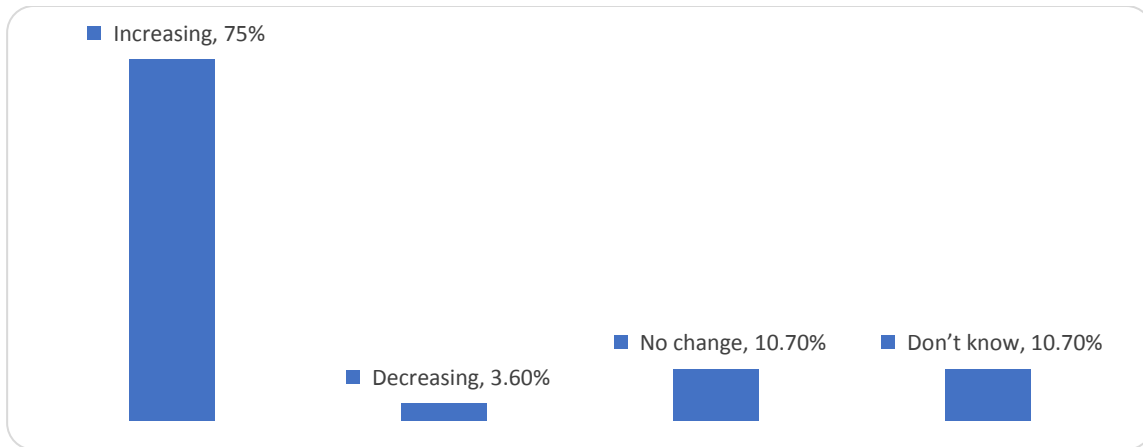


Figure 6: Perceived Change in Number of Hot Days

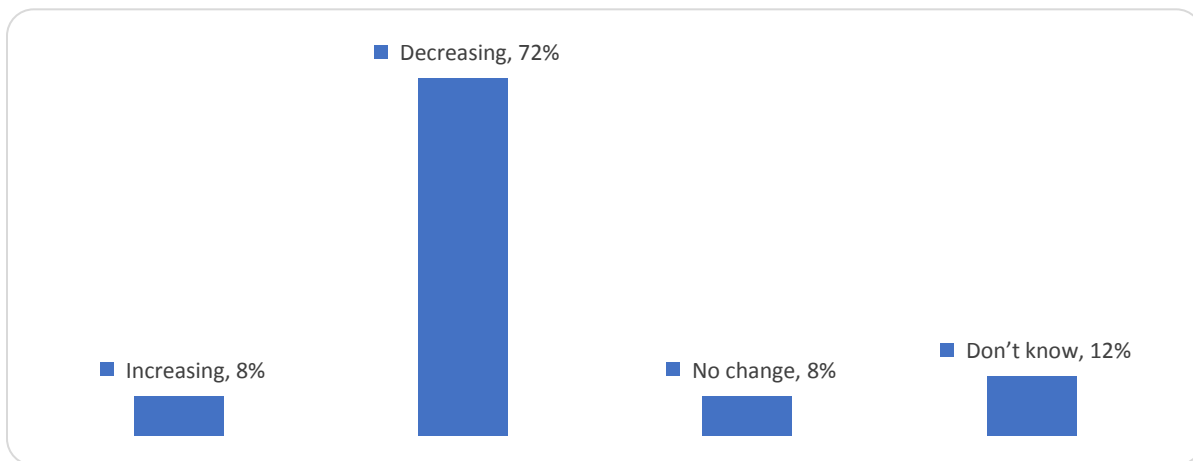


Figure 6: Perceived Change in Number of Cold Days

Factors affecting agroforestry farmers's perception on climate

In order to determine the factors affecting agroforestry farmers' perception on climate change, logistic regression models was used. The coefficients of logistic regression that tell us about the direction of effect of independent variables are presented in Table 2.

Farming experience of household head which also translates to the age influenced perception of climate change. The coefficient of years of experience in farming has a positive sign for perception on climate change, indicating a positive relation between farming experience and perception on climate change. An increase in the farming experience of household head resulted in better understanding of the climate, farmers are more

likely to perceive change in temperature (Gbetibouo, 2009). The results of the study are in accordance with those from Maddison (2007) and Nhemachena and Hassan (2007) which also found a positive relationship between farming experience and perception on climate change. Hence, it can be concluded that farmers with greater farming experience are likely to be more aware of past climate events.

Education is assumed to be an important factor in accessing advanced information on new improved agricultural technologies and increased agricultural productivity. In our study, the highly significant coefficient of education of the household head shows that the probability of perceiving changes in climate increases with an increase in the years of schooling. Various studies (Bryan et al., 2013; Deressa et al., 2009; Maddison, 2007) also found a

significant positive relationship between education of household head and perception on climate change that supports the finding of this study. Therefore, it can be concluded that farmers with more years of schooling are more likely to perceive changes in climate compared to the farmers with little or no education.

A positive coefficient of extension visits indicates a positive relationship between extension visit and probability of perception. It can therefore be assumed that the extension officers disseminate climate related information to the farmers. Findings of the study of Deressa et al., (2009) also support our findings of a positive relationship between extension visit and perception on climate change. Also, access to information on climate change was revealed to have a positive and significant effect on agroforestry farmers perception on climate change.

Table 2: Factors Influencing Agroforestry Farmers Perception on Climate Change

Predictor Variables	Coefficients	Standard error	P value
Constant	23.3215	2.0544	0.0000
Sex of House Head	5.6821	0.0203	0.0034***
Age (years)	3.4423	0.0535	0.0152**
Marital Status	1.2319	0.1345	0.0535
Educational status	0.9876	0.0095	0.0012***
Farming Experience	0.4927	1.7562	0.0339**
Household size	6.0402	5.3397	0.5402
Extension Visit	2.1842	2.8785	0.0284**
Cooperative Membership	9.2286	0.0223	0.0916
Credit Access	2.0973	5.7872	0.0640*
Credit Source	7.0332	3.2907	0.8340
Credit Amount	2.3079	0.2319	0.1190
Land Ownership	1.0288	0.1982	0.0756
Land size (ha)	4.6312	0.3756	0.0560
Access to climate change Information	6.3380	0.1482	0.0017***

***significant at 1%; **significant at 5%; $R^2 = 0.8713$; Adjusted $R^2 = 0.8615$; F -value = 17.19; $N = 120$

DISCUSSION

It is important to understand the perception of farmers to climate change when planning adaptation options. Ban and Hawkins (2000) define perception as the process by which we receive information or stimuli from our environment and transform it into psychological awareness. It is assumed that for households to decide whether to adapt or not to climate change and variability, they must first perceive the change (Deressa et al., 2009; Silvestri

et al., 2012). Most farmers in Southwest Nigeria still depend on rainfed agriculture and this makes the agricultural sector vulnerable to climate change and variability. Majority of farmers in this study perceived changes in rainfall parameters (rainfall onset and rainfall duration). The findings of this study agree with Adebayo, et al., (2011) who reported that farmers in South West Nigeria perceived low rainfall. Enete et al., (2013) also reported that rainfall is becoming unpredictable in

Nigeria. This study also shows that most farmers perceived increase in the number of hot days in the last 20 years. Several reports (Oruonye, 2011 and Falakiet *al.*, 2013) reported increasing temperature in most part of Nigeria. This finding agrees with the findings of Ajuwon (2004) that crop yields are very sensitive to rainfall and its amounts and distribution may have significant impact on crops. He argued also that temperature change can influence germination, maturity and harvesting of plant

Determining factors that influence perception is important not only to help farmers perceive correctly, but it's also useful for agriculture extension officers and policy makers to make sure that efforts directed to improving the performance of the agricultural sector could not be misplaced but be correctly directed to such factors in an effort to improve crop productivity and enhance food security. This study shows that gender, level of education, years of farming experience, extension visit and access to climate change information influence farmers perception to climate change. These findings agrees with Legesse *et al.*, (2012) findings who also observed that farmers' education level and, age influence their perception of climate variability and change. It was observed that age is directly linked to farming experience. Old farmers possess indigenous knowledge on how to perceive climate variables, especially rainfall change. Such knowledge, as the results indicate, is not possessed by the younger farmers but the older ones, and need to be passed on to the young generation to help them perceive correctly important climate variables such as rainfall. With respect to education, it can be observed that education also has a role to play in influencing the way farmers perceive climate change and variability, which is consistent with Kamruzzaman (2015), findings who also observed

that farmers with higher level of education perceived environmental factor and climate variables correctly and vice versa. This means that an effort to help farmers perceive correctly needs to also focus on improving the level of education of farmers. Access to extension services and weather information is also important in shaping perception farmers perception to climate change. Those farmers with access to extension services and weather information tend to perceive correctly alluding to the importance of improving farmers' access to weather data and agricultural extension services through improved weather focusing and information dissemination. It is important that all the factors influencing farmers perception are taken into consideration to improve their perception because these factors further influence households' choice of adaptation strategies to climate. as scholars have rightly observed

CONCLUSION AND RECOMMENDATION

The agroforestry farmers in Ibadan revealed that their area is getting drier and warmer. For drier atmosphere, this is as observed in the decreasing rainfall onset and duration as well as increasing rainfall cessation. Whereas for warmer atmosphere, it was due to the increasing number of hot days and decreasing cold days as perceived by the farmers in the last 20 years. It was further revealed that education level and farming experience of the farmers as well as extension visits are significant factors affecting the farmers perception on climate change. This study shows that the agroforestry farmers in Oyo state have a strong understanding that the climate is changing. There is therefore need for planned adaptation strategies to enhance resilience of the farmers to climate change and variability.

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