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Pattern of Rainforest Resources Usage and Sustainable Development in Ogbia Local Government Area, Bayelsa State

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Keywords

Pattern, Rainforest Resources, Sustainable Development, Ogbia Local Government Area.

Abstract
This study examined the pattern of rainforest resource utilization and its effects on sustainable development in Ogbia LGA of Bayelsa State. In this study, descriptive survey design was used and the data was obtained from both primary and secondary sources. This study used purposive sampling method to select 10 communities and systematic random sampling technique was used to select households in each of the sampled communities. The population of the study is 369,912 with a sample size of 400. The study used a self–developed four likert scale questionnaire which 400 was administered to the respondents with 385 successfully retrieved and analyzed using percentages for research questions. The findings of this study showed that trees, fodder, fiber, fruits, animals and birds are the major rainforest resources. The study further revealed that the pattern of rainforest resources utilization includes hunting and gathering, fishing, harvesting of fuel wood and timber, cultural and spiritual properties, subsistence farming (for cultivating crops such as cassava, yam, plantain, and vegetables). The study concluded that effective policy implementation and community participation are critical to balance rainforest resource utilization with ecological preservation. This study highlights the significance of sustainable management practices in ensuring that rainforest resources in Ogbia LGA contribute meaningfully to present and future socioeconomic development without compromising ecological integrity.

I. Introduction

Rainforests are among the most biologically diverse ecosystems on earth, providing essential ecological services and supporting numerous livelihoods. Ayanlade et

al. (2020) identified tropical rainforests as repositories of biodiversity, offering critical ecosystem services such as carbon sequestration and water purification. These forests host an array of resources, including timber, non-timber forest products (NTFPs), and medicinal plants, which contribute significantly to the livelihoods of forest-dependent communities. Similarly, Nunez (2020) emphasized the pivotal role of rainforests in regulating global climate systems while supporting both local economies and biodiversity.

The sustainable utilization of rainforest resources is crucial in maintaining biodiversity, ensuring economic stability, and mitigating climate change. Ogbia Local Government Area (LGA) in Bayelsa State, Nigeria, is endowed with rich rainforest resources, including timber, medicinal plants, wildlife, and non-timber forest products (NTFPs) such as fruits and nuts. These resources serve as sources of income, food, and raw materials for local industries. Majority of rural households and a smaller percentage of urban households depend heavily on forest resources for their livelihoods (Borokini et al., 2010). Unanaonwi (2020) in his submission, stated that forest resource use involves the extraction of such resources (such as grazing for livestock), cultivation of crops and cutting of trees (FAO, 2007) hunting of wildlife and harvesting and collection of non-timber products.

In a related development, Oriola (2007) stated that Nigeria has a total forest area of 14,387,000 hectares in 1990. Five years thereafter, the Nigerian forest estate stands at 13,780,000 hectares with an annual change of 0.9% which is deplorable. According to Unanaonwi (2020), sustainable agriculture can therefore be achieved by properly utilizing forest resources. Moreover, the increasing demand for these resources, coupled with unsustainable exploitation practices, raises concerns about environmental degradation, deforestation, and loss of biodiversity (Adepoju & Salami, 2017). The problem of over exploitation of forest resources arose from the wrong concept that forest resources are naturally renewable and therefore the amount, or quantity as well as the methods of removal or harvest is inconsequential in renewability.

The utilization of rainforest resources in Ogbia LGA has been largely unregulated, leading to deforestation, soil degradation, and biodiversity loss. Helmut et al. (2006) found that different combinations of diverse proximate causes and underlying driving forces in various geographical and historical settings determine the loss of tropical forests in their investigation of the proximate causes and underlying driving forces of tropical deforestation. The primary drivers of this exploitation include population growth, agricultural expansion, logging, and oil exploration activities (Nwankwo et al., 2020). These activities threaten the ecological balance and sustainable development of the region, as they often result in habitat destruction, water pollution, and declining agricultural productivity. Additionally, the absence of effective policies and poor enforcement of environmental regulations exacerbate the depletion of rainforest resources (Okonkwo & Eze, 2019). This unsustainable exploitation is jeopardizing the delicate balance necessary for ecological sustainability, thereby putting both the environment and livelihoods at risk (Nunez, 2020).

Sustainable development, which balances environmental conservation with socio-economic growth, is essential to ensuring that the benefits derived from rainforest resources continue for future generations. There is a pressing need to understand the

patterns of rainforest resource usage and how sustainable management strategies can be implemented to ensure long-term environmental and economic benefits. It is on this background the study sought to investigate pattern of rainforest resources usage and sustainable development in Ogbia Local Government Area, Bayelsa State.

Aim and Objectives

The aim of this study was to examine the pattern of rainforest resources usage and its implications for sustainable development in Ogbia Local Government Area of Bayelsa State. The specific objectives of the study are:

To identify the types of rainforest resources utilized in Ogbia LGA and their primary uses.
To analyze the patterns of exploitation of rainforest resources in Ogbia LGA.
To propose sustainable management practices that will enhance conservation while supporting local livelihoods.

II. Materials and Methods

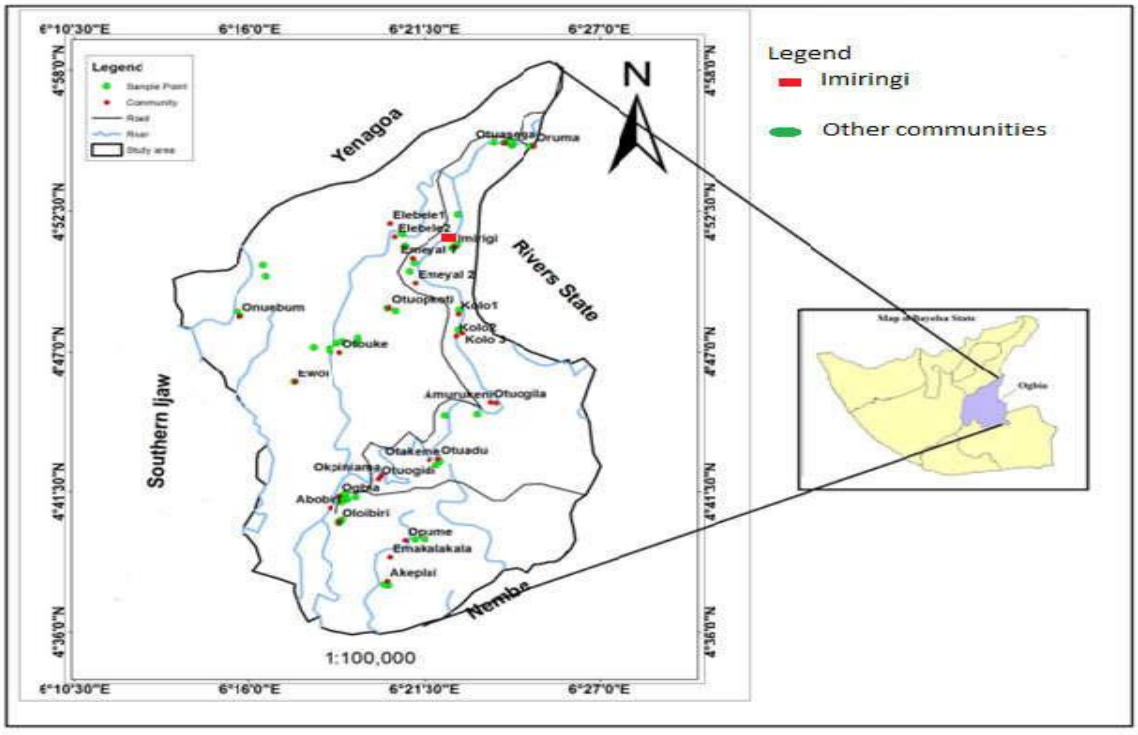

Figure 1.1: The Study Area (Ogbia Local Government Area) Showing Settlements
Source: Surveyor General's Office, Bayelsa State, 2020.

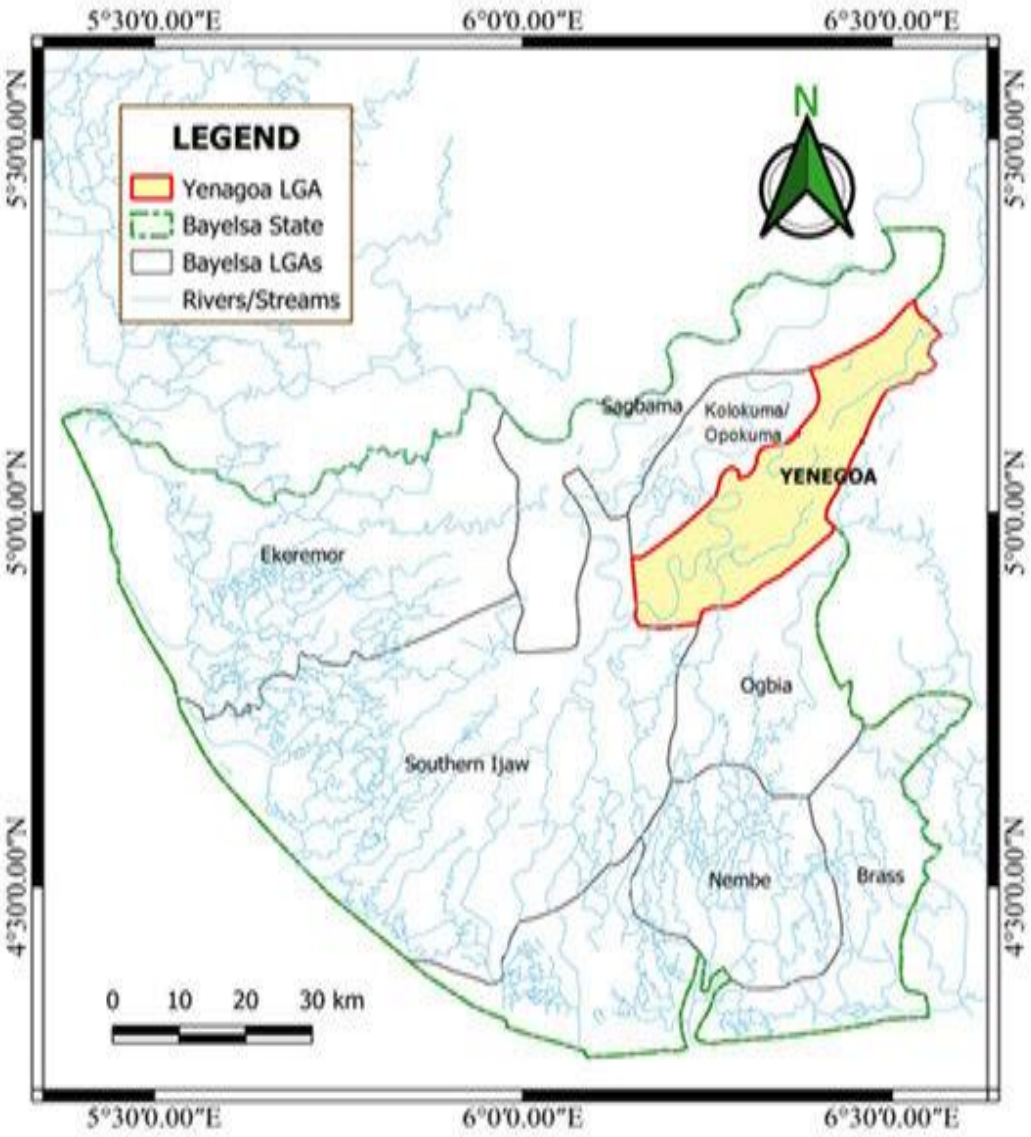

Figure 1.2: Bayelsa State showing the Local Government Areas
Source: Ministry of Land and Housing, Bayelsa State, 2020.

The area of the study is Ogbia is a Local Government Area of Bayelsa State. As one of the LGAs in Bayelsa State in the Niger Delta region of Nigeria, its headquarters is in Ogbia town in the south of the area at 4°39′00″N 6°16′00″E. It has an area of 695 km2 and a population of 369,912. It is well known for its historic value to the today Nigerian state economy mainstay (Bayelsa State Government, 2022). The study adopts descriptive survey design and the data was obtained through primary and secondary sources with sample size of 400. This study used purposive sampling technique where 10 communities were purposively selected because of their relatively large population and number of households, large land mass, communication channels (access roads, telecommunication), security etc. Systematic random sampling technique was used to

select households in each of the sampled communities. 400 structured questionnaires were administered to selected households in the study area and 385 questionnaires was successfully retrieved and analyzed.

III. Results

S/N	Rainforest Resources utilized in Ogbia LGA	SA	A	D	SD
1	Timber is one of the most utilized rainforest resources in the area.	210 (55%)	156 (40%)	14 (4%)	5(1%)
2	Fodder/Fibre are by the residents for both commercial and local use.	205 (53%)	151(39%)	23(6%)	6(2)
3	Non-timber forest products (e.g., fruits, nuts, medicinal plants) are widely harvested by residents.	166 (43%)	185 (48%)	30 (8%)	4(1%)
4	Water sources from the rainforest contribute to domestic and agricultural activities.	195 (51%)	175 (45%)	8 (2%)	7(2%)
5	Wildlife in the rainforest is hunted for food and economic purposes.	188 (49%)	168 (44%)	19 (5%)	10 (2%)

S/N	Patterns of Exploitation of Rainforest Resources	SA	A	D	SD
6	Agricultural expansion	150(39%)	192(50%)	30(8%)	13(3%)
7	Firewood and charcoal production.	120(31%)	250(65%)	10(3%)	5(1%)
8	Non-timber forest product (NTFP) harvesting,	170(44%)	185(48%)	24(6%)	6(2%)
9	wildlife hunting and oil exploration	200(52%)	175(45%)	8(2%)	2(1%)

S/N	Proposed Sustainable Management Practices	SA	A	D	SD
10	Community-Based Forest Management (CBFM)	145(38%)	220(57%)	15(4%)	5(1%)
11	Agroforestry	165(43%)	205(53%)	12(3%)	3(1%)
12	Controlled Harvesting and Sustainable Logging Practices	187(49%)	190(48%)	6(2%)	2(1%)
13	Ecotourism	125(32%)	240(62%)	16(5%)	4(1%)
14	Alternative Livelihood Programs	210(54%)	150(38%)	25(6%)	10(2%)

IV. Discussion Findings

Types of Rainforest Resources Utilized in Ogbia LGA and Their Primary Uses

Based on the findings of the study, timber, non-timber forest products (NTFPs), medicinal plants, wildlife, and freshwater resources are the various rainforest resources available in Ogbia Local Government Area. Each of these resources serves critical ecological, economic, and socio-cultural functions, playing a vital role in the sustainability of the region.

Timber is one of the most extensively exploited rainforest resources in Ogbia LGA. It is primarily used for construction, furniture making, and as a source of fuelwood. Species such as mahogany (Khaya ivorensis), iroko (Milicia excelsa), and obeche (Triplochiton scleroxylon) are highly valued for their durability and aesthetic appeal in the wood industry. However, the excessive logging of these hardwood species has led to deforestation and habitat degradation, raising concerns about the long-term sustainability of timber extraction in the region (Akindele et al., 2015). Non-timber forest products (NTFPs) such as nuts, fruits, spices, and resins are widely harvested for both subsistence and commercial purposes.

The sustainable harvesting of these NTFPs is crucial to maintaining biodiversity while supporting rural livelihoods (Shackleton et al., 2011). Medicinal plants play a significant role in traditional healthcare practices in Ogbia LGA. The local population relies heavily on plant-based remedies for treating various ailments due to the high cost and limited accessibility of modern healthcare services. Species such as Azadirachta indica (neem), Carica papaya (pawpaw), and Alstonia boonei (pattern wood) are widely used for their therapeutic properties in treating malaria, gastrointestinal infections, and skin diseases (Sofowora, 2008). Wildlife resources, including bushmeat species such as antelope, porcupine, and various bird species, are another crucial component of rainforest resource utilization in Ogbia LGA. Hunting for subsistence and commercial purposes is a common practice, providing a significant source of protein and income for local communities (Fa et al., 2006).

Patterns of Exploitation of Rainforest Resources in Ogbia LGA

The findings of the study reveal that the exploitation of rainforest resources in Ogbia Local Government Area (LGA), Bayelsa State follows various patterns driven by socio-economic factors, population pressure, and industrial activities. These patterns of exploitation can be broadly categorized into commercial logging, agricultural expansion, fuel wood and charcoal production, non-timber forest product (NTFP) harvesting, wildlife hunting, and industrial activities, particularly oil exploration. The high demand for timber species such as mahogany (Khaya ivorensis), iroko (Milicia excelsa), and obeche (Triplochiton scleroxylon) has led to extensive logging, often conducted illegally or without adherence to sustainable forestry practices (Akindele et al., 2015). Agricultural expansion is another major driver of rainforest resource exploitation. Shifting cultivation and small holder farming are common practices in Ogbia LGA, with farmers clearing forested areas to cultivate crops such as cassava, yam, and plantain (Nwankwo et al., 2020). While traditional slash-and-burn agriculture has been practiced for generations, increasing population pressure has reduced the fallow period, leading to soil depletion and a decline in agricultural productivity. Furthermore, large-scale commercial agriculture, particularly for oil palm and rubber plantations, has resulted in the conversion of vast rainforest areas into monoculture farms, thereby reducing biodiversity and altering local climate patterns (Okezie et al., 2017).

The harvesting of fuelwood and charcoal production is another prevalent form of resource exploitation in Ogbia LGA. Trees are felled indiscriminately for firewood and charcoal production, leading to deforestation and increased carbon emissions (Arowosoge & Popoola, 2018). Non-timber forest products (NTFPs) such as nuts, fruits, medicinal plants, and resins are heavily exploited for both subsistence and commercial

purposes. While these resources are generally considered renewable, overharvesting, coupled with habitat destruction, threatens their sustainability. For instance, the excessive harvesting of bush mango (Irvingia gabonensis) and bitter kola (Garcinia kola) has led to a decline in their natural populations, affecting both biodiversity and local economies (Shackleton et al., 2011). The lack of proper management strategies for NTFP collection increases the risk of resource depletion and undermines long-term economic benefits.

Wildlife hunting for bush meat is another widespread pattern of rainforest resource exploitation in Ogbia LGA. The hunting of animals such as antelope, porcupine, and various bird species is a traditional practice that provides food and income for local communities (Fa et al., 2006). However, the rise in commercial bush meat trade, driven by urban demand, has intensified hunting pressure, leading to population declines of many species. Unsustainable hunting methods, including the use of traps and firearms, exacerbate the problem, contributing to biodiversity loss and ecosystem imbalances (Nasi et al., 2011). The presence of multinational oil companies has led to large-scale deforestation, pollution, and environmental degradation. Oil spills, gas flaring, and pipeline leaks have contaminated soil and water bodies, reducing the availability of freshwater resources and negatively impacting both agriculture and fisheries (Obunwo et al., 2016). The destruction of mangrove forests and swamp ecosystems due to oil exploration further threatens biodiversity and the livelihoods of local communities who depend on fishing and farming for survival.

Sustainable Management Practices for Conservation and Livelihood Support

The result of the study indicates that the sustainable management of rainforest resources in Ogbia Local Government Area (LGA) is essential to balancing environmental conservation with the socio-economic well-being of local communities. Effective strategies must integrate ecological preservation, community participation, and economic viability to ensure long-term sustainability. Some of these strategies include community-based forest management, agroforestry, controlled harvesting, ecotourism, policy enforcement, and alternative livelihood programs. In Ogbia LGA, establishing community-managed forests with legal backing could encourage sustainable resource use while generating income through eco-friendly enterprises such as sustainable timber harvesting and non-timber forest product (NTFP) trade. Agroforestry, the integration of trees with crops and livestock, is a sustainable practice that enhances soil fertility, reduces deforestation, and provides multiple income streams for farmers. This method can be promoted in Ogbia LGA to reduce the pressure on rainforest resources by encouraging farmers to adopt tree-based farming systems. Species such as oil palm (Elaeis guineensis), bush mango (Irvingia gabonensis), and cocoa (Theobroma cacao) can be cultivated alongside food crops to improve productivity while maintaining ecological balance.

Controlled harvesting and sustainable logging practices are crucial to preventing overexploitation of timber and non-timber resources. Selective logging, where only mature trees are harvested while younger ones are preserved, ensures forest regeneration and biodiversity conservation (Putz et al., 2008). Establishing clear guidelines and enforcing sustainable timber certification schemes, such as those promoted by the Forest Stewardship Council (FSC), could enhance responsible forestry in

Ogbia LGA. Ecotourism offers a viable alternative to extractive industries by leveraging the natural beauty and biodiversity of the rainforest to generate income while promoting conservation. Well-managed ecotourism initiatives can create employment opportunities in tour guiding, hospitality, and handicrafts, reducing dependency on destructive resource exploitation (Honey, 2008). In Ogbia LGA, establishing eco-lodges, guided wildlife tours, and cultural heritage tourism could attract visitors while ensuring that conservation efforts are financially sustainable. However, ecotourism must be carefully planned to avoid negative environmental and socio-cultural impacts (Weaver, 2001).

Strengthening Policy Enforcement and Environmental Governance is essential to curb illegal logging, hunting, and land degradation. Despite existing environmental policies in Nigeria, weak enforcement has allowed unsustainable practices to persist (Ogunleye et al., 2019). Alternative Livelihood Programs can reduce reliance on rainforest exploitation by providing sustainable income-generating opportunities. In particular, the promotion of sustainable fisheries management in Ogbia LGA can help protect freshwater biodiversity while ensuring long-term food security (FAO, 2018). Furthermore, access to microfinance and cooperative funding can support small-scale entrepreneurs in developing environmentally friendly businesses.

V. Conclusion

The rainforest resources in Ogbia LGA provide critical economic and ecological benefits, supporting local livelihoods and biodiversity conservation. However, the utilization of these rainforest resources follows different patterns. The patterns of rainforest resource exploitation in Ogbia LGA are largely unsustainable, driven by commercial, subsistence, and industrial activities. Deforestation, habitat destruction, and resource depletion pose serious threats to biodiversity and the well-being of local communities. However, unsustainable exploitation poses a significant threat to their continued availability. Implementing sustainable resource management practices and strengthening conservation policies are essential to balancing resource utilization with environmental preservation. Sustainable management practices that integrate conservation with economic benefits are critical to preserving rainforest resources in Ogbia LGA. Community engagement, agroforestry, controlled harvesting, ecotourism, policy enforcement, and alternative livelihoods offer a comprehensive approach to achieving sustainability. Implementing these strategies requires collaboration between government agencies, non-governmental organizations (NGOs), research institutions, and local communities. A well-structured policy framework that prioritizes both environmental protection and economic development will ensure that rainforest resources continue to provide benefits for present and future generations.

VI. Recommendations

Based on the findings of study, the following recommendations were made;

Implement policies that regulate logging, hunting, and non-timber forest product extraction to prevent overexploitation.

Establish protected areas and conservation zones to preserve biodiversity.

Promote agroforestry and eco-friendly farming practices to reduce deforestation.

Strengthen enforcement of environmental laws to prevent illegal logging and poaching.

Provide alternative income-generating activities such as eco-tourism, aquaculture, and sustainable agriculture.

Organize environmental education programs to raise awareness about the importance of sustainable resource use.
Strengthen government policies on rainforest conservation and enforce strict penalties for environmental violations.
Encourage the use of renewable energy sources to reduce pressure on forest resources.

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Appendix

Rainforest Resource Utilization and Development Questionnaire

S/N	Rainforest Resources utilized in Ogbia LGA	SA	A	D	SD
1	Timber is one of the most utilized rainforest resources in the area.				
2	Fodder/Fibre				
3	Non-timber forest products (e.g., fruits, nuts, medicinal plants) are widely harvested by residents.				
4	Water sources from the rainforest contribute to				

	domestic and agricultural activities.				
5	Wildlife in the rainforest is hunted for food and economic purposes.				
	Patterns of Exploitation of Rainforest Resources				
6	Agricultural expansion				
7	Firewood and charcoal production.				
8	Non-timber forest product (NTFP) harvesting,				
9	wildlife hunting and oil exploration				
	Proposed Sustainable Management Practices				
9	Community-Based Forest Management (CBFM)				
10	Agroforestry				
11	Controlled Harvesting and Sustainable Logging Practices				
12	Ecotourism				
13	Alternative Livelihood Programs				