

Joint Prediction of Forest Resources Consumption and Biodiversity Conservation Among Rural Dwellers in Cross River State, Nigeria

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ABSTRACT

This study investigated the joint prediction of patterns of forest resources consumption on biodiversity conservation among rural dwellers in Cross River State, Nigeria. To achieve the purpose of the study, a research question was raised and a hypothesis was 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 the descriptive survey research design. The population for the study was 73,755 registered farmers in Cross River State. A sample of 409 registered farmers was used for the study. The instrument was titled 'Pattern of Forest Resource Consumption and Biodiversity Conservation among Rural Dwellers Questionnaire (PFRABCARDQ)'. The testing of hypotheses in the study was done with multiple regressions statistical tool. The result obtained from the data analysis revealed that joint exploitation of logging activities, harvesting of non-timber forest product, hunting practices, land tenure system and method of land cultivation were significant predictors of biodiversity among rural dwellers in Cross River State. It is therefore recommended amongst others that conservation agencies should collaborate with traditional institutions to ensure that forests are properly maintained in the communities, this would help to reduce unsustainable exploitation of forest resources, have strong enforcement mechanism in place to ensure that laws and regulations related to biodiversity conservation are being followed. This can include fines and penalties for illegal activities as well as incentives for those who comply with regulations.

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INTRODUCTION

Biodiversity is the variability among living organisms from all sources including terrestrial, aquatic and ecological complexes of which they are part of. This includes the diversity within and between species of an ecosystem. It is the wealth of life forms found on earth that describe nature's variety including both the number of frequency of plants and animal species as well as micro-organism and diversify living things (Akanimore, 2020). Biodiversity provides valuable bio-resources that support the existence of man on earth. In addition, biodiversity also provides unquantifiable services to human. The services include nutrients and water cycling, soil formation and retention, resistance against invasive species, pollination of plant and regulation of climate as well as pest and pollination control. Human activities over the years have continued to

put pressure on existing ecosystem, which have led to endangerment and extinction of various species of plants and animals. The alteration in the activities and functions of ecosystem has necessitated various stakeholders in environment to clamour for an urgent redress of certain conducts that impinge on the quality and sustainability of various ecosystems due to climate change (Anakwe, 2021).

The current trends in human demand for arable land for agriculture production and other forms of development has resulted in widespread deforestation and loss of biodiversity. The increasing pressure on the forest resources has led to the endangerment and extinction of various species of plants and animals. The need to conserve the forest and its resources has a long history with the adoption of various approaches including sensitization of citizens on the values of such resources with the aim of reducing human dependence on the scarce resources of the forest (Otukwa, 2018). The forest is an essential natural resource of the environment which comprises both timber and non-timber forest products with each playing a highly indispensable roles within the ecosystem, hence, the need to constantly utilize these resources in a manner that would ensure their availability at all times.

The ecological, social, cultural and economic implication of deforestation and the need to prevent the consequences associated with rapid deforestation in Cross River State informed government's decision to establish the Cross River Forestry Commission. (Agbor,2014) noted that the Forestry Commission is responsible for the day-to-day management and conservation of the forest in order to maximize the benefit accruable from the forest and its resources. The commission is responsible for sensitizing forest communities on the best management practices; regulate the utilization of these resources in ways that would not fasten their rate of endangerment and extinction. The commission also formulate guidelines for planning, conserving and harvesting both timbers and non-timber forest resources in order to achieve sustainable forest management. The efforts of the forestry commission have been commendable since is inception in the year 2000.

Forest conservation help conserve ecosystems that provide habitats, shelter, food, raw materials, genetic materials, a barrier against disaster, a stable source of resources and many other ecosystem goods and services and thus can have an important role in helping species, people and countries adapt to climate change. By virtue of their protective status, these forests should remain free from destructive human interventions. They can thus continue to serve as a natural storehouse of goods and services into the future. Forest areas may provide ecosystem services such as drinking water, carbon storage and fossil stabilization, harbour, sacred sites for different faith groups and hold important gene reservoirs of value in medicine, agriculture and forestry, In the

face of climate change, these roles all become more critical to enhance the adaptive capacity of local people to cope with climate change (Simms, 2015). An understanding of integral role of forest in the earth life support system could be better understood from the ecological and socio-economic services which they provide to both the environment and mankind (Shibu, Alarape & Bichi, 2018).

Notwithstanding the importance of forest resources, major challenges facing the forest resources include decline of forest biodiversity population, structural change due to forest removal and conversion of forest land to other uses, forest fragmentation, forest practices, climate change, disease conditions, pests, atmospheric pollutions and so on (Bisong, 2023).

Logging activities involves cutting down of trees, indiscriminate logging activities by rural dwellers have drastically depleted the biodiversity of the area. These logging activities are gradually eradicating the rainforest. Both urban and rural dwellers depend largely on forest either directly or indirectly. Logging activities could lead to complete loss of biodiversity which affects climate, undermine future economic development and threaten social and political stability of any State or country (Azeez & Aluko, 2019). Biodiversity has a lot of watershed, carbon sequestration, research and pharmaceutical, maintenance of water quality, maintenance of climate stability, flood control, provision of food, shelter, and construction of bridges, among others. The most disturbing aspect of impact of logging activities is the results in loss of species (Yaccoz, Nichols & Bouliner, 2017). It is quite clear that logging results in loss of biodiversity.

Logging has significantly reduced animal habitat, shrinking the animal populations that serve as a traditional source of protein in the study area. The plundering of trees which provides shelter, watershed, wind breakers or sufficient trees to check the devastating rainstorms are no more as a results of logging activities. Consequently, this has resulted in soil exposure and erosion, thereby placing a heavy burden on the environment and on the resource base. Harvesting of non-timber forest products (NTFPs) has severely influenced biodiversity conservation negatively. Non-timber forest products are harvested for commercial purposes and include thousands of wild or semi-wild species or parts of species used for medicines, food, decorations, fragrance containers, dyes, fuel, shelter, art, ceremonial purpose and more. Despite the known and substantial economic value of non-forest timber in aggregate, historically, managers have not included them as important factors in forest management. Not only do non-timber forest products comprise a significant part of the biological diversity of forest ecosystems but given the lack of formal NTFPs research, many people who harvest NTFPs part or full time have the most knowledge about NTFPs as a result of various forest management activities such as timber removal, grazing prescribed burning and non-forest products harvesting practices become an integral part of forest management. Non-timber

forest could be defined by six broad categories: (i) Food such as wild edible mushrooms, fruits and nuts (ii) Medicinal plants and fungi (iii) Floral greenery and horticulture stocks (iv) Fibre and dye plants, lichens and fungi (v) Oil, resins and other extracts from plants, lichens and fungi and (vi) Fuel wood and small diameters wood used for poles, post and carvings. Non-timbers forest products have been recognized internationally as an important element in sustainable biodiversity (Swanson, 2018).

The non-timber forest products which is the subset of biodiversity, plays a vital economic role in the lives of over communities living in and around the forest not to mention the vast majority of people who depend on the forest products. It represents an important underestimate part of rural economy. Forest is a vital source of food, medicine, raw material and income which rural communities have made use of unsustainably. The trees within the various forests provide the timber which houses are built and furniture constructed; trees produce, short fibre pulp for paper. They also produce a variety of useful resins and oil. Trees are useful in contributing to soil conservation, climate amelioration and provision of fodder for livestock. (Katja, Rudiger, Ernst & Karen, 2011).

Hunting practices has really resulted to biodiversity loss. The widespread of activities of hunting has come under increasing scrutiny based on ethical concerns and the arguments that it can threaten species and fail to contribute meaningfully to local livelihood. Hunting activities are eroding biodiversity and land use changes are historically the most influential drivers of biodiversity loss (Salawu, 2018). Strict protection or legislated restrictions on hunting activities can be appropriate actions in response to unsustainable rate of hunting activities that affects biodiversity negatively (Choa, 2016). Hunting activities can be divided into three broad categories: (i) Subsistence hunting (food for own consumption), (ii) Commercial hunting (sales of animal products to a consumer community in local, national or international markets) and (iii) Recreational hunting (recreational hunting can be broadly defined as the pursuit and killing of animal primarily for leisure and enjoyment purpose).

The rapid rate of global natural resources utilization for safe guarding human needs has promoted natural resources decline and deterioration various policies, programs and projects have been embarked upon as deliberate strategies to offset natural resources depletion through platforms of natural resource protection such as the protected area systems, protected areas within any geographically area. Mainstream ecological conservation objectives ranging from biodiversity protection, habitat provision to enhancing natural and associated cultural resources appreciation for varied purpose and benefits. Protected areas are designed to exist in different forms based on the priorities for conservation needs within landscapes (Andrew-Essien, 2017).

Land tenure system has to do with securing land rights from indigenous people and rural communities can activate critical change agents in the fights against biodiversity loss around the world, indigenous and rural communities are among those least responsible for biodiversity loss, yet they are often the first to suffer from its impacts, communities in rural areas are severely impacted by sudden and slow onset effects of biodiversity loss such as land and soil degradation and more frequently and intense floods effective solutions to confronting climate injustice, (Janis, 2016). Indigenous people live on lands governed by customary tenure and other community agreement. Securing access to these natural resources and formalizing of biodiversity. The rich or poor, city dwellers or rural farmers are affected by agriculture and by the rising global demand for animal and food crops. Against this background of potential water shortages, pollution and environmental damages, rising from fuel cost and the need to feed human population, more land has been claimed for agriculture, (Marian & Roland, 2010).

Poor biodiversity conservation has become a major concern in the study area. The high rate of biodiversity depletion without replacement by the rural populace has led to extinction of plants and animal species in Cross River State rain forest. This is because the rural dwellers perceived the forest as a source upon their livelihood depends on. Hence, the disruption of biodiversity is unavoidable. The status and trends of wildlife will not be adequate or considered without giving consideration to their habitats. This informed the basis for investigating pattern of forest resources consumption among rural dwellers and biodiversity conservation in Cross Rivers State, Nigeria.

1.2 Statement of the problem

Humans are constantly in a variety of activities like deforestation, logging and hunting activities that degrade the quality and well-being of the forest ecosystem. The need to develop positive attitude towards the exploitation of forest resources has become very necessary because of the continuous depletion of forest resources through various human activities aimed at providing for the needs of man. Despite the efforts of government and non-governmental organization in promoting rational and sustainable exploitation of forest resources, the manner in which some rural dwellers still exploit forest resources has become a source of concern to various stakeholders in the forest sector, some of the intervention efforts introduced has been awareness creation on the value of forest resources as well as provision of alternative sources of livelihood. These efforts have yielded little or no positive results as most rural dwellers still see the forest as a gift from nature, which should be exploited without any conscious effort to

conserve it. This has led to the loss of biodiversity and extinction of several species of plants and animals.

In some cases, rural dwellers forest guards tend to avoid taking responsibility for sustainable management of their forest resources and often blame the government for not assuming full responsibility for the conservation of forests. This also blame game has led people to develop carefree and unconcerned attitude towards the exploitation of forest resources in the study area. This accounts for the reason why most rural dwellers are not interested in the consequences of their actions resulting from Wanton and uncontrolled exploitation of the resources of the forest. This can be seen in the high rate of illegal logging, uncontrolled hunting, slash and burn agriculture, unhealthy competition for non-timber forest products among others. This situation encourages the destruction of the forest resources with subsequent endangerment and extinction of species of high environmental and economic value. This emphasizes the need to consciously promote the conservation of biodiversity, among the rural dwellers in the study area. This informed the researcher's resolve to carry out research on pattern of forest resources consumption and biodiversity conservation among rural dwellers in Cross River State, Nigeria.

1.3 Purpose of the study

The main purpose of the study is to examine the joint influence of the pattern of forest exploitation on biodiversity conservation among rural dwellers in Ikom Education Zone, Cross River State, Nigeria. Specifically, the study seeks to:

1. Examine the joint contribution of logging activities, harvesting of non-timber forest products (NTFPs), hunting activities, land tenure, methods of land cultivation on biodiversity conservation among rural dwellers.

1.4 Research questions

The following research question was posed to guide the study:

1. How does the joint contribution of logging activities, harvesting of non-timber forest product (NTFPs), hunting activities, land tenure system and methods of land cultivation predict biodiversity conservation among rural dwellers?

1.5 Statement of hypotheses

The following hypothesis was formulated for the study:

1. There is no joint significantly prediction of logging activities, harvesting of non-timber forest products (NTFPs), hunting practices, land tenure, method of land cultivation on biodiversity conservation among rural dwellers.

LITERATURE REVIEW

A study carried out by Aluko, Adejumo and Babadoye (2019) on attitude of rural dwellers towards biodiversity conservation in Onigamabri forest of Ondo State, Nigeria. The purpose of the study was to examine the attitude and pattern of rural dwellers to biodiversity conservation in Onigambari forest reserve. A multi-stage sampling technique was used to select 120 respondents from the study area. Data were collected with the aid of interviews scheduled and analyzed with descriptive and inferential analysis. One of the study posers was logging activities among rural dwellers in testing this hypothesis. Pearson Product moment Correlation statistics was applied and the result revealed that there is a significant relationship between logging activities among rural dwellers and biodiversity conservation in the study area. The study is relevant to this present study, based on its inquiry into logging activities of rural dwellers and biodiversity conservation.

In a research carried out by Mohammed (2014) on determination of attitudes and perception on resource use and management of Marsabit National Reserve, Kenya. The establishment of protected areas had negative consequences on local communities. The shift in conservation resulted in restriction of access to resources, disruption of local culture and economies by tourists, increased predation on crops and livestock and displacement of inhabitants. A survey was undertaken to determine relationship between respondent's socio-economic characteristics and their attitudes and perceptions towards protected areas conservations; determine the effects of wildlife benefits and their associated cost on attitude and perception. One hundred and eighty seven households were selected through stratified random sampling and surveyed using questionnaire composed of both open and closed ended questions. Information acquired was triangulated through informed interviews, field observations and focused group discussions. Cross-tabulation using Pearson Chi-square test controlled for selected variables were used to determine differences between independent variables and attitudes. The sex and conservation awareness do not affect respondent attitudes while age, level of education, economic activities, wildlife resources. In addition, age significantly affected the perceptions of the benefit accrued from the reserve while wildlife damage significantly related to economic activities. The above reviewed studies finding found relevance for this reviewed on the basis of its evaluation protected areas.

A research conducted by Solutu, Akanbi and Tyowua (2017) on the impact of human wildlife conflict on socio-economy of support zone communities in Cross River National Park, Nigeria, one of 25 United Nations biodiversity hotspots in the world, to bring to focus the implications of human wildlife conflict on the socio-economy of support zone countries. The finding shows that biodiversity conservation of Cross River State National Park (CRNP) is threatened by human population growth. It poses a threat of overexploitation of wildlife resources on the park as the communities depend majorly on the land and the park's resources for survival.

They noted the problem of human wildlife conflicts is that of resources utilization. The aforementioned reviewed studies are found relevance to the present study in that among other things, it sought to highlight the needs for hunting activities as a factor against biodiversity conservation in the study area.

According to a study carried out by Eneji, Ogundu and Ojelade (2019) titled “an indigenous cultural practices and conservation of natural resources in Nigeria”. The research was hinged on a survey research method. All locals dwelling in proximity of forests in Imo State formed the population while sample random technique was used to select 240 participants. Data was obtained using questionnaire and the study's hypotheses were that each of totemism, traditionally protected areas, evil forests and sacred grooves and sacred ponds and shrines do not contribute significantly to the conservation of wildlife resource. The data was analysed with Pearson Product Moment Correlation and the result showed that all of totemism, traditionally protected areas and sacred ponds/shrines did not contribute significantly to conservation of wildlife resources. Therefore, based on the result, all the study's three alternative hypotheses were accepted while their null hypotheses were rejected.

METHODOLOGY

The researcher employed survey design in this work. It is a design which is utilized when research work is focused in obtaining and analyzing data from a few subjects considered as a representative of a entire population in line with an investigated phenomenon, with the expectation of generalizing such finding on the entire population (Salaria, 2012). The approach was used based on the focus of the study which is to obtain and analyze data from a given population's representative with an intention of generalizing the findings on the study's population. Specifically, the approach was adopted with data from a sample of rural dwellers with the aim of generalizing the findings on the entire population of rural dwellers in the study area.

The area of this research is Cross River State. It is one of the thirty six (36) States of the Federal Republic of Nigeria, created on May 27, 1987 with Calabar Metropolis as the capital city. Cross River State is situated in the South-South geopolitical zones of Nigeria and has eighteen (18) local government areas (LGAs). The State lies between latitude 4° 28'N and 6°55'N of the equator and longitude 7° 50'E and 9° 28'E of the Greenwich Meridian (Ndiyo, Okon & Olamide, 2013) with a land mass of 2,307,074 km². According to National Population Commission (NPC), the State projected population for 2024 is 4,084,547 with a population density of 177inh/km (NPC, 2024). Cross River State is a unique State in Nigeria with abundant tourism sites such as Agbokim

waterfall, The Seven stream waterfall, The Canopy waterway, National Wildlife Park, Ikom Monoliths and The Mary Slessor's residence constructed in 1887 among others.

The population of this study consist of all farmers in Cross River State, Nigeria that are registered under the Agricultural Development Programmes across various local government areas. Records from the Agricultural Department Programme offices 2025 across the State showed that there are seventy three thousand, seven hundred and fifty five (73,755) registered farmers in the study area. The State is consist of eighteen (18) Local Government Area, which includes, Abi, Akamkpa, Akpabuyo, Bakassi, Bekwarra, Biase, Boki, Calabar Municipality, Calabar South, Etung, Ikom, Obaniku, Obubra, Odukpani, Obudu, Ogoja, Yala and Yakurr Local Governemt Area. The numbers of communities captured are six hundred and twenty seven (627).

Multi stage sampling procedure were adopted to select the LGAs, communities and respondents therein for the study. First of all, stratified sampling technique was applied to stratify the State in line with the 3 educational zones. Next, applying simple random sampling technique, the names of all the LGAs in each educational zone were written on a small piece of paper and folded into a paper ball. All the LGAs in the State had a zero chance for being selected because they all have patches of forest within them. Using a bowel each for the educational zones, the paper balls were mixed up and the researcher with a blindfold picked four (4) LGAs from Calabar Educational Zone and three (3) LGAs each from Ikom and Ogoja Educational Zones, thus totalling ten (10) LGAs across the State. Thirdly, purposive sampling technique was used to select four (4) accessible forested communities within each LGA before applying proportionate sampling technique to select 5% of the registered farmers within the communities. Lastly, using the list of registered farmers in the selected communities, systematic random sampling technique was adopted to pick every twentieth (20th) name as a respondent for the study. The sample for the study consists of four hundred and ninety nine (499) registered farmers with the Agricultural Development Programme in Cross River State. 5% of the population were selected from forty (40) communities across ten (10) LGAs in the study area.

The instrument for data collection was a structured questionnaire. It was tagged “Pattern of Forest Resources Consumption and Biodiversity Conservation among Rural Dwellers, Questionnaire” (PFRCBCARWQ) and was divided into three sections. Section A, contained items on the personal variables of the respondents. Section B was constructed using four (4) point Likert scales of Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD). It contains thirty (30) items measuring the independent sub-variables (logging activities, harvesting of non-timber products, hunting practice, land tenure system and method of land cultivation). Lastly,

Section C contained twelve (10) items measuring the dependent variables (biodiversity conservation) with the same response rubrics as that for the sub-independent variables.

The collection of data involved the researcher and three trained research assistants. The researcher and the research assistants visited all the communities selected for the study to administer copies of the questionnaire. In each of the community the researcher visited, the researcher obtained permission from the Head of the community, before engaging the respondents for data collection. The data that was obtained from respondents were assigned numerical scores to enable the researcher carry out coding. For the items that are positively worded, Strongly Agree (SA) was be scores 4, Agree (A) 3, Disagree (D) 2 and Strongly Agree (SD) 1. Negatively worded items in the questionnaire were coded using a reverse scoring as compared to the others.

RESULTS AND DISCUSSION

Presentation of results

In this section, each of the study hypotheses is restated in the null form. The results of data analyzed and their interpretation are presented. The presentation is done hypothesis by hypothesis followed by interpretation of results obtained from the analysis of data. Each hypothesis is tested at 0.05 level of significance.

Hypothesis

There is no joint prediction of patterns of forest consumption on biodiversity conservation among rural dwellers in Cross River State. The independent variables in this hypothesis logging activities, harvesting of non-timber forest product (NTFPs), hunting activities, land tenure system, while the dependent variable was biodiversity conservation. The test statistic used in testing the hypothesis was Multiple Linear Regression. The results of the analysis presented in Table 1 revealed that the calculated F-ratio of 3.607, which represents the composite prediction power, was significant at a p-value of 0.003 with 5 and 493 degrees of freedom at .05 level of significance. This shows that the predictor variables (logging activities, harvesting of non-timber forest product (NTFPs), hunting activities, land tenure system) had composite (joint) significant prediction on the criterion variable (biodiversity conservation). Results also show a joint correlation coefficient, measuring the strength of association between among the variables (R) of 0.188, and coefficient of determination (Adjusted R²) of 0.026. This shows the extent to which the variation of the dependent variable about its mean is explained by all the independent variables. It means that 2.6% of the variation in biodiversity conservation was as a result of variations in logging activities, harvesting of non-timber forest product (NTFPs), hunting activities, and land tenure system, while the other 97.6%(1- R^2) was as a result of variables extraneous to the study. The regression equation

of $Y = a + b_1 X_1 + b_2 X_2 \dots + b_n X_n + eiS$, therefore, given as: $Y' = 11.506 + .017(X_1) + .046(X_2) + .070(X_3) + .095(X_4) + .071(X_5) + 753$. The test of significance using the t-statistic shows non significance at .05 level, for all the sub-independent variables except land tenure system. The results indicate that the relative contributions were in the order of logging activities (t= .224), non-timber forest product (t= .935), hunting activities (t=1.377), land tenure system (t=1.961) and then and cultivation (t=.924). This means that there is no significant relative prediction of biodiversity conservation by the independent variables, in the order listed above. Based on these results, the null hypothesis was rejected.

TABLE 1

Summary of Multiple Linear Regression Analysis for the composite and relative predictive validity of logging activities, harvesting of non-timber forest product (NTFPs), hunting activities, and land tenure system on biodiversity conservation

ANOVA

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	89.369	5	17.874	3.607	.003
Residual	2442.755	493	4.955		
Total	2532.124	498			

	B	Std. Error	Beta	T	p-value
(Constant)	11.506	.753		15.275	.000
Logging activities	.010	.046	.017	.224	.823
Non timber forest product	.031	.033	.046	.935	.350
Hunting activities	.043	.032	.070	1.377	.169
Land tenure system	.056	.028	.095	1.961	.050
Land cultivation	.042	.046	.071	.924	.356

*significant at .05; $R = 0.188$ RSquare = 0.035, Adjusted $R^2 = 0.026$

IMPLICATION, CONCLUSION AND RECOMMENDATIONS

Implication of the study

Biodiversity conservation among rural dwellers brings about social and economic benefits to the people forest. Conservation helps conserve ecosystem that provide habitats, shelter, food, real materials, genetic materials, a barrier against disaster, a stable source of resources and many other ecosystem goods and services and thus can have an important role in helping species, people and adapt to climate change. By virtue of their protective status, these forests should remain free from destructive human interventions. They can thus continue to serve as natural storehouses of goods and services into the future.

Forest areas may provide ecosystem services such as drinking water, carbon storage and fossil stabilization, harbor, sacred sites for different faith groups and hold important gene reservoirs of value for medicine, agriculture and forestry. Notwithstanding, the importance of forest resource major challenges facing forest resources include decline of forest biodiversity population, structural change due to forest removal and conservation of forested land and other uses, forest fragmentation, forest practice, climate change, disease condition, pests, atmospheric pollutions among others.

Conclusion

Based on the findings, it was concluded that there is a joint significant prediction of patterns of forest exploitation on biodiversity conservation among rural dwellers in Cross River State. It was concluded that each of (i) logging activities inhibit biodiversity conservation in the study area (ii) harvesting of non-timber forest product (NTFPs) hinders biodiversity conservation in the study area. (iii) Hunting activities impedes biodiversity conservation in the study area. (iv) Land tenure system influenced biodiversity conservation (v) methods of land cultivation obstruct biodiversity conservation in the study area. (vi) Joint pattern of forest consumption like hunting activities, harvesting of non-timber forest product (NTFRs), hunting activities, land tenure system, methods of land cultivation influenced biodiversity conservation among rural dwellers in Cross River State.

Recommendations

On the basis of the findings of the study, the following recommendations were made:

1. The Government should Implement and enforce strict regulations on the amount and frequency of logging activities in forests. This will help to prevent overexploitation of timber resources and promote sustainable management practices.
2. Promote sustainable alternative livelihoods: In many cases, non-timber forest product harvesting are driven by economic necessity. Governments should promote sustainable alternative livelihood options for local communities, such as ecotourism, sustainable agriculture, and non-destructive use of forest resources.
3. The Governments and local communities should work together to develop and promote sustainable hunting practices. This could include setting limits on the number and types of animals that can be hunted, promoting traditional hunting methods, and implementing seasonal hunting bans to allow wildlife populations to recover.
4. Reformation of land tenure systems should be encouraged. Land tenure systems, which determine how land is owned, used, and managed, can have a significant impact on

biodiversity. Governments should work to reform these systems to ensure that traditional landowners, local communities, and indigenous peoples have secure rights to their land and are involved in decision-making processes.

5. The Governments should provide incentives and support for landowners to adopt sustainable land cultivation practices such as agroforestry, crop rotation, and intercropping. These methods can help to reduce the impact of agriculture on forests and promote biodiversity.
6. Governments must have strong enforcement mechanisms in place to ensure that laws and regulations related to biodiversity conservation are being followed. This can include fines and penalties for illegal activities, as well as incentives for those who comply with regulations.

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