Agricultural and Biological Sciences Journal
Vol. 5, No. 1, 2019, pp. 20-28
http://www.aiscience.org/journal/absj
ISSN: 2381-7178 (Print); ISSN: 2381-7186 (Online)

Knowledge on Non-Timber Forest Products (NTFPs) Marketed in Democratic Republic of the Congo: A Case Study of Gbadolite City and Surroundings, Nord Ubangi

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Abstract

The Congo basin with its 2.8 million km^2 of diversified and rich forests offering opportunity for local populations to meet their daily livelihood needs. In such forests like Ubangi eco-region, NTFPs remain the principal source of foods and income for many forest-based communities because of their availability. The present study was carried out with the aim to document and preserve knowledge on NTFPs from Ubangi eco-region marketed in Gbadolite city and surroundings. Results revealed that 30% of respondents get 5,000 to 10,000 CDF per day; 60% of respondents are female; 22% of the respondents are between 43-44 years of age; 66.04% of respondents associate this with agriculture; 30% of respondents have 5-10 years' experience in the trade of NWTPs; 69% of the respondents confirmed the absence of NWFP sector regulation. Fifteen different biological resources and derived products (honey, palm win) were identified in Gbadolite city and surroundings. The most used NTFPs were *Raphia hookeri, R. gentiliana, Megaphrynium macrostachyum, Sarcophrynium brachystachys, Gnetum africanum, Cola acuminata, C. nitida, Termitomyces mycelium, Imbrasia oyemensis, I. fruncata, Achatina achatina*, *Cola nitida, Piper nigrum, Kinixys erosa, Afromomum alboviolaceum and Eremeospatha macrocarpa.* 40% of respondents claim to produce 10 to 20 Kg of NTFPs per season. However, 80% of respondent have recognized that the harvested site of NTFPs is actually located at more than 5 Km of Gbadolite city. The results clearly show that the exploitation and marketing of NTFPs represents a profit for households. These findings contribute to the creation of a database on NTFPs of Nord Ubangi province and underlines the urgent need of strategies to implement and promote the natural regeneration/*in situ* conservation of most used NTFPs. Thus, further research on possibilities of NTFPs management for forest sustainability and its related services is needed.

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Keywords

Non-wood Forest Products, Household, Sustainability, Ubangi Eco-region, Democratic Republic of the Congo

Received: February 15, 2019 / Accepted: March 27, 2019 / Published online: April 29, 2019

1. Introduction

The Democratic Republic of the Congo (DRC) covers 60% (about 130 million hectares) of all the forests in the Congo Basin [1], and it is the second largest dense humid forest cover in the world after the Amazonian forest. In addition to this dimensional importance, it has a mega animal and vegetal biodiversity [2-6]. In these forests, the importance of forest products like non-timber forest products (NTFPs)/non-wood forest products (NWFPs) in rural livelihood security and as safety nets is well established. Recent findings established that these products supplement household agricultural production by providing them with essential foods, medicinal products but also sources of income for many households [7-11]. The economic value of the forest products can promote the biodiversity conservation, contribute to resource maintenance, and participate in socio-economic development on a sustainable basis. In fact, NTFPs provide a wealth of resources for both rural and urban dwellers throughout DRC including foods, medicines, construction materials, fuel wood, as well as resources of spiritual and cultural significance [12].

Many people in Nord Ubangi province (DRC), particularly in Gbadolite city, make extensive use of biological resources from plant and animal origin for their survival. These items also defined as NTFPs [13] are harvested for both subsistence and commercial use, either regularly or as a fall-back during times of need. They add to peoples' livelihood security, especially for rural dwellers. The key role these NTFPs play as vital sources of income, nutrition (edible insects, bushmeat, wild honey, etc.) and sustenance for many forest-based communities around the world is well documented [13-14]. Ubangi eco-region forest is source of a variety of NTFPs such as fruits, honey, medicinal and aromatic plants as well as bushmeat. These products are essential for the livelihoods of both rural and urban communities of Nord Ubangi province (including Gbadolite city and its surroundings) and constitute a significant source of household income [8, 10-11]. However, the NTFPs trade is an unorganized activity where it is difficult to measure the costs of income and the impact on natural resources conservation since there is a total lack of management structures [15]. NTFPs were also mooted as a potential cause of deforestation and land conversion activities [16]. Thus, in order to document and preserve the knowledge on NTFPs from Ubangi eco-region, a few studies have been undertaken but the results are incomplete [8-11]. The present study was carried out with the aims (i) to evaluate the knowledge on the NTFPs marketed in Gbadolite city and its surroundings, (ii) to determine the socio-demographic profile of the implicated stakeholders and (iii) to assess the socio-economic and environmental impacts of NTFPs collected and marketing in this least documented region.

2. Material and Methods

The present study was carried out at Gbadolite city and its surroundings (Nord-Ubangi Province) in DRC. Gbadolite city is located in the Ubangi eco-region, a subgroup of *Northeastern Congolian lowland forests* [17]. This eco-region is one of the 200 globally priority terrestrial eco-regions known as the "G200" [18]. Information about NTFPs reported in this study was obtained by interviewing NTFPs traders in the study area and this survey was realized between February and August 2018 in five markets (*viz*. Marché central, Petit marché du cimetière, Marché de Molegbe, Marché de Nyanki and Marché de Mangundu).

A total of 100 NTFPs traders (20 people selected by market) were interviewed, on a voluntary basis. The local language Ngbandi or Lingala was used during anthropological interviews. The questionnaire was structured into four sections: (i) socio-demographic characteristics of respondents (including age, sex, marital status, education level and primary activity); (ii) NFTPs material characteristics (including scientific and vernacular names, collection method, used parts and importance); (iii) information related to NTFPs traded in the markets (including quantity, price, nature of income, reason of exploitation) and (iv) sustainability knowledge. The questionnaire was pre-tested before final administration to respondents.

3. Results and Discussion

3.1. Socio-demographic Characteristics of Respondents

The survey conducted among 100 sellers and forest loggers of NTFPs, revealed an age average comprised between 35

and 50 years It was observed that 22% of respondents are between 43-44 years, 12% are 41-42 years, 11% are respectively between 45-46 years, 39-40 years and under 35 years, 10% are between 35-36 year, 9% are between 47-48 year, 08% have between ages 37 and 38 years and 6% are between 49 and 50. This shows that the exploitation of NTFPs and their marketing concerns people of almost all ages because they do for their families subsistence (figure 1a).

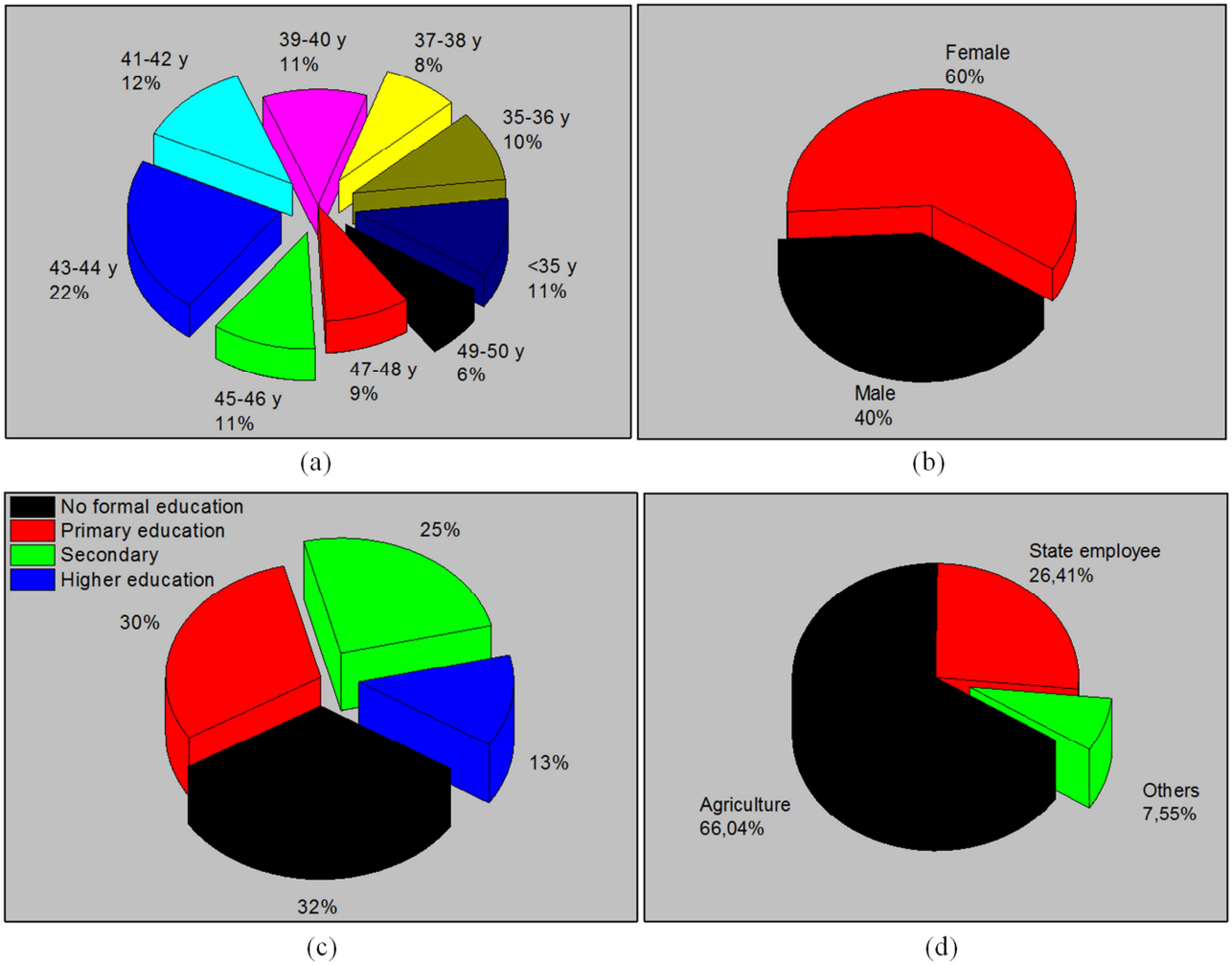

Figure 1. Socio-demographic data of respondents: (a). Age of respondents; (b). Sex of respondents; (c). Education level; (d). Activity associated with NWFP exploitation in Gbadolite city.

The figure 1b shows that 60% of respondents are female compared to 40% of male; this shows that women are the primary producers and traders of NWFPs. These results support the general observation that women tend to trade in NTFPs, whereas men are more involved in selling wood products including fuel wood [19]. The figure 1c shows that 32% of respondents have no formal education, 30% have primary school education, 25% have secondary school education and 13% have higher education.

Apart from the exploitation activities of NTFPs, 66.04% of respondents associate this activity with agriculture; 26.41% are state employees and 7.55% who do something else (figure 1d). This indicates that the exploitation of NWFP is an activity that improves the household economy and thus generates income in the household.

3.2. Market Trade and Experience of Respondents on NWFPs

The results of the survey related to the market where NWFPs are traded revealed that non-timber forest products are traded in all markets surveyed. Regarding the experience of respondents on NWFPs, the surveys revealed that 30% of respondents have 5-10 years' experience in the trade of NWTPs, 26% have 3 to 5 years' experience, 24% have more than 10 years' experience and 20% have less than 3 years' experience in this sector (figure 2a). This shows that the respondents have a perfect knowledge on NTFPs. Among respondents, 50% are vendors of NTFPs, 38% are farmers and 12% are consumers of NTFPs (figure 2b).

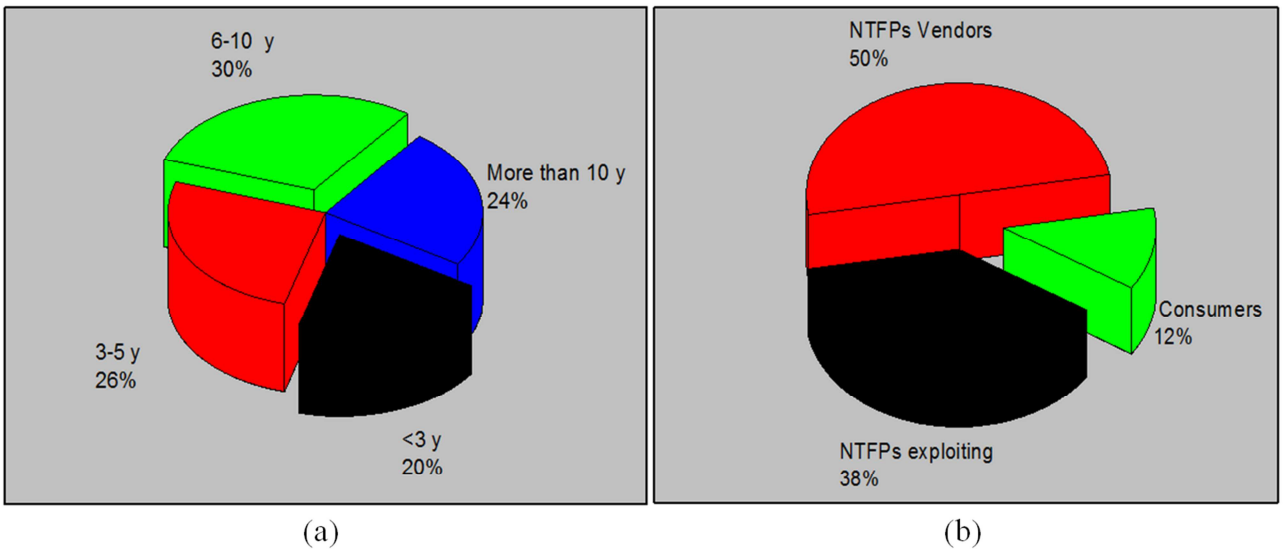

Figure 2. Experience in the NTFPs sector (a) and status of respondents (b).

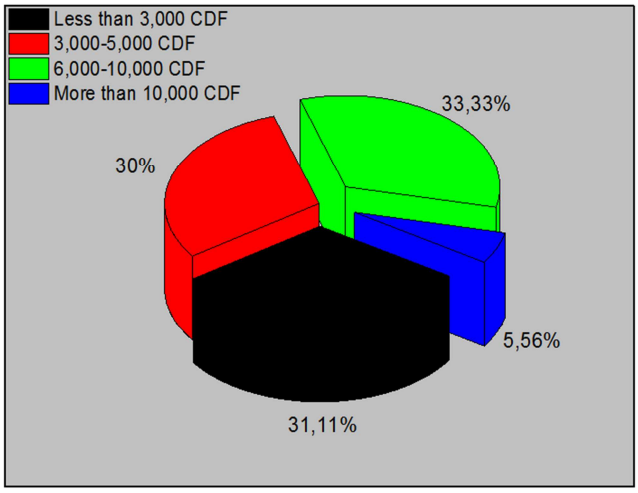

Figure 3. Daily income from NTFPs trade in Gbadolite city.

In Gbadolite city as well as in other cities and villages around Africa, population depends on NTFPs as a means to support general subsistence (source of foods and medicines) and to gain additional income for special needs. The NTFPs of both plant and animal origin are an important second order revenue component for local people after agriculture [19-22].

The present study revealed that 33.33% of respondents get 6,000 to 10,000 CDF (exchange rate: 1 USD = 1,650 CDF) per day, 31.11% get less than 3,000 CDF per day, 30.00% get between 3,000 to 5,000 CDF per day and 5.56% has any income more than 10,000 CDF (figure 3).

But, this sector is not correctly regulated by the law. Indeed, 69% of the respondents confirmed the absence of NWFP sector regulation against 31% who confirmed the presence of texts regulating the management of the NTFPs exploitation in Gbadolite city. The ignorance of the majority of respondents testifies the lack of popularization of such policy texts. The lack of systematic efforts to conserve and manage resources is thus a major concern in Nord Ubangi province.

3.3. Types of NTFPs Marketed in Gbadolite City and Surroundings

Fifteen different biological resources and derived products (honey, palm win) were identified in Gbadolite city and surroundings (tables 1 & 2).

Table 1. Type of some NTFPs, quantity and price.

NTFPs	Quantity	Price (CDF)	Income duration	Observation
Leaves of Marantaceae	1 package of 1 Kg	300.00	Permanent	Economic need
Leaves of *Raphia spp.*	1 package of 3 Kg	2,000.00	Permanent	Economic need
Caterpillar	1 cup of 400 g	1,500.00	Seasonal	Economic and alimentary needs
Gnetum africanum	1 package of 1 Kg	2,200.00	Permanent	Economic and alimentary needs
Cola nut	1 fruit	500.00	Permanent	Economic and alimentary needs
Black pepper	1 Kg	2,500.00	Seasonal	Economic and therapeutic needs
Honey	300 ml	2,000.00	Seasonal	Economic and therapeutic needs
Turtle	Unit	4,000-5,000.00	Seasonal	Economic and alimentary needs
Snail	Bunch of 8 to 10 snail	1,000.00	Seasonal	Economic and alimentary needs
Palm win	1 cup of 400 mL	200.00	Permanent	Economic and alimentary needs

Table 2. List of NTFPs inventoried in Gbadolite city and surroundings.

Scientific name	Vernacular name	Harvesting Method	Used part	importance
Imbrasia oyemensis	Mboyo	Collection	Whole animal	Food
Imbrasia fruncata	Mbanga	Collection	Whole animal	Food
Gnetum africanum	Fumbwa/ koko	Cutting	Leaves	Food and medicinal use
Eremeospatha macrocarpa	Mbobi	Cutting	Rod	Building house
Raphia hookeri	Sese	Cutting	Leaves and rod	Stubble and win
Raphia gentiliana	Ndele	Cutting	Leaves and rod	Stubble and win
Megaphrynium macrostachyum	Kongo	Cutting	Leaves	Packaging
Sarcophrynium brachystachys	Kongo	Cutting	Leaves and rod	Packaging and making mat
Cola acuminata	Makasu	Picking	Seeds	Stimulant
Cola nitida	Makasu	Picking	Seeds	Stimulant
Termitomyces mycelium	Mayebo	Picking	Fruiting bodies	Food
Piper nigrum	ketshu	Cutting and picking	Seed and bark	Food and medicinal use
Afromomum alboviolaceum	Tondolo	Picking	Fruits	Food
Kinixys erosa	Koba	Collection and hunting	Meats	Food
Achatina achatina	Mbembe	Collection	Meats	Food

The most used NTFPs were Raffia's leaves (*Raphia hookeri and R. gentiliana*) with 26%, followed by Marantaceae leaves (*Megaphrynium macrostachyum* and *Sarcophrynium brachystachys*: 21%), leafy vegetable (*Gnetum africanum*:11%), cola nuts (*Cola acuminata*: 9%), edible mushroom (*Termitomyces mycelium*) and honey (6% each), caterpillars (*Imbrasia oyemensis* and *I. fruncata*) and snails (*Achatina achatina*: 5% each), *Cola nitida* and Black pepper (*Piper nigrum*) (4% each), turtles (*Kinixys erosa:* 2%) and *Afromomum alboviolaceum* (1%) (Figure 4) and *Eremeospatha macrocarpa*.

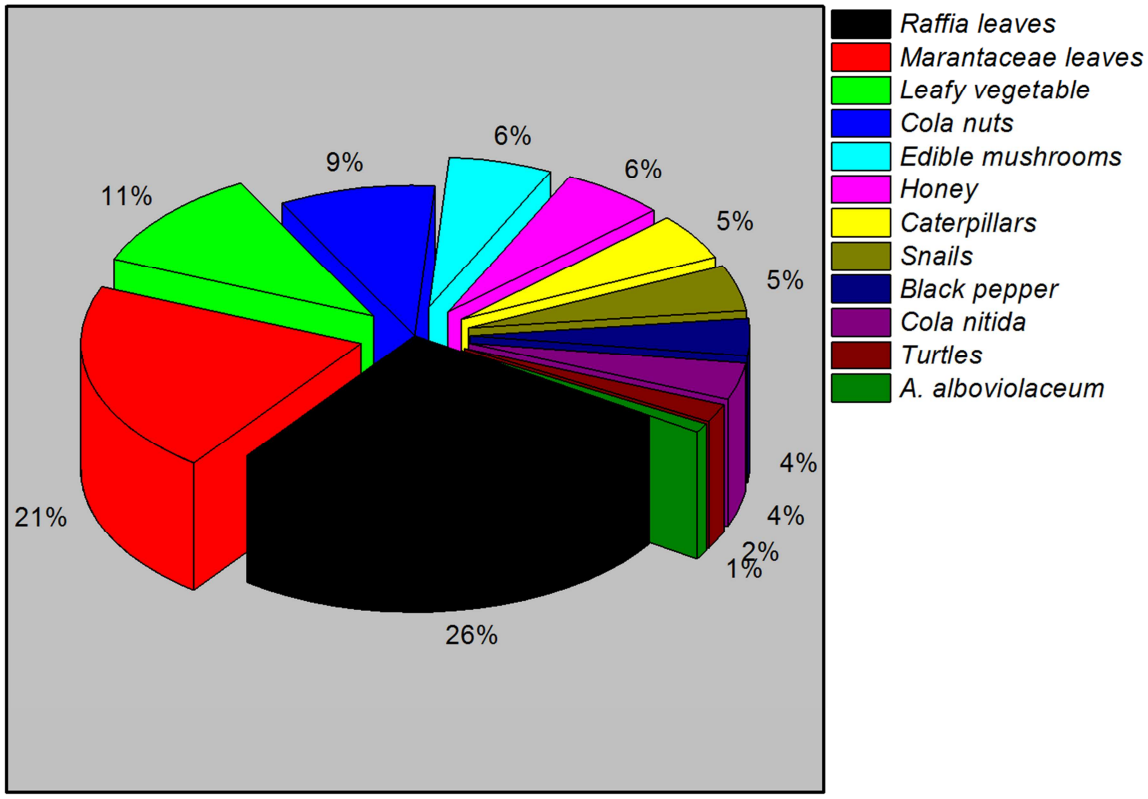

Figure 4. Most used NTFPs in Gbadolite city and surroundings.

According to NTFPs from plant origin, results show that the most exploited part is leaves (42%), followed respectively by seed (21%), stem (20%), root (9%) and bark (8%) (figure 5a) while for the quantity of NTFPs produced per season in Gbadolite city and surroundings, 40% of respondents claim to produce 10 to 20 Kg of NTFPs per season, 34% produce less than 10 kg and 26% produce more than 20 kg (Figure 5b).

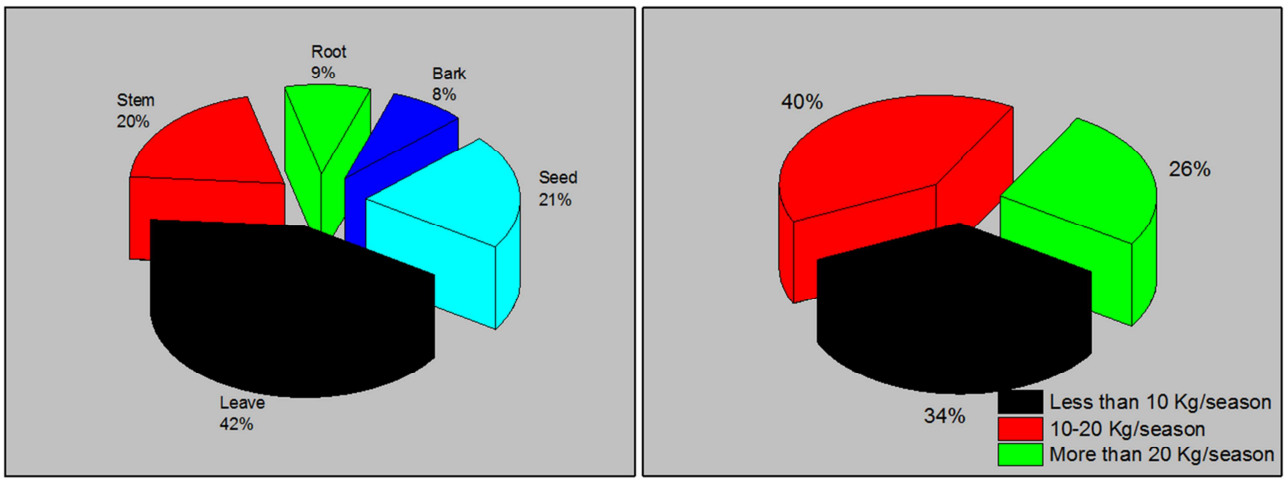

Figure 5. The most used parts of plant-derived NTFPs (a) and quantity of NTFPs produced per season in Gbadolite city and surroundings (b).

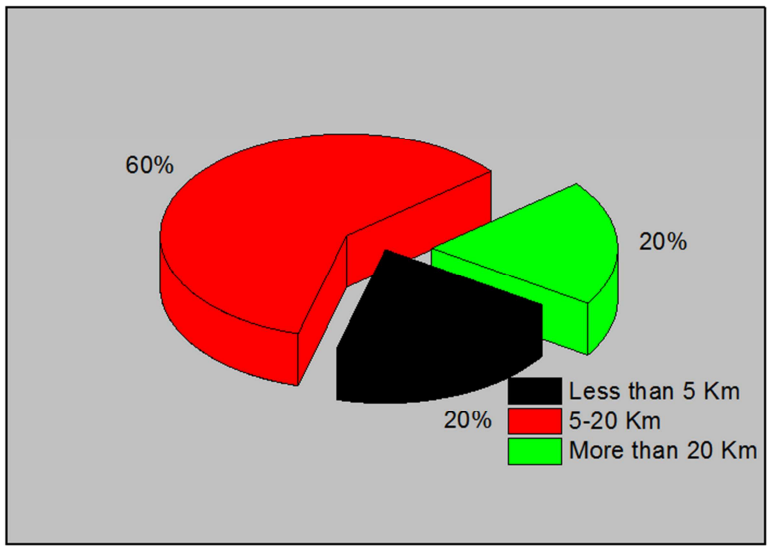

Figure 6. Distance of NTFPs harvesting sites.

In Gbadolite city, NTFPs are mostly harvested in the periurban forest; therefore a questionnaire was administered to respondents about the distance of NTFPs harvesting sites. In fact, 80% of respondents have recognized that the harvested site of NTFPs is actually located at more than 5 Km of Gbadolite city (figure 6) showing that some NTFPs become increasingly rare.

NTFPs (figure 7) are defined as biological resources from plant and animal origin, harvested from natural forests, man-made plantations, wooded land, farmlands, and trees outside forests and/or domesticated. These products are vital sources of income, nutrition and sustenance for many forest-based communities around the world [13]. In Africa, more than two-thirds of the population relies partly on these forests products to satisfy their livelihood needs [20-22]. NTFPs are traded in all Gbadolte markets, confirming the report of Liengola [23] about NTFPs trades in Beni and Kisangani (DRC) markets; with an average of 3,000 CDF per month (1.5 USD). Typically, households of Gbadolite city use several different types of NTFPs to meet their everyday needs. The most commonly used products are Caterpillar, Raffia, *Gnetum africanum,* cola nuts and *Megaphrynium macrostachyum* leaves. Endamana et *al*., [24] revealed that caterpillars, cola nut, *Gnetum africanum* and Raffia represent the principal sources of income for NTFPs users in Bantu community. Meanwhile, Masamba [15] showed that the average sales amount of *Megaphrynium macrostachyum* leaves is 7 USD, while that from other sources is 4 USD for an average weekly income of 11 USD. This gives 63% for the contribution of leaf marketing of the species in household income. In addition, the present study carried out in Gbadolite city and surroundings confirmed that NTFPs are a source of income for households evidencing thus the importance of these forest products in rural and urban livelihood security as previously reported [25-26].

The present study also revealed that the management and

exploitation of NWFPs is done in a traditional way and is informal, this has been also reported [27]. However, this activity could have a negative impact on the environment (forest ecosystems) because the excessive extraction of NTFPs could cause deforestation [28-29].

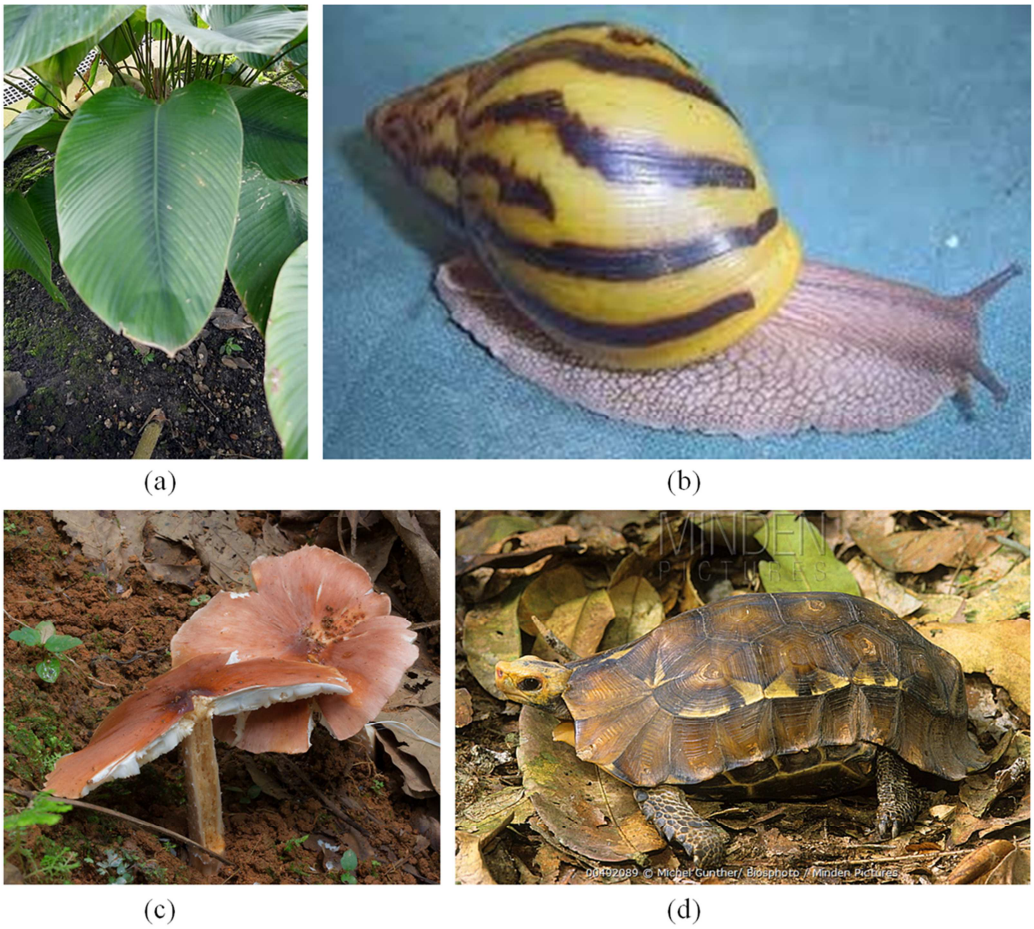

Figure 7. Picture of some NTFPs, (a) *Megaphrynium macrostachyum*; (b) *Achatina achatina*; (c) *Termitomyces mycelium*; (d) *Kynixis erosa* (Source: Google Image).

4. Conclusion and Suggestions

The present study was carried out with the aim to document and preserve knowledge on NTFPs from Ubangi eco-region marketed in Gbadolite city and surroundings. The findings revealed that 30% of respondents get 5,000 to 10,000 CDF per day; the majority of respondents are female, are between 43-44 years old, associate this activity with agriculture, have 5-10 years' experience in the trade of NWTPs; and confirmed the absence of NWFPs sector regulation. Fifteen different biological resources and derived products (honey, palm win) were identified in Gbadolite city and surroundings. The most used NTFPs were *Raphia hookeri, R. gentiliana, Megaphrynium macrostachyum, Sarcophrynium brachystachys, Gnetum africanum, Cola acuminata, C. nitida, Termitomyces mycelium, Imbrasia oyemensis, I. fruncata, Achatina achatina*, *Piper nigrum*, *Kinixys erosa, Afromomum alboviolaceum and Eremeospatha macrocarpa* and 40% of respondents claim to produce 10 to 20 Kg of NTFPs per season. The harvested site of NTFPs is actually located at more than 5 Km of Gbadolite city. These findings clearly show that the exploitation and marketing of NTFPs represents a considerable profit for households. This knowledge will contribute to the creation of a database on NTFPs of Nord Ubangi province and underlines the urgent need of strategies to implement and promote the natural regeneration/*in situ* conservation of NTFPs. Thus, further research on possibilities of NTFPs management for forest sustainability and its related services is needed.

Acknowledgements

The authors are indebted to Professor Ngbolua Koto-te-Nyiwa, Chancellor of the University of Gbado-Lite and Principal investigator of "Ubangi BioXplore" project for the promotion of scientific research on the biodiversity of the Ubangi eco-region.

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