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Perception and Adaptation Strategies of Agroforest Farmers to Climate Change in Ekiti State

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Perceptions and understanding of rural agroforest farmers about climate change, the possible consequences of climate change and available adaptation options for its mitigation in the tropics have been noted to be abysmally low. This study examines the perception and adaptation strategies of agroforest farmers towards climate change mitigation in Ekiti State. The study area was stratified into two vegetation zones (rainforest and derived savannah). Pretested interview schedule were administered to eighty randomly selected agroforest farmers for collection of data in the two zones. Field observations revealed that majority of the respondents are married (96.25 %) male (93.75 %) of over 40 years old (81.25 %) with 50 % of them having more than 10 years of farming experience. The study revealed that farmers perceived that there are changes in climatic parameters (temperature, rainfall and wind intensity) with its attendant consequences on their production. Measures such as mulching, adjustment in planting period and planting of different crop were employed by respondents to mitigate the effect of climate change on their livelihood. The study also identified among others; lack of water for irrigation and lack of information on weather forecast as some of the problems militating against their adaptation to climate change.

*Key Words***:** Perception, adaptation strategies, agroforest farmers, climate change, Ekiti State

Introduction

It has been argued that the world's climate is changing and will continue to change at rates unprecedented in human history, and that all societies need to enhance their adaptive capacity to face both present and future challenges of climate change (Adger *et. al.*, 2003). Recent research on climate change has noted the impacts of climate change on agriculture and natural resources management in rural communities in Sahara zone of West Africa (Mortimore and Adam, 2001). A consensus has emerged that developing countries are more vulnerable to climate change than developed countries, because of the predominance of rain-fed agriculture in their economies, the scarcity of capital for adaptation measures, their warmer baseline climates and their heightened exposure to extreme events (Kandlinkar and Risbey 2000).

There is increasing evidence that climate change will strongly affect the African continent and will be one of the challenging issues against her future developments, particularly in the drier regions (Adger *et. al*., 2007). In Nigeria just as in many developing countries in the sub-tropical region, both forestry and agricultural sectors are more vulnerable to climate change. The degree to which these sectors are affected by climate change depends on the adaptive capacity of the stakeholders in these sectors. Adaptive capacity is the ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damage, to take advantage of opportunities, or to cope with the consequences (IPCC, 2007).

Adaptation to climate change requires that farmers and foresters /or communities first notice that the climate has changed, and then identify useful adaptation measures and implement them (Mendelson, 2006). Christensen *et. al.*, (2007), has reiterated the need to understand how farmers, foresters and pastoralists in the Sahel have coped with climate variability and change in order to guide the strategies for adaptation in the future. The way foresters and farmers think and behave in relation to climate change as well as their values and aspirations have significant role to play in addressing climate change (Doss and Morris, 2001).

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Agroforest farmers and other traditional people are key stakeholders in the climate change debate. However, they are rarely considered in academic, policy and public discourses on climate change, despite the fact that they have great role to play in climate change mitigation (Berkes and Jolly, 2001). Disconnects in awareness of farmers of the role of governments in climate change mitigation is worth noting. Although, some visible actions regarding climate change have been taken by the government in the recently time, perceptions and understanding of the processes and impact of climate change have hitherto remained unclear to agroforest farmers.

Advocacy on climate change in order to enlighten people on the dynamics of climate change cannot be done effectively without concrete evidence. The need for such baseline information especially as it concerns designing appropriate strategies for mitigating climate change effect on agriculture and forestry development cannot be overemphasized. In taking informed decisions about climate change, information is necessary. Studies on climate change will therefore promote evidence-based advocacy to catalyse actions aimed at raising awareness of farmers on the issue of climate change and building capacities of farmers in the study area to adapt to climate change impacts. This cannot be done effectively without any evidence. It is these facts that this study aimed to provide.

Methodology

The study area

The study was carried out in Ekiti-State, Southwest Nigeria. The state covers about 7,500 km^2 of land mass. Ekiti-State is located between Longitude $4^0\ 50^1$ and $5^0\ 45^1$ East of the Greenwich meridian and Latitudes $7^0\ 15^1$ and $8^0\ 5^1$ North of the Equator. The state enjoys a tropical climate with two distinct seasons; these are rainy season (April-October) and the dry season (November-March). Temperature ranges between 21^0 C and 32^0 C with little variation throughout the year while the mean annual relative humidity is over 75 %. The mean annual rainfall in the southern part of the state is about 1,700 mm and in the northern part is hardly over 1,500 mm (Adebayo, 1993). The state is mainly an upland zone located on altitude of 250 m above the sea level. Ekiti has a rhythmically undulating surface underlain by metamorphic rock of the basement complex. Two distinct type of vegetation are predominant in the study area namely; the derived savannah vegetation to the north and the rain forest vegetation to the southern belt.

Sampling technique

The study area was stratified on the basis of vegetation into two zones namely; derived savannah and the rain forest. One forest reserve was selected from each of the vegetation zone. The selection was based on the level of farming activities of agroforest farmers in the forest reserve. Questionnaires were administered to forty (40) random selected agro-forest farmers in each of the selected forest reserves (Table 1). The farmers were interviewed personally on the field by the researcher using the interview schedule. In some cesses researcher's observations were used to deduce appropriate answer to some questions. Data collected from the study were analyzed using descriptive statistics of frequency tables and percentages.

Table 1: Distribution of respondents in the study area

Vegetation	Local government	Forest reserves	No of respondents
Rain forest	Ise /Orun	Ogbese	40
Derived savannah	Ekiti East	Eda	40
Total	2	2	80

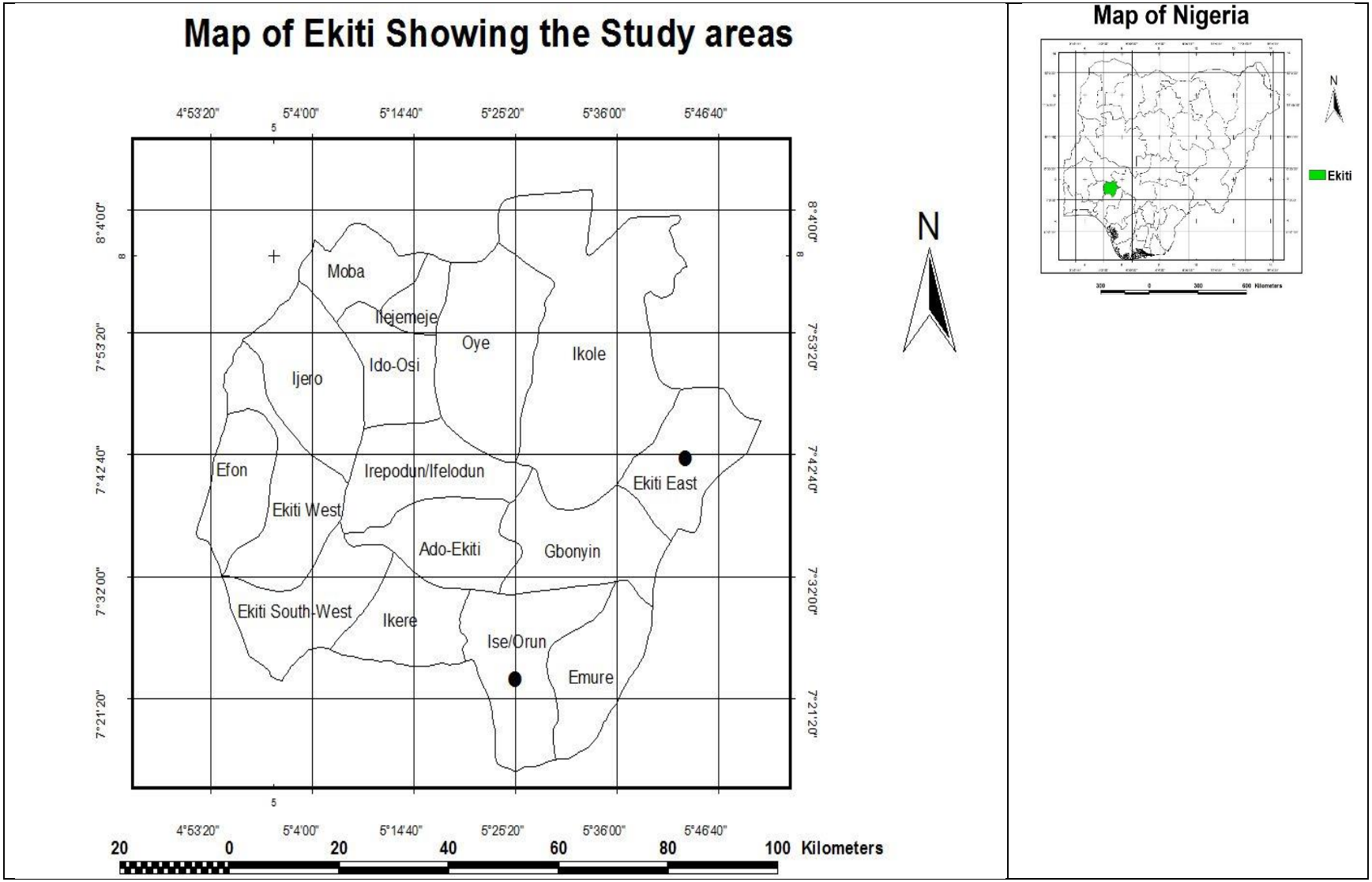

Figure 1. Map of Ekiti showing the study areas

Results

Socio-economic characteristics of respondents

Table 2 shows that majority of the respondents are married (96.5 %) men (93.75 %) with 60 % of them over 50 years old. The result also shows that 66.25 % of the respondents had at least secondary education.

Table 2: Socio-economic characteristics of respondents

Variables	Frequency (n=80)	Percentage (%)
Sex		
Male	75	93.75
Female	5	6.25
Age		
< 40 Years	7	8.75
41-50 Years	25	31.25
51-60 Years	40	50
> 60 Years	8	10
Educational background		
Primary	21	26.25
Secondary	38	47.50
Tertiary	15	18.75
Non–formal	6	7.50
Marital status		
Single	0	0
Married	77	96.25
Divorced	0	0
Widowed	3	3.75

Respondents farming practices

Table 3 shows that 81.25 % of the respondents have over 10 years of farming experience with majority of them (81.25 %) operating on full-time bases. The result also revealed that 56.25 % of the respondents embark on both subsistence and commercial farming with 36.46 % of them relying on family members for their source of labour.

Table 3: Respondents farming practices

Variables	Frequency (n=80)	Percentage (%)
Year of experience		
1-10 Years	15	18.75
11-20 Years	39	48.75
> 20 Years	26	32.50
Farming status		
Full – Time	65	81.25
Part – Time	15	18.75
Scale of farming		
Subsistence	21	26.25
Commercial	14	17.50
Both	45	56.25
Source of labour		
Self	51	28.18
Family members	66	36.46
Hired labour	52	28.73
Co-operators	12	6.63

Perception and adaptation of agroforest farmers to climate change

Result on perception to change in climatic parameters shows that 76.25 %, 68.75 % and 47.5 % of the respondents agreed that there is decrease in annual rainfall, rainy period and rain intensity respectively. Also 85 % and 88.75 % of the respondents opined that hot period and heat intensity increases while 82.5 % says that wind intensity increases during the rainy period (Table 4). Table 5 shows that climate change has some effects on the livelihood of the people in the area of crop production, social behaviour and environment. The result on Table 6 shows that mulching, adjustment in planting period, and planting of different crops were most adopted with 15.35 %, 14.93 % and 13.86 % of the respondents respectively, while lack of information on weather forecast 18% and lack of capital 17.52 % form one of the greatest problem against adaptation among the respondents (Table 7).

Table 4: Perception of agroforest farmers on change in climatic parameters

Climatic Parameter	Indices	Increase		No change		Decrease		I can't say	
		Freq.	%	Freq.	%	Freq.	%	Freq.	%
Rainfall	Annual	15	18.75	0	0	61	76.25	4	5
	Rainy period	14	17.5	4	5	55	68.75	7	8.75
	Dry period	60	75	3	3.75	12	15	5	6.25
	Rain Intensity	32	40	0	0	38	47.5	10	12.5
Temperature	Hot period	68	85	0	0	8	10	4	5
	Cold period	39	48.75	2	2.5	24	30	15	18.75
	Heat Intensity	71	88.75	0	0	9	11.25	0	0
Wind Intensity	Dry period	53	66.25	11	13.75	9	11.25	7	8.75
	Rainy period	66	82.5	12	15	2	2.5	0	0

Table 5: Effects of climate change on the livelihood of the people in the study area

Effects of climate change	Problems	*Frequency	Percentage (%)
	Low crop yield	74	19.58
	High cost of labour	56	14.81
	Disease infestation	48	12.70
Production effects	Stunted growth and eventual die back of trees and annual crops during prolong dry-season	69	18.25
	Destruction of trees and crops due to wind throw and flooding	67	17.72
	Reducing production of crops to one cycle due to delay in rainfall	64	16.93
	Total	378	100
	Rural-urban drift	54	28.13
	Shifting from farming to other business	58	30.31
Social effects	Hunger due to shortage of food supply	44	22.92
	Outbreak of diseases	36	18.75
	Total	192	100
	Flood in the raining season	58	26.13
	Too much heat in the dry season	60	27.08
Environmental effects	Outbreak of pests	51	22.97
	Loss of biodiversity	53	23.87
	Total	222	100

* Multiple responses

Table 6: Measures taking to reduce effect of climate change

Measures	*Frequency	Percentage (%)
Planting different crops	65	13.86
Planting of short duration varieties	58	12.37
Adjustment in planting period	70	14.93
Practicing dry-season farming/fadama farming	57	12.15
Mulching	72	15.35
Planting cover crops	58	12.37
Prayer	61	13.00
Delay weeding during dry-season	28	5.97
Total	469	100

* Multiple responses

Table 7: Problems militating against adaptation to climate change

Problems	*Frequency	Percentage (%)
Lack of information on weather forecast	74	18
Inadequate supply of improved varieties	69	16.79
Lack of access to water for irrigation	60	14.60
Lack of information on modern adaptation techniques	70	17.03
Lack of capital	72	17.52
Lack of modern equipment	66	16.06
Total	411	100

* Multiple responses

Discussion

The observed involvement of older people with long years of experience in farming activities in this study suggests that young men in the study area are no longer interested in farming. This trend could be dangerous to the growth and peace of the society, since these aged people are no longer strong enough to produce on a large scale to feed the timing population, hence it may pose a threat to food security thereby leading to hunger, theft, robbery and all kind of social vices. This assertion further corroborate the report by Abaje and Giwa (2007) who listed effects of climate change in Nigeria to include increased rural-urban migration, increased loss of biodiversity, food insecurity and spread of infectious diseases. The high literacy level observed among the respondents in this study could be an advantage for the forest officers to explore while dissemination information to them on modern agroforestry practices aimed at mitigating climate change. This assertion agrees with the findings of Awolala and Ajibefun, (2012) when they concluded that with higher education, farmers are more likely to access better information on modern production techniques.

The high level of subsistence production compared with low commercial production observed among the farmers in this study may largely be due to age of the farmers and source of labour. In most cases the household members used as source of labour by agroforest farmers could be made up of the man and the wife only, while the children occasionally joined them during the holidays. This observation is in line with the submission of Ajewole, (2013) who stated that a unit increase in age will reduce the probability of large scale farming among the farmers. Also inability of the farmers to form co-operative society, a platform upon which it would have been easy for them to get loan from bank to embark on large scale production could be another important factor responsible for low level of commercial production. All these factors despite the full time status of the respondents in farming couple with the change in the climatic parameters affect their production capacity.

The perception of the respondents to change in climatic parameters revealed that majority of the respondents perceived that there is decrease in annual rainfall, rainy period and rain intensity. Also larger percentage of the respondents opined that hot period and heat intensity increases. This observed decreasing trend in the rainfall pattern and increasing trend in temperature parameter could be attributed to continued depletion of the ozone layer as a result of the deforestation leading to emission of greenhouse gas. Also the perceived increase in wind intensity during the rainy period by the respondents in the study area could be traced to human activities such as burning of fossil fuel and indiscriminate remover of trees and

vegetation cover which serves as wind break and carbon sink. This assertion corroborates the submission of Scholze *et. al.,*(2006) who indicated that human induced actions such as deforestation and increased environmental damage are major factors responsible global warming.

The observed impacts of climate change on production, social and environmental aspect of respondents in this study (Table 5) is an attestation that climate change greatly affects the livelihood of the people in the study area. Some of the production effects of climate change which include low crop yield, disease infestation, stunted growth and eventual dieback of trees and annual crops during prolong dry season, mentioned in this study are in line with the report of Butt *et. al.*, (2005. Also the social impacts of climate change such as rural-urban drift; shifting from farming to other business, hunger due to shortage of foods and environmental effects of the climate change such as flood in the raining season, too much heat in the dry season, out-break of pests, loss of biodiversity reported in this study is in consonance with the submission of Brett, (2009) and *Lancelot et. al., (2008).*

The various measures adopted by the respondents to mitigate the effects of climate change on their production in the study area is a proof that farmers in the study area are well informed about the management and control of climate change impact. This could be attributed to their level of education and this attribute would be an advantage for the farmers in the study area to adopt new improved strategies for climate change mitigation.

Conclusion and Recommendation

The study reveals that the effect of climate change is well pronounced in the study area especially on farmers' production, social behaviour and environmental degradation. The study also revealed that farmers in the study area employed some control measures to reduce the effects of climate change on their farm produce and livelihood. Moreover the study also revealed that farmers in the study area are still faced with some challenges such as lack of information on weather forecast, lack of modern equipment and lack of access to water for irrigation. Consequent upon these problems the study recommended that government should encouraged the farmers by providing assistance inform of incentives such as supplying improved variety at a subsidised rate provision of modern equipments and regular training to update their knowledge on modern agroforestry techniques.

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