Socio-Economic Imperatives of Forest Based Rural Livelihoods in Climate Constrained Environments in Ondo State, Nigeria

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Abstract

The rural people have been recognized as knowledge holders on climate change. This work examines the socio-economic imperatives of such knowledge particularly as it affects livelihood in selected forest fringe communities in Ondo State, Nigeria. Multistage random sampling technique was adopted in which 4 Local Government Areas (LGA$_S$): Odigbo, Akure North, Owo and Idanre were randomly selected in Ondo state. In each of the LGAs, a forest reserve (Oluwa, Ala, Owo and Idanre, respectively) was selected. Three rural communities surrounding each of the forest reserves were then selected while thirty respondents were randomly selected for interviews in each of the selected communities with the use of well-structured questionnaire. The data were analysed using desscriptive and inferential statistics. More males (52.9%) were interviewed with majority (95.6%) being married while modal age group (42.2%) was between 30 and 40 years. A high percentage of the respondents (30.8%) had no formal education while 34.7% had only primary school leaving certificates. The modal household size was between 11 and 15 people in Owo LGA. Farming was the major source of livelihood for all the respondents. Most of the respondents (52.6%) were aware of climate change through radio. The source of their awareness was however, discovered to be a function of location, age, level of education and secondary occupation. Sources of awareness were found to be dependent upon respondents' LGA (χ^2 = 30.2, df = 12, p = 0.003), age (χ^2 = 41.6, df = 8, p = 0.000), level of education (χ^2 = 31.2, df = 16, p = 0.103) and secondary occupation (χ^2 = 69.2, df = 44, p = 0.009). The dependence of respondents' livelihoods on forest resources in this study is dependent on their LGA (χ^2 = 25.0, df = 4, p = 0.000), age (χ^2 = 34.6, df = 10, p = 0.001), years of resident (χ^2 = 46.6, df = 12, p = 0.010) as well as their primary (χ^2 = 64.5, df = 12, p = 0.000) and secondary (χ^2 = 32.9, df = 7, p = 0.000) occupations. The annual income of respondents' from their primary sources of livelihoods is dependent on their LGA (χ^2 = 29.8, df = 12, p = 0.003), sex (χ^2 = 23.0, df = 8, p = 0.003), Age (χ^2 = 86.5, df = 16, p = 0.000), level of education (χ^2 = 70.5, df = 16, p = 0.000), marital status (χ^2 = 79.9, df = 8, p = 0.000) and primary occupation (χ^2 = 363.9, df = 40, p = 0.000). The study established interdependence among respondents' livelihoods, their socio-economic background, forest resources in the study area and climate. However, such dependency is location specific. It further observed climate change as negatively affecting agriculture and by extension food production in the study area. Creation of awareness for sustainable use of forest resources among residents and the identified alternative livelihoods to farming in Ondo State were recommended.

Keywords: Rural Livelihoods, Climate constrain, forest land use

Introduction

Climate change is used to describe a systematic change in the key dimensions of climate –temperature, wind and rainfall patterns – over a longer period of time (Paavola, 2008). Climate can change over a period of time ranging from months to thousands or millions of years. The classical time period was however put at 30 years by Paavola (2008). Climate change has significant impacts on the forest's ability to provide vital ecosystem services and on the well-being of people living in and around forest environments (Somorin, 2010). About 60 million local communities around the globe are estimated to depend on forests (World Bank, 2008). Also, climate change had been documented to cause substantial impacts on forest ecosystems (Parmesan, 2007; IPCC, 2007a) and by extension, a major threat to sustainable development because of its effects on health, infrastructure as well as agriculture and food security (IPCC, 2007).

Also topical is the vital role of forests to man's existence because of the many ecological and economic functions they perform. They assist in the global cycling of water, oxygen, carbon and nitrogen and lend stability to hydrological system. They ensure regular supply of fresh water, prevents flood, soil erosion and siltation of river beds down stream. They also assist in improving air quality, stabilize global climate condition and protect soils (Sharma, 1992). They supply many products in form of wood (basic material for construction, furniture, paper etc.) and non wood items (extractions, bark, dye, fibre, gum, incense, latexes, oils, resins, waxes, shellac, tanning compounds), food, bush meat, flowers, fruits, honey, nuts, leaves, seeds, spices etc. as well as decorative, ceremonial and medicinal items (Sharma, 1992; World Bank 2001; Adebisi, 2001).

Forests contribute to agricultural stability by protecting the soil. They also contribute to poverty reduction. The majority of the rural communities depend heavily on forest products for their livelihoods (MNRT, 2009) more than 50% of the sampled household derived cash income from sale of forest products, such as charcoal, honey, wild fruits and firewood, with the peri-urban households deriving almost 70% of their cash income from the woodlands. Thus income-generation from forests is supplementing the farm income although, not many households have the capacity to take advantage of forest-based income generating activities. Increasing agricultural production costs in relation to product prices and increasing living costs in general have pushed people to exploit forests more intensely, particularly on the general lands, to generate cash income. Milledge *et al.* (2007) reported that forests support the livelihoods of 87% of the rural poor, which may partly be why Africa was predicted to suffer the most from the impacts of climate change (IPCC, 2001). The changing climatic patterns in Nigeria, occasioned by increased temperatures and changes in rainfall patterns, is predicted to have strong impacts on livelihood and biodiversity in the country (Basu and Ostro, 2009). Decreasing availability of forest-produce such as food, fuel, medicinal and herbs deprive the rural poor from a supplementary source of income, food and healthcare (Basu and Ostro, 2009).

The impacts of climate change are being felt globally. In Nigeria, the impacts are unfolding at an unprecedented and devastating rate. The changes have economical, social and environmental adverse effects. This has far reaching implications not only for the livelihoods but also for the economic and social development of the rural communities. Understanding the impacts of climate change on forest-dependent rural livelihood will better inform sustainable forest management planning. This paper aims at assessing the level of awareness of the forest dependent-communities about the effects of climate change on their livelihoods.

Materials and Methods

The study area

This study was carried out in Ondo State, Nigeria. The State is located in southwestern part and lies within latitude 7°18'N

and longitude 5°02'E. It covers an area of over 15,595 square kilometers. The climate of the state is tropical with two distinct seasons viz: the dry and rainy seasons. The rainy season commences in March and ends in October with a peak in July/August while the dry season occurs between October and March. Up to 2000mm of rainfall may be experienced in the coastal areas of the south, which diminishing to 1500mm in the hinterland. The temperature varies from 21^oC to 29^oC throughout the year with an average value of 25^oC. The State has 17 Forest Reserves covering over $3,07566km^2$ stratified into: 2,834.68 high forests, $194.76Km^2$ savannah and $46.22Km^2$ mangrove/fresh water swamp.

Sampling Procedure and Data Analyses

Stratified, multistage random sampling procedure was used for this study. Ondo State was stratified into Local Government Areas (LGAs). Four LGAs were first randomly selected viz: Odigbo, Akure North, Owo and Idanre. In each of the LGAs, one Forest Reserve was then selected for this study. In Odigbo LGA, Oluwa Forest Reserve was selected.

In Akure North, Ala Forest Reserve was selected. In Owo LGA, Owo Forest Reserve was selected while Idanre, Forest Reserve was selected in Idanre LGA. From each Forest Reserve, three rural communities surrounding the Forest Reserve were randomly selected for the study. Thus, twelve communities were used for this study from each of which thirty households were randomly selected. Finally, thirty (30) respondents were randomly selected for interviews from the selected households in each community. Ninety respondents' were randomly selected for sampling in each LGA making a total of three hundred and sixty (360) respondents.

Primary data were collected from the sampled respondents through socio-economic survey employing the use of personal interviews, structured questionnaires and checklists. The socio-economic data generated were subjected to both descriptive and inferential statistical analyses. Descriptive statistics include the use of tables, bar chart, means, percentages while inferential statistics were carried out where necessary using Chi-square test at $\alpha_{0.05}$.
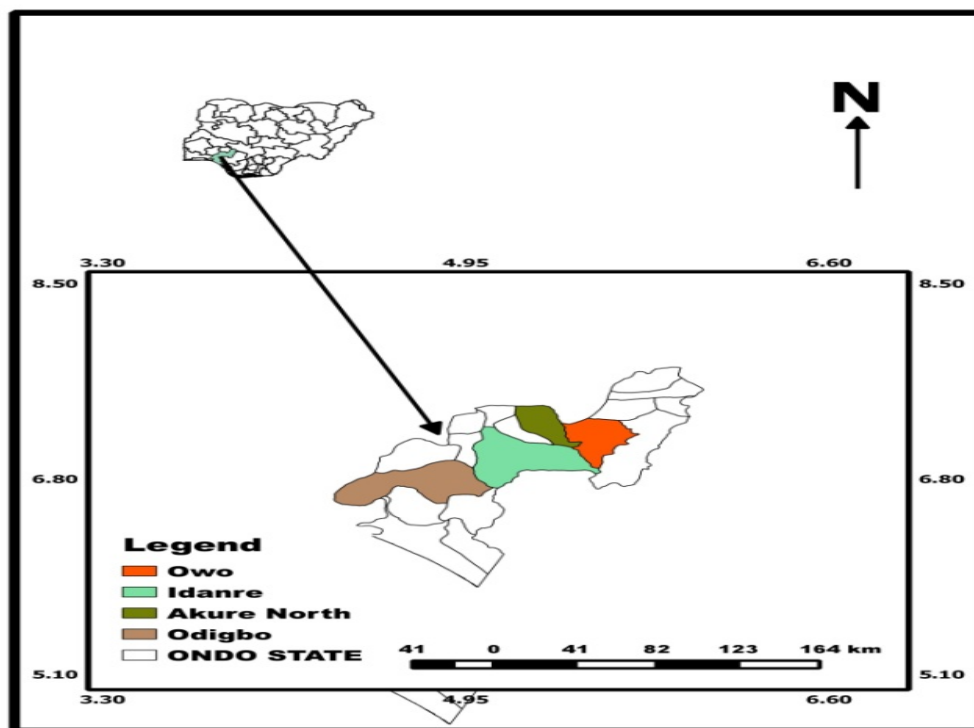

Figure 1: Map of Ondo State showing the Study Areas

Results

More males were interviewed than female with the modal representation of male coming from Owo LGA while modal female representation was from the Akure LGA (Table1). On age (Table 1), the highest proportion of the respondents were between ages >30 and 40 years (42.2%) while only 0.8% (the lowest) fell between 11 – 20 years and were from Owo. The proportion of those whose ages were more than 30 years but less than 50 years were the highest in the Odigbo sites (>30 – 40, 52.2% and >40 – 50, 26.7%). However, more of those with ages greater than 50 years were found in Akure (8.9%).

Most of the respondents were married with a mean of 95.6 and the modal married population was at the Akure sites where all the respondents were married (Table 1). The modal single respondents were recorded in Owo (3.9) while those separated and widowed were the highest in the Idanre sites where 0.5% was recorded for each. Also, the study revealed (Table 1) that the majority of the respondents were Christians with a modal Christian in Akure (97.8%) and the lowest in Owo (82.2%). Islamic faith was found to be highest among the Owo respondents (16.7%) while African Traditional religion worshippers were highest among respondents from the Odigbo sites (2.2%). The results of the education status of the respondents were also shown in Table 1. The highest percentage of those not having formal education was from Akure North (43.3%) while the least was from Odigbo (21.1%). Attendance at adult literacy class was more popular among Owo respondents (11.1%) but least popular in Idanre (2.2%). The highest form of formal

education recorded (OND/NCE) was in Owo (6.7%). The study (Table 1) also revealed that the highest frequency distribution of the respondents' with the lowest household size was in Owo study site while the frequency of the highest household size (11 – 15 members) was also domicile in Owo (6.7%). The modal distribution of respondents with household size of between 6 and 10 members was in Odigbo Site (31.1%).

The study (Figure 2) revealed that 52.0% of the respondents were aware of climate change through the radio media. This was followed by those who were informed through the television (26.1%) while 13.6% of the respondents were informed by friends and peers (class). The results of the respondents' perceptions of climate change impacts on their livelihood were presented in Table 2. It was discovered that Idanre LGA was the most impacted by all the identified constrains except reduction in agricultural production, which was mostly felt in Akure North LGA as reported by 72.2% of the respondents. Flooding, spread of diseases and pest, reduction in the quality and quantity of water as well as the unpredictability of weather by respondents were mostly felt in Idanre LGA. The distribution of the respondents' livelihood activities was displayed in Figure 3, which depicts farming as the most important income generating activity (100.0%) in the study area. This was followed by trading (80.0%), processing of farm produce (60.0%), Transport business (44.5%), Hired labourer (40.0%), Livestock rearing (34.6%), Gathering Non-Timber Forest Products (NTFPs, 25.0%), Artisans (20.0%) and Hunting (10.0%).

Table 1: Frequency Distribution of Respondents' Socio-Economic Background

|	Odigbo		Akure North		Owo		Idanre			
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Mean	Mode
Sex										
Male	51	56.7	45	50.0	53	58.9	52	57.8	55.9	Owo
Female	39	43.3	45	50.0	37	41.1	38	42.2	44.1	Akure
Age (Years)										
11 – 20	0	0.0	1	1.1	2	2.2	0	0.0	0.8	Owo
>20 - 30	15	16.7	30	33.3	41	45.6	30	33.3	32.2	Owo
>30 – 40	47	52.2	32	35.5	34	37.8	39	43.3	42.2	Odigbo
>40 – 50	24	26.7	19	21.1	8	8.9	16	17.8	18.6	Odigbo
>50	4	4.4	8	8.9	5	5.6	5	5.6	6.1	Akure
Marital Status										
Married	86	95.6	90	100	82	91.1	86	95.6	95.6	Akure
Single	4	4.4	0	0	8	8.9	2	2.2	3.9	Owo
Separated	0	0	0	0	0	0	1	1.1	0.5	Idanre
Widow	0	0	0	0	0	0	1	1.1	0.5	Idanre
Religious Background										
Christianity	79	87.8	88	97.8	74	82.2	84	93.3	90.3	Akure
Islam	9	10.0	2	2.2	15	16.7	6	6.7	8.9	Owo
Traditional	2	2.2	0	0.0	1	1.1	0	0.0	0.8	Odigbo
Educational Status										
None	19	21.1	39	43.3	34	26.7	29	32.2	30.8	Akure
Adult literacy	6	6.7	8	8.9	10	11.1	2	2.2	28.9	Owo
Primary	29	32.2	31	34.4	29	32.2	36	40.0	34.7	Idanre
Secondary	35	38.9	11	12.2	8	23.3	23	25.6	25.0	Odigbo
OND/NCE	1	1.1	1	1.1	5	6.7	0	0	2.2	Owo
Household Size										
1-5	58	64.4	63	70.0	71	78.9	64	71.1	71.1	Owo
6-10	28	31.1	26	28.9	13	14.4	26	28.9	25.8	Odigbo
11-15	4	4.4	1	1.1	6	6.7	0	0.0	10.3	Owo
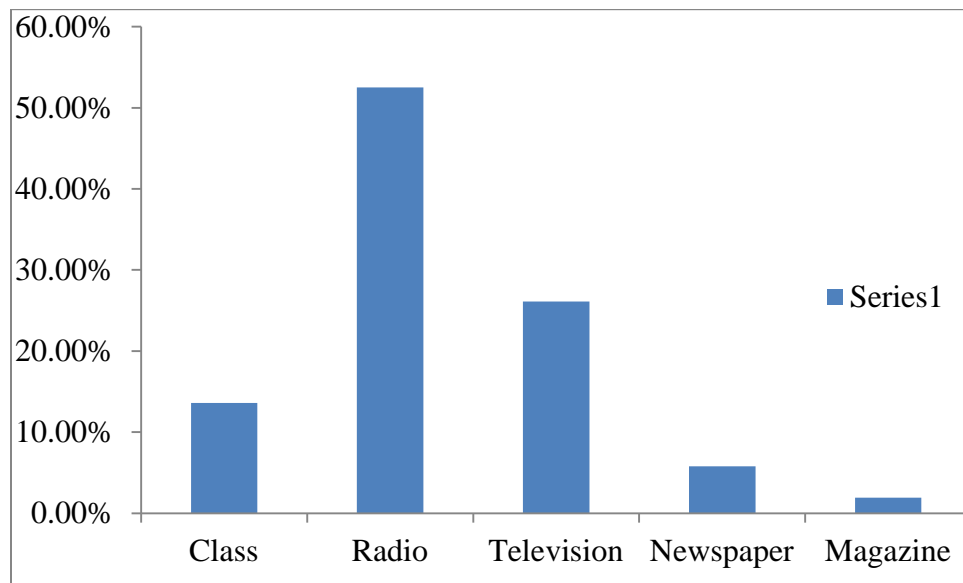
Figure 2: Percentage Distribution of respondents' Sources of Awareness about Climate Change

Table 2: Frequency Distribution of the Respondents' Perception of the Impacts of Climate Change on their Livelihood

| Identified Impacts	Odigbo		Akure North		Owo		Idanre		Mode
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	
Flooding	3	3.3	2	2.2	1	1.1	7	7.8	
Spread of Pests and diseases	25	27.8	15	16.7	30	33.3	32	35.6	Idanre
Reduced quantity and quality of water	3	3.3	7	7.8	2	2.2	8	8.9	Idanre
Makes Weather Forecasting difficult	0	0.0	1	1.1	1	1.1	5	5.6	Idanre
Reduces agricultural production	59	65.6	65	72.2	56	62.2	38	42.2	Akure
Total	**90**	**100.0**	**90**	**100.0**	**90**	**100.0**	**90**	**100.0**	
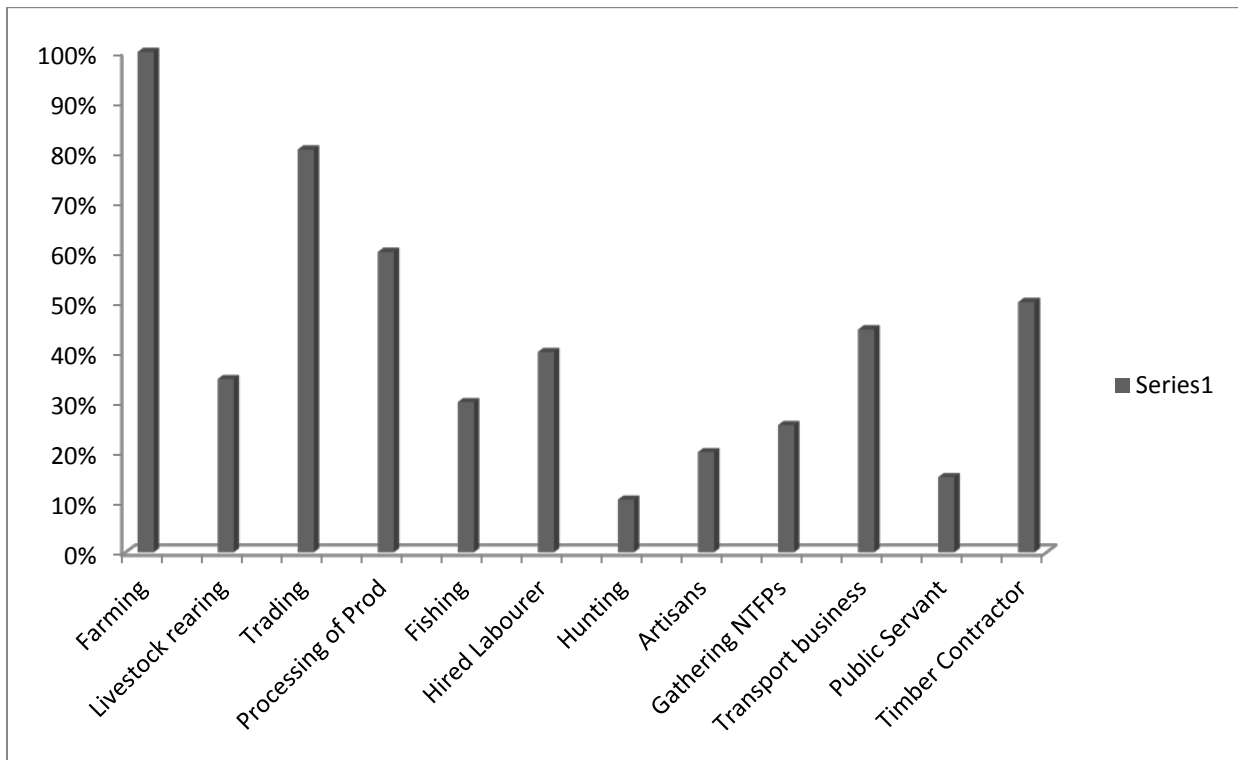
Figure 3: Frequency Distribution of Pooled Respondents Livelihood Activities in the Study Area

From the results of this study (Table 3), Idanre recorded the highest number of respondents (13.3%) with the lowest annual income of between ₦12000.0 and ₦60000.0 from their primary livelihood sources. The highest annual income of between ₦36000.0 and ₦420000.0 was recorded among the respondents from Akure North (2.2%) and those in Owo (2.2%). The modal annual income of between >₦60000 and ₦18000 (30.0%) was recorded among the respondents from Odigbo LGA.

Distribution of respondents annual income from other sources (Table 3) also indicated that majority of those making more than ₦120000.0 in the study area were from Owo LGA (38.9%) while Akure North LGA host majority of those earning between ₦12000 and ₦60000/annum (91.1%). The modal annual income of between >₦60000 and ₦12000 (26.7%) was recorded in Idanre LGA. The study also examined the respondents' spending on household health (Table 4) and found that the modal spending on household health was by the respondents from Idanre LGA who spent between ₦120000 and ₦180000 annually on health care. The

lowest spending on household health was recorded in Owo (31.1%), which was between ₦12000 and ₦60000. Also, Akure North was observed to record the modal spending of between >₦60000 and ₦120000 on household health care by 63.3% of respondents.

Modal spending on children education was observed to be between ₦360000 and ₦420000 by 10.0% of the respondents' in Akure North (Table 4). Respondents from Idanre recorded the lowest modal spending (₦12000 – ₦120000) on children education. Owo LGA was observed to record the modal spending (42.2%) in the range of ₦120000 and ₦180000 and Odigbo respondents recorded a modal spending of between ₦180000 and ₦360000 on children education (Table 4). The chi square result (Table 5) showed that there was significant relationship (P<0.05) between respondents' LGA, age, level of education and secondary occupation. Invariably, sources of awareness of climate change were found to be dependent on respondents LG of origin, age, level of education and secondary sources of livelihood.

Table 3: Frequency Distribution of Respondents' Annual Income and Sources

Income (₦ '000)	Odigbo Freq.	%	Akure North Freq.	%	Owo Freq.	%	Idanre Freq.	%	Mode
Income from Primary Sources of Livelihood									
12 – 60	4	4.4	3	3.3	2	2.2	12	13.3	Idanre
>60 – 120	27	30.0	15	16.7	13	14.4	18	20.0	Odigbo
>120 – 180	6	6.7	10	11.1	4	4.4	22	24.4	Idanre
>180 – 240	29	32.2	18	20.0	33	36.7	22	24.4	Owo
>240 – 300	8	8.9	15	16.7	11	12.2	15	16.7	Akure/Idanre
>300 – 360	16	17.8	25	27.8	22	24.4	0	0.0	Akure
>360 – 420	0	0.0	2	2.2	2	2.2	0	0.0	Akure/Owo
Nill	0	0.0	1	1.1	3	3.3	1	1.1	Owo
Total	90	100.0	90	100.0	90	100.0	90	100.0	
Income from other Sources									
12 – 60	73	81.1	82	91.1	36	40	66	73.3	Akure
>60 – 120	15	16.7	7	7.8	13	14.4	24	26.7	Idanre
>120 – 180	0	0	0	0	35	38.9	0	0	Owo
Nill	2	2.2	1	1.1	6	6.7	0	0	Owo
Total	90	100.0	90	100.0	90	100.0	90	100.0	

Table 4: Frequency Distribution of Some Respondents' Annual Spending

Spending (₦'000)	Odigbo Freq.	%	Akure North Freq.	%	Owo Freq.	%	Idanre Freq.	%	Mode
Spending on Household Health									
12 – 60	41	45.6	30	33.3	60	66.7	28	31.1	Owo
>60 – 120	46	51.1	57	63.3	22	24.1	56	62.2	Akure
>120 – 180	3	3.3	3	3.3	8	8.9	6	6.7	Owo
Total	90	100.0	90	100.0	90	100.0	90	100.0	
Spending on Children Education									
12 – 60	1	1.1	1	1.1	3	3.3	46	51.1	Idanre
>60 – 120	0	0	6	6.6	46	51.1	38	42.2	Owo
>120 – 180	13	14.4	16	17.8	38	42.2	2	2.2	Owo
>180 – 240	24	26.7	16	17.8	3	3.3	0	0	Odigbo
>240 - 300	15	16.7	8	8.9	0	0	0	0	Odigbo
>300 - 360	24	26.7	17	18.9	0	0	0	0	Odigbo
>360 - 420	5	5.6	9	10	0	0	0	0	Akure
Nill	8	8.9	17	18.9	3	3.3	4	4.4	Akure
Total	90	100.0	90	100.0	90	100.0	90	100.0	

Table 5: Summary of Chi-Square (χ^2) Statistics of the Impact of Respondents' Socio-economic Background on their Sources of Information on climate change

Socioeconomic Characteristics	χ^2 value	Df	P-value	Decision
Local Government Area	30.216	12	0.003	Significant
Sex	10.434	8	0.236	Not significant
Age	41.585	16	0.000	Significant
Year of Resident	24.647	16	0.076	Not significant
Level of Education	31.182	16	0.013	Significant
Marital Status	11.901	8	0.156	Not significant
Primary Occupation	39.998	40	0.470	Not significant
Secondary Occupation	69.230	44	0.009	Significant

The chi-square statistics (Table 6) showed significant dependence of respondents' consent on the dependence of their livelihoods on forests and respondents' LGA, age, years of resident and their occupation. The dependence of fringe forest communities in Ondo State on forest resources for livelihoods is dependent on the LGA, age, years of resident as well as the primary and secondary occupations of respondents. The chi-square statistics (Table 7) showed that the test was significant (P<0.05) for all the assessed socio-economic variables. The annual income of the respondents from their primary sources of livelihoods is dependent on their LGA, sex, Age, Level of education, marital status and primary occupation.

Table 6: Summary of Chi-Square (χ^2) Statistics of the Dependence of Respondents' Consent on their Livelihood being forest based on their Socio-economic Background

Socioeconomic	Calculated χ^2	Df	P-value	Decision
Local Government Area	25.005	4	0.000	Significant
Sex	0.214	2	0.621	Not significant
Age	34.634	10	0.001	Significant
Year of Resident	46.629	12	0.010	Significant
Level of Education	2.392	5	0.072	Not significant
Marital Status	0.195	4	0.998	Not significant
Primary Occupation	64.451	12	0.000	Significant
Secondary Occupation	32.871	7	0.000	Significant

Table 7: Summary of Chi-Square (χ^2) Statistics on the Impact of Respondents' Socio-economic Background on their Annual Income from Primary Sources of Livelihood

Socioeconomic	Calculated χ^2	Df	P-value	Decision
Local Government Area	29.812	12	0.003	Significant
Sex	23.048	8	0.003	Significant
Age	86.527	16	0.000	Significant
Level of Education	70.491	16	0.000	Significant
Marital Status	79.879	8	0.000	Significant
Primary Occupation	363.902	40	0.000	Significant

Discussion

Socio-economic Characteristics of Respondents and Climate Change Impacts

In this study, more males were observed, which is similar to the finding of Acharya (2011) in a similar environments of Nepal's mid hills. However, equal male/female representation was observed in Akure LGA, which departs from Adekunle *et al.* (2011). Further, modal (42.2%) mean age of the respondents was between 30 and 40 years, indicating that the study area is inhabited by more active age group. This finding is close to that of Adekunle *et. al.* (2011), which reported a mean age of 43 years in a similar locations in southwest Nigeria. Sofoluwe *et al.* (2011) also reported a mean age of 45.4 years from a similar study. Also important, the study found age as significantly impacting media attendance for sourcing information on climate change (Table 5) as well as the primary source of respondents' livelihood being forest dependent (Table 6). Thus, a nexus can by extension be established between forest use and climate change in the study area while media attendance for information by youths can be employed to inform them on sustainable forest land use as submitted by Azeez (2006) and Azeez and Okafor (2013).

While the majority of the respondents were married in the study area, all of them were married in Akure North LGA. This is similar to the finding of Kassa and Eshetu (2014).

However, a closer observation by Kassa and Eshetu (*Op. cit.*) revealed that a considerable proportion of households in Legehida woreda in South Wollo of the Amhara National Regional State of Ethiopia were female-headed. This suggests the existence of a large number of single, divorced or widowed women that were not captured by their study, which has serious implication for their findings. However, marital status had no significant impact on media attendance for information on climate change (Table 5) or livelihood being forest dependent (Table 6) in the study area. Invariably, even if respondents' marital status is not properly captured, it has no implication for this study's findings. Also, the highest group of the respondents' (90.4%) were Christians, which was similar to the finding of Adekunle *et al*. (2011) that reported 65.9% Christians as the modal religious group within similar settings in southwest Nigeria.

The study also observed that majority of the respondents (34.7%) had primary school leaving certificates, 25.0% had secondary school certificates and 28.9% attended adult literacy classes meaning that majority (88.6%) of the respondents' can read and write. This has positive implication for climate change awareness. However, the commonest medium of awareness of climate change, according the respondents, is the radio. Radio had been

reported by Azeez (2010) as the most important source of information in rural southwestern Nigeria despite the relatively higher level of education in this part of the country. Adekunle *et al*. (2011) also reported the use of radio as the first external sources of awareness of climate change by his respondents. Findings from this particular study however, deviates sharply from the finding of Armah *et al*. (2010) which, reported two-thirds of the respondents in their study as having no formal education (compared to one-third from this study), and are hence vulnerable to adverse effect of climate change. Worthy of note also is that although respondents' education status significantly impacts their primary source of livelihood (Table 7) and media attendance for climate change information (Table 5), it has no impact on their livelihood being forest dependent (Table 6). Similar finding was reported by Onyema and Azeez (2015) in their study in rural Southeastern Nigeria. This may mean that the livelihood of all categories of respondents' were forest dependent. Thus, curbing unsustainable exploitation of forest resources in the study area can be through first creating awareness among the enlightened community members.

The finding of this study on household size was similar to that of Armah *et al*. (2010), which also reported similar range of dependants on household heads in similar environment. Also, the majority of the respondents were farmers, which was in line with the findings of Adekunle *et al*. (2011) that put primary occupation of 83.2% of respondents in a similar study area as farming. Okunlola *et al*. (2012) also reported similar finding in a similar study. Respondents who engaged in farming reported during the Focus Group Discussions (FGDs) that climate change has degraded their land and has led to the reduction in farm output and by extension reduced their income. Famers are more vulnerable to climate change. According to FAO (2007), agriculture, forestry and fishery are highly sensitive to climate change because of its impacts on production functions. In their study, Paudel *et al*. (2011)

linked the dominance of farming as a livelihood activity to the non-availability of forest products while several studies (Khaleel-Basha *et. al.*, 2014; Aigbe and Oluku, 2012; Government of Finland, 2009) had linked forests exploitation to climate change. This may be linked to why the proportion of respondents who engaged in fishing in the study area is very minute. A reduction in the quantity and quality of water available in these locations, which negatively impacted their fishing activity and by extension their incomes was reported. Those that involved in gathering NTFPs in Owo (1.1%) also reported a reduction in NTFPs gathered as a result of climate change.

The majority of the respondents are without secondary occupation. So, they are utterly dependent on their primary source of livelihood, which in most cases, is farming. This increases their vulnerability to climate change effects like spread of pests and diseases as well as reduced quantity and quality of water. As noted by FAO (2015), MNRT (2009) and the World Bank (2008), rural poor mostly rely on environmental goods and services and therefore the most vulnerable to the effects of climate change. IPCC (2013) confirmed that human activities are more responsible for global warming. It also reported that many observed impacts are happening more quickly than previously predicted, and climate change is creating more frequent and more intense extreme weather events. People who are relying on natural resources for their subsistence living are hit the hardest from these climate change. From the results of the FGDs, climate change has decreased the availability of forest resources. This has led to a reduction in income from forest resources in the study area.

Impact of Climate Change on Livelihood
Farming and trading were the most popular sources of livelihood in the study area. Ifeanyi-obi and Matthews-Njoku (2014) identified farming and trading as the most sustainable

livelihood options in their study. Nzeh and Eboh (2010), Adesope *et al* (2011) and Ifeanyi-obi, *et al* (2011) also reported farming and trading as the major livelihood activities by rural dwellers in Nigeria. Climate change has both direct and indirect negative impacts on the general well-being of people. Livelihoods of rural communities are therefore likely to suffer most as they are highly exposed to climate extremes such as severe droughts and floods and they have limited capacity to respond to its impacts (DFID, 2009). Dube and Phiri (2013) also reported that about 98% of their respondents were of the view that crop yields were negatively affected by climate change in their study. They further reported that crop yields were affected by inadequate rainfall and rising temperatures, leading to wilting.

Decline in food production will lead to increased malnutrition and severe consequences, particularly for children (Dube and Phiri (2013). According to Ninan and Satyasiba (2012), food production is likely to be affected by the climate sensitivity of rain fed agriculture. This in turn will impact on poverty and livelihoods. The economic impacts of climate change on crop and livestock farming system were reported by Nhemachena *et al*. (2010) in their study. Lecocq and Shalizi (2007) also stated that the ultimate damages of climate change may significantly affect economic growth. In their study, Hamilton *et al.* (2005) also reposed the impact which changes in rainfall patterns and increase in temperature can have on livelihood and economic growth.

These climate change impacts affect food security through altering or restraining livelihood strategies, while also affecting the variety of food available and nutritional intake. According to Muller-Kuckelber (2013) one of the most pertinent issues of climate change in regards to human development is reduced agricultural productivity. This reduction in agricultural production is the consequences of increase in the infestation of pests and diseases. A change in

climate may bring about the introduction of new crop pests and diseases. Crop pests and diseases are greatly influenced in their incidence, spread and distribution by climate especially temperature, moisture and relative humidity. They often damage the health of forests and crops in a relatively short period, which requires a high level of preparedness to cope. This has tendency to reduce farm output and income.

Effect of socio-economic characteristics of respondents' on awareness about climate change

The LGAs of respondents' were observed to impact their sources of information about climate change. Even though the radio was advanced as the most popular source of information on climate change in Ondo State, the level of radio and other media popularity vary from one LGA to the other. Age of the respondents also determines the source of respondent's awareness of climate change. Some of the respondents who were between ages 21-30 became aware through magazine, newspaper and television. Levels of education also determined the source of respondents' awareness of climate change. Those that had tertiary and secondary education may be informed through the pages of magazine and newspaper as well as by watching television while some of those that had primary school certificate or no formal education may be informed through radio and television, which has audio and or video quality advantage. Cronholm and Sandell (1981) and Ostman and Parker (1986) also revealed that people prefer newspapers to television as important source of environmental knowledge. Thus, high literacy level coupled with accessing newspaper information through radio programmes may be responsible for the popular nature of this media in the study area. Secondary occupation also determines the source of respondents' awareness of climate change. Sex, years of resident, marital status and primary occupation of respondents had no significant impact on sources of awareness about climate change in the study area. This could be adduced to non-

discrimination of identified information media towards these characteristics. As reported by Marukatat (1991) the media should be responsible for keeping people informed about

Effect of Socio-economic characteristics of Respondents' on their Forest-based livelihood

World Bank (2001) iterated that forests are at risk from agriculture, grazing expansion and excessive exploitation among others. This goes a long way to inform us on the need to take grass root development very seriously, most especially where residents are of the view that their livelihood sources are mostly forest resources dependent. The study revealed that residents' livelihood dependence on forest resources is a function of their LGA, age and occupation (Table 6). This finding agrees with the work of Ifeanyi-obi and Matthews-Njoku (2014), which observed rural areas in Nigeria as being occupied by old people Chi-square statistics (Table 7) indicated that respondents LGA, sex, age, level of education, marital status and primary occupation impacted their annual income from primary occupation. The age-structure of a population is expected to give valuable insights into the dependency ratio, economically active and other socio-economic indices of such population. The highest levels of economic dependency were observed in Owo and Akure North while the most economically active group was recorded in Odigbo. All these will explain why annual income was found to be dependent on age in the study area. The study of Kassa and Eshetu (2014) was in line with this finding. Also, though more married respondents was recorded by the study, there were other groups viz: single, separated and widowed. This may explain the impact of marital status on respondents' annual income. A high percentage of married respondents' was also reported by Kassa and Eshetu (2014) who linked their observation to prevailing early marriage, relative stability of marriages and the possibility of remarriage among rural communities. The study by Ifeanyi-obi and Matthews-Njoku (2014) submitted that the more educated rural dwellers are,

environmental deterioration in order to increase their awareness on this issue.

consequent of youth's migration to the urban areas in search of white collar jobs. This may also support the tendency for the remaining youths in rural areas of Nigeria to pursue multiple livelihood activities as observed by Chukwuezi (2001), Bryceson (2002) and Maegher (2001). However, whichever age group and for whatever reason, imperil the future to meet present livelihood negate sustainable development and is sitting on a keg of gun powder. This was why the World Bank (2001) was of the view that sustainable management of forests is critical to eradicating poverty.

Effect of socio-economic characteristic of respondents' on their annual income from Primary Occupation

the more they are likely to abandon farming for other livelihood activities. This is expected to impact their annual income. The study of Adi (2007) also identified education as one of the determinants of livelihood strategy in Eastern Nigeria. Since agriculture is the major livelihood activity in the study area, something should be done and on time to make it attractive. Also, worthy of note is that rural dwellers who earn higher monthly income may be involved in other livelihood activities apart from farming. Adi (2007) also inferred availability of fund as a significant variable determining diversification into non-agricultural livelihoods in Eastern Nigeria.

Conclusion

This study assessed the perception level of rural people to climate change impacts in twelve communities in Ondo State. The communities were selected from four LGAs in Ondo State. Rural people to a large extent are aware of the dynamics of their local climate; they are aware of climate change issues. Climate change impacts such as changes in temperature and rainfall patterns has caused increase in

extreme climatic events such as floods, drought, pest and diseases on forest ecosystems and their provision of goods and services, which form the safety nets for many rural poor in Ondo State. Majority of the respondents were aware of the climate change and the adverse impacts of climate change on their livelihoods. Also, documented are the socio-economics of local residents that impact such perception. It was established that perception is differ from LGA to LGA and that most respondents are dependent on forest resources for their livelihood sources. Age is another important variable in the determination of livelihood sources and by extension agriculture based livelihoods.

Recommendations

- Government should carry out awareness program on climate change and the impacts on livelihoods among the rural dwellers to expand the level of awareness.

- Inform residents on the implication of unsustainable exploitation of forest land and other resources therein to guard against mortgaging the future for the present

- Alternative means of livelihood should be created in the study area to curb over dependency on forest land and other forest resources by residents

- The forests in the study area are rough diamonds, the full exploitation of which demands the creation of a multi-stakeholder platform, involving the local actors, most especially to generate an all inclusive policy framework for their sustainable management.

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