



Protected Areas and Management Practices: Evidence in Southwest Nigeria

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Abstract: Forests are important plant communities that consist of trees and other woody vegetation that perform life supporting functions on earth. Forest reserves are areas protected from use mainly by the government in order to preserve this resource. With the phenomenal increasing population globally and in particular Nigeria and over dependence on forest resources, it is crucial to be aware of the rate of deforestation and how to curb it. In view of this, the paper assessed the conditions of the forest reserves and management systems by government officials and communities in south-western Nigeria, particularly Ekiti and Ondo states. Remote sensing techniques and social surveys were employed in carrying out this task. Landsat imagery of 1984, 2000 and 2016 and the Nigerian topographic map of 1960 were the spatial datasets used. Two sets of questionnaires were also used for the study covering community leaders (10), and government agencies (26) to further explain the observed changes and management systems. Results show that there has been a general decline in the area of heavy forests in most of the forest reserves. This decline was as much as 48%, and 54% of its base year size in Ekiti, and Ondo state respectively; which has given way to the emergence of light forests and the underlying rock outcrops. Forests are mainly in care of government officials who widely accepted the reality of deforestation within their jurisdiction while also acknowledging excessive lumbering and forest clearance for agriculture as their main challenges. The need for more aggressive forest regeneration efforts by agencies in charge of the protected areas; urgent delimiting of these reserves, increased capital investment in forest monitoring, and improvement in agricultural system efficiency were recommended.

Keywords: Forest Degradation, Land Use Land Cover Change, Forest Management, Forest Reserve

1. Introduction

The Food and Agricultural Organization of the United Nations [4]. Defined forest as an area of land greater than 0.5 hectare with more than 10% tree cover. The world's forests store more than 650 billion tons of carbon: 44 percent in biomass, 11 percent in dead wood and litter, and 45 percent in soil [11]. They are large areas of land covered with trees and bushes, either growing wild or planted for some purposes [10].

Forests play an important role; they are the homes of wild animals, the trees serve as wind breaks and helps to prevent soil erosion; the wood of the trees provide the raw materials for furniture making and pulp for manufacturing papers;

provide herbs for traditional medicines and serves to beautify the environment. They also play an important role in the global carbon cycle; they help in the purification of the air by removing carbon dioxide (during photosynthesis) and adding oxygen (during respiration). [10] Forests have low surface albedo and can mask the high albedo of snow which contributes to planetary warming through increased solar heating of land [2, 12, 8, 16].

In recent years, the inability to control deforestation and degradation of forest has been recognized in many countries. Very little of Africa's forests remain in a 'primary' condition i.e. broadly, unmodified by humankind [18]. This can be linked to deforestation, over population, incessant logging and poverty [15]. Deforestation in the tropics is often driven

by agricultural expansion and exploitation of forest resources [9, 12]. Deforestation is now the second leading cause of greenhouse gas emissions, just behind industrial emissions [17]. Overall, direct conversion of forests into permanent agriculture is the major driving force of deforestation [1].

In response to perceived over-exploitation of forest resources, the first forest reserve in Nigeria was created in 1901, with the promulgation of the Forestry Ordinance and creation of a Forestry Department ran by Conservators of forests. Prior to this however, several communities had areas that were protected from farming, hunting and any other human activity. These areas may have been a shrine or something of cultural heritage; others termed as: “evil forests”. There are now 445 gazetted forest reserves distributed over the five main ecological zones of the country. These are however being subjected to de-reservation as a result of increase in population and economic expansion in other sectors [6].

The importance of Nigeria’s ample biodiversity and associated habitats cannot be over-stressed as it spans beyond the local to the international community in ways beyond pure aesthetics; providing valuable environmental services, present and future economic benefit and quality of life values that are difficult to quantify [14]. Thus as climate change and global warming become ever more evident, the values that forests and wetlands serve in regulating temperature and

protecting against storm damage cannot be exaggerated. Forests of multiple species- biodiverse ones- are more resilient to climate change, and their ecosystem services of temperature control under their canopy helps modulate the rise [15].

Efficient management of resources is primarily hinged on adequate information about the condition of such resource. This study thus takes a look at the changes that have occurred in the composition of the gazetted forest reserves in south-west Nigeria by conducting a land use/land cover assessment over three decades (1984-2016), while also examining issues around their management.

2. Study Area

The study area is known as the south west geographical zone of Nigeria which consists of six states. Two of these were chosen for this study: Ondo and Ekiti states. The area lies between longitude 2°31’ and 6°00’ East and Latitude 6°21’ and 8°37’N [3] with a total land area of 77,818 km². The study area is bounded in the East by Edo and Delta states, in the North by Kwara and Kogi states, in the West by the Republic of Benin and in the south by the Gulf of Guinea. The study area had 85 constituted forest reserves with a forest area cover of 842,499 ha [3].

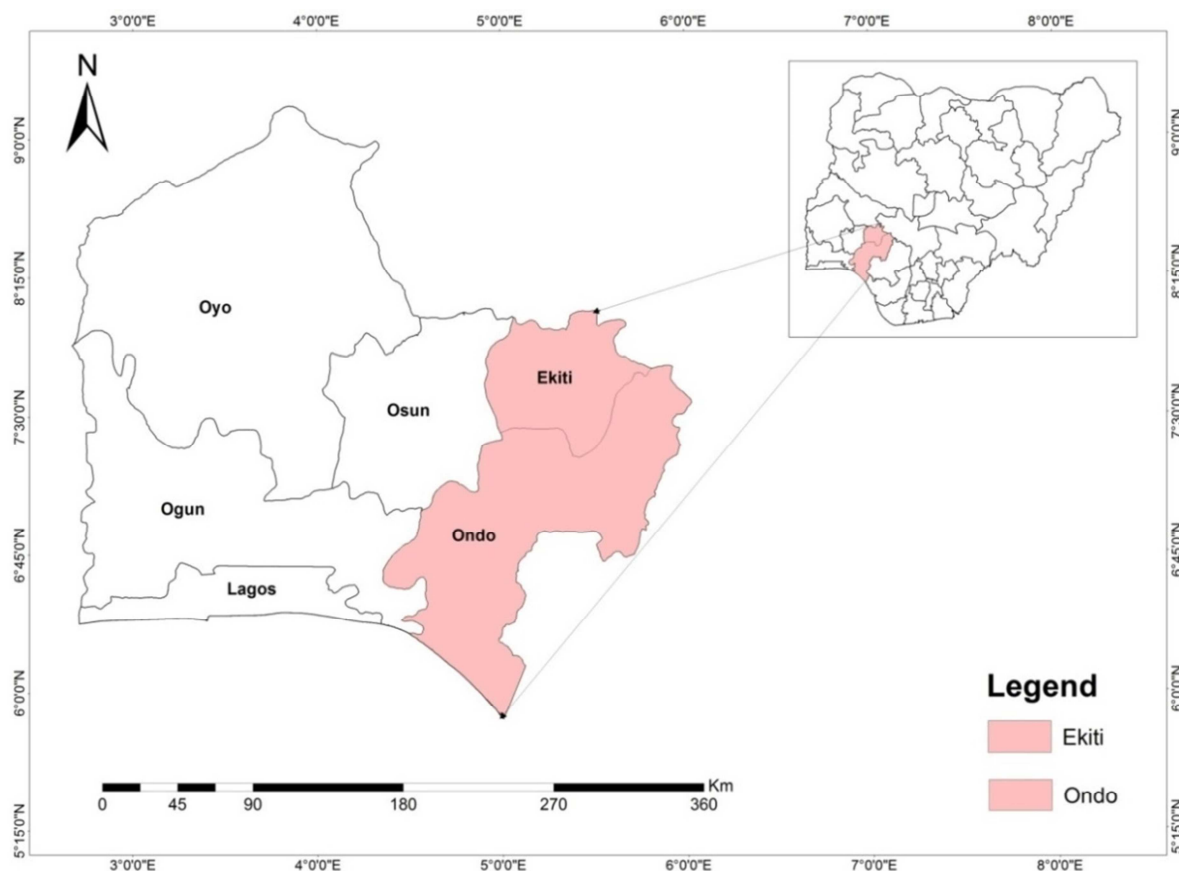


Figure 1. The Study Area.

The climate of southwestern Nigeria is tropical in nature and it is characterized by wet and dry seasons. The

temperature ranges between 21 and 34°C while the annual rainfall ranges between 150 and 300 mm [13].

The vegetation is made up of fresh water swamp and mangrove forest at the belt. The low land in the forest stretches inland to parts of Ondo State, while secondary forest is towards the northern boundary where the derived southern Savannah exists [3].

The South-Western Nigeria is generally regarded to as the Yoruba speaking states. The settlements pattern is a mixture of rural and urban settlement pattern. The estimated population of the region is 32.5 million. Important cities include Ikere, Ado-Ekiti, Illawe, Akure, Ikare, Owo, Okitipupa, Ore, Ile-Oluji, Ejigbo.

The South-Western region measures relatively well on the economic scale. The dominant source of income and occupation (economy) of Ekiti is Agriculture while Ondo state prides itself in the production of wood crafts, clothes, artifacts among others.

3. Methods and Procedures

In order to analyze the spatio-temporal changes of the protected areas in southwest Nigeria, the research made use of both spatial and non-spatial (attribute) data. The spatial data include topographic map and satellite imagery. The non-spatial data are responses from field observations and questionnaires administered to the officials of the government agencies and community leaders. Landsat imagery of 1984, 2000 and 2016 which was freely downloaded from United States geological survey (USGS) website was used for the land use change detection and mapping while the topographic map of 1966 was used as a base map to produce the boundaries of the study area. These were analyzed using the ArcGIS 10.3.1 and ENVI 5.0 software. The source and acquisition date of these data are given in Table 1.

Table 1. Spatial data sources.

Type of data	Identification/Coverage/ Sheet number	Scale resolution	Date acquired	Acquisition source
Topographic sheet	Sheet 9	1:500,000	1960	Laboratory for Remote sensing and GIS. Geography Department, University of Lagos.
Landsat TM, ETM and OLI	WRS-2, Path 189 Row 55 Path 190 Row 54, 55, 56 Path 191 Row 55, 56	30 meters	1984, 2000 and 2016	USGS Global Visualization Viewer http://glovis.usgs.gov

A 7,5,3 band composite was made using the ENVI software. The bands were used because of its technical capability to distinguish features in their natural color. These composite images were subjected to an image classification scheme adapted from Anderson, (1976). The classes of training sites include cultivated land, heavy and light forest, rock outcrop, built-up area, water body, wetland and bare surface. Classification signatures were generated and all subjected to the supervised MAXLIKE (maximum likelihood) algorithm. This was adopted using the ENVI image analysis software due to the merits of image statistics that is embedded in the supervised classification algorithm. The classified images of 1984, 2000 and 2016 were imported into the GIS environment to identify what has changed between the three years. The amount of changes that have occurred and the direction of changes were calculated and the final land cover change map produced in the GIS environment. The extent of deforestation and rate of disappearance of the different land use changes were calculated through simple subtraction of the previous inventory data from the current one and the rate of the changes determined by calculating their respective percentage values.

Two sets of questionnaires were also used for the study covering community leaders and government agencies. The stratified random sampling method was used within the study area of Ekiti and Ondo and the communities were then chosen based on their proximity to the protected areas. Their responses were evaluated using the Statistical Package for the Social Sciences (SPSS) software, especially their perception on the state of forests under their jurisdiction,

and the procedures for commercial logging and forest clearance for agriculture. Other issues examined include the services they render to their host communities, requirements from communities, identified barriers to community cooperation and the various challenges encountered in forest management. Responses from the community leaders (Obas, Baales and village heads) and stakeholders (forest users, herb collectors and firewood sellers) were also analyzed to ascertain specifically their involvement in the management of forests around them.

4. Results and Discussion

4.1. Assessment of the Changes in the Land Cover of the Forest Reserves (1984, 2000 and 2016)

The changes in the land cover of the forest reserves were assessed on a state basis and are discussed in the following sections.

4.1.1. Ekiti State

The eight forest reserves in Ekiti state were analyzed for their landuse/land cover characteristics for the years 1984, 2000 and 2016. The major reserves in Ekiti are Ise (70.13km²) and Ogbesse (55.17km²), with Ogotun south being the smallest with a total land area of 3.47km². The study revealed that in 1984, majority of the forest reserves were covered with both heavy and light vegetation (figure 2).

Ara, had 60% heavy forest of the total land area; Ogbesse 56% and Ise 57%. Ara had a portion of built-up in it (1km² or 5% of the total land area), indicating the presence of human

habitation even as at 1984. Small patches of rock appear to have surfaced in some of the forest reserves amidst the

presence of dense vegetation cover; Ogbesse with 2% rock outcrop, Ogotun North with 2% and Ikeji Oke with 3%.

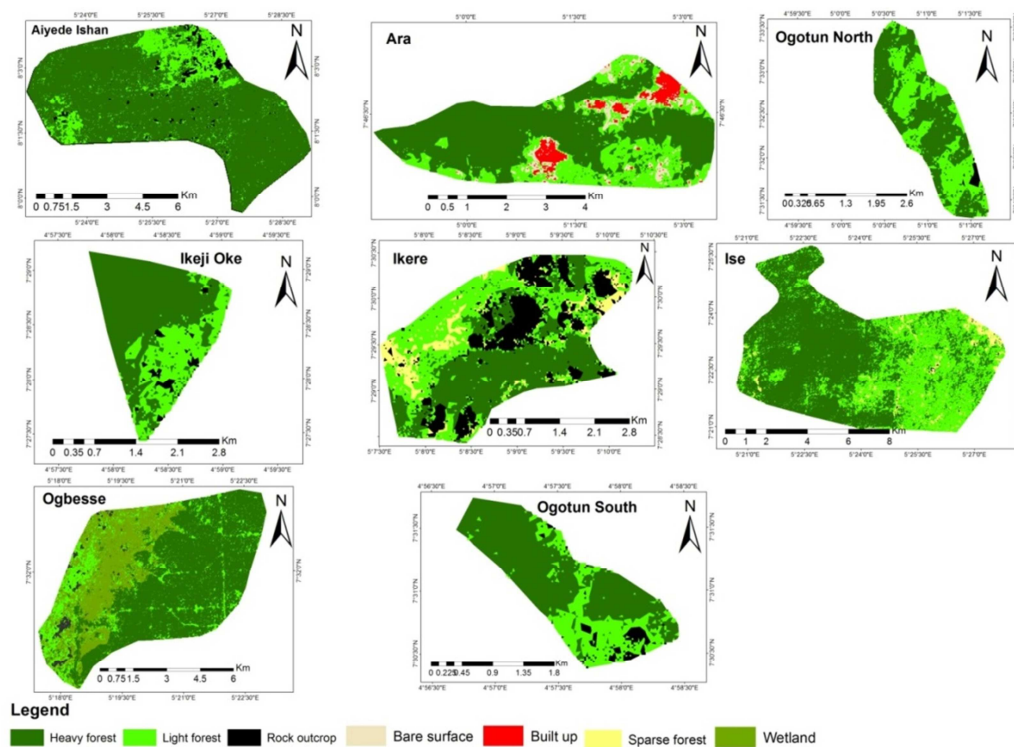


Figure 2. Land cover of the forest reserve in Ekiti 1984.

Moving forward, distinct land use classes began to appear in the year 2000. Heavy forests reduced in area, giving way to light forest due to the activities of man including urbanization, clearing for agriculture and lumbering (figure 3).

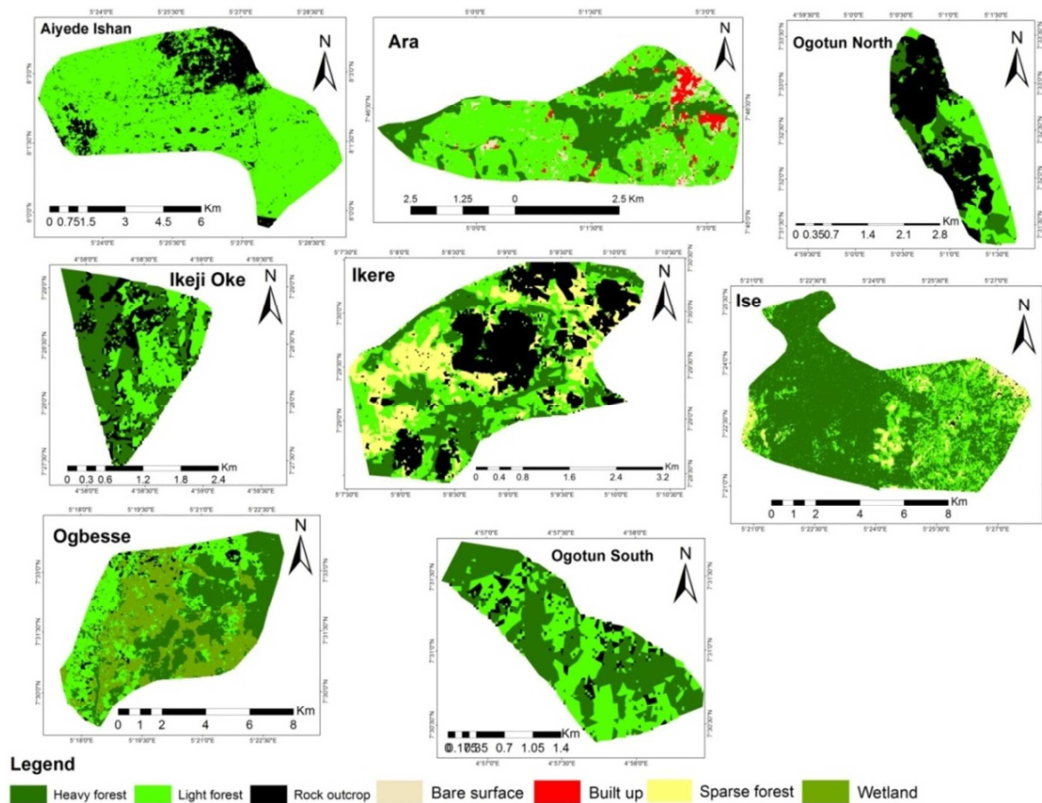


Figure 3. Land cover of the forest reserve in Ekiti 2000.

By the year 2016, the portion of heavy forest appears to have drastically reduced in all the forest reserves in Ekiti state. Similarly, heavy forest in Ikeji Oke appeared to have given way to light forest and rock outcrops (figure 4).

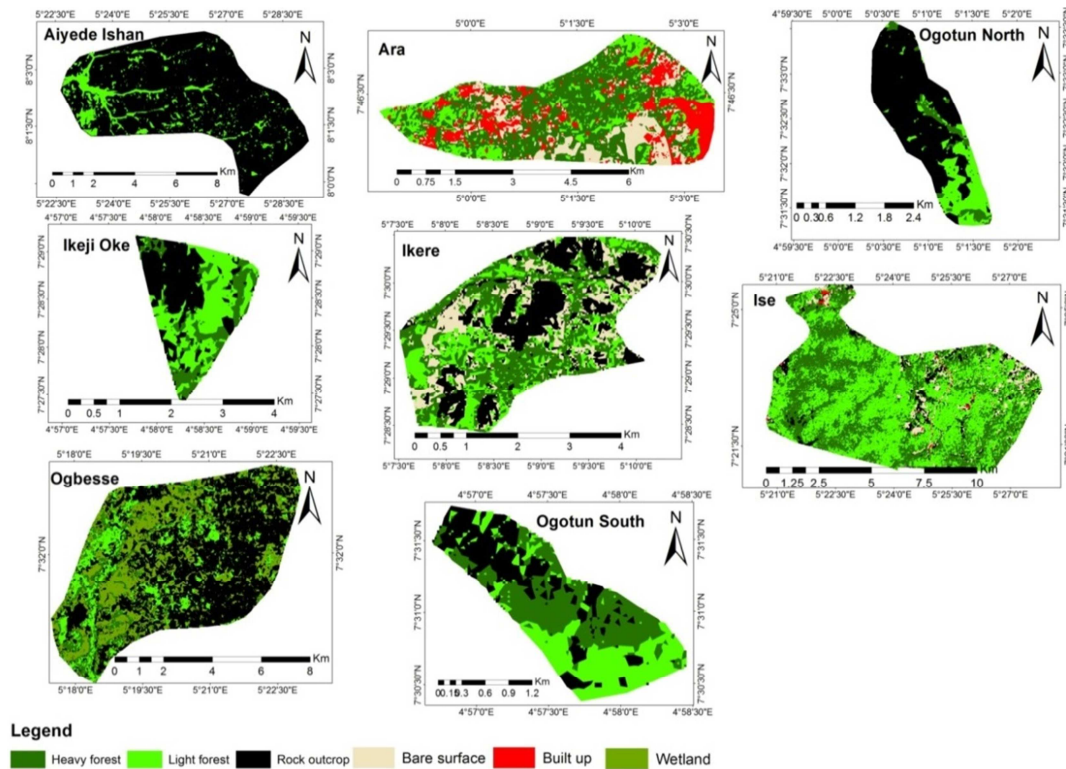


Figure 4. Land cover of the forest reserve in Ekiti 2016.

However, there were some natural re-growth and afforestation efforts in Ara, leading to a reversal in the areas lost by heavy forests to regain about 47% of the land area. Thus, the apparent increase in area covered by

built up should be taken seriously by the forest administration.

The summary of net gain and losses for each of the land cover from 1984 to 2016 is illustrated in table 2.

Table 2. Gain/Loss between 1984-2016 (Ekiti).

LULC TYPE	Heavy forest		Light forest		Rock outcrop		Bare surface		Sparse forest		Built up		Wetland	
	Area (sqkm.)	Area (%)	Area (sqkm.)	Area (%)	Area (sqkm.)	Area (%)	Area (sqkm.)	Area (%)	Area (sqkm.)	Area (%)	Area (sqkm.)	Area (%)	Area (sqkm.)	Area (%)
Ogbesse	-25.18	-45	-1.8	-2	21.90	44							-0.13	-1
Aiyede Ishan	-40.53	-48	-1.41	-2	41.95	50								
Ara	-2.36	-13	-2.04	-9			1.68	9			2.71	15		
Ise	-12.49	-18	7.26	10	3.81	6	3.86	6	-2.80	-4	0.37	0		
Ikere	-0.32	-3	-1.68	-14	0.84	7	-0.32	-3	-1.11	-9				
Ogotun North	-2.31	-48	-0.97	-40	3.3	68								
Ikeji Oke	-1.9	-44	0.39	9	1.5	35								
Ogotun South	-1	-28	0.15	4	0.84	24								

Significant losses of close to 50% of the heavy forest area were recorded in Aiyede-Ishan, Ogotun North, and Ogbesse FRs within the period. The least loss of this natural forest was recorded in Ikere FR. The implication is that most of these forest reserves are now left with secondary growth. The underlying rocks covered by the heavy forests were therefore made more visible hence the high amount of net gain in area by 2016 in most of the reserves.

4.1.2. Ondo State

Ondo state has quite a large number of forest reserves,

totaling eighteen and concentrated in the center of the state with a few spread across. The most prominent of the reserves are; Oluwa (792km²), Idanre (535.63km²), Akure Ofosu (351km²), Ala (288km²), Ifon (266km²) and Owo (210km²), the smallest being Ejigbo (19.21km²). As with their counterparts in Ekiti, in 1984, all the reserves in Ondo were majorly covered with heavy forest, which made up the bulk of the land use class with slight patches of rock outcrop. (Figures 5 and 6).

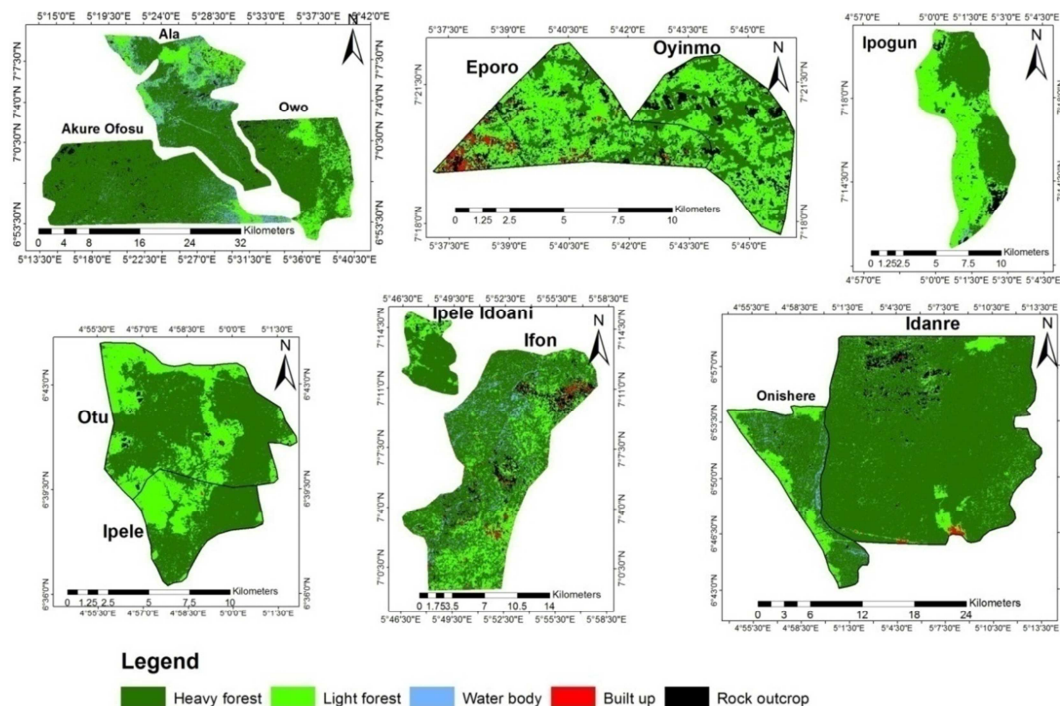


Figure 5. Land cover of the forest reserve in Ondo 1984.

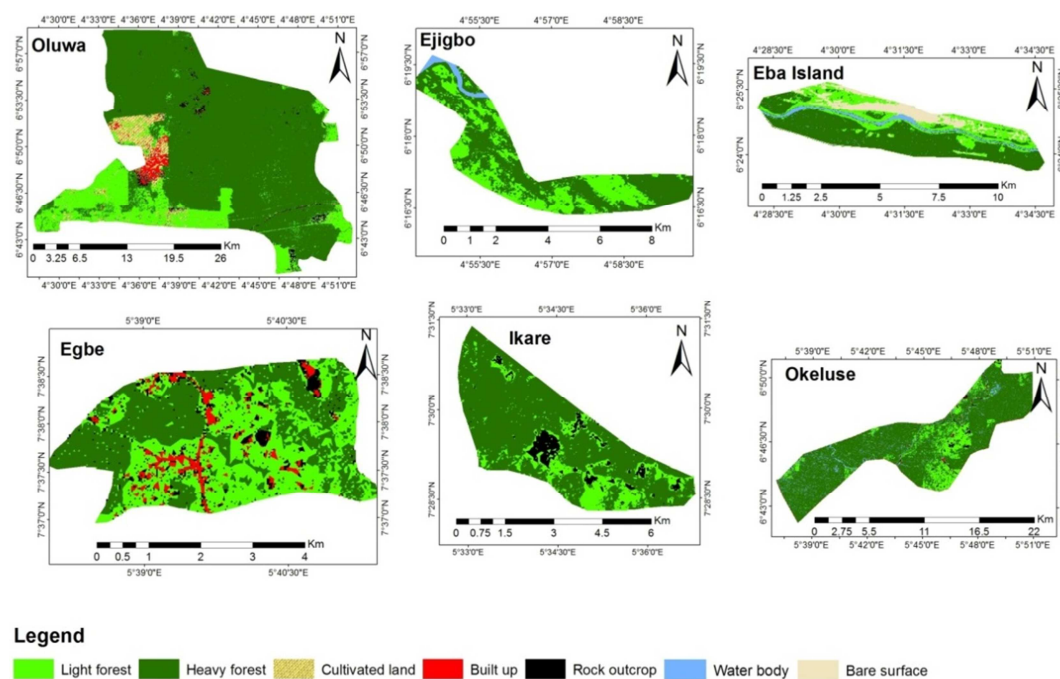


Figure 6. Land cover of the forest reserve in Ondo 1984.

Oluwa reserve had the largest coverage of heavy forest (587km²). This was closely followed by Idanre (468km²), Akure Ofosu (296km²), Ala (167km²), Ifon (158km²) and Owo (138km²). The reserve covered the least by heavy forest was Egbe (5km²), despite it not being the smallest in size of all the reserves in Ondo state. In addition, Oluwa forest reserve had a portion delineated for plantation agriculture (34km² or 4%) of the total land cover. Other reserves had the presence of human habitation (built up) such as Oluwa

(11km²), Egbe (0.81km² or 6%), Eporo (1.73 km² or 6%), Ala (0.63km²) and Idanre (1.94km²).

In year 2000, decline in heavy vegetation began to be prominent. Oluwa experienced a 13% decline from 1984 and light forest increased in the same intensity. This decline was followed by Idanre (12%), which also experienced an increase in light forest (50km²), and a more exposed rock outcrop (7.4km²) (Figures 7 and 8).

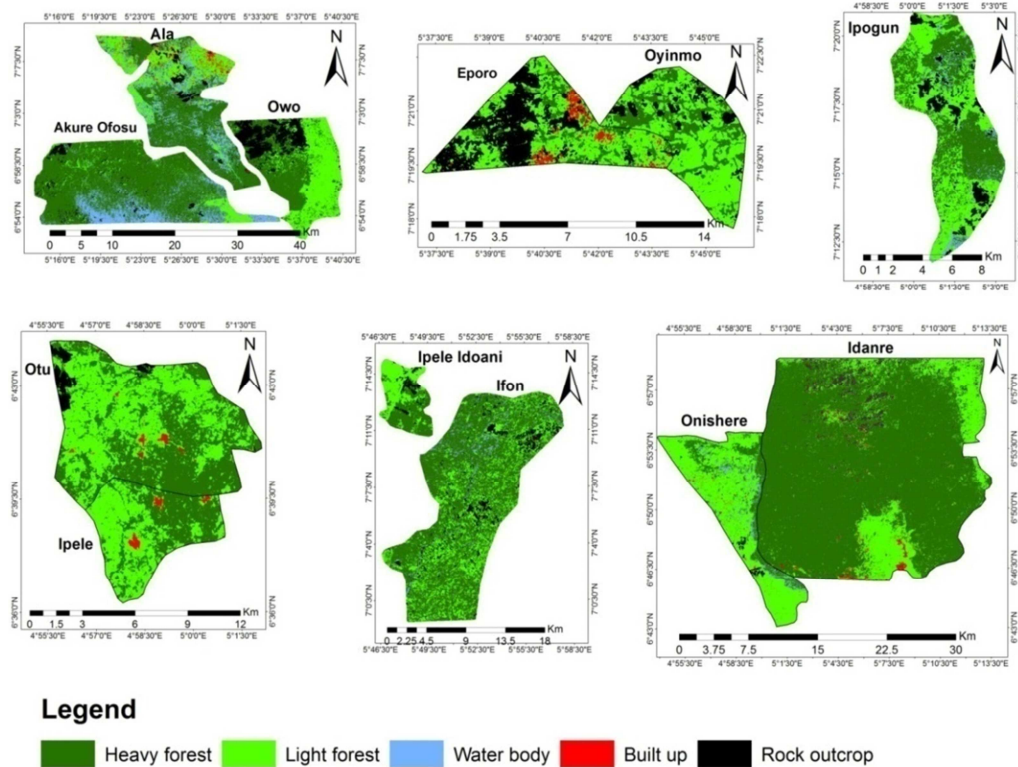


Figure 7. Land cover of the forest reserve in Ondo 2000.

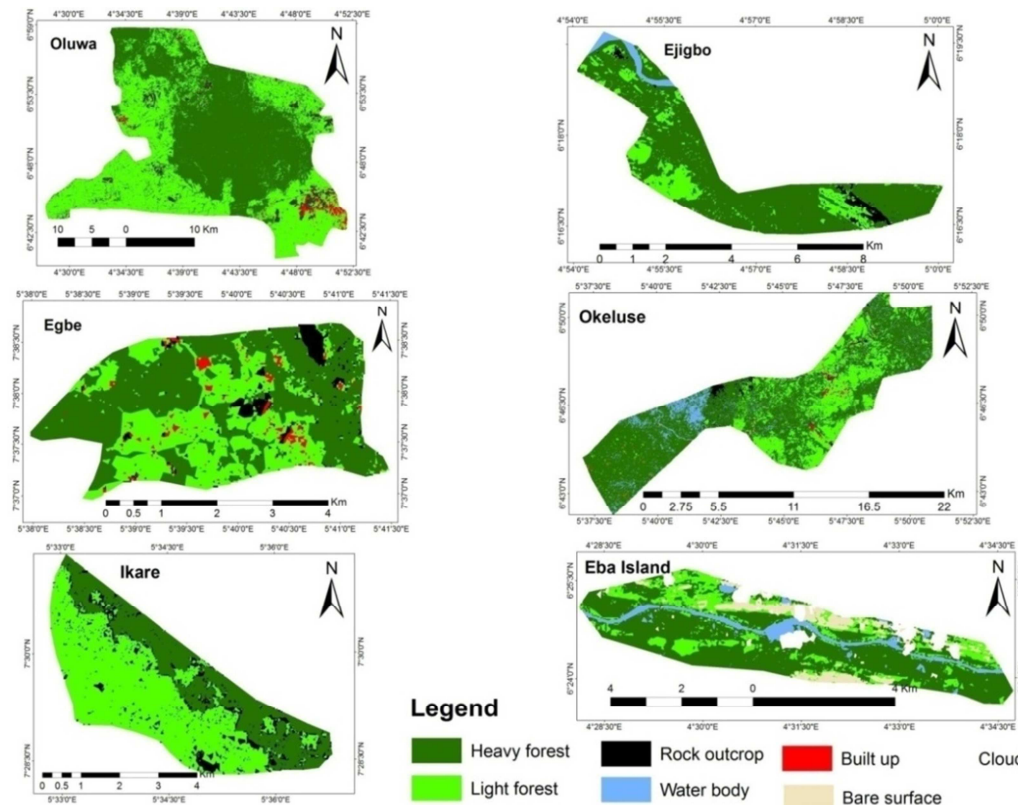


Figure 8. Land cover of the forest reserve in Ondo 2000.

Owo, although small in size compared to Oluwa and Idanre had the most loss of heavy forest from 1984 from 138km² in 1984 to 65km² in 2000. Despite the decline in heavy forest

cover for some reserves in Ondo state in the year 2000, Egbe and Ifon forest reserves recorded a 13% and 1% increase in heavy forest cover respectively during this period which could

be attributed to some re-afforestation efforts in both.

The year 2016 saw a major decline in heavy forest cover of the reserves from 1984. Idanre had the most loss with 54% of its heavy forest cover gone (468-180km²), followed by Ifon, Owo and Ala with a loss of 52%, 49% and 48%

respectively. Notwithstanding, two of the smallest forest reserves experienced a growth in heavy forest cover from 1984; Ejigbo (2%) and Oyinmo (6%) (Figures 9 and 10). This could be attributed to regeneration or regrowth of the light forest, resulting in a dense forest cover.

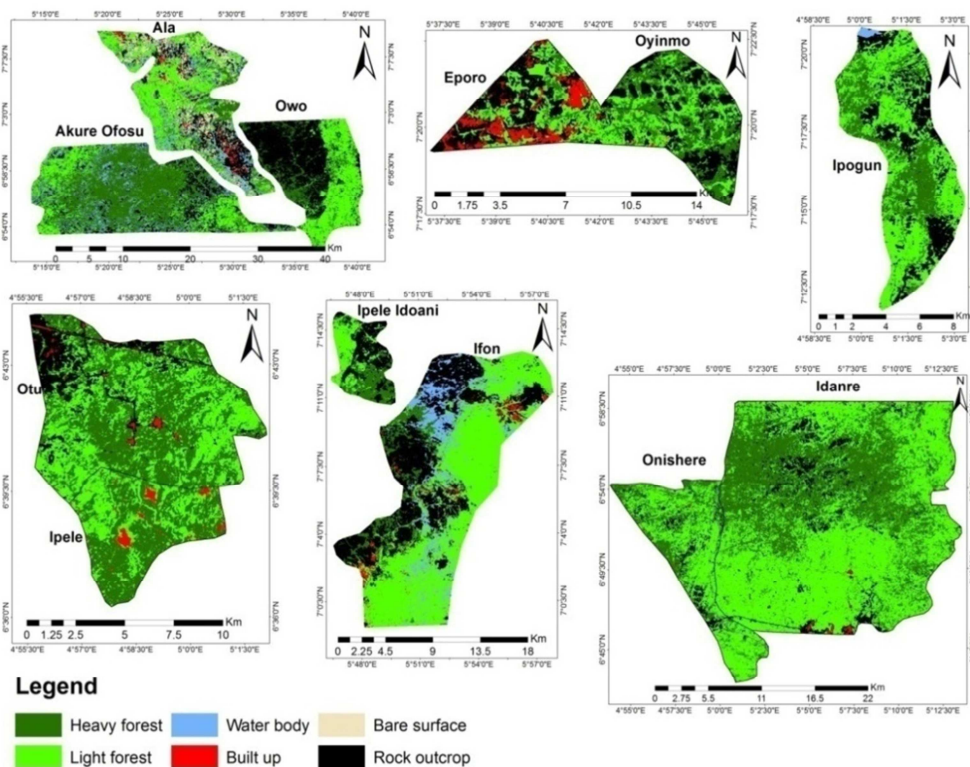


Figure 9. Land cover of the forest reserve in Ondo 2016.

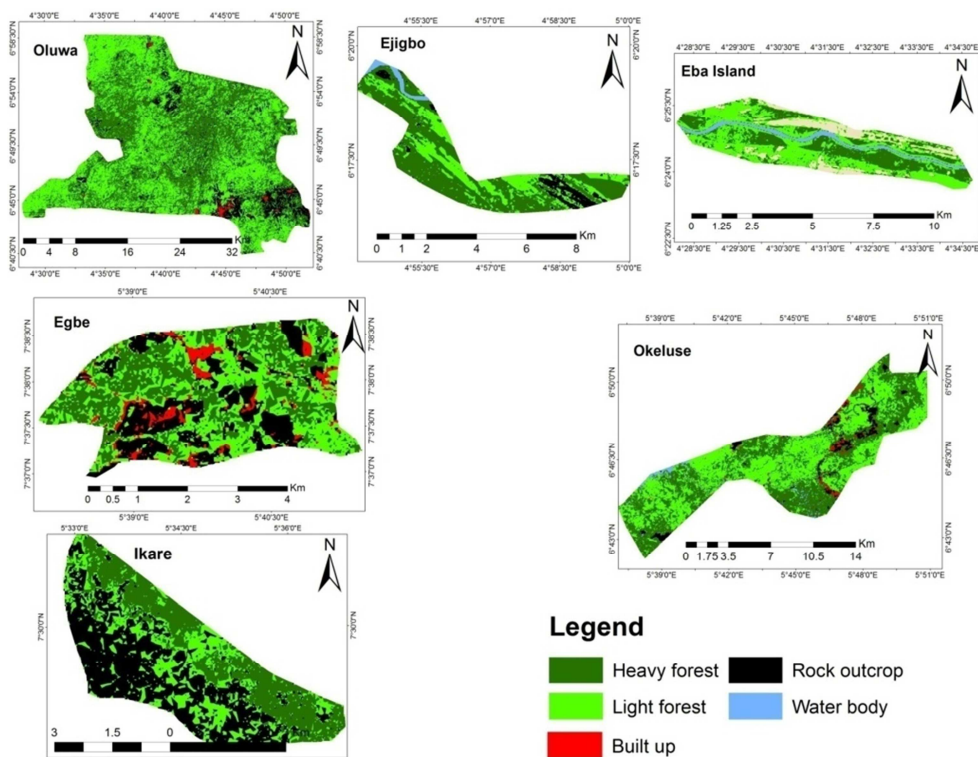


Figure 10. Land cover of the forest reserve in Ondo 2016.

The summary of net gain and losses for each of the land cover from 1984 to 2016 is illustrated in table 3.

Table 3. Gain/Loss between 1984-2016 (Ondo).

LULC TYPE	Heavy forest		Light forest		Rock outcrop		Bare surface		Cultivated land		Built up		Water body	
	Area (sqkm.)	Area (%)	Area (sqkm.)	Area (%)	Area (sqkm.)	Area (%)	Area (sqkm.)	Area (%)	Area (sqkm.)	Area (%)	Area (sqkm.)	Area (%)	Area (sqkm.)	Area (%)
Egbe	-1.51	-11	-1.11	-8	2.4	17					0.2	2		
Eporo	-3.66	-10	-8.02	-22	7.13	20					4.55	12		
Ipele Idoani	-17.26	-50	6.45	16	12.52	34								
Ifon	-139	-52	65.13	24	57.22	22					0.43	0	16.03	6
Okuluse	-40.92	-30	43.15	32	3.08	2					1.16	1	-6.61	-5
Ala	-139.41	-48	41.52	15	48.26	16	49.68	17			6.26	2	-6.3	-2
Owo	-102.94	-49	18.57	9	84.36	40								
Akure Ofosu	-129.48	-37	59.72	17	40.38	12							29.37	8
Idanre	-288.33	-54	269.19	51	19.42	3					-0.27	0		
Otu	-13.67	-18	2.76	3	10.12	14					0.77	1		
Ipele	-1.69	-5	0.34	1							1.35	4		
Onishere	-46.8	-41	41.73	36	10.87	10					0.27	0	-6.06	-5
Oluwa	-250.97	-32	230.99	29	60.03	7			-34.16	-4	-5.93	0		
Eba Island	-4.61	-20	4.71	21			-0.37	-2					0.27	1
Ejigbo	0.28	2	-1.83	-10	1.6	8							-0.05	0
Oyinmo	1.75	6	-7.45	-25	5.69	19								
Ipogu	-10.94	-17	-2.52	-4	13.29	20							0.13	1
Ikare	-8.06	-42	1.43	7	6.64	35								

As noted earlier, significant losses in heavy forest cover were recorded in Idanre, Ifon, and Ipele-Idoani FRs from 1984 to 2016. In Idanre, this mostly gave way to light forest or secondary growth which was the highest gaining land use class at 51%. Other forest reserves that experienced same were Onishere, Okuluse, and Oluwa with about 36%, 32% and 29% gain respectively.

Comparatively, the forest reserves in Ondo seem to experience more of forest degradation as the light forest offer the hope of full regeneration of the forest resources of the reserves while greater attention must be given to those in Ekiti which seem to have been widely deforested, giving way to the underlying rocks. This forest degradation as described

by GOFC-GOLD [7] leads to a continuous decrease in carbon stocks in these areas.

4.2. Assessment of Current Forest Management Systems

4.2.1. Government Forest Management Strategies

The perception of resource managers is significant in determining current and future approaches to its management. Government officials across the sampled states were interviewed to gain an understanding of the management systems and challenges. Their perception on the state of forests within their jurisdiction is presented in Table 4:

Table 4. State of forests and woodlands (%).

State	Deforestation	Exploitation	Decline in forest size	Appropriate management	Too much emphasis on revenue generation	None
Ondo	25.0	50.0	-	-	25.0	-
Ekiti	20.0	20.0	40.0	-	-	20.0

Source: Computed from field survey (2018).

Deforestation and forest size decline were seen as the bane of forest management in the sampled states. Most of the respondents agreed that there was a general decline in the forest resources under their control owing to over-exploitation. This indicates that resource managers understand the problem, which is the first step towards a

better forest management approach.

To further understand the dynamics of forest management in these states, the procedures for the use of the forest resources, especially by lumber men and farmers were examined. This is against the background that these are the most significant deforestation activities in these areas (Table 5).

Table 5. Procedure for commercial logging and forest clearance for agriculture (%).

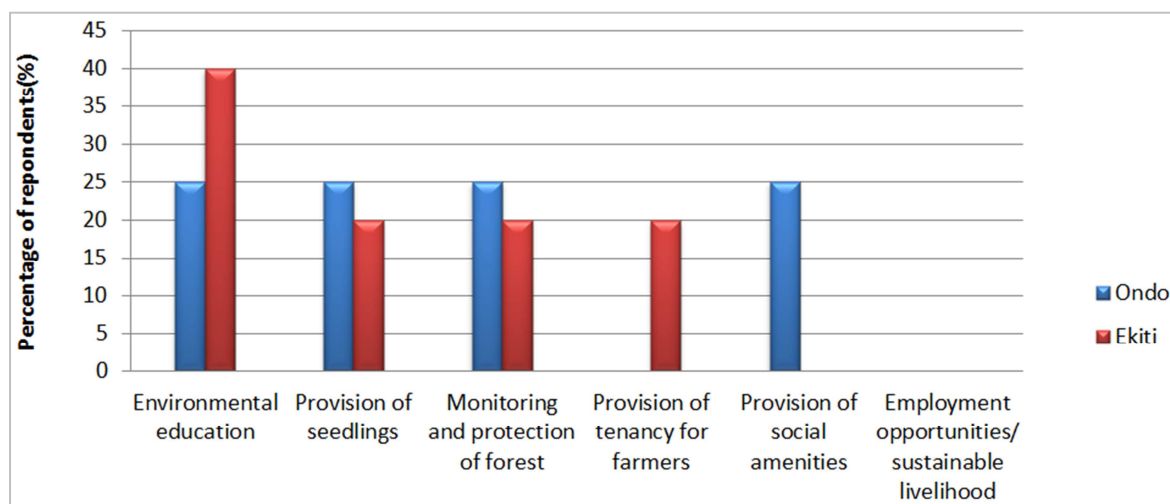
	Ondo		Ekiti	
	Commercial Logging	Agriculture	Commercial Logging	Agriculture
Through application	75	75	60	60
Government approval	25	0	20	20
None	0	0	20	20
Not allowed	0	25	0	0

Source: Computed from field survey (2018).

Generally, commercial logging is an ongoing activity in the sampled states but it requires approval from government agencies through permits and applications. None of the respondents indicated the use of forest allocation method as is used in other areas. Some other officials were not aware of authorized procedure for commercial logging in their states. Forest clearance for agricultural use is generally through application to the agencies responsible for the management of the forest reserves. Some officials in Ondo state noted that this was not an authorized activity within the reserves, while

most of them (75%) indicated that it was through application. In Ekiti state, majority of the officials stated that it was through application (60%) while some others noted that it could also be by government approval (20%) and still another 20% stated that this was not applicable in their region.

In addition to forest management, government agencies were involved in the provision of other services like environmental education and facilitating sustainable livelihood (Figure 11).



Source: Computed from field survey (2018).

Figure 11. Service rendered to communities (%).

Agency officials in both states indicated the most significant services rendered to communities within their jurisdiction. Environmental education, provision of seedlings, and monitoring and protection of forests were common to both states. In Ondo state, some agencies provided social amenities to the communities while in Ekiti state, they provide tenancy for farmers to ensure land tenure security for reduced risk production. It was observed that none of the state agencies employed members of the communities. This could have been a tool for better partnership if they were involved perhaps as forest guards as they have a better

understanding of the terrain.

Government alone cannot handle the responsibilities of forest management. Therefore, the need to incorporate community efforts is of paramount importance. The need for tree re-planting and protection of available ones was noted by all agencies across the states as a significant requirement for community participation (Table 6). In Ondo state, there was the mention of a need to establish new reserves or renovate the existing ones. Also of importance in Ekiti state was the need for partnership in public enlightenment programmes, and information dissemination through various channels.

Table 6. Requirements from communities (%).

State	Establishment/ renovation of new reserves	Enlightenment programmes, cooperation and information	Prevention of felling of trees	Regeneration/ protection of trees	Labor supply	No response
Ondo	25.0	-	25.0	50.0	-	-
Ekiti	-	20.0	20.0	20.0	20.0	20.0

Source: Computed from field survey (2018).

4.2.2. Community Involvement in Forest Management

Community leaders showed high involvement in tree replanting/afforestation (33%) (carried out individually), and encouraging privately owned or managed forests (50%). There were efforts generally at creating awareness about protected areas, planting indigenous tree species, training on alternative livelihood, and the use of alternative energy

sources (Table 7). However, the prevention of illegal farming, forest burning, and reporting forest offenders were activities that recorded low levels of involvement.

Although 50% of community leaders have encouraged the development of privately owned forests, they have rarely been encouraged or praised for their efforts or even compensated by any agency.

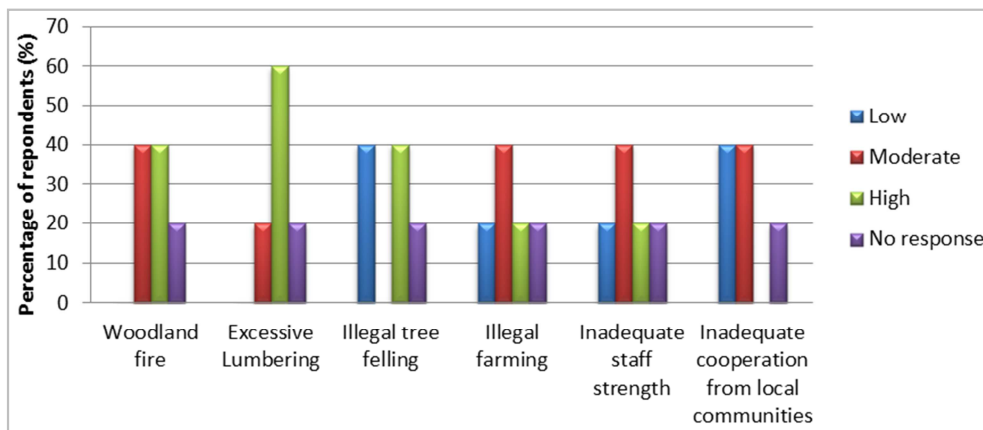
Table 7. Community involvement in forest management (%).

Afforestation	Creating Awareness about protected areas	Managing Woodlot	Indigenous trees specie Woodlot	Reporting Offenders	Training on alternative livelihood	Preventing Illegal farming	Preventing Illegal burning	Use of Alternative energy source	Development of community forest	Regular dialogue on forest / climate issues
33.3	33.3	16.7	33.3	16.7	33.3	16.7	16.7	33.3	50.0	16.7

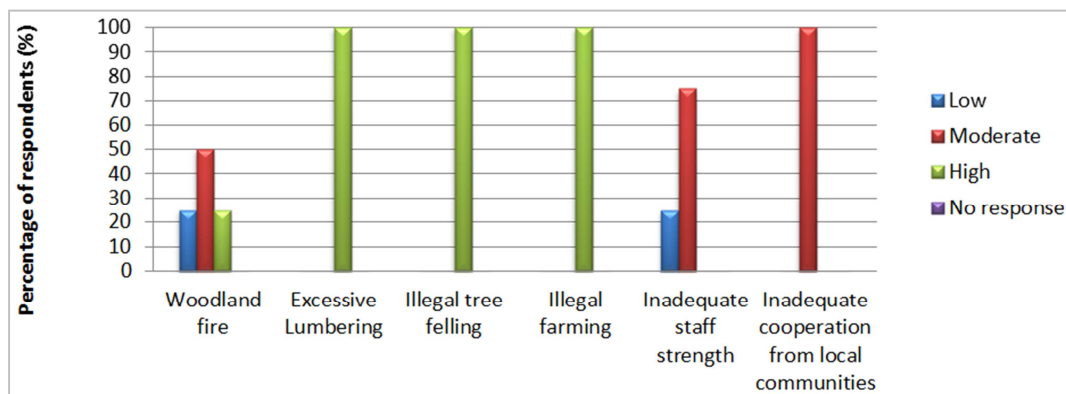
Source: Computed from field survey (2018).

The management of forest reserves and protected areas in the study area comes with a number of challenges. These challenges were examined on state basis as shown in Figures 12 and 13. Uncontrolled burning of land parcels within the protected areas poses a serious threat to the sustainability of these resources. These are usually done by farmers who are in search of arable land and some hunters in search of

animals. About 25% and 40% of government officials in Ondo and Ekiti states respectively regarded this as a very significant challenge. Uncontrolled lumbering is another factor that leads to the depletion of forest resources. All the respondents in Ondo state indicated that this was a major challenge to forest sustainability while 60% of their counterparts in Ekiti state shared this view.



Source: Computed from field survey (2018).

Figure 12. Challenges of forest management (Ekiti).

Source: Computed from field survey (2018).

Figure 13. Challenges of forest management (Ondo).

Closely related to excessive lumbering is illegal tree felling, which could be for various purposes such as fuel wood. As was the case with excessive lumbering, Ondo state officials believed this was quite another significant challenge, while those in Ekiti were evenly distributed in their perception of its significance. Illegal farming on forest reserves should not be allowed. Despite the fact that plots of

land could be acquired through application as noted earlier in Ondo state, illegal farming is also perceived as a threat to sustainable forest management in the region. Its importance in threatening forest management in Ekiti state was perceived to be quite modest even though land parcels could also be acquired through government approval.

Forest monitoring over a significant range of hectares

requires a requisite number of staff to efficiently carry out this task. Apart from the foresters, there are administrators who are reported to. Government officials in both states were quite conservative about the significance of this challenge with the exception of about 20% who perceived this as of outmost importance.

Government officials cannot manage forests on their own. They need the contributions of stakeholders like the community members. However, some of these community members are not easy to convince and therefore pose a challenge in adequate forest management as active community participation in managing these reserves seem to be very low. This challenge was noted to be of moderate significance generally in both states and is consistent in Fasona *et al.* [5].

There were also significant barriers to efficient cooperation between the government agencies and local communities which were analyzed and summarized in Table 8.

Table 8. Barriers to community cooperation (%).

State	Policy	Institutional	Land Dispute	Cultural	Literacy
Ondo	50.0	50.0	50.0	50.0	75.0
Ekiti	80.0	40.0	100.0	60.0	100.0

Source: Computed from field survey (2018).

About half of the Ondo state officials described the various barriers and challenges to government-community cooperation as significant. These include policy. The exception was of the barriers attributed to the level of literacy of host communities which has made it quite challenging to get them to understand current developments in techniques and theory. It was a more varied situation in Ekiti where land disputes and literacy topped the list of significant barriers (100% each), followed by weak policy instruments to apply. There seemed to be a workable institutional arrangement in the state to facilitate community cooperation. A part of the institutional challenge in both states can be attributed to the low staff strength of the forest ministry workers who try to meet the never-ending demands of forest management. This is consistent in Fasona *et al.* [5].

5. Conclusion and Recommendation

Forests are sources of carbon sink and their importance cannot be overemphasized. The study showed that the forest reserves are losing heavy forest cover in large number. With the continuous activities of man in building/construction, agricultural expansion, tree felling and other activities that lead to forest degradation, it is no surprise that global warming is on the rise.

This study has identified the pattern of land use land cover changes in the forest reserves of Ekiti and Ondo states, highlighted the various strategies employed by both government agencies and communities in ensuring forest sustainability, and also identified the major challenges to efficient forest management in the area. In line with these issues, the following recommendations are hereby suggested;

- 1) There is a need for more aggressive forest regeneration efforts by agencies in charge of the protected areas.
- 2) Protected areas must be urgently delimited so as to avoid incessant encroachment into these areas since they are mostly left open without established borders.
- 3) Agricultural systems should be improved to help farmers maximize the available arable land around the protected areas without necessarily encroaching into these areas in search of virgin lands.
- 4) Lumbersmen should be educated on the potential advantages of sustainable feedstock harvesting.
- 5) Increased capital investment in forest monitoring and oversight functions of government agencies.
- 6) Localization of international agreements that promote forest conservation like the REDD+ programme.

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