

Impact of Artisanal Wood Harvesting on the Availability of Non-Timber Forest Products in a Community-based Forest in Gbado-Lite, DRC

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Abstract

The forest, besides the services that it offers like carbon sequestration and soil stabilization against the deteriorations, is source of the NTFPs from plant and/or animal origin. Its sustainable management is a major concern of the hour. A survey was carried out to the riparian population of the community forest of Moanda and a questionnaire was administered to respondents. The findings revealed that, 14 food based-NTFPs from plant origin have been listed in this forest. From these 14 identified NTFPs, 12 (86%) saw their number decreased following the artisanal wood exploitation in the Moanda community-based forest. Only two NTFPs (14%), like Marantaceae and *Raffia hookeri* that were not negatively impacted by the artisanal wood exploitation. Besides, before the artisanal wood exploitation in the Moanda forest, 12 animal taxa served as source of proteins for the population. However, since the artisanal exploitation started, it was observed the reduction of 9 (75%) of these animal species and the disappearance of three big mammals of which the Chimpanzee, the elephant and the Buffalo. These results demonstrate the negative impact of the uncontrolled artisanal exploitation on biodiversity in this forest. However, five forest gases the most exploited in the artisanal exploitation is caterpillar plant hosts of which the leaves and peels are used in traditional pharmacopeia for the management of common pathologies. Some damages are associated to the felling of the trees that destroy the NTFPs as the wild yams (tubers) and the vegetable-leaves like *Gnetum africanum*. Moreover, the artisanal woods sawing is a factor modifying the ecology of the food-based NTFPs in the Moanda community-based forest. Therefore, it is desirable to establish the law relative to the use of community-based forests in application in the Democratic Republic of the Congo, which could be respected for the sustainable conservation of their potential through a private-public partnership.

Keywords

Non Timber Forest Products, Community Based-forest, Exploitation, Nord-Ubangi

Received: February 23, 2019 / Accepted: July 12, 2019 / Published online: August 29, 2019

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1. Introduction

Since 1970, ecologists have been denouncing the waste of natural resources and making the world aware of the degradation of the global environment because of abusive economic models of forest exploitation. In fact, the exploitation of timber, the cutting of firewood, the agrarian system accompanied by ruralisation, the rapid population growth and the influx of refugees are causing severe forest degradation. Such exploitation is at the root of deforestation around large urban areas [1].

According to the Forest Code in application in the Democratic Republic of the Congo (DRC), forest exploitation is the set of activities consisting precisely in the felling, processing and transport of wood or any other wood products, as well as the collection of other forest products for economic purposes [2]. The forest exploitation as applied in the DRC remains of the selective type to date, limited to a few forest species of high commercial value, and the collection is performed on few individuals (between 0.5 and 3, per ha) [3]. In Gbado-Lite, Nord Ubangi province however, the wood exploitation is artisanal and does not meet the relevant standards. In addition, the aforementioned exploitation mainly concerns woods, which are not really needed on the International market, but they are sometimes used as host plants for caterpillars or other plants of which different parts are used as Non-Timber Forest Products (NTFPs) [4-5]. It should be noted that artisanal exploitation can lead to the erosion of biodiversity, hence the need to assess its impact on the availability of food NTFPs. NTFPs are goods from biological origin other than wood, originating from forests, woodlands or trees outside forests that are also used for domestic or commercial purposes and have social, cultural even religious significance. They are part of the natural resources that contribute significantly to urban-rural livelihoods by creating income for poor households [6-8].

The Moanda community-based forest in the DRC precisely in Nord Ubangi Province possesses a diversified richness in NTFPs resources. These products cover the daily food needs of the local populations and complement those of the populations of Gbado-Lite city, particularly as sources of medicines, food and income [4, 9-11]. However, a disorganized exploitation coupled with the slash-and-burn agriculture, poaching and the influx of Central African refugees are all factors that could lead to the erosion of biodiversity in this part of the forest block in Nord Ubangi Province and to changes in the ecology of NTFPs.

The current survey was aiming at the assessment of artisanal exploitation impact on NTFPs availability in the Moanda community-based forest (Nord Ubangi Province) in the DRC.

The specific objectives were to quantify the NTFPs produced before and artisanal exploitation and host plants felled. The current research is a part of a vast biodiversity exploration program (Ubangi Bio-Xplore) initiated by Professor Ngbolua Koto-te-Nyiwa Jean-Paul's research team for the promotion of biological resources in this ecoregion of the DRC [5].

2. Material and Methods

2.1. Study Area

This survey was carried out in the Moanda community-based forest, located at 5 km from Gbado-Lite city, Nord Ubangi Province, DRC between October 25, 2016 and May 25, 2017 (pre-survey: between October 25, 2016 and November 24, 2016 and the final survey: between November 30, 2016 and May 25, 2017).

2.2. Method

The survey targeted the riparian population living near the Moanda community-based forest (villagers, local forest managers and local operators: 75 respondents were interviewed of which 55 male and 20 female) in order to assess the impact of exploitation activities on the availability of NTFPs using a questionnaire and based on the respondent's consent in accordance with the Helsinki Declaration [12-13]. The stratified probabilistic sampling method was used and this method consisted in dividing the study area into different strata, represented in this case by the target groups and all the strata have an equal number of respondents [14]. For the current research, five groups were formed and 15 people were interviewed per group. The knowledge about wood and NTFPs was used as an inclusion criterion for selecting respondents. The reconnaissance visit allowed to identify the areas of exploitation of these resources and to observe the damage caused by the exploitation.

Regarding the identification of taxa, the members of each target group were asked to list in two categories: NTFPs from plant origin and NTFPs from animal origin. Afterwards, they were asked about their perception on the availability of listed products before and after the exploitation activities. For the NTFPs from plant origin, each group was asked to make a monthly (or weekly) estimation of the price and quantity of products sold before and after the exploitation. On the other hand, for the NTFPs from animal origin, each group was asked to make a monthly estimation of the number of animals hunted before and after the exploitation.

However, 75 people including 15 local forest managers, 15 artisanal farmers and 45 focus group members trained in the three cells of the Moanda district bordering the forest. These

cells are namely: Kpobito, Nzanguma and Waka.

3. Results and Discussion

3.1. Results

After the survey, a total of 26 NTFPs were identified. Out of the 75 respondents interviewed, 73% were male and 27%

were female. Regarding their education level, it was observed that 41% had a secondary level, 36% had a primary level and 15% were illiterate while 8% of the respondents had a university level. The main NTFPs identified in the Moanda community-based forest are presented in the table below.

Table 1. Main food NTFPs of plant origin in the Moanda Forest and their use.

N°	NTFPs	Local Names	Availability		Observation
			Before exploitation	After exploitation	
1	<i>Calamus deerratus</i> Mann & Wendl.	Mbobi (Ngbandi)	10 packs/day/season	6 packs/day/Season	Decrease
2	Cartepillars	Mbindjo (Lingala)	1 basin/day/season	1/2 basin/day/Season	Decrease
3	Honey	Kpo lavu (Ngbandi)	15 liters/day	12 liters/day	Decrease
4	<i>Marantochloa congensis</i> (K. Schum) J. Léonard & Mullend.	Kongo (Lingala)	1 mat/day 1 bucket/days	2 mats/Jet 1 bucket/day	Increase
5	<i>Dioscorea spp</i>	Mboma ya zamba (Lingala)	5 to 10 tubers/day	2 to 5 tubers/day	Decrease
6	<i>Raphia hookeri</i> Mann & Wendl.	Ndele (Lingala)	100 mats/year 4 beds/months	150 mats/year 7 beds/months	Increase
7	<i>Gnetum africanum</i> Welw.	Fumbwa (Lingala)	20 bundle/day	8 bundles/day	Decrease
8	<i>Aframomum loviolaceum</i> (Ridley) K. Schum	Tondo (Ngbandi)	1 gamebag/day	2 gamebags/day	Decrease
9	<i>Annonidium mannii</i> (Oliv.) Engl. & Diels	Mopombi (Lingala)	40 fruits/day	20 fruits/day	Decrease
10	<i>Canarium schweinfurtii</i> Engel.	Bée (Ngbandi)	1 basin/day	1/2 basin	Decrease
11	<i>Cola acuminata</i> (P. Beauv.) Schott et Endl.	Makaso (Lingala)	1 basin/day	1/2 basin	Decrease
12	<i>Piper nigrum</i> L.	Ketsu (Lingala)	1 basin/day	1/2 basin	Decrease
13	<i>Ricinodendron heudelotii</i> (Baill.) Heckel	Njansang (Swahili)	1/2 basin	1/4 basins	Decrease
14	Mushrooms	Makombo (Lingala)	1 basin/day	1/2 basin/day	Decrease

As shown in the table above, 14 NTFPs food from plant origin were listed in the Moanda Community-based forest. Of these 14 listed NTFPs, 12 (86%) have seen their numbers decreased after artisanal exploitation in the Moanda forest. Only two NTFPs (14%) of the total, including the

Marantacées and *Raphia hookeri*, were not influenced by the uncontrolled artisanal exploitation.

The bushmeat listed as NTFPs from the animal origin in the Moanda community-based forest is presented in table 2.

Table 2. Main food NTFPs from animal origin in the Moanda Community-based Forest and their use.

N°	Scientific names	Vernacular Names (language)	Average number of hunted animals		Observation
			Before exploitation	After exploitation	
1	<i>Phataginus tricuspis</i> (Rafinesque, 1821)	Kakolo (Lingala) Nka (Ngbandi)	5	2	Decrease
2	<i>Cercopithecus spp</i>	Nvi (Ngbandi)	15	5	Decrease
3	<i>Atherurus africanus</i> (Gray, 1842)	Kumba (Ngbandi)	5	2	Decrease
4	<i>Lepus spp</i>	Baba (Ngbandi)	8	4	Decrease
5	<i>Python regius</i> (Shaw, 1802)	Nkwa (Ngbandi)	3	1	Decrease
6	<i>Pan troglodytes</i> (Blumenbach, 1799)	Nvo (Ngbandi)	2	0	Decrease
7	<i>Loxodonta cyclotis</i> (Matschie, 1900)	Doli (Ngbandi)	2/year	0	Decrease
8	<i>Bitis arietans</i> (Merrem, 1820)	Longo (Ngbandi)	5	1	Decrease
9	<i>Sus scrofa</i> (Linnaeus, 1758)	Mbenge (Ngbandi)	4	1	Decrease
10	<i>Kynixis erosa</i> (Schweigger, 1812)	Nako (Ngbandi)	10	2	Decrease
11	<i>Syncerus caffer caffer</i> (Sparrman, 1779)	Ngba (Ngbandi)	2	0	Decrease
12	<i>Sciurus vulgaris</i> (Linnaeus, 1758)	Mobo (Ngbandi)	12	4	Decrease

From the above table, it emerges that before the artisanal exploitation in the Moanda Community-based forest, 12 animals were used as a source of meat for the population food. However, since the artisanal exploitation has been taking place in this forest to date, there has been a decrease of nine of these animal species and the disappearance of three large mammals including *Pan troglodytes*, *Loxodonta africana cyclotis* and *Syncerus caffer nanus*.

These findings reveal the negative impact of artisanal

exploitation on the biodiversity of this forest. In fact, the most exploited five forest species used in the artisanal exploitation are host plants for caterpillar of which roots, leaves and barks are used in the traditional pharmacopeia for the management of several diseases. In addition, some damages are associated with the felling of trees, which destroy the NTFPs such as wild yams (tubers), and leafy vegetables like *Gnetum africanum*. This reveals that the wood artisanal sawing is a factor modifying the ecology of food NTFPs in the Moanda community-based forest.

Some pictures of a few NTFPs provided by the Moanda community-based forest is presented in the figures below.

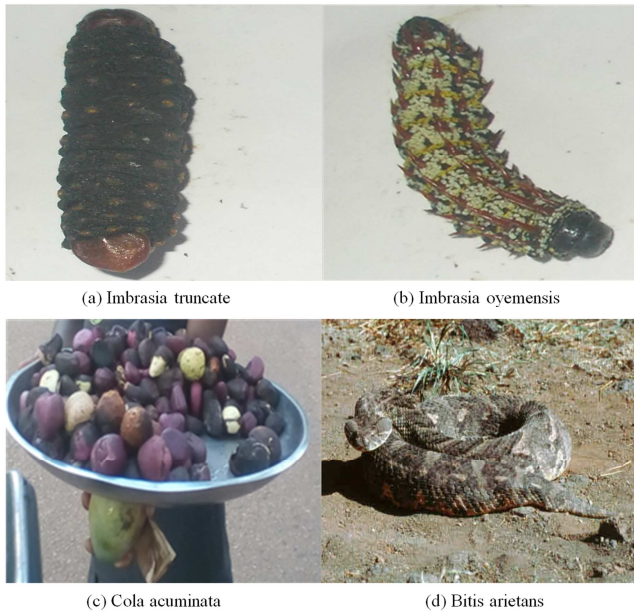


Figure 1. Some NTFPs from the Moanda Community-based forest.

Figure 2 shows images of some plant taxa that produce caterpillars but are exploited as timbers.



Figure 2. Caterpillar plant hosts exploited as timbers.

3.2. Discussion

The Moanda Community-based forest is an ecotone having an exceptional ecological function located between the Sahel and the Great Equatorial Forest. However, despite its importance as a source of essential NTFPs for food and health for the local populations, the uncontrolled artisanal exploitation in this forest has a negative impact on the availability of these NTFPs. In fact, the current study gives a general trend downward from 26 to 21 NTFPs listed. Three large mammals have completely disappeared from this forest due this excessive exploitation namely *Pan troglodytes*, *Loxodonta cyclotis* and *Syncerus caffer nanus*. Since these NTFPs represent a source of income for the local population, it should be expected therefore an increase of poverty in this area.

Malnutrition is also another consequence of the scarcity of

NTFPs for the communities that depend on them. Indeed, it is well established that NTFPs are rich in nutrients (carbohydrates, fats, proteins, minerals, trace elements and vitamins) and secondary metabolites to ensure food and health security for local populations (riparian) [4-5, 9, 14-16]. The findings of the current research are similar with those of Cifor [17] who observed the same situation in the ZEGA forest in Cameroon. However, out of the 18 NTFPs collected by local populations, 72% were intended for both consumption and marketing and 78% of the NTFPs collected in ZEGA forest saw their number decreased with its consequences on the socio-economic life of local populations, for the same reasons mentioned in the current study. Regarding the bushmeat, it was demonstrated that these NTFPs are important for food security and income generation in the forest areas of Central Africa.

Yet, it should be noted that the local populations in Moanda believe that this exploitation alters and interrupts the biological cycles of some species and destroys their habitat. The decrease in NTFPs in this community-based forest is due to the non-compliance with the law and standards established for the artisanal foresters. This statement is supported by Ibanda [1] while reporting about the artisanal exploitation in the community-based forests in Cameroon, believes that the scarcity of wood resources and the uncontrolled reactions that can result from the development of illegal exploitation represent a serious threat to the future of community-based forests in the Congo Basin. This last is known as one of the largest and most important tropical forest biomes/ecosystems in the world and the richest in terms of abundance and diversity of both animal and plant species [18-21]. In the case of the DRC precisely, the second largest tropical forest country in the world with 155 million ha of forests, 69% of which are humid dense forests (60% of the Congo Basin forests and nearly 10% of the planet's humid tropical forests). It is increasingly noted that the area of dense formations is decreasing in favor of open forests and fallows [22].

Due to the degradation of forest ecosystems, it is important to conserve the biodiversity in the context of sustainable development as reflected in the Convention on Biological Diversity, with a view to sustainable use and fair and equitable sharing of the benefits arising from its use. *In situ* or *ex situ* conservation of NTFPs is an alternative that would guarantee their survival in an ecosystem that is constantly fragmented as a result of human actions.

4. Conclusion and Suggestions

This study was initiated to assess the impact of artisanal exploitation on NTFPs availability in the Moanda community-based forest. The findings revealed that 26

NTFPs were identified, 21 of which are now rare due to the uncontrolled artisanal exploitation and three large mammals (*Pan troglodytes*, *Loxodonta africana cyclotis* and *Syncerus caffer nanus*) have completely disappeared as a result of habitat fragmentation. In order to safeguard this community-based forest and ensure its sustainable management, it is desirable that the provincial government regulate the artisanal exploitation by strictly applying the law in this area and setting up policies and principles, which ensure the protection, conservation and management of the biodiversity in the Moanda community-based forest. To partners, it is asked to them the support for research in order to identify the non-timber forest resources, which are threatening to extinction without being known.

Acknowledgements

The authors would like to thank Professor Ngbolua Koto-te-Nyiwa, Chancellor of Gbado-Lite University and initiator of the "Ubangi-Ebola Bio-Xplore" Project for promoting scientific research on biodiversity in Nord Ubangi, DRC".

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