Gender Differentials and Climate Change Perceptions on Non Timber Forest Products (NTFPs) Use and Trade in Ago-Owu Forest, Osun State

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Certification

This is to certify that **Bolatito Kehinde OGUNDELE** with the matriculation number **LCU/PG/002503**, carried out this research work titled "Gender Differentials and Climate Change Perceptions on Non Timber Forest Products (NTFPs) Use and Trade in Ago-Owu Forest, Osun State" in the Department of Biological Sciences, Faculty of Natural and Applied Sciences, Lead City University Ibadan, Oyo State, for the award of Masters' Degree (MSc) in Environmental Management and Toxicology and this has not been previously submitted.

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Dedication

This thesis is dedicated to Almighty God and to my wonderful family.

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Abstract

NTFPs are increasingly touted as having significant value in the tropical area as the political economics of forest resources shifts globally.This study investigated the gender differentials in the use and trade of NTFPs in three selected markets around Ago-Owu forest namely Araromi market Omu, Total market Apomu and Oba Olatunde Falabi market Ikire. It was also aimed at investigating the contribution and impact of NTFPs to the livelihoods of local traders in Ago-owu forest and how climate change has affected the availability of the products to the traders. From the three selected markets, a hundred and one traders who agreed to be interviewed were used as respondents in the study. The survey was done using a semi structured questionnaire eliciting information on demographics, perceptions on NTFPs, gender differentials and perceived effect of climate change. Findings indicated that common NTFPs available in Ago-owu include Garden egg (*Solanum macrocarpon*), Bologi (*Solanecio biafrae*), Field pumpkin (*Curcubita pepo*), Fire wood (*Crassocephalum crepidoides*), Water leaf (*Talinum triangulare*), African mango (*Irvingia gabonensis*), Avocado (*Persea Americana*), Jute leaf (*Corchorus spp*), Wrapping leaves (*Thaumatococcus danielli)*, Walnut (*Juglans spp*), Locust bean (*Parkia biglobosa*), Spinach (*Spinacia oleracea L.*), Tomatoes (*Solanum lycopersicum*), Okro (*Abelmoschus esculentus*), Water yam (*Dioscorea alata*), Cocoyam (*Xanthosoma sagittifolium*), Plantain (*Musa acuminate*), Cocoa (*Theobroma cacao*), Kolanut (*Cola acuminate*), Bitter yam (*Dioscorea dumetorum*), Bitter Kola (*Garcinia kola*), Mandarin orange (*Citrus reticulate*) and Snail (*Gastropoda spp*). The study established the significance of NTFPs to traders' livelihood as it formed at least 85 % of their income. Furthermore, respondents perceived extreme rainfall to be a strong agent of climate change and has caused crop destruction. Male traders were more inclined to harvest activities while women were more prominent in gathering, processing and transporting activities.

Keywords: Forest, NTFPs, Market, Livelihood, Climate Change

Word Count: 283

Table of Contents

Chapter Two: Literature Review

List of Tables

List of Figures

List of Acronyms

Abbreviation	Meaning
NTFPs	Non-Timber Forest Products
FAO	Food and Agricultural Organization
UN	United Nations
WHO	World Health Organization
MAPs	Medicinal and Aromatic Plants
MFP	Minor Forest Products
NWFP	Non-Wood Forest Products
CBD	Convention on Biological Diversity
CITES	The Convention on International Trade in Endangered Species of Fauna and Flora
NGO	Non-Governmental Organizations
ACP	African, Caribbean and Pacific
GDP	Gross Domestic Products
USD	United State Dollar
INR	Indian Rupee

Chapter One

Introduction

1.1 Background to the Study

Forests offer important social and economic advantages, particularly in developing nations. However, among Africans, non-timber forest products (NTFPs) serve a crucial role as a source of income and a means of sustenance[1]. For Nigerians in particular, NTFPs including fuelwood, medicinal plants, wild edible veggies, home construction materials, etc. constitute an essential component of daily subsistence activities[2]. The importance of NTFPs for the sustainable management of forests and the reduction of poverty has grown since the early 1990s[1]. It is now well acknowledged that NTFPs are valuable and have a significant socioeconomic impact on the economies of tropical nations[3]. NTFP gathering is a significant economic activity in virtually all tropical nations, and 500 million people who live in or near forests rely on it to support their daily needs[4]. Non-Timber Forest Products (NTFPs) are increasingly touted as having significant value in the tropical area as the political economics of forest resources shifts globally[5]. The importance of non-timber forest products (NTFPs) for sustaining forest usage and reducing poverty has grown since the early 1990s. It has happened as a result of the recognition that they have a significant economic impact on rural areas. In the past, NTFPs have helped support rural lifestyles through both subsistence and commercial applications, including those for food, medicine, energy, and other things[1].

For millions of people worldwide, non-timber forest products (NTFPs) provide a vital source of income. It is estimated that over 50 million people in sub-Saharan Africa alone depend on NTFPs for both their subsistence and their means of monetary support. These people obtain

their NTFPs from sources like fuel wood, fodder, poles, and a variety of fruits, nuts, vegetables, fish, animals, medicinal plants, resins, essences, and a variety of barks and fibers like bamboo, rattans, and a variety of other palms and grasses[6]. In developing nations, mostly in the NTFPs region, forest-based activities generate between 13 and 35% of all rural non-farm employment, or the equivalent of 17 million full-time jobs in the formal sector and another 30 million in the non-official sector[7].

About 20% to 40% of the yearly income of forest dwellers, who are mostly disadvantaged and landless communities with a predominance of rain forest residents, is provided by NTFP. Especially for prehistoric aboriginal populations like hunter-gatherers and the landless, NTFPs gives them vital food throughout the hard seasons. Since women gather, utilize, and sell the majority of NTFPs, there is a significant connection between this activity and the financial empowerment of women in forest-fringe communities[8].

There are other equally significant non-wood goods that are gathered from the woods, however the word "forest product" almost immediately conjures images of wood and items derived from it. The term "Non-Timber Forest Products" (NTFPs) refers to all botanicals and other natural products that are derived from forests other than wood. NTFPs are natural forest products that are often not farmed. They are part of the forest system. Non-timber forest products (NTFPs) are plants or plant parts that are seen as having a significant economic or consumer value to stimulate their removal from the forest[9].

Natural resources gathered from forests that are not sawn wood are referred to as "non-timber forest products" (NTFP)[10]. Plants, plant parts, fungus, and other biological elements that are taken from within and on the boundaries of natural, controlled, or damaged forests are sometimes referred to as non-timber forest products[11]. Fungi, moss, lichen, herbs, vines,

shrubs, and trees are examples of NTFP. The socioeconomic growth of every rural community is heavily influenced by the forest, a valuable renewable natural resource[11].

The Food and Agricultural Organization of the United Nations (FAO) uses the phrase "non-timber forest products" to describe all plants and animals that are harvested from the wild on forest lands or from species that live in forests[12]. NTFPs may also be generated in intermediate production systems with variable levels of domestication, or they can be harvested from semi-domesticated plants in plantations or agroforestry programs. In any event, they differ from established agricultural products like oil palm, cocoa, coconut, rubber, or coffee due to their wild or semi-domesticated condition[13].

In many developing nations, the use of forest products helps to promote rural livelihoods and food security. Because the poor rely heavily on forest resources, maintaining the integrity of forests is essential for global food security[12]. Conservation and development organizations' interest in non-timber forest products (NTFPs) has grown significantly during the past ten years[11].

The widespread use and increased interest in NTFPs throughout the world is due to a variety of factors. It is thought that encouraging the sustainable use of NTFPs might result in a situation where reducing poverty and preserving biodiversity coexist harmoniously[13]. This is because it is becoming more widely acknowledged that NTFPs may considerably improve the food security and nutrition of households, the livelihoods of communities who depend on the forest, as well as provide extra job and income possibilities and NTFP-based businesses[10]. Additionally, NTFPs can help with foreign exchange earnings, benefit biodiversity and other conservation goals, and are more accessible to the poor[13]. Additionally, NTFPs may be collected with just a minor negative effect on the forest ecosystem[12].

Evidently, by affecting the life-supporting system, NTFPs contributes significantly to improving the quality of the environment. Additionally, forests are inextricably related to National civilization and culture[14]. Lac, fibers, floss, pharmaceuticals, and other non-timber forest products of importance are obtained from several species. Food (tuber, root, leaf, fruit, meat from birds and other animals, and medications) is also frequently obtained by the residents of rural forest regions directly from the forest where they live[1].

Forests provide food, income, raw materials, medicine, and fuel to millions of people worldwide. According to the Food and Agricultural Organization (FAO), individuals who live in or close to forests—and in certain regions, are people who rely primarily on forests as a source of food as it offers them dietary nutrients[1]. Forest foods provide a much-needed safety net in many developing nations, allowing people to survive in between harvests, when crops fail, or in times of hunger, famine, or civil unrest. Forests in certain regions provide feed for animals, while in others, like coastal mangrove swamps, they sustain local fisheries. In addition to these immediate benefits for food security, forests' environmental services are essential for supporting sustainable agricultural productivity[15]. By absorbing carbon dioxide from the atmosphere, forests and woodlands may help filter and preserve water supplies, prevent soil erosion and land degradation, regulate temperature, and reduce global warming. In addition to being abundant in biological diversity, forests also offer a huge number of poor people with fuel for cooking and heating their houses, while jobs in the forest provide money for many more[16].

In recent years, non-timber forest products have garnered a great deal of attention on a worldwide scale as their value to family economics, food security, and environmental goals including the preservation of biological diversity has become more widely acknowledged[17].

According to estimates from the World Health Organization (WHO), around 80% of people in underdeveloped countries rely on NTFP for their nutritional and health needs[18]. Numerous families throughout the world rely largely on these goods for income and/or subsistence consumption. Some NTFPs also supply raw materials for large-scale industrial processing, particularly for commodities like foods and drinks, flavorings, fragrances, and medications that are traded globally. At the moment, at least 150 NTFPS play an important role in global trade, including: rattan; forest nuts; arable gum; cork; honey; essential oils; mushrooms; and plant or animal parts for medicinal goods[19].

There are two broad groups of NTFPs namely consumptive and non-consumptive[20]. Consumptive NTFPs are used on a personal and household level and are also used to make items that are sold in the market, whereas non-consumptive NTFPs have an indirect benefit from good forest management and support ecotourism. Among all NTFP categories, medicinal and aromatic plants (MAPs) are essential for socioeconomic prospects, livelihood, and health[20].

The history of NTFP utilization only reveals excessive medicinal plant collection. A lack of local control over resources, rural poverty, social and cultural traditions, and the consumption of NTFPs have all increased in recent years. On the one hand, these factors have contributed to the loss of organisms and ecosystems, and on the other, socio-cultural factors have hastened the loss of indigenous knowledge[21]. Numerous precious plants are in danger due to overuse of natural resources without following any regulatory procedures. Given this, it seems crucial to document any additional NTFP uses that could aid the community in improving its economic standing. There is also a need for systematic management,

sustainable harvesting techniques for trade, a reduction in deforestation, control of fire, soil erosion, and excessive grazing on pasture land[22].

1.2 Statement of the Problem

The inability to provide for one's fundamental requirements, including those for food, shelter, healthcare, clothes, and educational services, is referred to as poverty[23]. The poverty line is the threshold of income below which it is commonly accepted that any person would not be able to satisfy those essential necessities. Anyone whose income is below this amount is seen as being poor. A multidimensional perspective that takes into account factors like income, health, cultural and social resilience, self-esteem, and other factors has replaced the traditional income-based definition and assessment of poverty (the standard being below $1 per day or any other officially established income criteria)[24]. About 70% of sub-Saharan Africa's rural population lives in poverty, with poverty rates in Nigeria rising from 27.2% in 1980 to 65.6% in 1996 before falling to 54.4 in 2004[25].

On the other hand, forest outputs may be roughly divided into Timber and Non-Timber Forest Products (NTFPs). Previously the value of non-timber components had not gotten much attention from social scientists and development planners, as the importance of wood components was more emphasized as a significant contributor to both national and local economies. Any type of biological resource found in woods outside timber is referred to as a non-timber forest product (NTFP). They include non-consumptive benefits (services received from forests) that contribute to human wellbeing as well as edible and medicinal plants, mushrooms, moss and lichen, bark, leaves, and cones, wood products, wild and managed wildlife, and others. Microclimate improvement, soil and watershed protection, biodiversity conservation, and preservation of aesthetic and cultural values are a few examples of non-

consumptive usage. Thus, the rural poor are heavily dependent on non-farm occupations to augment their household income and ensure they have access to food, especially during the "Hungry Season" when food crops are out of season. The bulk of the rural population relies on herbs and other materials from the forest for their healthcare requirements because traditional medication is unavailable in rural regions and, when it is, is expensive for the people who live there. It is important to critically assess how non-timber forest products help reduce poverty in Nigeria in order to manage and use forest resources sustainably[26].

While NTFPs have long been recognized in literatures for their potential economic, ecological, and cultural value, there is a significant knowledge gap regarding more location specific commercial contributions to trader livelihoods and the perceived effect of climate change on its availability particularly in the market structures where NTFPs are been sold and gender differential within the market structure[9,10]. Therefore the role of Non-Timber Forest Products (NTFPs) in livelihoods and climate change impact on its availability in Ago-Owu forest presents a pressing research challenge that requires comprehensive investigation in neighborhood markets.

The Ago-owu Forest is an important ecosystem that offers a variety of ecosystem services, including the production of non-timber forest products (NTFPs) that sustain the livelihoods of communities that depend on the forest for their subsistence. The types, amounts, and qualities of NTFPs that are gathered and used in the forest, as well as their potential for carbon sequestration, watershed protection, and soil conservation, studied but further research is required to increase understanding. Furthermore, due to poor management techniques, overexploitation, and poor governance, the sustainability of NTFP collection and usage methods in Ago-owu Forest is in jeopardy[5]. This research aims to address this gap by

examining the multifaceted relationship between marketed NTFPs, trader livelihoods, and climate change perceptions, with a focus on the market structure and the gender differential in the trading of NTFPs.

1.3 Justification of the Study

In the past, several studies have been carried out on agroforestry practices, contributions of NTFPs to household economy and livelihood relating to how people have utilized a variety of forest products[27]. NTFPs are important goods for local, national, and worldwide markets which are steadily expanding[28]. Resources other than timber offer a lot of promise to improve environmental health, cultural endurance, and sustainable rural development through diversified economic growth. NTFPs are significant sources of food and money for populations who depend on forests, particularly in developing nations[29]. Because they are inexpensive and accessible on common property areas, NTFPs are important in general but particularly for the poor. People utilize them because they have fewer access to alternate sources of food and income. NTFPs play a significant role in a nation like Nigeria where more than half of the population lives in rural regions and is dependent on forest products for livelihood[30]. The collecting of NTFPs should however not interfere with environmental goals like forest preservation and biological variety.

Many studies in the literature have highlighted the impacts and benefits of NTFPs on the environment and on livelihood of forest dwellers, rural communities, household economy, and among rural farmers. in terms of both cash and household subsistence, cash income generation and household subsistence[6,7,8,9,10] However, little or nothing has been written about NTFPS in the market structure bringing out its roles to traders' livelihood.

Also not much has been written on gender differentials within the market structure as well as the perceived effects of climate change on NTFPs' availability.

These are significant knowledge gap in both their usage and specific contributions to livelihoods. Due to their abundance of diversity as various sources of food, fodder, fiber, herbal remedies, etc., NTFPs plays a key part in the subsistence and rural market economies[31]. NTFPs roles in the market structure should ideally be based on sustainable availability of the products for commercial purposes. A minimal set of reliable data on the resources' abundance, distribution, and biology of reproduction must be provided in order to determine the levels and possibilities of continuous availability of these products in the market[32].

This study will detail the kinds of NTFPs that are harvested and used in the Ago-Owu forest as well as how NTFPs contribute to market economy and livelihood of traders.

1.4 Aim and Objectives of the Study

Aim

The aim of this study is to investigate the contribution/impact of NTFPs to the livelihoods of local traders in Ago-owu forest, highlighting gender differentials in use and perceived climate change impact on the availability of the products to the traders.

Objectives

The specific objectives of this study are to;

i. identify the commercial non-timber forest products (NTFPs) in Ago-Owu forest.
ii. identify the role of these NTFPs to trader livelihoods in markets around Ago-Owu forest

iii. determine the perceived effect of climate change on the availability of NTFPs around Ago-Owu forest

iv. investigate the gender differentials in the use and trade of NTFPS around the selected area

1.5 Research Questions

1. What are the non-timber forest products (NTFPs) available in Ago-owu forest, Osun State?
2. How are the non-timber forest products (NTFPs) utilized by local communities and in the market places? Are NTFPs more of domestic or commercial value to local communities in Ago-owu forest, Osun State?
3. What are the perceived effect of climate change on the availability of NTFPs around Ago-Owu forest?
4. What are the gender differences in the trading of NTFPs?

1.6 Significance of the Study

This study will provide light on the Ago-owu forest traders' utilization of non-timber forest products (NTFPs) for commercial purpose. The results of this study may be utilized to create policies that support sustainable livelihoods based on the forest, lessen poverty, and enhance the standard of living for forest traders. Additionally, this study will give information to policymakers so they can create the right laws and policies to promote sustainable forest management, biodiversity preservation, natural resource protection, and sustainable use of non-timber forest products (NTFPs). This study will shed light on how the availability of

non-timber forest products (NTFPs) have been affected by climate change and mitigation in the forest ecosystem, which has environmental relevance. Using this knowledge will help create plans for conservation and sustainable management of forests. In terms of culture, this study will also give insight into the beliefs and customs that the Ago-owu forest community has towards the utilization of non-timber forest products (NTFPs). The results can be utilized to support historical preservation and cultural preservation. Last but not least, the research will add to the body of fundamental information on the use and management of non-timber forest products (NTFPs) and their contribution to regional livelihoods and climate change impacts on its availability in forest ecosystems. The results may be utilized to generate future research on NTFPs' impact on forest ecosystems and sustainable forest management.

1.7 Scope of the Study

This study will concentrate on the markets in Ago-owu forest, which is found in the Nigerian state of Osun. The traders' union and other stakeholders in the market system rely on NTFPs for their subsistence will be included as participants. The variety of NTFPs present in the markets and their roles towards subsistence and climate adaptation will be the main focus of the study. Income creation, and access to necessities are the criteria that will be used to evaluate the impact of NTFPs on the way of life in the traders. NTFPs' potential for carbon sequestration, watershed protection, and soil conservation will all be examined as part of this study's examination of the function of the forest ecosystem in climate adaptation.

1.8 Limitation to the Study

This study made use of a limited sample size due to time and resource constraints, which may not be representative of the entire population in the markets. There may be potential bias in the data collection process due to cultural as well as potential biases in the selection of respondents. This study was conducted in the rainy season and therefore limiting the availability of dry season NTFPs. which may affect the study's capture a holistic picture of these products in Ago-owu forest. Some respondents were unwilling to grant interviews due to previous researchers making empty economic promises. Most respondents also could not communicate or express themselves in English and needed questions translated before answers could be gotten. Some of the respondents did not allow their pictures to be taken or recording during the interview.

1.9 Operational Definition of Terms

Forest: A forest is a large area of land covered by trees and undergrowth, typically larger than an area covered by woodlands. Forests are typically characterized by a high density of trees, a diverse range of plant and animal species, and an intricate ecological system. They play an important role in regulating the Earth's climate, providing habitats for wildlife, and supplying resources such as timber, fuel, and non-timber forest products. Forests can be found in various types of climates and regions around the world, including tropical, temperate, and boreal regions.

Forest Reserves: A forest reserve is a legally designated area of forestland that is set aside for the purpose of conservation, protection, and sustainable use. It is usually managed by a government agency or a non-governmental organization with the goal of preserving the

ecological, economic, and social benefits of the forest for present and future generations. Forest reserves may be established to protect watersheds, conserve biodiversity, support research and education, provide recreational opportunities, or sustainably manage forest resources such as timber and non-timber forest products. Access to forest reserves may be restricted or regulated to prevent overuse or destruction of the forest ecosystem.

Non-Timber Forest Products (NTFPs): NTFPs refer to forest resources other than timber that are harvested for their commercial, subsistence, or cultural value. Examples include fruits, nuts, medicinal plants, honey, and wild game.

Local Livelihoods: Local livelihoods refer to the means by which people in a particular area support themselves and their families. This can include activities such as farming, fishing, hunting, and gathering of forest products.

Climate Change Impact: refers to the wide range of significant and lasting effects on various aspects of the environment, ecosystems, economies, societies, and human well-being that result from alterations in Earth's climate patterns. These impacts are primarily driven by the accumulation of greenhouse gases in the atmosphere, primarily carbon dioxide, which traps heat and leads to global warming.

Forest Management: Forest management is the practice of planning, implementing, and monitoring activities to ensure the sustainable use and conservation of forest resources. It involves the integration of ecological, economic, and social considerations to maintain the health and productivity of forest ecosystems while meeting the needs of society. Forest management activities can include timber harvesting, non-timber forest product extraction,

forest regeneration and restoration, wildlife management, fire prevention and suppression, and recreation management.

Biodiversity: Biodiversity refers to the variety of life on Earth, including the variety of species, ecosystems, and genetic diversity. Forests are important centers of biodiversity, and the sustainable management of forest resources is essential for maintaining biodiversity.

Stakeholders: Stakeholders refer to individuals, groups, or organizations that have a vested interest in a particular issue or project. In the context of forest management, stakeholders can include local communities, government agencies, NGOs, and private companies involved in extractive activities

Community: A group of people living in a particular area, often sharing cultural, social, and economic ties.

Rural: An area outside of cities and towns characterized by low population density and generally associated with agriculture, forestry, and other primary economic activities.

Sustainable: Practices that ensure the use of natural resources in a way that meets the needs of the present without compromising the ability of future generations to meet their needs.

Conservation: The protection, preservation, and management of natural resources to ensure their sustainable use for future generations.

Traditional Knowledge: Knowledge, skills, and practices passed down from generation to generation within a community or culture.

Market: A place where goods and services are exchanged between buyers and sellers.

Value Chain: The series of activities involved in the production, processing, marketing, and distribution of a product or service.

Income: The amount of money earned or received from various sources, including wages, salaries, and profits.

Poverty: A state of deprivation, characterized by a lack of access to basic necessities and economic opportunities.

Gender: The social and cultural roles, behaviors, and expectations associated with being male or female.

Empowerment: The process of enabling individuals and communities to take control of their lives and make decisions that affect them.

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Chapter Two

Literature Review

2.1 Conceptual Review

2.1.1 Forests

Forests support local populations and offer a haven for many plant and animal species[1]. In a significant ecosystem, forests are essential to maintaining the diversity of life on Earth and regulating the climate[2]. The capacity of forests to absorb carbon dioxide from the atmosphere through photosynthesis, which lessens the effects of climate change, is one of their most significant functions. Additionally, forests support a diversity of species and offer a number of ecosystem services, including soil stability, water management, and cultural and recreational benefits3. Nearly 10% of Nigeria's land area, or 9.6 million hectares, is covered by a diverse forest environment. Mangroves, dry forests, and wet forests make up the three categories of forests. Due to their high degree of richness and support for several unique species, wet forests are the most significant in terms of ecology[4].

However, human activities like deforestation, illicit logging, and changes in land use are the principal causes of the numerous threats to Nigeria's forests. In Nigeria, the development of agriculture, urbanization, and logging operations are the primary causes of deforestation[5]. With an estimated 400,000 hectares of forest lost each year, Nigeria has one of the worst rates of deforestation in the world. Deforestation contributes significantly to climate change and is mostly brought about by human activities including logging, agriculture, and urbanization[6]. Another major issue is forest degradation, which includes pests, illnesses, and illicit logging. Another issue is what's known as "forest fragmentation," which is the partition

of huge wooded regions into smaller, isolated sections, which results in habitat loss and decreased biodiversity[7].

In Nigeria, illegal logging poses a serious problem since many forests are used without the required permission or control. This causes soil erosion, forest degradation, and biodiversity loss[8]. A serious danger to Nigeria's forests is also posed by changes in land use, such as the conversion of forests into agriculture or cities[9]. Numerous conservation measures have been suggested as solutions to these problems. One such tactic is the application of sustainable forest management techniques, which include maintaining forests for both economic and environmental purposes. Selective logging, forest certification, and community-based forest management are examples of this[10].

To preserve biodiversity and ecosystem services, protected areas can be created, such as national parks and reserves. Currently, Nigeria has 10 national parks and various wildlife reserves, totaling 22,000 km2. These protected regions do, however, suffer difficulties including poaching, illicit logging, and encroachment[4].

Additionally, restoring damaged and deforested regions can aid in reducing climate change and restoring biodiversity. Reforestation, afforestation, and the restoration of the forest landscape can all help with this. Various programs are being implemented in Nigeria to encourage regeneration and afforestation, such as the Green Bonds Programme, which seeks to collect money to support forestry projects[11].

2.1.2 Forest Management

The phrase "forest management" is frequently used synonymously with the idea of forestry in literary works. In reality, a lot of academics believe the two notions refer to the same thing. The management of forests for timber conservation is what is meant by the term "forestry," which is taken from its definition in the dictionary as "the science of cultivating forests and of promoting their growth[12]. Also, Forestry is defined as "the management of forests for economic or other reasons, as well as the production, marketing, and utilization of other forest products"[13]. In order to improve the higher living standards of the community where the forest is located, the term "forestry" may alternatively be defined as "the theory and practice of growing trees, the management and utilization of forest products as a renewable resource"[14].

So, to enable the forest resources under management to produce the desired yield of goods and services while taking into account the resources' systematic and renewable nature and the need to maintain their potentials, forest management entails planning, executing, and monitoring in space and time of the necessary actions[14]. According to a different perspective, forest management comprises making use of populations of trees and other associated plants and animals in ways that support the forest ecosystem[15]. This clearly demonstrates that managing forests involves more than just managing trees and other plants; it also involves managing animals[16].

Some concerns are clearly highlighted by the opinions presented above. Although the term "forestry" is occasionally used in place of "forest management," according to many academics, forest management is actually a subset of forestry[17]. Furthermore, it is accepted in the earlier judgements that forests, regardless of their kind, may or may not be managed[18].

Human engagement in their management must be given serious and sufficient thought if the managed are to achieve the desired goals[19]. In other words, it is crucial to strategically include people in a way that will inspire them to work toward the desired goals[20]. Without a doubt, this necessitates the development of a suitable atmosphere where the relevant parties or persons may contribute effectively and efficiently to the desired results. In addition, it is intriguing to pinpoint additional significant grounds for the researchers' consensus[21].

According to all of the categories listed above, managing forest resources is primarily focused on addressing human needs, which might be social, economic, or both[22]. They seem to be arguing that the foundation for managing forests should be expanded to address human needs over generations rather than only being focused on the present[23]. Given that human demands are reversible; stakeholders' collaboration or collective action is almost a need to achieve the goal. Therefore, it may be claimed that organizing the use of forest resources to assure their long-term, productive usage across generations is the primary goal of forest management[24].

2.1.3 Forest Cover Change and Species Distribution

The literature has shown that anthropogenic activities constitute human intervention in the forest and that humans need a lot of land for farms and industry, which eats up a lot of the forest[25]. It was proposed that human activities including farming, overly intensive logging, illegal logging, building construction, mining, and sand excavation had a direct impact on the ecosystem's structural components. The ecosystem of the forest has been damaged and degraded as a result of all these activities[26]. The conversion of forest reserves to farmland for

cash and arable crops has been accomplished by these actions.[27]. Due to the constant growth in human population, which eventually led to environmental deterioration, these have harmed plant ecosystems. A growing population leads to increasing clear-cutting of plant communities, which has been linked to significantly harmed ecosystems, as has been underlined in the literature[28]. According to reports, a strong domestic demand for poles, firewood, and other building materials as well as illicit wildlife hunting put forest resources in peril and created a feedback loop that culminated in forest degradation[29].

According to reports, the rate of deforestation and forest degradation has recently been fairly serious in the majority of developing nations throughout the world. Each year, over 13 million hectares of forest are lost due to natural causes or converted to other uses, primarily agriculture[30]. It has also been emphasized that the destruction of forest resources in developing nations results in soil erosion, a loss of biodiversity, floods, global warming, and a reduction in local people's incomes[31]. More than 50% of Nigeria's primary forests were destroyed in the previous several decades due to irresponsible logging, agriculture, and fuel wood collecting, making it one of the nations with the worst rates of deforestation worldwide[32]. The rural population's severe human activities, such as the collecting of firewood and the cutting of the forest for agriculture, have a negative impact on the environment[33]. This conclusion was supported by a survey that found that the use of fuel wood in Nigeria led to an increasing and worrisome rate of forest degradation, which seriously harmed the environment and endangered the country's natural resources, particularly its flora and fauna[34]. Cutting poles and fuel wood had a major impact on the decline in biomass, the diversity of plants, and changes in the pattern of species distribution in the forest[35].

In a research on the subtropical forests of India, it was shown that human exploitation had a negative impact on species density, basal area, and number in disturbed woods compared to equivalent, undisturbed stands[36]. Incessant human activity has negative consequences on forests that can be quite severe. It was proposed that the impact of disturbance caused by humans on forests revealed that as disturbance intensity grew, species richness and variety of trees and shrubs decreased[37]. Because soil fertility is essential to the growth and production of forest trees, shrubs, and plant species, human activities may have an impact on their soil qualities[38]. A constant increase in the cutting of timber from forest reserves and undeveloped regions has also been brought on by the rise in the number of persons entering the timber logging industry[39].

2.1.4 Non-Timber Forest Products

Non-Timber Forest Products are made up of both plant- and animal-based materials and may be found in "indigenous forests" as well as any other type of land-use system, such secondary forests or agricultural land [35]. It has increasingly come to be understood that the term "NTFP" refers to a wide range of goods made from various plants, animals, or fungus. A broad variety of NTFP production strategies are also available, including the gathering of products from the wild, domestication in agroforestry systems, enrichment planting in the wild, and extensive commercial scale cultivation[32]. Once more, domestic and international value chains that are either driven by producers or by buyers make up the market systems for NTFPs[43]. NTFPs frequently play many functions throughout time, ranging from a subsistence product to a safety net service to a product for generating money, as a result of their versatility. In order to successfully combine the goals of income generation and forest conservation, Forest

showed that the production of NTFPs may yield large net earnings with little forest damage. This notion is consistent with various demands for improvement toward sustainable utilization of biodiversity for the advantage of regional communities[43]. Many international documents, especially the Convention on Biological Diversity (CBD) and the Millennium Development Goals, also take into account these dual goals. The CBD supports systems and rewards for biodiversity preservation and fair benefit distribution. When viewed in the context of current developments in NTFP commercialization in tropical forest regions, the notion that NTFPs fulfill the twin aims of forest conservation and poverty alleviation has raised interest in promoting NTFPs as a forest resource and has been well received[44]. Recent research however, admits that different products' capacity to support numerous aims vary because to the significant variation in NTFP production and usage[45]. The regulations and governance systems are fragmented and frequently impacted by other policy areas due to the diversity of NTFPs, which range from wild goods harvested in natural forests to domesticated products produced in agricultural systems[45]. Policies on a variety of topics, including product quality and safety, land tenure, intellectual property rights, and labor issues, are also included in these, in addition to policies on biodiversity protection and NTFP income distribution[46]. The NTFP literature also indicates a conundrum about how to regulate NTFP resources: should it be done through an integrative strategy or by species-specific approaches[45]? A recent thorough review of governance arrangements for various NTFPs, which includes case studies from a variety of nations, revealed a number of elements that affect the complexity of NTFP governance systems[46]. There is a need for further country-specific research on important topics related to NTFP governance in order to comprehend this complexity better[47]. Institutions and processes are necessary to handle collective action

difficulties surrounding the usage of resources because the majority of NTFPs are gathered from communal regions, where they are accessed as common-pool resources. Institutions can be official or informal, and its purpose is to allow or prevent people from acting in a way that is acceptable to society. Examples of this include participatory decision-making and the sustainable harvesting of NTFPs[44].

The development of NTFP institutions is frequently ad hoc, and they undergo constant alteration in response to social and environmental cues[46]. The variation in market arrangements is an illustration of such institutional processes. Some NTFPs' market growth is characterized by boom-and-bust cycles, with expansion being followed by stagnation and eventually decline[47]. For *Hoodia gordonii,* a succulent plant used to stifle hunger, similar developmental phases in Southern Africa have led to various governmental responses[48]. The environment protection laws of Namibia, Botswana, and South Africa already proclaimed Hoodia spp. to be a protected species in 2002. The Convention on International Trade in Endangered Species of Fauna and Flora (CITES) included all Hoodia spp. to its Appendix II in 2004 as a result of rising demand[48].

This type of reactive and iterative policy procedure, which focuses on a particular species, is useful for resolving the complex problems related with the growth of NTFPs, such as the need to stop unsustainable harvesting methods brought on by rising NTFP demand and problems with product quality[48]. To properly understand the development of such NTFP policies, this process must be regarded as "a varied and dynamic process of institutional change"[46]. The numerous products, players, and goals involved in the governance of NTFPs are a second problem that has to be taken into consideration when evaluating NTFP governance systems. Due of this complexity, various market groups frequently apply distinct

sets of NTFP manufacturing and marketing rules. The intricacy of NTFP governance systems has recently received more attention in research on NTFPs[45]. A sectoral strategy based on the conventional distinction of natural resource sectors, such as forestry, agriculture, and wildlife, has proven increasingly challenging to handle NTFP concerns as a result of this complexity. This sectoral segmentation does not easily reflect the realities of NTFP manufacturing[48].

Thus, NTFP administration and decision-making have steadily shifted toward a multi-stakeholder and multi-disciplinary approach[49]. Due to the diverse roles that stakeholders play in the many activities that take place along the NTFP value chain, from manufacturing to consumption, the engagement of several stakeholders is frequently necessary[50]. The coordination of a wide variety of stakeholders necessitates the creation of policy networks that concentrate on the interactions between the state and society as well as the mobilization of limited resources that are frequently distributed across public, commercial, and civic actors[51]. Impacts on policy results frequently result from the activation of such networks for enhancing stakeholder engagement. The fact that NTFP makers and harvesters are frequently not consulted when management choices are made about NTFPs is an excellent example of this, as their involvement in the establishment of NTFP policy has, in numerous instances, led to novel outcomes, including increased community control[52]. Some NTFP value chains are characterized by interactions between harvesters and producers where they have little leverage to negotiate important value chain parameters such product price and value chain upgrades[53]. NTFP development policies must address these social challenges in order to be more effective rather than brushing them off. The necessity to conceptualize the evolution of NTFP as "a change in a complex governance system" is illustrated by these instances[54].

2.1.5 Transportation of NTFPs

A significant barrier to the commercialization of NTFPs is transportation expenses[55]. Because it may be so expensive to get items to market, some producers cannot compete with others who are closer to the towns. This is the case until consumers can no longer get their items in more populous locations and their unit costs are high enough to pay transportation expenses. Therefore, in remote rural locations, collecting the items for commercial purposes is rarely profitable[54]. This implies that the only goods it is usually worthwhile to bring from rural regions to urban markets are live animals and bush meat. The majority of medicinal herbs, forest fruits, nuts, and craft supplies may be collected around market towns. The sale of the goods from distant forests would often not be worthwhile unless subsidies from governments or NGOs are implemented for NTFPs, or raw materials might be locally processed into marketable products[56].

2.1.6 Processing and Preservation of NTFPs

A significant issue for the commercialization of NTFPs is the fact that many wild plant products are gathered a great distance from markets and processing facilities. The expense of transporting goods to urban markets is significant, and wild fruits and vegetables sometimes deteriorate before they reach their destination[53]. To address this issue, tiny 'cottage businesses' that are located close to fruitful woods must be set up, with locals in charge of processing fruits and other plant-based goods. Drying, grinding, freezing, canning, making candy, and extracting oil all raise the cost of the product and the amount that belongs to the villagers. Some of these methods appear to be out of the question for groups that live in forests since they need a consistent source of inexpensive energy[55]. However, this type of

processing is already being done in many rural regions in a sophisticated manner. When oil is extracted from the seeds of the crabwood tree (*Carapa guianensis*), it is relatively pricey due to the laborious processing procedure (the seeds are submerged in water for a month to rot, then they are pulverized, kneaded, and sun-dried to enable the oil drop out of the paste)[57]. Crabwood oil, a disinfectant and insect repellant, may be kept for a long time. Thus, bottles can be kept until a person has the chance to go to a market and sell the good there. Today, several NGOs help isolated indigenous groups commercialize this oil. The product has already established a reliable market in Nigeria's cosmetics sector[57].

2.1.7 Environmental, Economic and Cultural Importance of NTFPs

Non-timber forest products are vital resources that have a positive impact on the environment, the economy, and culture. The continuing health of forest ecosystems and the populations who depend on them depends on their sustainable management and protection.

2.1.7.1 Environmental Importance of NTFPs

Growing NTFP species in an agroforestry ecosystem aids in attaining environmental goals including protecting watersheds, biological variety, and genetic resources. NTFPs are a potential "magic bullet" to address the issue of deforestation. They are significant, pervasive, and culturally essential to both rural and urban life, and forest management choices must continue to take them into account[58].

2.1.7.2 Economic Importance of NTFPs

It's possible that NTFPs have a more significant financial impact than timber in some regions. As an illustration, a research conducted in Zimbabwe found that 237300 people were engaged by small-scale NTFP-based firms, as opposed to just 16000 by traditional forestry and forest industries[59]. Around $1100 million USD is thought to be the approximate worth of all NTFP transactions globally. In recent years, the market for NTFPs has increased by around 20% yearly. Consider the 13.15 percent yearly growth rate of the market for natural medicines.[58].

2.1.7.3 Cultural Importance of NTFPs

Additionally, NTFPs play a significant cultural role as well. The maintenance and survival of traditional ways of life depend heavily on the preservation of NTFPs. Both biological research and natural medicine are expanding quickly. People that utilized them historically frequently researched the plants, their applications, and the gathering and processing methods across many generations. The individuals, communities, and nations from whence these discoveries come must get an equal share of the advantages as they develop into valuable enterprises[58].

2.1.8 Contribution of NTFPs to Food, Income and Employment

Non-Timber Forest Products (NTFPs) are precious resources that contribute significantly to the financial stability, employment opportunities, and food security of millions of people throughout the world, particularly those who live in or near forests. These advantages may be increased, and NTFP growth and administration can help fight poverty and advance rural areas[59].

2.1.8.1 Contributions on a Global Perspective

When contemplating the responsibilities NTFPs play in any country, the contributions of NTFPs cannot be overstated. Humanity has always relied on non-wood resources to fulfill fundamental needs[59]. Although NTFPs play substantial subsistence and safety-net roles in rural economies, only a tiny fraction of forest products has the potential to provide sizable amounts of cash revenue and jobs. NTFPs continue to be a significant source of income for hundreds of millions of people who reside in rural areas, despite the globalization of the world's economy and the growth of industry[60]. The rural economy is mainly dependent on the production of arable crops; hence it would seem that NTFPs have the ability to diversify the rural economy. There is always some degree of volatility in the rural economy because of the uncertainty of a successful crop. So, diversity would result in more stability in turn. This is sometimes the primary source of income for rural impoverished people[61]. It was estimated that in British Columbia, the commercial harvest of wild mushrooms, floral greens, and other products in 1997 employed nearly 32,000 people on a seasonal or full-time basis, generating direct business revenues of $ 280 million and overall provincial revenues of more than $ 680 million[61]. If dry deciduous woods are used responsibly, it was also projected that NTFP will provide 77% to the yearly net returns[62]. The average current value of the NTFP is estimated

to be US$1182 per hectare, which is considerably less than the comparable estimate given for Equador, where the figure was US$2830[61]. Additionally, the importance of the Amazonian forest has been evaluated, and it was determined that the Net Present Value of sustainably harvested fruit and latex may reach US $ 6330 per hectare[60].

When the significance of NTFPs in Sri Lanka's Hantana forest was examined, it was found that one individual regularly entered the forest to gather five bundles of fuel wood every day for five days in a row[63]. From these five bundles, one was preserved for his own use, while the others were sold. The value of grass was estimated to be around INR 578, compared to INR 71052 for fuel wood harvested from the forest per hectare annually. All of the NTFPs were evaluated, and it was discovered that the cost per hectare per year was equal to INR. 1961[63]. People who are most likely to use NTFPs on Botswana's Southern African Plateau, particularly rural groups, have very little access to technology. As a result, it is likely that they will end up selling the NTFP in a somewhat "raw" condition to an intermediary, who would subsequently sell it to a processor. The harvester would thus realize the least profit margin because the profit margin rises the further up the chain you go[64].

2.1.8.2 NTFPs in Rural Employment and Income Generation

In addition to the fact that most rural families in Nigeria and a significant amount of urban households rely on forest products to cover a portion of their nutritional needs, a very large number of households in Nigeria also rely on the sales of tree products to supplement their income[65]. Nearly everywhere, small-scale non-farm enterprise operations provide employment and revenue, and their significance in the rural economy is growing[65].

According to a report, 20–45% of rural households' income is frequently derived from non-farm employment[66]. Local people mainly depend on the utilization of forest products for their supplemental income, according to a new research in the tropical rainforests. Utilized in some capacity are 280 animal species and more than 500 plant species[65]. The local markets get around 20 non-timber forest products, which greatly raise the income of rural residents[65]. Each NTFP may not make much of an individual contribution, but taken as a whole, they have a big impact on the rural economy and can increase export earnings. The NTFPs are especially the foundation of many income-generating enterprises in rural regions[65].

In a research conducted on the Ejagham forest reserve in Cameroon between 1995 and 1998, it was discovered that a total of 563,131 kg of *Gnetum africanum*, 251,594.7 kg *of Irvingia sp*, 119,112,288 kg of *Capolobia sp*, and 1,109,367 kg of *Massularia sp*. were extracted from the sales of these items, which brought in US$788,128.4 in total. The financial stability of rural residents depends on a variety of stems, fruits, and seeds, especially during times of emergency[67]. Bush meat and snail gathering and sales are a significant source of revenue virtually all year long in the high forest zones of Eastern and Western Nigeria. Fuel wood, honey, gum Arabic, locust bean seeds, basket weaving (Figure 2.1), and the production of charcoal in the savanna region of central and northern Nigeria provide a significant portion of the revenue for rural residents[68].

It has been noted that the economic impact of non-timber forest products on Nigeria's rural areas equals or exceeds that of timber. In many regions, the harvesting and processing of NTFPs has advanced from the subsistence level of supplying only the nutritional needs of the home and local market sales to international cross-border trades[69]. Trade across international borders among Nigeria, Cameroon, Ghana, and the Benin Republic involves a large number

of forest products. Although economists may believe that the supply of the majority of these products is rigid and that their rising prices and low level of competition portray their extraction as a largely primitive activity that is likely to give way to domestication and the cultivation of similar products, it is clear that the economic significance of non-timber forest products has been acknowledged on a global scale. It is imperative that the potential of NTFPs in reducing rural poverty be understood and acknowledged[70].

Figure 2.1: Basket weaving using NTFP

Source[44]

2.1.8.3 Non Timber Forest Products in Rural Poverty Reduction

In Nigeria, there are two ways (direct and indirect contributions) whereby non-timber forest products might help to alleviate rural poverty. The direct contribution includes the provision of goods such fruits, vegetables, resins, fibers, fuel-wood, charcoal, bush-meat, and medicinal plants that may be sold for money or eaten at the home level. More than 80% of rural residents directly rely on wood energy for cooking, food preservation, and the production of food-related goods such bush meat. More than 75% of the country's population lives in rural regions[71].

In Nigeria, the selling of firewood provides a significant portion or all of the income for many households. Another activity centered on the forest, bush-meat marketing, provides rural residents with a sizable source of income (Figure 2.2). Plants such as *Dacryodes edulis* (native pear), *Chrysophyllum albidum* (white straw apple) *Zobo plant* (Figure. 2.3), *Treculia Africana* (African bread fruit), *Vitellaria paradoxum,* (Shear butter), *Parkiabiglobosa* (Locust bean), *Phoenix reclinata* (date palm) (Figure 2.4), *Annona mauricate* (sour sop), *Tamaridus indica, Xylopiaaetiopica,Irvingia sp.* (bush mango), and *Tetrepleura tetraptera*, and various spices of chewing stick and wrapping leaves constitute valuable sources of income particularly for rural women. Species such as *Gentum africaum, Carpolobia sp.* (Shepherds sticks) *Irvingia sp* and various species of bush meat are already involved in international trade along the west coast of Africa[72]. Their sales bring in money to boost the farm's income. In fact, some people get as much as 80% of their income from the sales of these goods[73]. Other forest products are important sources of income for both rural and urban residents. These include honey, Acacia Senegal (gum Arabic), chewing sticks, Sannda sticks (*Capolobia sp.*), and different medicinal plants (Figure 2.5). Making mats and producing

charcoal are two examples of forest-based activities that considerably boost rural income. Non-timber forest products may directly increase people's income, which makes a substantial contribution to the fight against poverty in Nigeria.[72]. Non-timber forest products also indirectly contribute to lowering poverty. These include the various functions they perform in the ecosystem, such as the pollination of useful plants by nectivorous insects, the dispersal of seeds by frugivorous birds and animals, the contribution of soil micro- and macro-organisms to soil fertility, the protection of watersheds, and the various functions of plants and animals in succession and ecosystem renewal[70]. These varied contributions guarantee that the ecosystem will be able to continue supplying the numerous commodities and services that people rely on for their daily needs. Although these indirect applications are sometimes difficult to measure, there is little question that they have a huge positive impact on human wellbeing[70].

Figure 2.2: Smoked Animals Displayed for Sale at Bush Meat Market

Source[72]

Figure 2.3: Zobo Flowers (Rich in Vitamins), for sale in the market

Source[72]

Figure 2.4: Date palm (*Phoenix reclinata*)

Source[72]

Figure 2.5: Medicinal Herbs

Source[72]

2.1.8.4 Non-Timber Forest Products in Household Food Security

Man consumes a wide variety of goods that are both of plant and animal origin, either as a direct food source or as a complement to other foods. While some may be consumed without any prior boiling, heating, or processing, others can only be consumed after processing[72]. Regardless of the way the goods are consumed, they significantly contribute to family food intake, especially during times of food shortage when the old harvest is finished and the new crop is still in the growing stage[73].

Fruit is one way that plants that support food security may be found (Figure 2.6). such as: *Carica papaya, Treculia africana, Adansonia digitata, Irvingia gabonesis, Dacryoides eduli, Anana mauricata* and *Phoenixreclinata.* They are either consumed as a full meal or as snacks to satiate hunger while working on the farm before the real dinner is ready. They may also come in form of leafy vegetables such as *Vitex doniana, Lactuca taraxaxifolia, Adansonia digitata; Bombax, buonopozense. Moringa olivera, Gnetum africamuum, and Sesamium radiatum*. The villagers may get money by selling them[74]. These veggies are offered during the off-season for the majority of grown vegetables. As a result, they are helpful when it counts. Bush meat also helps ensure the food security of households[75]. Honey is a food that has been consumed for ages and continues to dominate diets in both rural and urban areas. Patients with diabetes and hypertension who substitute it for table sugar have lately started to use it more frequently[73]. Bush meat and fish are the main sources of animal protein, especially in rural regions. According to a report, bush meat made about 80% of the animal protein eaten by rural Nigerians in villages near forests, whether it was grilled, boiled, sun dried, or smoked[74]. In various regions of the nation, insects and birds are also eaten. In certain regions of the nation, people eat insects such as palm worms, flying termites,

grasshoppers, and crickets, and they make a significant contribution to food consumption. Household dietary supplements also significantly depend on condiments and flavoring plants[75]. To give food a particular distinctive scent or flavor, species including *Occimum gratismum, Pipper guineense, Aframomum meligueta, Allium sativum,* and *Tetrapleura tetraptera* are added to the dish. Many of these regional condiments have health benefits for the body.

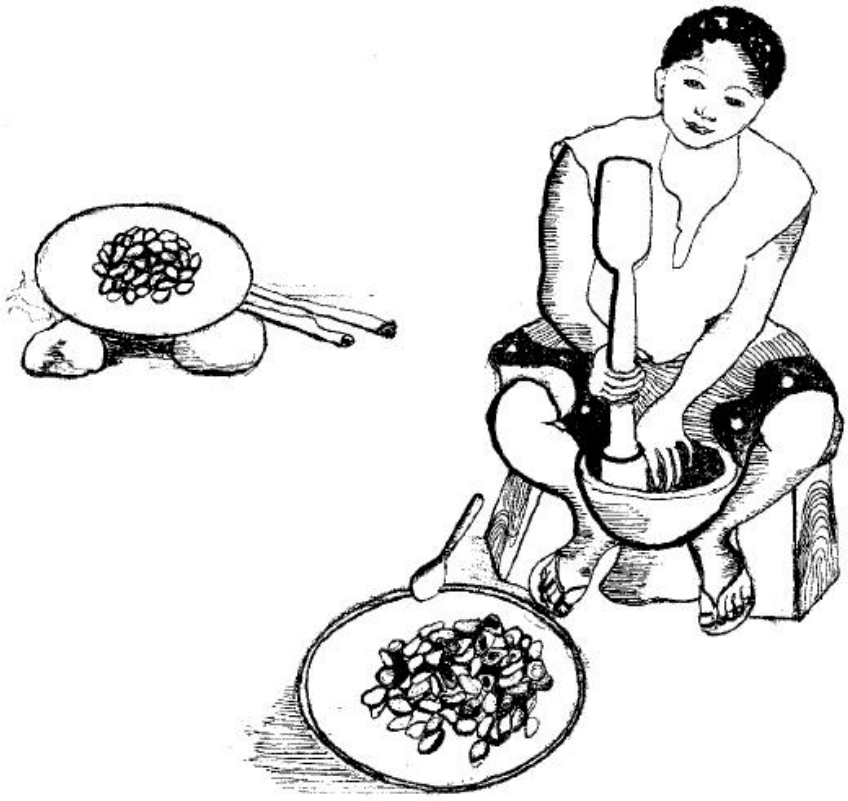

Figure 2.6: Toasting and Pounding of bush mango (*Irvingia gabonesis*) kernels for food

Source[75]

2.1.8.5 Non-Timber Forest Products in Environmental Amelioration

Our environment is made more hospitable for people and other ecosystem members by a variety of forest species that exist both inside and outside of forest environments[76]. In many locations of Nigeria, species such *Azardiracta indica, Bamboosa vulgaris, Eucalyptus sp.,* and *Acioa barterii* have been discovered to be helpful in reducing gully and wind erosion. Numerous plant species serve as habitats and breeding grounds for various other plant and animal species[73]. Animals that leave either partially or wholly on trees include pangolines (*Manis tricupsis*), tree squirrels (*Funisciurus sp*.), tree hyraxes (*Dendohyrax dorsalis*), and porcupines (*Artherurus sp.).* Various fish species use the spawning grounds provided by several mangrove (*Rhizophora sp.)* species[73].

In many regions of the world, trees are employed to improve the microclimate by providing shade, wind barriers, and soil stabilization[75]. Certain plant species aid in lowering airborne particles. Some plants have the ability to decrease nitrogen oxides (NO and NO2) by foliar absorption, whilst others may absorb carbon from the environment as carbon monoxide (CO)[76]. In the course of photosynthesis, the majority of plants fix carbon dioxide[75]. In order to lower the risk of global warming, this is crucial. In the majority of Nigeria's metropolitan areas, landscaping is quickly gaining popularity. Living spaces with lovely scenery encourage mental relaxation, and healthy bodily function is improved by the gaseous exchange that occurs between plants and the atmosphere. The forest's ability to provide these services results in higher output and a healthier living environment, which lowers the prevalence of poverty[76].

2.1.8.6 Non-Timber Forest Products and Household Health

About 80% of all households, particularly those in rural regions, are claimed to rely on natural herbs for medication[74]. This finding has been supported by recent statistics, which show a steady rise in the number of people who depend on herbs for their health requirements. In part, this is attributable to the nation's escalating poverty, which prevents the rural poor from affording mainstream medical. Rural residents naturally turn to traditional medicines when they are in need since there are sometimes great distances between their settlements and orthodox medical facilities[77]. When things go out of hand, such during difficult labor, fetal accidents, and persistent illnesses, people only turn to modern medicine for help[76]. The line separating food from medication is hazy. The majority of foods have therapeutic effects whether they are eaten on their own as part of regular meals or as a complement to other diets. *Zingiber officinale, Veronia amygdalena* (bitter leaves), *Tetrapleura tertraptera* (aridan plant), *Aframonum melegueta, Pipper guineense, Alium sp, Xylopia aethiopica* (Guinea pepper), *Hymenaea courbaril* (Figure 2.7), and honey are some examples of these.

When talking about medicinal plants, it is undoubtedly referring to those that are utilized to heal both human and animal illnesses. The general public has always shown a tremendous degree of interest in herbal treatments, particularly regional herbal therapies[78]. According on their specific illness, socioeconomic background, or prior experiences, people employ a variety of treatment and healthcare options[79]. All of the individuals who were questioned in a research region in Ghana reportedly utilized herbal medications, with 80% of them citing wild plants as their primary source of medication[80]. The majority of Africans generally hold the opinion that goiter, epilepsy, mental disorders, and spiritual issues are among the

conditions that are best treated using traditional remedies. The usage of herbs for medical purposes also spares rural residents the costs they would have suffered in hospitals, thereby highlighting their economic strength[78].

In the current pharmacopoeia, at least 25% of the medications are made from plants, and many others are synthetic equivalents based on plant-derived prototype molecules, thus the use of traditional medicine is not just limited to underdeveloped nations[81]. Few medicinal plants are grown because it is still commercially unappealing to grow them given the low cost of natural materials. But given that natural woods are disappearing due to deforestation, logging, fuelling, agriculture, etc., it is clear that additional species will need to be domesticated soon[82]. Currently, and for some time to come at least in the developing countries, natural sources of therapeutic plants are essential. Some species will be challenging to grow or the synthesis of their active components will be challenging[81]. A combination of sustainable wild plant collecting and/or cultivation of therapeutic plants has been suggested. The commercial collection of medicinal plants may be one of the few chances for paid work or for generating supplemental money in the rural regions, in addition to the fact that millions of people rely on them for household health[81].

Figure 2.7: Illustration of how to use locust bark (*Hymenaea courbaril*) to treat cough.

Source[75]

2.1.9 NTFPs and the Forest Socio-Cultural Life

Data and information on the current characteristics of demand, supply, and usage of NTFPs to sustain forest people have been developed as a result of extensive study on the significance of NTFPs on forest peoples' cultural, social, and economic lives in tropical forests[84]. A thorough investigation of the identification, dependency, and interaction between tropical forests and forest people, as well as how such relationships may alter through time in light of the surrounding socio-physical environment, is included in the research. The spiritual and cultural existence of the forest peoples is frequently closely tied to the tropical woods. More than 1 billion people (particularly those living in forests) depend on NTFPs for all of their everyday requirements, including social and cultural ones[85].

2.1.10 Environmental Impact of NTFP Gathering

It is frequently asserted that NTFPs may be extracted without harming the environment. It is true that gathering fruits, honey, mushrooms, bark, or leaves causes less harm than felling whole trees for lumber or turning large forest areas into farmland[90]. Although many natural goods are harvested without endangering the forest, different collection methods have varied effects on the species' ability to regenerate and, as a result, their availability in the future. Because just certain sections of the fruit, nut, leaf, or bark are taken, and because the tree or shrub can easily recover, the practice is less hazardous[91]. The accumulation of wood or resin, however, can be extremely harmful in some circumstances since the entire tree is taken down. Overharvesting may result in the destruction of forests and potentially the local extinction of species[92]. It can also be brought on by unrestrained harvesting, extremely low, or

extraordinarily high pricing. Figure 2.8 shows how inefficient extraction of a valuable tree resin in Africa has led to significant environmental and financial issues.

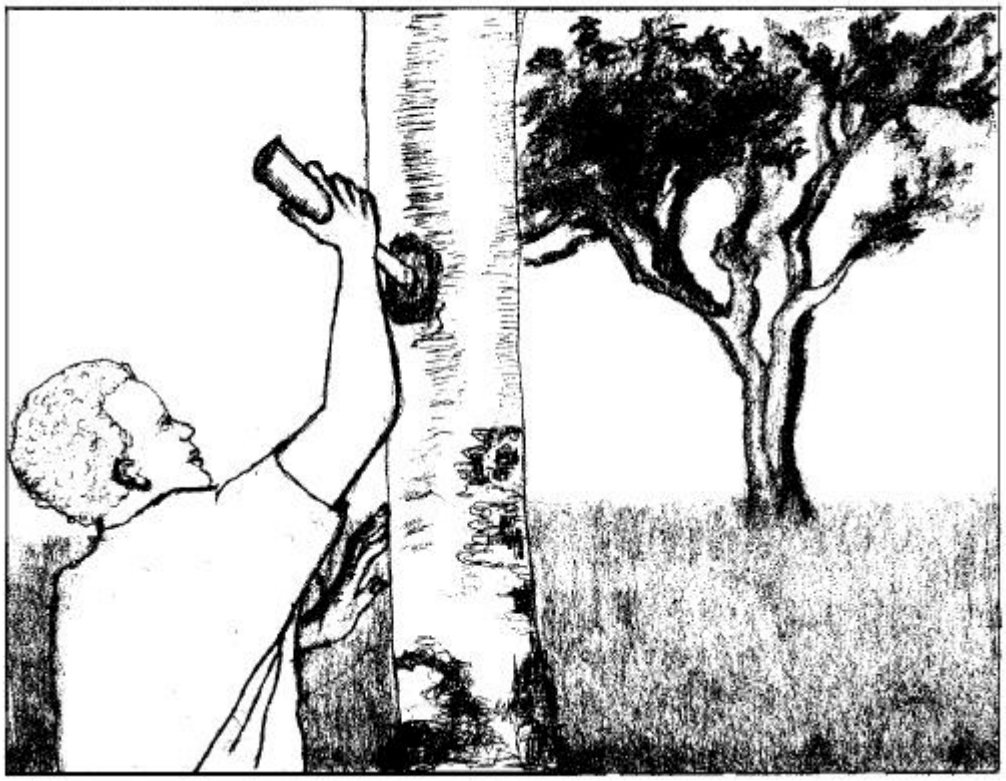

Figure 2.8: Cutting the bark of Frankincense Tree to obtain its Resin

Source[75]

2.1.11 Gender and NTFP Commercialization

Studies from almost every tropical location show that both men and women engage in commercial NTFP activities. Though the vast majority of NTFPs are sometimes harvested, processed, and used by women[90,91]. Thus, in order to fully comprehend the consequences of NTFP commercialization on social justice, equity, and welfare, a gender analysis is essential. The relationships between NTFP commercialization and society are marked by large and complicated discrepancies, inequities, and divisions when gender is considered as a social category. In order to increase women's political and economic power in comparison to men, several projects have a special female audience. In other instances, commercialization has the resulted in women being pushed out of their traditional sources of income, lowering their economic position.[92]. Whether commercialization will raise or lower women's socioeconomic standing depends on a variety of intricately interrelated issues. The results of the study specifically show that the gender distribution of labor and the gender management of income might differ geographically, by species, by technological level, and by the type of activity in the chain of activities from harvest to marketing. There are several recurring themes in the literature that appear in cases from a number of geographical regions within this complexity and variety[93].

2.1.12 Contributions of NTFPs to Climate Change Adaptation

NTFPs have a significant function in forests and subsequently in the preservation of such forests. Traditional attempts to combat climate change in forests have centered on trees as a way to build and safeguard forest carbon stocks[86]. However, forests consist much more than

only trees[88]. The importance of NTFPs in strategic efforts to battle and adapt to climate change cannot be overstated, therefore this study investigates their different possible roles and contributions in climate change mitigation and adaptation, as well as offers recommendations to enhance, safeguard, and promote these efforts.

2.1.12.1 NTFPs and the Conservation of Forest Ecosystem

Sadly, NTFPs have only gained attention in the second half of the 20th century[87]. Collection of NTFPs has less of an adverse impact on forests than wood harvesting. Interest in NTFPs "began in earnest in the late 1980s and early 1990s, concurrent with increasing global concern about environmental issues, especially deforestation, with increased attention to rural poverty, and with the emergence of the concept of "sustainable development"[88]. However, NTFPs are becoming less common in both quantity and kind globally. The expansion of transportation networks in inhospitable regions of Africa, Asia, and South America, as well as the conversion of forest areas for alternative purposes and the overexploitation of timber products, are to blame for this[88]. In addition to reducing forest cover due to irresponsible wood harvesting, many more plant species that generate NTFPs are also becoming extinct[89]. Both the amount and quality of NTFPs suffer at the same time. This is especially true for the densely populated developing world, where a significant portion of the population still resides near forests and relies on forest products[88]. Based on the regional geo-physical environment, NTFPs vary in kind, nature, and quantity from one forest area to the next, even within the same type of forest areas in different regions or at various locations within the same region. The variety of plant and animal species found in tropical forests is well known[89].

2.1.12.2 NTFPs and Carbon Sequestration

Carbon sequestration is the act of removing atmospheric carbon dioxide (CO2) from the atmosphere and storing it in long-term repositories such soil, forests, and oceans[93]. By lowering the atmospheric concentration of carbon dioxide, one of the main greenhouse gases responsible for global warming, this process helps to lessen the effects of climate change. A number of NTFPs can directly aid in the sequestration or storage of carbon. Here, fast-growing woody NTFPs like bamboo are the main emphasis[94]. NTFPs can be utilized to reduce emissions if the necessary techniques are available. They can therefore be used as a direct carbon sequestration technique. Through the preservation of forests, NTFPs can also indirectly aid in the sequestration of carbon. Because healthy forests are necessary for the production of goods like maple syrup and Brazil nuts, they serve as incentives to safeguard forest systems[95]. Because of this, NTFP production also has the potential to indirectly aid in the sequestration and storage of carbon in forest systems. Additionally, NTFPs can help prevent deforestation by generating income and livelihoods, which is relevant for REDD+ (Reduced Emissions from Deforestation and Forest Degradation). The relationship between NTFPs and carbon sequestration in forests has to be further studied in order to quantify the relationships in order for such notions to function successfully[96].

Figure2.9: Women making Charcoal from Bamboo as part of Carbon Credit Generation

Source[96]

Extraction difficulties (i.e., the removal of biomass from the forest) must be taken into account when examining the function of NTFPs in carbon sequestration[97]. By restricting access to or logging (for example, by logging bans), several programs seek to safeguard forests. However, in order to offer means of subsistence and incentives for forest protection, NTFPs frequently need to be mined, removed, or used[98]. Since NTFPs can have quite different re-vegetation and re-growth cycles than trees, sustainable harvest may be feasible at far shorter periods. This demonstrates that in order to fully realize NTFPs' potential for carbon sequestration and forest protection, forest policy may need to handle them differently. Additionally, it is important to do research on the sustainable extraction of NTFPs[99].

2.1.12.3 Impacts of Climate Change on NTFPs

As a part of forest ecosystems, NTFPs are inherently impacted by climate change for example, by changes in climatic conditions or the incidence of natural catastrophes (such as floods, forest fires, or storms)[100]. According to forest models, "Climate change will substantially impact services, such as seeds, nuts, hunting, resins, plants used in pharmaceutical and botanical medicine, and in the cosmetics industry; these impacts will be highly diverse and regionalized[101]. Due to the wide range of NTFPs, drawing a generalized conclusion in this situation is challenging. The "spatially varying impacts of environmental change" on NTFPs were anticipated by a recent research in West Africa. The effects of climate change on NTFPs might be good or detrimental, such as enhanced yields brought on by favorable climate conditions or storms, floods, or forest fires[102]. This demonstrates the necessity of assessing and forecasting the effects of climate change on NTFPs in order to

design adaptation strategies, save multifunctional ecosystems, and guarantee the sustainability of livelihoods[103].

2.1.13 National Policies on NTFPs

Since acknowledging the importance of forests, the Nigerian government has taken a variety of steps to promote their sustainable management and usage. Additional work is still necessary to ensure that these standards are effectively applied and managed in order to achieve their intended goals. In Nigeria, the following are some of the NTFP-related policies:

2.1.13.1 The 1988 National Forest Policy

The Federal Ministry of Agriculture issued "Agricultural Policy for Nigeria" in 1988, which contains the current national forest policy. This policy defined forestry as the management and use of forests as renewable natural resources. For the management, growth, and utilization of forests, as well as their resources and products, it offers goals, targets, and implementation methodologies[104]. The Policy is "demand-led" since its declared goal is to grow the forestry industry in order to fulfill the rising national demand for forest products. This will be accomplished through growing Nigeria's forest estate, including, but not limited to, raising the percentage of forest under protection from 10% to 20%[105]. The aims of the policy may be summarized as follows:

(i) Consolidation and expansion of the forest estate, and its management for sustained yield,

(ii) Forest conservation and protection of the environment

(iii) Forest regeneration at a greater rate than exploitation

(iv) Reduction of waste in utilizing both the forest and forest products

(v) Protection of the forest from fires, poachers, trespassers and unauthorized grazers

(vi) Encouragement of private forestry

(vii) Creation of man-made forests for specific end uses

(viii) Increase of employment opportunities

(ix) Development of national parks and game reserves

(x) Development of secondary forest products which are significant in the local economies, and encouragement of agro-forestry

(xi) Cooperation with other nations in forestry development

Development of more efficient use of wood energy and encouragement of alternative energy sources to wood fuel[105].

2.1.13.2 The 2006 National Forest Policy

The overarching goal of the national forest policy is to establish sustainable forest management that would guarantee sustainable growth in the economic, social, and environmental benefits from forests and trees for the current and future generation, especially the underprivileged and vulnerable groups[106]. The goals of the nation and the tenets of sustainable development are shared by the National Forest Policy[107]. Its main goal is to manage the country's forestry industry so that the woods can provide commodities and services indefinitely[108]. To put it another way, to address the requirements of this generation

without jeopardizing the rights of future generations[109]. Specifically, the objectives include the need to:

(i) Increase, maintain and enhance the national forest estate through sound forest management practices.

(ii) Address the underlying causes of deforestation, desertification including lack of policy support, market distortions, weak regulations and rural poverty.

(iii) Promote and regulate private sector involvement in forestry development, and to create a more positive investment climate in the sector.

(iv) Capitalize on the economic, social and environmental opportunities in forestry without undermining the resource base.

(v) Encourage forest dependent people, farmers and local communities to improve their livelihood through new approaches to forestry.

(vi) Ensure the survival of forest biodiversity and to balance this with the pressing development needs of the country.

(vii) Rehabilitate and conserve key watershed forests.

(viii) Promote and maintain the greening of the urban environment, and meet the increasing demand for forest products by urban centers.

(ix) Ensure that improved tenure to land and tree acts as an incentive for individuals, communities and women in particular to invest in forestry.

(x) Help private owners and communities to reserve land for forestry.

(xi) Build capacity and systems for state and local government to engage actively in forest resources management and development.

(xii) Apply an effective regulatory system to safeguard public interests under private sector forest management agreements to ensure adequate legal provisions for tenure in order to encourage long-term investment.

(xiii) Develop partnerships or management agreement with local communities that improve forest management and alleviate poverty.

(xiv) Strengthen and make best use of the capacity and reach of NGOs and CBOs in facilitating forest development.

(xv) Develop and promote responsive, affordable, well-informed and decentralized forestry advisory services to farmers, communities and the forest industry.

(xvi) Develop and support demand driven, well-coordinated forestry research and training institutions and programmes.

(xvii) Develop a forest sector programme that translates forest policy into action in a way that complements programmes in related sectors[110].

2.2 Review of Empirical Studies

2.2.1 NTFPs in the International Market

There are markets selling wild plants almost everywhere in Africa, the Caribbean, and the Pacific, but little is known about how much the national economies of those regions are impacted by these sales. Few nations keep records of the species sold, where they are sold, how much they cost, and where they are sold. Those who collect them, sell them, and who buys them are even less well known[50]. The resources, supply networks, and socioeconomic impact of NTFPs at the national level are not routinely monitored or evaluated, in contrast to forestry and agricultural goods. Rarely do national statistics include just exported non-timber

forest products. Nevertheless, it is estimated that the yearly global market for items made from wild plants is worth US$60 billion and that it is expanding by about 20% annually[50]. The global market for medicinal plants was valued at US$1.3 billion in 1996, according to the trade monitoring network TRAFFIC. The percentage of grown plants or the percentage of genuine NTFPs involved is not shown in these numbers. It is challenging to provide an overview of the main commercial NTFPs in Africa, the Caribbean, and the Pacific because to the lack of trustworthy data[50].

There have been more research groups and NGOs involved in NTFP study in a few nations than anywhere else, including India, Guyana, and South Africa. Simply because their data are readily available, these nations are frequently mentioned here. We simply do not know which forest products are marketed in other African, Caribbean and Pacific (ACP) nations, which does not imply that these items are less significant there. Therefore, the offered values and volumes should be viewed as estimations, which may differ from real data but will highlight some patterns[50].

2.2.2 NTFPs in the West and Central African Market

Although there has been commerce between various African peoples for thousands of years, Europeans were unaware of the sub-Saharan area until the middle of the 15th century. But even before the arrival of European influence, there were created several trading routes through the Sahara. These economic connections were established as a result of the Arab conquest of North Africa in the seventh century[51]. Since then, many high-value goods have been shipped from the wooded areas of West and Central Africa for consumption and trade

in the Muslim-majority parts of North Africa. Kola nuts (*Cola acuminata and C. nitida*), in example, were carried widely from the Guinea and Akan forests to the sub-Saharan Sudanic region in addition to palm oil, slaves, and ivory[52].

Another woodland product, melegueta pepper or "grains of Paradise" (*Aframomum sp.*), started getting imported to Europe in the early medieval period for use as a spice and condiment. The fact that it was used in Europe in 1214 A.D., long before there was direct European commerce, attests to the importance and reach of these trans-Saharan commercial networks. In addition to engaging in the profitable slave trade, Europeans began to explore the African coastline throughout the 16th and 17th centuries and recognized there was a great deal of opportunity for "legitimate" commerce [54]. In order to exchange iron items, clothing, and weaponry for spices and condiments, palm oil, and ivory, a vast network of trading stations was set up at key locations along the coast[52].

These commercial hubs later served as stepping stones for colonial expansion, and during the "scramble for Africa," several European nations utilized their economic clout to acquire vast tracts of land. Large swaths of forest lands were turned into plantations for agriculture during the colonial era, and both wood and non-timber resources were actively exploited. For instance, natural sources of rubber for tire manufacturing were highly prized before plantations emerged to offer Brazil rubber (*Hevea brasiliensis*). A cruel and exploitative strategy of forced collection resulted from the exploitation of African rubber (*Funtumia elastica*) in the Congo Free State for the limited time that the practice was profitable[55].

Today, trading in NTFPs from west and central Africa is mostly conducted inside and between African countries. The improvement of transportation infrastructure and expanded access to forested regions have made this trade easier to conduct[56]. It was discovered that

from January to June 2021, four significant NTFPs sold in Cameroon's border markets and humid forest region sold for US $753,000. The bark of *Garcinia lucidaand G. kola* as well as nuts from *Irvingia spp*. and *Cola acuminata* were among the NTFPs examined. According to a new NTFP valuation model conducted in the South-West and North-West provinces of Cameroon, the region's NTFP production and selling will be worth more than US $19 million in 2019, or 2.8% of the local GDP. Only 5% of this heavily logged-over area's income came from timber sales[57].

2.2.3 NTFPs in the Nigerian Markets

Due to the fact that they are used in a various household, small and medium-sized companies, and even the manufacturing industries in Nigeria, NTFPs are significant commodities in the Nigerian market[55]. These usages included the use of fruits, nuts, honey, insects, and animals. NTFPs are also utilized as exudates, fibers, fertilizers, construction materials, extracts for use in medicine, cosmetics and cultural products, natural colors, tannin, and gums[58]. Other advantages include those from using essential oils, spices, edible oils, decorative items, horns, tusks, bones, pelts, plumes, hides, and skins, as well as those from using on-wood ligno-cellulosic materials (brown coal with a woody texture), phytochemicals, and fragrance chemicals[59].

In Nigeria, non-timber forest products received little to no attention while the supply, marketing, and processing of timber were given top priority. NTFP processing is enabled by a framework that includes typical market and value chain traits[58]. Market attributes, market accessibility that is simple in both space and time are important for business success. As

shown by the large demand for charcoal, brooms, amarula products, and agar oil, there needs to be a high demand for NTFP goods before NTFP firms can be established[60]. Intense marketing campaigns are frequently used to generate demand, especially for new items that are entering worldwide markets and for which funding is not always easily available. However, research has revealed that there is a sizable market for NTFP products, with quality and environmental friendliness ranking as their top qualities[58].

There have been several problems with NTFP marketing in Nigeria. The most major issue with NTFPs marketing was determined to be poor transportation, followed by a lack of storage space[59]. On another instance, a threat to Nigerian NTFP marketing is the lack of a consumer to support the product vendors. This can be as a result of the poor condition of the majority of the roads heading to woodland areas. Because of this, moving goods from the point of purchase to the location of sales results in significant transportation expenses[60]. Since NTFPS includes a range of products that cater to the interests and desires of various end customers, marketing NTFPS encompasses all marketing endeavors. Other products are purchased by industrial customers who use them as raw materials to make either other industrial products (such as converting essential oils to fragrances) or consumer products. Some products are purchased by final consumers without any significant processing (such as fruits, berries, mushrooms, etc.). Despite the fact that NTFPS like leaves, fruits, fuel wood, mushrooms, and others are heavily reliant on both rural and urban economies to create income[60].

2.3 Conceptual Model

A number of academics have proposed a variety of models as a result of their interest in the long-term, beneficial use of forests. Two of these models are found to be very pertinent to this study and have been utilized as a foundation by many academics and policymakers to offer market or state solutions. "The Tragedy of the Commons" and "The logic of Collective Action" are two examples of these models[111].

2.3.1 Tragedy of the Commons

When it comes to the Tragedy of the Commons, it depicts the nature of the issue people face when they use a limited resource collectively. This model's main tenet is that each participant just looks out for their own interests. However, consideration for resource conservation is given the least attention[111]. "Everyone's property is nobody's property," so quite frequently, The Tragedy of the Commons has been codified as a Prisoner's Dilemma Game. The core tenet of the Prisoner's Dilemma Game is the assumption that the participants are unable to alter their uncooperative circumstances[112]. To put it another way, the paradox that "individually rational strategies lead to collectively irrational outcomes" serves as the framework's central tenet[113].

2.3.2 Logic of Collective Action

The Logic of Collective Action is a different theoretical framework that depicts rational persons' non-cooperative behavior when using a shared pool of resources. According to this

line of reasoning, rational, self-interested individuals will not work to further their common or group interests "unless the number of individuals is quite small or unless there is coercion or some other special device to make individuals act in their common interest"[112].

In the two models discussed above, the issue of free-riding is the main impediment to cooperative behavior. This is the issue that develops "whenever one person cannot be excluded from the benefits that others provide, each person is motivated not to contribute to the joint efforts, but to free-ride on the efforts of others"[113]. The persons involved are caught in a trap they cannot get out of on their own because of the propensity for freeriding behavior.

2.4 Summary of Gaps in Literature

There is a lack of comprehensive research and data on the specific NTFPs present in Ago-Owu Forest, their abundance, distribution, and their contribution to local livelihoods and climate change adaptation. Without this information, it's challenging to make informed decisions and policies[114].There's a gap in understanding how the availability of different NTFPs in Ago-Owu Forest are affected by climate change, and how they can contribute to the resilience of local ecosystems in the face of changing climatic conditions. Indigenous knowledge and traditional practices related to NTFPs are not well-documented[115]. This knowledge is crucial for sustainable NTFP management and could provide insights into effective climate adaptation strategies. Knowledge about how Ago-Owu Forest's climate is expected to change in the long term and how this might affect the availability and distribution of NTFPs is lacking[116].The extent to which NTFPs are currently integrated into local climate adaptation strategies is not well-documented[117]. Understanding this integration

could reveal opportunities for enhancing adaptive capacity. Specific guidelines for sustainable harvesting of NTFPs in Ago-Owu Forest is also lacking, this gap hampers efforts to prevent overexploitation and depletion of these resources[118].

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Chapter Three

Methodology

3.1. Research Design

The research design for a study on Gender Differentials and Climate Change Perceptions on Non Timber Forest Products (NTFPs) Use and Trade in Ago-Owu Forest, Osun State involved a purposive sampling technique in three Markets around Ago-Owu namely Araromi market Omu, Total market Apomu and Oba Olatunde Falabi market Ikire. The study used a survey questionnaire to collect qualitative and quantitative data. The data were analyzed thematically and using descriptive statistics to identify key themes and patterns and determine the economic value of NTFPs for local livelihoods. Ethical considerations were taken into account.

3.2 Study Area

The study was carried out in Osun State located within the tropical rainforest, Southwestern Nigeria within a year (2022 to 2023). The State is located between latitudes 6˚40'N and 8˚10' North and, between longitudes 4˚05'E and 5˚02' East. It covers an area of about 8602 square kilometres approximately[1]. It is bounded in the west by Oyo State, in the East by Ondo State, in the North by Kwara State, in the Northeast by Ekiti State and in the South by Ogun State. In view of its location, Osun State is endowed with eleven forest reserves which cover a total area of 91,268 hectares (ha.). The eleven forest reserves are; Ago-Owu, Ede, Ejigbo, Ife Native Authority, Olla, Ikeji-Ipetu, Ila, Oba Hills, Oni, Osogbo and Shasha forest reserves[2]. The mean annual rainfall is about 1500 mm and mean annual temperature is about 27˚C with the annual range of about 3˚C. The soils belong to the highly ferruginous tropical red soil

associated with basement rocks. Tree species such as *Tectonagrandis.Gmelinaarborea , Albiziazygia , Terminalia superba , Blighiasapida and Miliciaexcelsa*are dominant in the study area[3].

The Ago-Owu Forest is located in Osun State, Nigeria, and is known for its high ecological and biodiversity value. The forest covers a total land area of approximately 13,000 hectares and is located within the tropical rainforest biome. It is situated in the southwestern part of Nigeria with coordinates of 7.8879° N, 4.4741° E. (Figure 3.1), with its location characterized by lowland and highland areas, rivers, and streams[4]. The forest has a diverse topography, ranging from flat to undulating terrain, with some areas of steep hills and valleys[4]. The forest's altitude ranges from about 150 meters to over 400 meters above sea level, and it is crisscrossed by several streams and rivers, including the Osun River, which is a major tributary of the Niger River[5]. Ago-Owu Forest is home to several unique and endemic species of flora and fauna, many of which are threatened due to habitat loss and degradation. Some of the forest's dominant tree species include *Terminalia superba, Triplochiton scleroxylon*, and *Entandrophragma angolense.* There are also several species of primates, birds, reptiles, and mammals, including the endangered Nigerian-Cameroon chimpanzee, forest elephants, and duikers[6]. The forest is surrounded by several communities that are largely dependent on its resources for their livelihoods. The forest provides several Non Timber Forest Products (NTFPs) that are collected and traded by local communities, including medicinal plants, fruits, honey, and timber[5].

The people of Ago-Owu Forest are mainly of Yoruba descent and are known for their rich cultural heritage. They have a deep understanding of the forest ecosystem and the resources it provides, which has enabled them to develop sustainable harvesting practices for NTFPs. The

forest is an important source of food, medicine, and building materials for these communities, and they have a strong attachment to the forest and its resources[4]. The cultural practices of the people of Ago-Owu Forest are also closely linked to their spiritual beliefs. They believe that the forest is inhabited by spirits and deities that protect and guide them in their daily lives. These beliefs have resulted in the development of several cultural practices, such as the annual Osun-Osogbo festival, which is held in honor of the goddess of the Osun River[6].

Despite their strong attachment to the forest, the people of Ago-Owu Forest are facing several challenges. Deforestation, degradation, and climate change have led to a decline in the availability and quality of NTFPs, affecting the livelihoods of local communities. In addition, the forest is under increasing pressure from population growth and inadequate forest management practices[7].

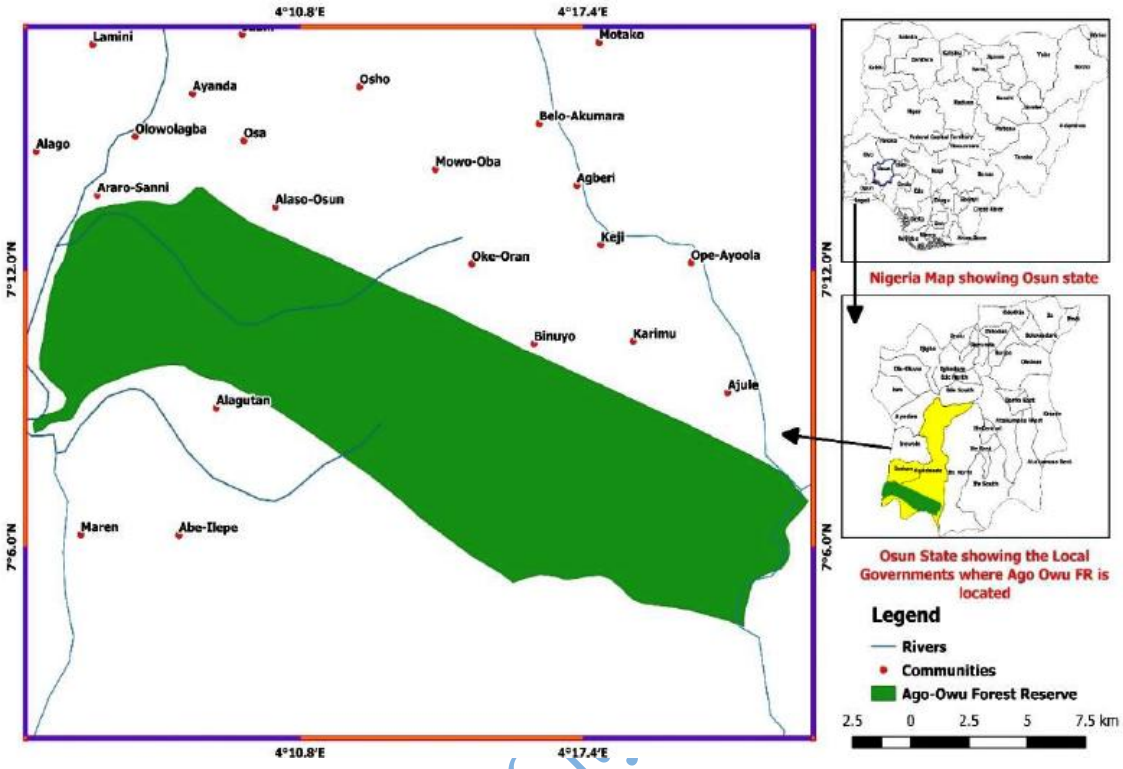

Figure 3.1: Map of Ago-Owu Forest Reserve, Osun State.

Source[1]

3.3 Sample and Sampling Technique

Multistage sampling technique was used for this study. Three markets around Ago-Owu forest were purposively selected because of the existence of large portions of the forest and its territories and where most of all the products gotten from the forest are sold, as well as the high number of forest-dependent families. The markets were selected due to their high tendency to depend on non-timber forest resources from the reserve[8]. The first Market which is Araromi, only twenty-one (21) respondents which were willing to participate in the study were selected. For the second market which is Oba Olatunde Falabi International Market, thirty-six (36) willing respondents were also selected and interviewed, and the third market is Total Market, where forty-four (44) traders responded positively and were interviewed making one hundred and one (101) respondents as the entire population.

3.4 Description of Research Instrument

The instrument that was used for data collection for this study is a semi-structured questionnaire. This is due to the nature of information required and the form of analysis to be conducted. The questionnaire consisted of four (4) sections. Section A required the demographic information of the respondents, Section B was about perception about NTFPs, section C was aboutclimate change adaptation while section D was about gender differentials. The instrument employed both 2 point Likert scale rating of Yes and No, and 4 point Likert scale rating of Strongly Agreed, Agreed, Disagreed and Strongly Disagreed[9].

3.5 Validity of Research Instrument

The face and content validity of the instruments was carried out through the assistance of researcher's supervisor, and other experts in Environmental Studies. Thorough scrutiny of the instrument was carried out and necessary corrections was effected for the instrument to be adjudged valid for the study.

3.6 Reliability of Research Instrument

The reliability of the instrument was determined by using the test- retest method of testing reliability[10]. This was done by administering the test twice on 10 traders who were not part of the sample within an interval of two weeks. The scores obtained from the two successive administrations was subjected to Cronbach Alpha Reliability Estimate at 0.05 level of significance. A reliability coefficient of 0.87 was obtained. This implies that the instrument was reliable for the study[10].

3.7 Method of Data Collection

Data were collected from the sample market through interviews using a semi- structured questionnaire. The questions asked included: types of various NTFPs harvested in the area, main actors involved in collection, value of NTFPs consumed and sold by the traders in the market, various sources of traders' income, contribution of NTFPs to traders' wellbeing. Others were on demographic and socio-economic attributes of the respondents such as sex, age, membership of the social group, educational status, primary, and secondary occupation.

The questionnaires were administered to the traders within the market area, in a case whereby the farmers are still available they were also interviewed directly and even follow some to the forests to see their portion for farming.

3.8 Method of Data Analysis

Both descriptive and analytical (inferential) statistics were used for data analysis.

All inferential analysis was carried out at 95% confidence interval.

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Chapter Four

Results and Discussion of Findings

4.1. Results of Demographic Data Analysis

This section presents the analysis and results of the demographic data of respondents collected in chapter three based on the four research questions generated from the study and is presented in Table 4.1.

Table 4.1: Descriptive Analysis of Demographic Data

				95% Confidence Interval	
Variables	**Option**	**Frequency**	**Percentage**	**Mean**	**Standard Deviation**
Gender					
	Male	45	44.6		
	Female	56	55.4	1.5545	0.49950
Age	<20	0	0		
	20-30yrs	35	34.65		
	31-50yrs	50	49.50		
	51-70yrs	16	15.84		
	Total	101		39.7728	11.8879
Education	Primary	19	18.6		
	Secondary	64	63.4		
	Tertiary	8	7.9		
	No Education	10	9.9	7.0891	0.81362
Status	Single	8	7.9		
	Married	89	88.1		
	Widow(er)	4	4.0	3.9604	0.34412

Source: Author's Field Work, 2023.

The descriptive analysis of the statistical demographic characteristics showed in Table 4.1 revealed that the gender had mean of 1.5545(44.6%) with corresponding standard deviation of (0.4995) whereby the majority of the respondents were female 56 (55.4%) while remaining 45 (44.5%) were male. In relation to age, the result showed that it had mean of (39.7228) with corresponding standard deviation of (11.8879) whereby none of the respondents were 20 years or less,35(34.65%) of the respondents were between 20 and 30years: 50(49.5%) were between 31 and 50 years: 16(15.84%) were between 51 and 70years.

In terms of their education, 19 (18.6%) of the respondents had primary school education, while 64 (63.3%) had secondary education, 8(7.9%) of the respondents had tertiary education and 10(9.9%) of the respondents had no formal education.

However, in relation to their marital status, it was shown that it had the mean of (3.9604) with corresponding standard deviation of (0.3441) whereby 8(7.9%) of the respondents were single, 89(88.1%) of the respondents were married while 4 (4.0%) of the respondents were widow(er).

4.2. Research Question One: What are the non-timber forest products (NTFPs) available in Ago-owu forest, Osun State?

A register of NTFPs available at the study area is presented in Table 4.2

Table 4.2: Inventory of Non-Timber Forest Products (NTFPs) Available at Ago-Owu Forest.

S/No.	Yoruba Name	English Name	Botanical Name
1.	Igagba	Garden egg	*Solanum macrocarpon*
2.	Worowo	Bologi	*Solanecio biafrae*
3.	Elegede	Field pumpkin	*Curcubita pepo*
4.	Ebolo	Fire weed	*Crassocephalum crepidoides*
5.	Gbure	Water leaf	T*alinum triangulare*
6.	Oro	African mango	Irvingia gabonensis
7.	Piha oyinbo	Avocado	*Persea americana*
8.	Ewedu	Jute leaf	*Corchorus*
9.	Ewe	Wrapping leaves	*Thaumatococcus danielli*
10.	Awusa	Walnut	*Juglans*
11.	Iru	Locust bean	*Parkia biglobosa*
12.	Amunututu	Spinach	*Spinacia oleracea L.*
13.	Tomati	Tomatoes	*Solanum lycopersicum*
14.	Ila	Okro	*Abelmoschus esculentus*
15.	Igbale	Broom	
16.	Isu ewura	Water yam	*Dioscorea alata*
17.	Koko	Cocoyam	*Xanthosoma sagittifolium*
18.	Ogede Agbagba	Plantain	*Musa acuminata*
19.	Cocoa	Cocoa	*Theobroma cacao*
20.	Obi	Kolanut	*Cola acuminata*
21.	Epo	Palm Oil	
22.	Esuru	Bitter yam	*Dioscorea dumetorum*
23.	Orogbo	Bitter Kola	G*arcinia kola*
24.	Tangerine	Mandarin orange	*Citrus reticulata*
25.	Igbin	Snail	*Gastropoda spp*

Source: Author's Field Work, 2023.

Table 4.2showed all the Non-Timber Forest Products found physically by ocular analysis at the three-markets visited. These products were transported directly from the forest to the markets through the middle men who bought the products from the forest. The Table Q.3 highlighted the local Yoruba names of different products, alongside the English and the botanical names for easy understanding. The products include fruits, vegetables, yams and others which serve different purposes, as shown in Figure 4.1 to Figure 4.9.

Figure 4.1: Transportation of Banana at Ago-Owu Forest.

Source: Author's Field Work, 2023.

Figure 4.2: Banana Selling Point at the Market

Source: Author's Field Work, 2023.

Figure 4.3: Snail

Source: Author's Field Work, 2023.

Figure 4.4: Bitter Yam

Source: Author's Field Work, 2023.

Figure 4.5: Walnut

Source: Author's Field Work, 2023.

Figure 4.6: Orange

Source: Author's Field Work, 2023.

Figure 4.7: Baskets

Source: Author's Field Work, 2023.

Fig 4.8: Brooms

Source: Author's Field Work, 2023.

Figure 4.9: Waterleaf from the Forest

Source: Author's Field Work, 2023.

4.3 Research Question Two: How are the non-timber forest products (NTFPs) utilized by local traders? Are NTFPs more of domestic or commercial value to local communities in Ago-owu forest, Osun State?

Table 4.3: The Role of NTFPs to Market Traders

Roles identify from the market's traders	N	Percentage
Source of income	85	85%
Consumption	5	5%
Medicinal	10	10%

Source: Author's Field Work, 2023.

Table 4.3 showed the roles of Non-Timber Forest Products identified by the traders and the communities at large. 85% of the respondents identified the role NTFPs played for them as the source of income while 5% of the respondents identified the role as consumption which is the smallest response of all, although most of the respondents claimed they consume out of the products but very minimal to avoid loose of gain. 10% of the respondents identified the role of NTFPs as medicinal, where they prepare different herbs in commercial scale for people within and outside the communities to buy especially during the market days in the area. According to the respondents, this had invited a lot of people to patronize the market more, most especially those that believes more in herbs. The pie chart below shows the response of the respondents on the role of NTFPs.

Table 4.3.1: Perceptions on NTFPs Availability

	YES	NO
Do you think NTFPs are getting scarce.	65	36

Source: Author's Field Work, 2023.

It was clearly shown that the NTFPs is becoming scarce in Ago-Owu forest as indicated by the respondents, 65 respondents declare it getting scarce while 36 agree it wasn't getting scarce.

Table 4.3.2: Perceived Causes of NTFPs Scarcity.

	Low rainfall (%)	Infertility of soil (%)	Heavy rainfall (%)
What you think is responsible for the NTFPs scarcity?	19(18.8)	4(3.9)	78((77.2)

Source: Author's Field Work, 2023.

Table 4.3.2 shows the respondents response towards the factors causing the scarcity of NTFPs in Ago-Owu forest, 19(18.8%) of the respondents identified the cause as low rainfall, 4(3.9%) of the respondents identify the cause to infertility of soil, while 78(77.9%) of the respondents identified the cause as heavy rainfall within the forest that most time wash away the top soil and the non-timber forest products as a result of deforestation taking place within the area.

Table 4.3.3 Awareness of the Government Intervention for NTFPs

	Yes (%)	No (%)
Are you aware of any government intervention or support for NTFPs	28(23.7)	73(72.3)
Are you aware of laws regarding how forests can be used in Osun State	33(32.7)	68(67.3)

Source: Author's Field Work, 2023.

Table 4.3.3 shows the respondents awareness of the government intervention towards NTFPs production, it was revealed that 28(23.7%) of the respondents are aware of government intervention towards the NTFPs while 73(72.3%) of the respondents are not aware of any government intervention towards NTFPs. Also, 33(32.7%) of the respondents are aware of the laws regarding forest used while 68(67.3%) of the respondents are not aware of any law. This indicates that the respondents are not aware of any government intervention and laws regathering NTFPs.

The perception of the respondents about NTFPs was clearly identified as the NTFPs is becoming scarce on a yearly basis which was as a result of heavy rainfall and there's little or no information as regarding the use and gathering of NTFPs within the forest.

4.4 Research Question Three: What are the effect of climate change on the availability of NTFPs around Ago-Owu forest?

Table 4.4.1: Awareness of Climate Change and its Impact

	Yes (percentage)	No (percentage)
How did you hear about climate change?	Radio 20(19.8)	Not at All 81(80.2)
Do you think climate change is occurring in Ago-Owu	91(90.1)	10(9.9)
Have you experienced any extreme weather conditions that you interpreted as caused by climate change?	96(95)	5(5)

Source: Author's Field Work, 2023.

Table 4.4.1 reveals the awareness on climate change, 20(19.8) of the respondents heard about climate change in one way or the other while 81(80.2) have not heard about the climate change at all. It also revealed that 91(90.1) of the respondents noticed the climate change is occurring which was ascribe to heavy rainfall in the area while 10(9.9) of the respondents does not think climate change is occurring in the area.

Table 4.4.2 Perceived impact of Climate Change within Ago-Owu

	Yes (percentage)		No (percentage)
What kind of changes do you think has been caused by this climate change.	Low Rainfall Nil	No Rainfall 5(5)	Heavy Rainfall 96(95)
Do you think climate change affect the availability of these NTFPs	96(95)		5(5)

Source: Author's Field Work, 2023.

Table 4.4.2 reveals the evidence of climate changes within Ago-Owu as the respondents with 96(95%) observe heavy rainfall within the area for the recent time while 5(5%) observe low rainfall which was as a result of heavy transpiration that is taking place within the area, this has been attributed to the unlawful deforestation that is taking place within the area. Also, 96(95%) of the respondents agrees that climate change have a great effect on the availability of NTFPs while 5(5%) disagree with the claim. This clearly shows that climate change contributes more to the scarcity of NTFPs.

80.2% of the respondents have not heard about the climate change nor understand climate change, 19.8% have heard about the climate changes from the media on a yearly basis which has an effect on the NTFPs, and gave examples of excessive rainfall and at times low rainfall.

90.1% of the respondent agreed that climate change occurred within and around the forest while 10% were against the climate change whereby they believed nothing has changed about the area. 95% of the responses showed they have experienced many extreme weather conditions that can be interpreted as caused by climate change, while 5% do not agree with the extreme conditions. The suggested changes that the respondents think off, that are caused by climate change is scarcity of NTFPs. 95% of the respondents agrees that climate change affect the availability of NTFPs, while 5% disagree with the stands. The reasons suggested by the respondents are as follows: Excessive rainfall, inadequate rainfall, late rainfall, cutting down of trees that serves as shed for most of the NTFPs.

4.5 Research Question Four: What are the gender differences in the trading of NTFPs?

Table 4.5: Gender Differences in the Trading of NTFPs

	Men (%)	**Women(%)**
More men or women do engage in NTFP's activities?	85(84.2)	16(15.8)
Are there specific activities for men or women?	Harvesting by men and Gathering of NTFPs by women	
Who do you think makes more profit from NTFPs male or female?	24(23.7)	77(76.2)
Are NTFPs more accessible to women than men?	90(89.1)	11(10.9)
Who get more in the exploitation of the NTFPs	90(89.1)	11(10.9)
Are NTFPs majorly cultivated by men than women?	90(89.1)	11(10.9)
Who plays more role in protecting the NTFPs or sensitizing more on human activities that reduce the NTFPs.	64(63.4)	37(36.3)
Who plays the major role in the processing, transporting of NTFPs locally gender wise	29(28.7)	72(71.3)

Source: Author's Field Work, 2023.

Table 4.5 showed the involvement of gender in the trading of the Non-Timber Forest Products in market visited. It revealed that men involvement in NTFPs activities 85 (84.2%) while women involvement was 16(15.8%). This indicated men played more roles in NTFPs activities than women, ranging from working around the forest for the products to be on high yield. Some specific activities carried out by men and women were identified during the cause of the research, according to the respondent's cultivation and harvests of NTFPs were done by men while gathering to motorable junctions were carried out by women, they have to walk many kilometers before accessing the nearby road. On the fact that who makes more profit from NTFPs 24(23.7%) of the respondents claimed male while 77(76.2) of the respondents believed that women made more profit on NTPFs than male, the reason being that they negotiated with the traders on behalf of men. On accessibility to the NTFPs, the respondents believe men with 90(89.1%) have more access to the NTFPs with the fact that, they stay more within the forest than the women.

4.6 Discussion of Findings

The NTFPs that were identified in markets around Ago-Owu were similar to what was reported Edo State, Ekiti State and Oyo State Nigeria[1,2,3,4]. The NTFPs were generally divided into plant and animal raw materials and products[5]. Food, fodder, raw materials for medicines and aromatic goods, raw materials for colorants and dyes, raw materials for utensils, handicrafts and construction, decorative plants, exudates, and other specifically categorized plant products were among the plant products/raw materials[6]. Living animals, hides, skins, and trophies, wild honey and beeswax, wild (or bush) meat, raw materials for medicines, raw materials for colorants, other edible animal products, and other non-edible animal products made up the animal products and raw materials[7]. "All products obtained from plants of forest origin and host plant species yielding products in association with insects and animals or their parts and items of mineral origin except timber, may be defined as 'Minor Forest Products' (MFP) or 'Non-Wood Forest Products' (NWFP) or Non-Timber Forest Products (NTFP)" [7]. NTFPs were derived from two main sources, namely; the natural forest, human influenced systems such as plantations and modified forests[8].

It was also identified that most NTFPs in markets around Ago-Owu were ma engaged for income generation and medicinal purposes. The study established the significance of NTFPs to traders' livelihood as it formed at least 85% of their income. In the markets, different medicinal herbs were prepared in commercial scale for people within and outside the communities to buy especially during the market days in the area. According to the respondents, this had invited a lot of people to patronize the market more, most especially those that believes more in herbs. This finding do not agree with some reports that in Nigeria, non-timber forest products received little to no attention while the supply, marketing, and

processing of timber were given top priority[9]. NTFP processing is enabled by a framework that includes typical market and value chain traits[10]. Market attributes, market accessibility that is simple in both space and time are important for business success. As shown by the large demand for charcoal, brooms, amarula products, and agar oil, there needs to be a high demand for NTFP goods before NTFP firms can be established[10,11]. Nearly everywhere, small-scale non-farm enterprise operations provide employment and revenue, and their significance in the rural economy is growing[12]. According to a report, 20–45% of rural households' income is frequently derived from non-farm employment[13]. Local people mainly depend on the utilization of forest products for their supplemental income, according to a new research in the tropical rainforests. Utilized in some capacity are 280 animal species and more than 500 plant species[14]. The local markets got around 20 non-timber forest products, which greatly raise the income of rural residents[15]. Each NTFP may not make much of an individual contribution, but taken as a whole, they have a big impact on the rural economy and can increase export earnings. The NTFPs are especially the foundation of many income-generating enterprises in rural regions[16].

In the area of climate change and climatic adaptation, excessive rainfall, inadequate rainfall, late rainfall, cutting down on trees that serves as shed for most of the NTFPs were identified by the respondents as impacts affecting the availability and sustainability of NTFPs in the study area. Some other reports have also indicated that NTFPs are inherently impacted by climate change for example, by changes in climatic conditions or the incidence of natural catastrophes (such as floods, forest fires, or storms)[21]. According to forest models, "Climate change will substantially impact services, such as seeds, nuts, hunting, resins, plants used in pharmaceutical and botanical medicine, and in the cosmetics industry; these impacts will be

highly diverse and regionalized[22]". The effects of climate change on NTFPs might be good or detrimental, such as enhanced yields brought on by favorable climate conditions or storms, floods, or forest fires[23]. This demonstrates the necessity of assessing and forecasting the effects of climate change on NTFPs in order to design adaptation strategies, save multifunctional ecosystems, and guarantee the sustainability of livelihoods[24].

The observations in this study also revealed that both men and women are involved in the value chain of NTFPs. This observation aligned with some other studies from tropical locations which concluded that both men and women engaged in commercial NTFP activities. Though the vast majority of NTFPs were sometimes harvested, processed, and used by women[24,25]. Thus, in order to fully comprehend the consequences of NTFP commercialization on social justice, equity, and welfare, a gender analysis is essential. The relationships between NTFP commercialization and society are marked by large and complicated discrepancies, inequities, and divisions when gender is considered as a social category. In order to increase women's political and economic power in comparison to men, several projects have a special female audience. In other instances, commercialization has resulted in women being pushed out of their traditional sources of income, lowering their economic position.[26]. Whether commercialization will raise or lower women's socioeconomic standing depends on a variety of intricately interrelated issues. The results of the study specifically showed that the gender distribution of labor and the gender management of income might differ geographically, by species, by technological level, and by the type of activity in the chain of activities from harvest to marketing.

Endnotes

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Chapter Five

Conclusion

5.1 Summary of Findings

The study identified the non-timber forests products (NTFPs) in Ago-Owu, the role of non-timber forest products to livelihood in markets around Ago- Owu forest. The study determined the climatic adaptation practices of the people trading around Ago-Owu forest and also investigated the gender differentials in the use and trade of NTFPs around the selected areas.

The research design adopted for the study was a descriptive research design of survey type. The population of the study comprised of all the market people in selected markets around Ago-Owu forest. The sample size of one hundred and one (101) was obtained for the study from the total population of all the traders in the three selected market which was based on purposive, the trader that allowed to be interview. The study made use of a self-structured questionnaire consisting of four (4) sections. Section A required the socioeconomics characteristics of the respondents. Section B was on the perceptions about non-timber forest products. Section C seeks the information's based on climatic change while Section D was on the gender differences in the use and trading of non-timber forest products. The instruments employed both open ended answer and 2-point Likert scale rating of Yes and No.

The face and content validity as well as the reliability of the instrument are ensured in other to get the exalt data and information needed for the research. The researcher with the help of two research assistants administered the questionnaire on personal bases. However, the researcher plan to interview fifty respondents from each market but was only able to

interview one hundred and one (101) in all. Data collected were subjected to descriptive statistical analysis using mean, percentage, and standard deviation.The research questions formulated were answer accordingly.

The findings of this study revealed that Garden egg, Bologi, Field pumpkin, Fire weed, Water leaf, African mango, Avocado, Jute leaf, wrapping leaves, Walnut, Locust bean, Spinach, Tomatoes, Okoro, Broom, Yam, Cocoyam, Plantain, Cocoa, Kolanut, Palm Oil, Bitter yam, Bitter Kola, Mandarin orange, and Snail were the Non-Timber Forest Products that are physically available at the three-markets considered around Ago-Owu forest. These products were transported directly from the forest to the markets through the middle men who bought the products from the forest. Also, it was identified that most NTFPs in markets around Ago-Owu were majorly engaged for income generation and medicinal purposes. Various medicinal herbs were prepared in commercial scale for people within and outside the communities to buy especially during the market days in the area. According to the respondents, this had invited a lot of people to patronize the market more, most especially those that believed more in herbs. Climate agents including excessive rainfall, inadequate rainfall, late rainfall, cutting down on trees that serves as shed for most of the NTFPs were identified by the respondents as impacts affecting the availability and sustainability of NTFPs in the study area. The findings in this study also indicated that men played more roles in NTFPs activities than women, ranging from working around the forest for the products to be on high yield. Some specific activities carried out by men and women were identified during the cause of the research, cultivation and harvests of NTFPs were done by men while gathering to motorable junctions were carried out by women.

5.2 Conclusion

The findings established that, there are so many non-timber forest products going out of Ago-Owu like, snail, banana, plantain bitter yam, Ebolo, worowo, coconut and many others as we have it in figure 4.2. The study was able to established the role plays by non-timbers forest product to livelihood in markets around Ago-Owu. The study also established the extreme weather condition that was interpret as caused by climate-change and how it affects the non-timber forest product heavily. The study also reveals that men plays more roles in the sensitizing or protecting human activities that tends to reduce the NTFPs but women play a vital role in processing and transportation of the non-timber forest products.

5. 3 Recommendations

Based on the findings of this study, the following recommendations were made.

1. Government should provide a good road network for easy transportation on forest products.
2. Government should sensitize the communities around the forest to avoid over dependent on chemicals and burning.
3. The community and market people around the forest need to preserve the forest to help the reduce the heavy loss of water from the soil.
4. Women should be encouraged to participates more in non-timber forest products.

5.4 Contributions to Knowledge

From this study, there are appreciable findings which are key contribution to knowledge as follows;

1. An inventory of NTFPs physically available in the markets around Ago-Owu was compiled.
2. 84.15% of people involved with NTFPs in Ago-Owu market are between age 20 to 50 years and had at least primary school education
3. NTFPs in markets around Ago-Owu were majorly engaged for income generation and medicinal purposes
4. Climatic agents including excessive rainfall, inadequate rainfall, late rainfall, cutting down on trees that serves as shed for most of the NTFPs were identified as impacts affecting the availability and sustainability of NTFPs in the study area.
5. Specific activities carried out by men and women were identified during the cause of the research, cultivation and harvests of NTFPs were done by men while gathering were carried out by women.

5.5 Suggested Areas for Further Studies

This research was carried out on the role of non-timber forest products (NTFPS) to local livelihoods and climate adaptation.

i. Similar research could be replicated in other forests in south west Nigeria.

ii. Further research can be done to explore the encroachment of farmer into the forest, the possible consequence.

iii. Also, the involvement of women in processing, transporting and marketing of the NTFPs can be investigated.

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Appendix I

Questionnaire on Gender Differentials and Climate Change Perceptions on Non Timber Forest Products (NTFPs) Use and Tradein Ago-Owu Forest, Osun State.

A. Socioeconomic characteristics of the respondents

i. Name: ……

ii. Gender: Male [ ] Female [ ]

iii. Age: ……

iv. Marital Status: Single [ ] Married [ ] Widow(er) [ ]

v. Religion: Islam [ ] Christianity [ ] others [ ]

vi. Community Area: ……

vii. Household Size: ……

viii. Level of education: primary [ ] secondary [ ] tertiary [ ] others specify [ ]

B. Perceptions about NTFP's

i. What do you think are the common NTFP's in Ago-Owu?

ii. Do you consume or sell NTFPs? Yes or No …. If yes, which ones

iii. How do you get the NTFPs? …….

iv. Do you think NTFPs are getting scarce? Yes or No, if yes, which ones

v. What do you think is responsible for NTFP scarcity? ……..

vi. Do you plant, grow or raise any NTFPs?

vii. Are you aware of NTFPs being planted or raised by other? Yes or No, if yes, who do you know?

viii. Are you aware of any government intervention or support for NTFPs? ……..

ix. Are you aware of Laws regarding how forests can be used in Osun State? If yes, state which ones you know and about what ……..

x. What challenges do you face to source NTFPs? ……

xi. What benefits do you derived from NTFPs?.....

xii. Do you know if any human activities affect the availability of NTFPs? Yes or No

xiii. If Yes, which one do you know? …….

C. Climate change

i. What do you understand by climate change?

ii. How did you hear about climate change?

iii. Do you think climate change is occurring in Ago-Owu?

iv. Have you experienced any extreme weather conditions that you interpreted as caused by climate change?

v. What kind of changes do you think has been caused by this climate change?

vi. Do you think this climate change affect the availability of these NTFPs? If Yes,

vii. How.

D. Gender

i. More men or women do engage in NTFP activities?

ii. Are there specific activities for men or women?

iii. Who do you think makes more profit from the NTFPs male or female?

iv. Are NTFPs more accessible to women than men?

v. Who get more in the exploitation of the NTFPs.

vi. Are NTFPs majorly cultivated by men than women?

vii. Who plays more role in protecting the NTFPs or sensitizing more on human activities that reduce the NTFPs.

viii. Who plays the major role in the processing, transporting of NTFPS locally gender wise?

Appendix II

Picture of Researcher in the Ago-Owu forest

Source: Author's Field Work, 2023.

Appendix III

Picture of Researcher with Mr Elisha, a Farmer at Ago-Owu Forest

Source: Author's Field Work, 2023.

Appendix IV

Figure 4.2: The Researcher at Oba Olatunde Falabi International Market Ikire

Source: Author's Field Work, 2023.

Appendix V

Figure 4.2: The Researcher at Total Market Apomu

Source: Author's Field Work, 2023.

Appendix VI

Figure 4.2: The Researcher at Araromi Market Owu

Source: Author's Field Work, 2023.

Appendix VII

Picture of Palm Oil Sellers at the Market

Source: Author's Field Work, 2023.

Appendix VIII

Picture of Water yam at the Market

Source: Author's Field Work, 2023.

Appendix IX

Researcher Interviewing vegetable seller

Source: Author's Field Work, 2023.

Appendix X

Collection of Brooms at the Market

Source: Author's Field Work, 2023.

Appendix XI

Researcher at Basket loading point

Source: Author's Field Work, 2023.

Appendix XII

Cross section of Traders in the market

Source: Author's Field Work, 2023.

Appendix XIV

Coconut in the Market

Source: Author's Field Work, 2023.

Appendix XV

Researcher interviewing basket traders

Source: Author's Field Work, 2023.

Appendix XVI

Researcher with basket sellers

Source: Author's Field Work, 2023.

Appendix XVII

Researchers with traders

Source: Author's Field Work, 2023.

Appendix XVIII

Researcher with banana traders

Source: Author's Field Work, 2023.

Appendix XIX

Researcher with vegetable traders

Source: Author's Field Work, 2023.

Appendix XX

Researcher with Palm oil makers

Source: Author's Field Work, 2023.

Appendix XXI

Palm oil makers

Source: Author's Field Work, 2023.

Appendix XXII

Researcher interviewing a trader

Source: Author's Field Work, 2023.

Appendix XXIII

Researcher interviewing Iyaloja

Source: Author's Field Work, 2023.

Appendix XXIV

Researcher with traders

Source: Author's Field Work, 2023.

Appendix XXV

Researcher interviewing a trader

Source: Author's Field Work, 2023.

Appendix XXVI

Researcher with market and forest guide

Source: Author's Field Work, 2023.

Appendix XXVII

Researcher interviewing a trader

Source: Author's Field Work, 2023.

Appendix XXVIII

Source: Author's Field Work, 2023.

Appendix XXIX

Source: Author's Field Work, 2023.

Appendix XXX

Source: Author's Field Work, 2023.

Appendix XXXI

Researcher with Babaloja

Source: Author's Field Work, 2023.

Appendix XXXII

Source: Author's Field Work, 2023.

Appendix XXXIII

Source: Author's Field Work, 2023.

Appendix XXXIV

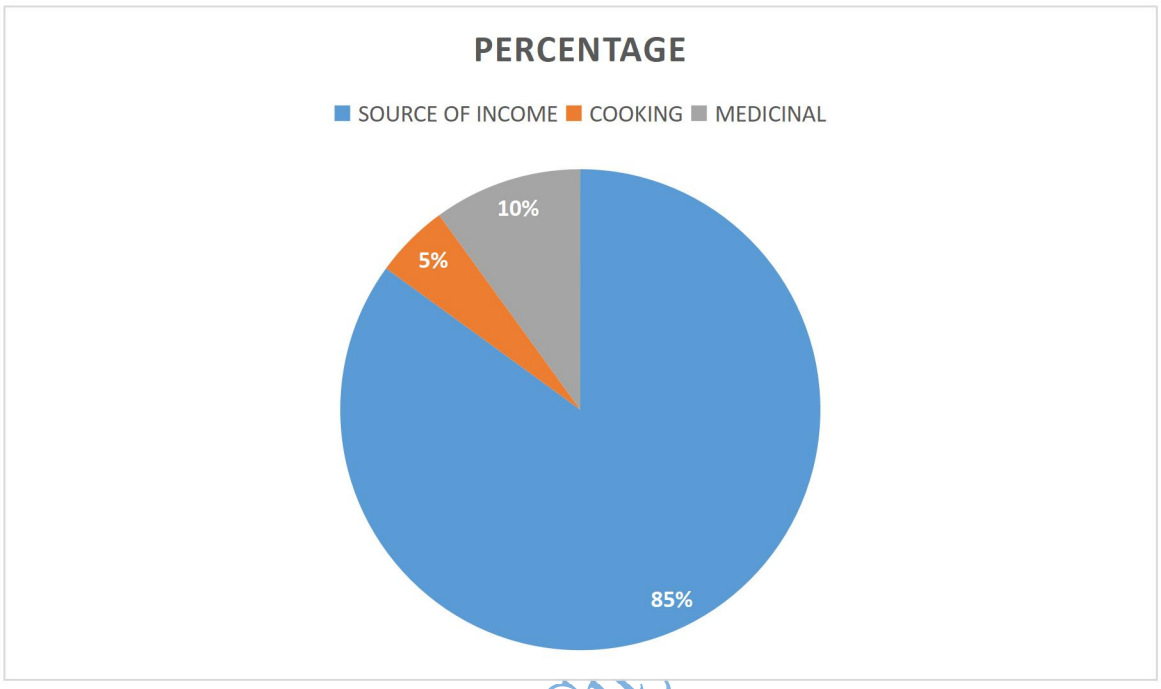


Chart showing the Role of NTFPs as Indicated by the Respondents

Source: Author's Field Work, 2023.

Appendix XXXV

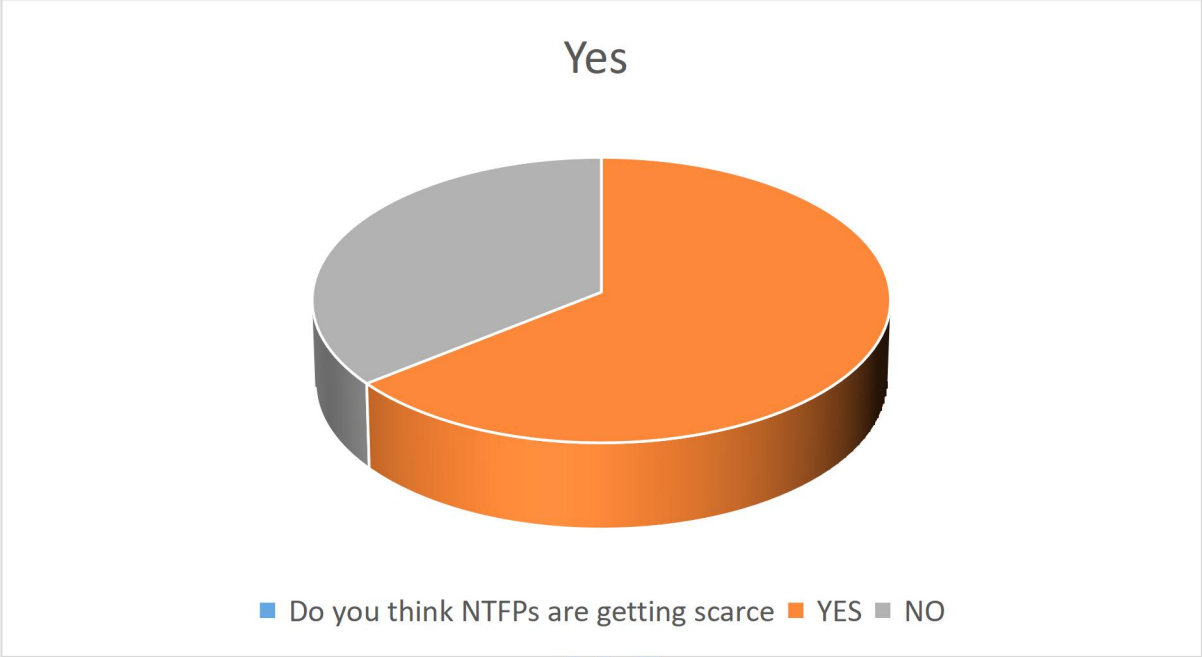


Chart Showing the Perception of Respondents Towards Scarcity of NTFPs

Source: Author's Field Work, 2023.

Appendix XXXVI

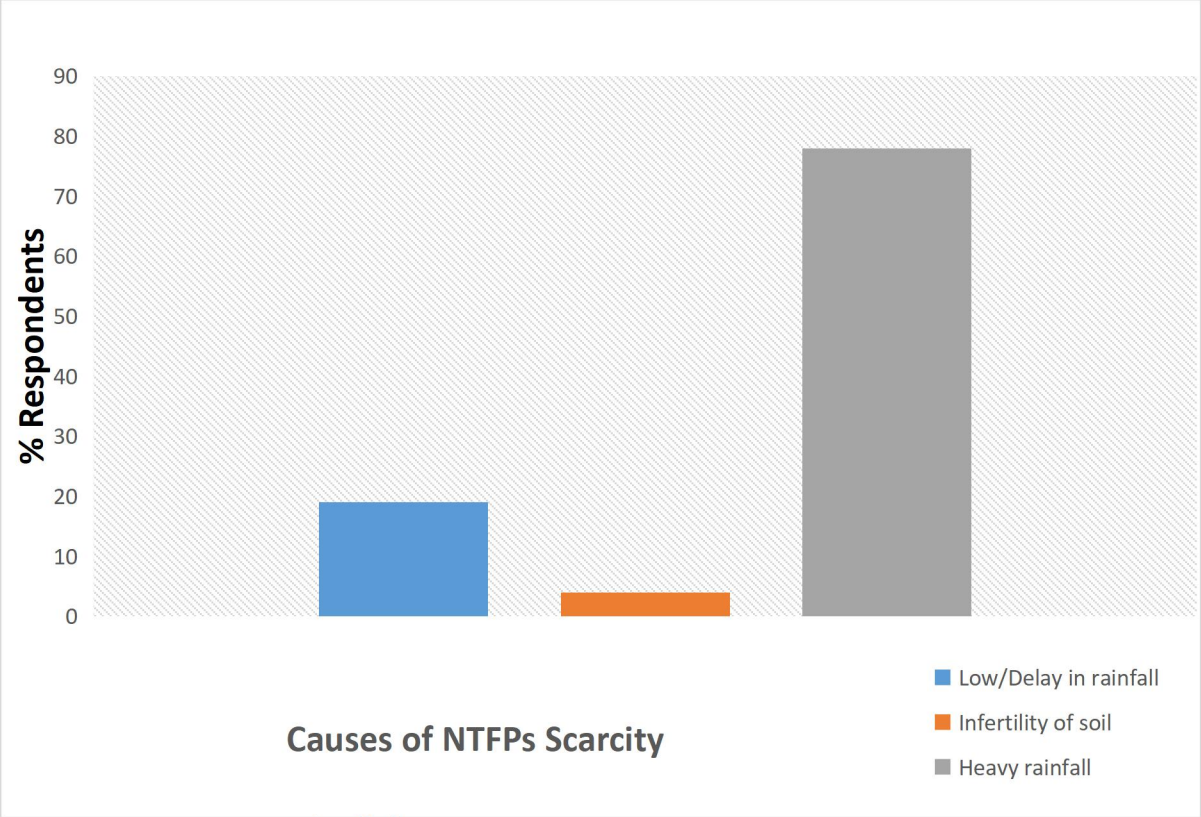


Chart showing the perception or the respondents towards the factors causing the scarcity.

Source: Author's Field Work, 2023.

Appendix XXXVII

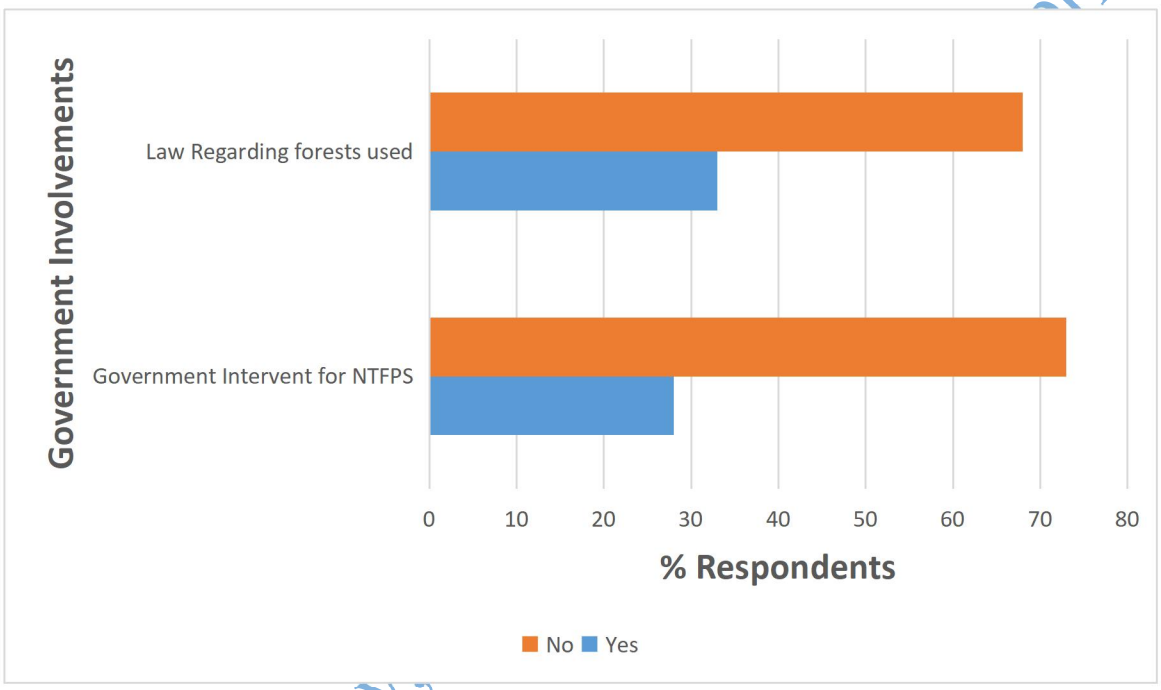
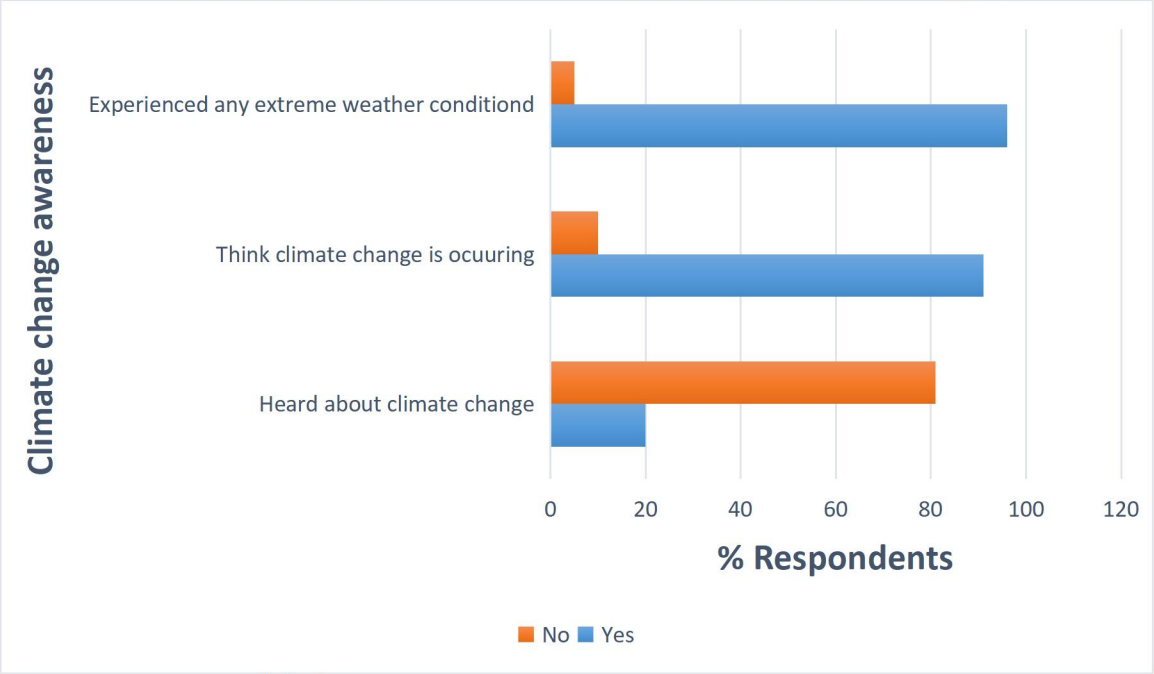


Chart showing the Awareness of Government Intervention.

Source: Author's Field Work, 2023.

Appendix XXXVIII



Graph showing the level of awareness of climate change at Ago-Owu

Source: Author's Field Work, 2023.

Appendix XXXIX

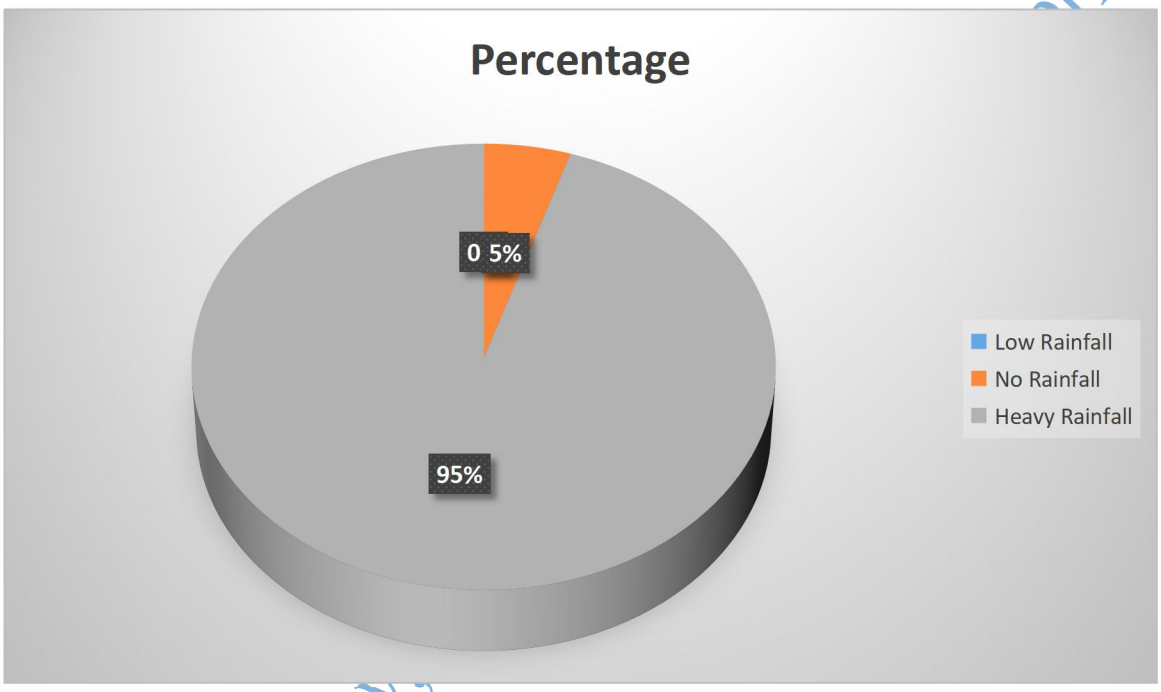


Chart Showing the evidence of climate change within the Ago-Owu forest

Source: Author's Field Work, 2023.

Appendix XL

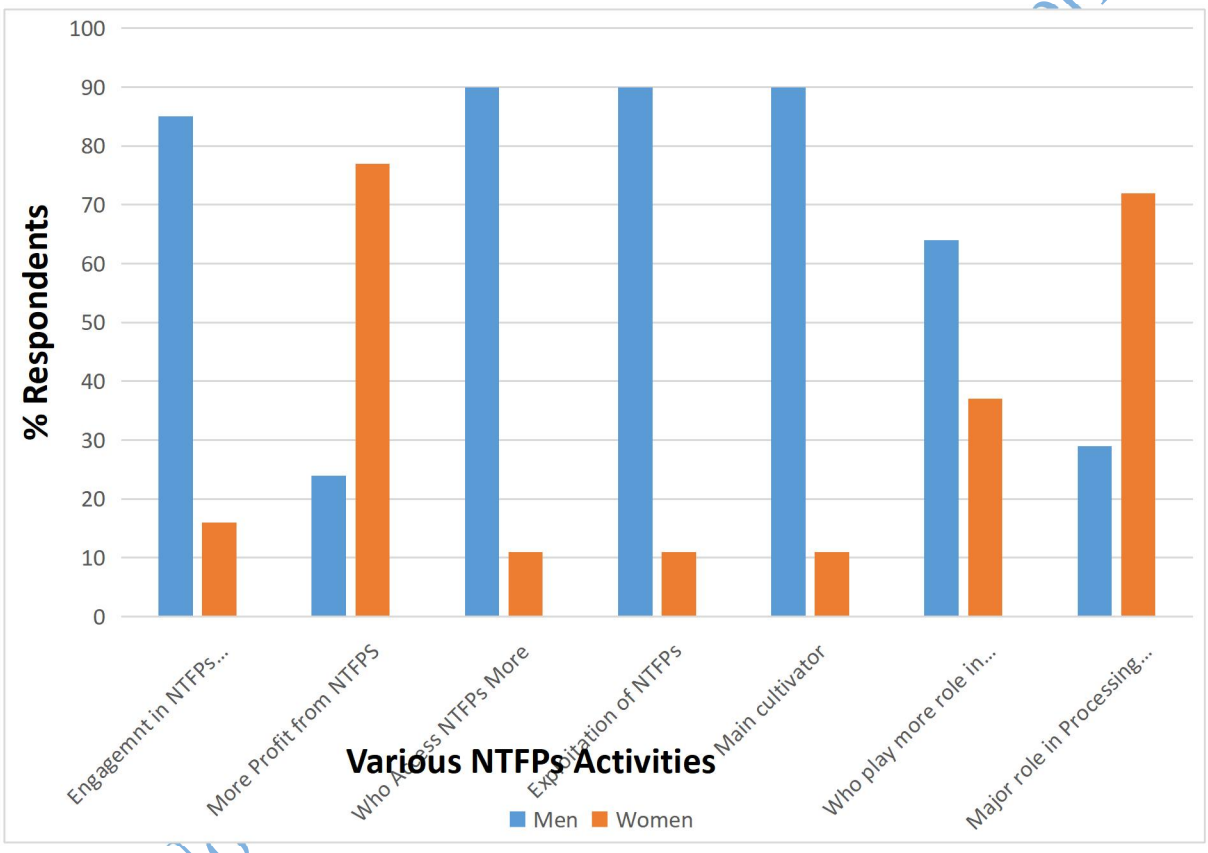


Chart Showing the graph gender differences in the trading of non-timber forest products

Source: Author's Field Work, 2023.

Bio-data

A. Personal Data:

1.	**Full Name:**	Bolatito Kehinde OGUNDELE Alara's Compound Isoko-Ejigbo, Osun State. ogundelebolatitorose@gmail.com 08165315254
2.	Date and Place of Birth:	24th March, 1993; Ejigbo
3.	Nationality:	Nigerian
4.	State of Origin	Osun State
5.	Name and Address of Next of Kin:	Miss Ojo Esther Alara's Compound Isoko-Ejigbo, OsunState.

B. Educational Background:

Educational Institution Attended with Dates and Qualification:

School Attended	**Dates**	**Qualifications**
❖ GOF Nursery and Primary School Ejigbo	2000-2005	First Leaving Sch. Cert.
❖ GOF International College Ejigbo	2005-2008	
❖ Ilushin Grammar School Ilushin	2008-2010	West African Exam. Cert.
❖ Federal Polytechnic Offa, Kwara State	2012-2016	National Diploma
❖ Lead City University, Ibadan, Oyo State	2016-2020	B.Sc.
❖ Lead City University, Ibadan	2021-2023	M.Sc. in View

C. Working Experience with Dates:

❖ National Population Commission	2021 till date

D. Awards and Fellowship: Nil

E. Membership of Professional Bodies: Nil

F. Publication

- Ekanade C.T. and Ogundele B.K., *Role of Non Timber Forest Products (NTFPs) to Local Trader Livelihoods and the Perceived Effect of Climate Change on its Availability in Ago-Owu Forest, Osun State.*

G. Major Conferences Attended with Dates:

- FASCON International Conference, 2022

H. References:

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Mr Solomon Olajide,
National Population Commission,
Osogbo,
Osun State.
08061608784

_____ _____

Signature **Date**

The University Compliance Certification

This is to certify that, this Thesis written by **Bolatito Kehinde OGUNDELE** with Matric No**. LCU/PG/002503,** in the Department of Biological Science, Faculty of Natural and Applied Sciences, Lead City University, Ibadan is in full compliance with the approved University format and style.

_____ _____

Signature **Date**