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# SUSTAINABLE FOREST MANAGEMENT PRACTICES AND BIODIVERSITY CONSERVATION IN CALABAR EDUCATION ZONE OF CROSS RIVER STATE, NIGERIA

**Adaga Mary Egbe**
**Department of Environmental Education**
**Faculty of Science Education**
**University of Calabar , Calabar**
**evalkez911@gmail.com**
**08072197450**

## ABSTRACT

The study examined the relationship between sustainable forest management practices and biodiversity Conservation in Calabar Education Zone of Cross River State, Nigeria. Two research questions were posed and Two null hypotheses were formulated and tested at .05 level of significance. Review of literature was carried out according to the sub-variables of the study. The study adopted survey research design. The population of the study comprised of 1,812,801 inhabitants, comprising 897,312 males and 915,489 females base on 2023 population projection, among residents of the seven local government areas of zone the sample of the study comprised 606 respondents drawn from the calabar education zone of cross river state.. The instrument for data collection was 25 items structured questionnaire develop by the research and supervisor. The instrument was titled: Sustainable Management Practices and Biodiversity Conservation Questionnaire (SMPBCQ) questionnaire was used to collect data. Face and content validity of the instrument was done by the supervisor and three experts in measurement and evaluation department. Cronbach Alpha coefficient was used to determine the reliability of the instrument. From the administered questionnaire, data was organized and analyzed using Pearson Product Moment Correlation. The finding of the study revealed that the selective exploitation and Taungya system c contribute to sustainability of forest resource management in Calabar Education Zone. Based on the findings, the researcher recommended among others things that, government and forestry officials should enforce selective exploitation practices to enhance biodiversity conservation in Calabar Education Zone of Cross River State, Nigeria.

**Keywords**: Sustainable forest, Management Practice and Biodiversity Conservation.

## INTRODUCTION

Biodiversity constitutes an important natural resource required for the survival of mankind and other species within the forest ecosystem. This makes it imperative for individuals to develop positive attitude towards its conservation within the ecosphere. The reason is to ensure that man and other living organisms continue to benefit from the numerous services provided by it. These services include among others, sequestration of carbon, regulation of temperature, provision of watershed, prevention of soil erosion, habitat for various plant and animal species, medicinal herbs and shrubs, as well as food. Otukwa (2017) reported that the forest is an essential natural resource of the environment, which comprises both timber and non- timber forest products with each playing highly indispensable roles within the ecosystem. Hence, the need to constantly utilizes these resources in a manner that would ensure their availability at all times.

The protection of biodiversity in Nigeria has long been part of the traditions and practices of Nigerian culture. Many communities protect their forests against hunting in certain designated areas of the forest such sacred groves for the worship of their traditional deities or as places where they collected medicinal resources (herbs, tree barks, animal parts, etc.). Such forests were effectively preserved through taboos is has cultural or spiritual significance such as sacred sites, ancestral land ete. Biodiversity, in the context of plants and animals, refers to the variety and variability of living organisms within a particular ecosystem or across the planet. It encompasses the different species of plants, from trees and shrubs to grasses and herbs, as well as the animal species, including mammals, birds, insects, reptiles, and aquatic life. This diversity is essential for maintaining ecological balance, as each species plays a specific role in nutrient cycling, recycling, pollination, seed dispersal, and predator-prey relationships. Higher availability of biodiversity enhances ecosphere resilience, allowing forests to withstand disturbances like diseases, climate change, fire outbreak, or human

activities. Conserving both plant and animal species ensures the sustainability of forest ecosystems and the continued provision of resources and their services that humans and other life forms depend on. With expanding population pressure and modern development of infrastructure, these traditional measures were rendered inadequate to ensure effective protection and preservation of resources and culture in Nigeria (Fred, 2018).

The current trends in human demand for arable land for agricultural production and other forms of development have resulted in widespread deforestation and loss of vegetation cover. The increasing pressure on biodiversity has led to the endangerment and extinction of various species of plants and animals. The need to conserve forest resources has a long history with the adoption of various approaches including sensitization of citizens on the value of such resources with the aim of reducing human dependence on the scarce resources of the environment. The major occupation of residents of the study area is farming. The people engage in agricultural practices that continuously cause damage to the forest and its resources. The rural dwellers of Cross River State depend on the forest for timber, and other Non-Timber Forest Products (NTFPs). The wanton quest for forest resources is without reservation, and with no deliberate attempt to conserve the resources available in the community forest.

Human attitude towards biodiversity can either be positive or negative depending on the surrounding circumstances or motive of the individual. Odogwu (2014) stated that before the advent of colonial rule in Nigeria, people were more committed to the conservation of nature. The people revered nature and ascribed supernatural power to nature by declaring certain places as sacred, shrines, and evil forests. This perception made people see nature as being sacred to their sustenance and live in mutual relationship with other creatures, by caring for nature and also being cared for by nature. However, all these changed during the period of colonial rule. During this period, man began to see nature, particularly the forest, as a commodity that should be traded. The forest was no longer held in awe but was exchanged for

money and other material gifts. This attitude encouraged undue exploitation of forest resources leading to the endangerment and extinction of several species of plant and animal (Olorunfemi, 2019).

Within the last three decades, the role of the forest in regulating global temperature has been greatly appreciated by various stakeholders due to rising temperatures associated with climate change. The forest has long been identified as having potential to maintain a balance in the amount of oxygen and carbon present in the atmosphere. This potential is needful in addressing issues of climate change arising from resource mismanagement. Segun (2013) opines that the increasing adverse consequences resulting from climate change and global warming have been responsible for persistent emphasis on the conservation of the forest by rural inhabitants in recent decades. The destruction of forest vegetation cover has contributed significantly to increased evaporation and loss of fresh water sources. It has also increased the amount of carbon in the atmosphere, which has a direct influence on change in climatic conditions of an area.

Conservation of biodiversity aims to maintain and enhance the economic, social and environmental values of all types of forests, for the benefit of present and future generations. Sustainable forest management aims to preserve the world's forest by maintaining and enhancing the economic, social and environmental value of all types of forests, for the present and future (Ickowitz et al., 2019). The forest is indiscriminately coveted for both lucre and livelihood with no commensurate effort to replenish the products being indiscriminately extracted. While the rural dweller covets the forest for food, housing and commerce, the urban dweller covets the forest principally for commerce and housing.

Sustainable forest management in the Calabar Education Zone of Cross River State, Nigeria is supported by recent empirical research. For example, Etan, Akpono and Ayua (2025) reported that forest regulation strategies combined with community-participatory management

significantly contribute to the sustainable use of forest resources in the zone. Their findings suggest that involving local communities in decision-making and enforcement encourages responsible use and reduces overexploitation. The authors also recommend active reforestation and afforestation efforts to restore and maintain forest cover. When regulation, community engagement and restoration are applied together, the forest ecosystems in Calabar Education Zone have a better chance of remaining healthy and continuing to support diverse plant and animal life for future generations

Selective exploitation is the cutting of matured trees leaving the young ones to continue growing to avoid destructive effects of both wind and water erosion. Selective exploitation occurs when forest managers allow the use of trees, plants, and other natural resources more intensively than the environment can sustain. Selective exploitation means specifically targeting and cutting down trees of certain ages and girths. In other words, it involves selecting and harvesting trees based on their specific characteristics. Selective exploitation involves targeting trees of specific ages and girths. By doing so, it allows for the sustainable management of forests and ensures that trees are harvested in a controlled and responsible manner.

The Taungya System is a form of agroforestry system in which short-term crops are grown in the early years of the plantation of a woody perennial species to utilize the land, control weeds, reduce establishment costs, generate early income, and stimulate the development of the woody perennial species. Taungya is a system of forest management in which land is cleared and. planted initially with food crops. Seedlings of a desirable timber species are then planted on the same plot of land, either in combination with the food crops, or following several years of cultivation.

Based on this background the researcher was poised to study the relationship between sustainable management activities (independent variable) and Conservation of biodiversity in

Calabar Education Zone Cross River State (dependent variable). Some forest resource management activities considered in this study include selective exploitation and taungya system.

**Methodology.**

**The designed employed on this research study is a survey research design.**

**This is because the research study purpose is concerned with the investigation phenomena, situation, events and opinions that occur within a given population. The study design was also adopted in order to investigate the relationship between selective exploitation and taungya system within the study area.** The population of the study comprised of 1,812,801 inhabitants, comprising 897,312 males and 915,489 females base on 2023 population projection, among residents of the seven local government areas of the zone. The sample of the study comprised of 606 respondents drawn from the calabar education zone of Crosss River State, and using a multi-stage sampling procedure and proportional allocation across the study area.

Two research questions were raised to guide the study..

1. How does Selective exploitation relate to biodiversity conservation in Calabar Education Zone of Cross River State?
2. To what extent does taungya system relate to biodiversity conservation in Calabar Education Zone of Cross River State?

Two statement of hypotheses were formulated to guide the study.

1. Selective exploitation is not significantly related to biodiversity conservation in Calabar Education Zone of Cross River State

2. There is no significant relationship between taungya system and biodiversity conservation in Calabar Education Zone of Cross River State

Structured questionnaire were used as instrument for data collection in the study area. The instrument for data collection was 25 items structured questionnaire develop by the research and supervisor. The instrument was titled: Sustainable Management Practices and Biodiversity Conservation Questionnaire (SMPBCQ) questionnaire was used to collect data. Face and content validity of the instrument was done by the supervisor and three experts in measurement and evaluation department. The researcher advise the respondents and informed them of the exercise and the essence of giving objective responses to the items.the respondent were advise to be honest in their reponses to the item as information obtained will be treated with and amount of confidentially in analyzing the data.

Hypotheses was tested by the statistical tool employed.

Data was organized and analyzed using Pearson Product Moment Correlation.

Results

TABLE 1

Pearson Product Moment Correlation (PPMC) of relationship between selective exploitation and biodiversity conservation in Calabar Education Zone of Cross River State (N=606)

| Variables | $\bar{x}$ | SD | r-ratio | df | p-level |
|---|---|---|---|---|---|
| Selective exploitation (X) | 11.92 | 1.52 | | | |
| | | | .104* | 604 | .002 |
| Biodiversity conservation (Y) | 26.46 | 2.10 | | | |

*Significant at .05 level; p<.05.

The finding Table 1 indicated that selective exploitation had a mean score of 11.92 with a standard deviation of 1.52 while biodiversity conservation had a mean score of 26.46 with standard deviation of 2.10. The outcome further showed that the r-calculated value of 0.104 is significant at .05 level of significance and 604 degrees of freedom. Also, the p<.002 is less than p<.05. Based on this, the null hypothesis which expressed that Selective exploitation is not significantly related to biodiversity conservation in Calabar Education Zone of Cross River State was rejected indicating that Selective exploitation is significantly related to biodiversity conservation in Calabar Education Zone of Cross River State.

The findings of this study are in consonance with International Union for Conservation of Nature (IUCN), that stated that overexploitation is one of the main drivers of species extinction globally (IUCN, 2020). According to them, sustainable management practices, such as selective logging with reforestation, can help minimize the impacts of exploitation on

biodiversity. However, even sustainable practices can have unintended consequences if not carefully managed. Biodiversity conservation requires a balanced approach that considers the needs of both humans and the environment. Effective conservation strategies must take into account the complex relationships between species and ecosystems to mitigate the impacts of selective exploitation. However, many of the rural forest dependents are still poor and exposed to food insecurity. Even with economic and agricultural advancement, many rural households in developing countries still depend on forests to support their livelihoods and for food security (Ali & Rahut, 2018).

TABLE 2

Pearson Product Moment Correlation (PPMC) of relationship between taungya farming and biodiversity conservation in Calabar Education Zone of Cross River State (N=606)

| Variables | $\bar{x}$ | SD | r-ratio | df | p-level |
|---|---|---|---|---|---|
| Taungya farming (X) | 12.75 | 1.78 | | | |
| | | | .111* | 604 | .001 |
| Biodiversity conservation (Y) | 26.46 | 2.10 | | | |

*Significant at .05 level.

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. The finding in Table 2 indicated that Taungya farming had a mean score of 12.75 with a standard deviation of 1.178 while biodiversity conservation had a mean score of 26.460 with standard deviation of 2.10. The outcome further showed that the r-calculated value of 0.111 is significant at .05 level of significance and 604 degrees of freedom. Also, the p<.001 is less than p<.05. Based on this, the null hypothesis which expressed that there is no significant relationship between taungya system and biodiversity conservation in Calabar Education Zone of Cross River State was rejected indicating that there is significant relationship between taungya system and biodiversity conservation in Calabar Education Zone of Cross River State.

The finding inTable 2 indicated that selective exploitation had a mean score of 12.75 with a standard deviation of 1.178 while biodiversity conservation had a mean score of 26.460 with standard deviation of 2.10. The outcome further showed that the r-calculated value of 0.111 is significant at .05 level of significance and 604 degrees of freedom. Also, the p<.001 is less than

p<.05. Based on this, the null hypothesis which expressed that there is no significant relationship between taungya system and biodiversity conservation in Calabar Education Zone of Cross River State was rejected indicating that there is significant relationship between taungya system and biodiversity conservation in Calabar Education Zone of Cross River State.

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The result of data analysis from hypothesis two analysis that the null hypothesis was rejected. This implies that taungya farming is significantly related to biodiversity conservation in Calabar Education Zone of Cross River State. The finding aligns with Ajayi et al. (2011), who reported that agroforestry practices such as the Taungya system enhance biodiversity conservation by integrating trees with agricultural crops. The system also supports rural livelihoods by providing multiple income sources and strengthening community resilience. Overall, effective implementation of the Taungya system contributes to improved ecosystem services, sustainable forest use, and enhanced rural development outcomes. By adopting the Taungya system, farmers and landowners can play a crucial role in protecting biodiversity and promoting sustainable land use.

Conclusion.

**Conclusion**

This study concludes that sustainable forest management practices, including selective exploitation and taungya system, are significantly related to biodiversity conservation in Calabar Education Zone of Cross River State. The findings suggest that these practices can contribute to effective biodiversity conservation in the region. The study's results underscore the importance of adopting sustainable forest management practices to promote biodiversity conservation and ecosystem sustainability. Overall, the study provides valuable insights for policymakers, conservationists, and local communities seeking to protect and preserve biodiversity in the region.

**5.4 Recommendations**

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

1 The government and forestry officials should enforce selective exploitation practices to enhance biodiversity conservation in Calabar Education Zone of Cross River State.

2 Forestry agencies and NGOs should promote and support the adoption of the taungya system to conserve biodiversity in the region.

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