

## Study of the importance of plants with tubers and edible roots in the life of local populations in the Nimba Mountains Biosphere Reserve

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### Abstract

This study focusing on root and tuber plants in the riverside villages of Nimba aims to promote the importance of roots and tubers in the lives of people living near the UNESCO heritage site, Nimba Mountains Biosphere Reserve. . The method of collecting data from resource people and the focus group through a questionnaire developed using the Kobocollect tool was used. The survey concerned 190 people including 79 women or 41.58% who were grouped into age groups with an interval of 5 years and the age group over 20 years was the most interested with 143 people or 75 .26% of respondents. Among all agricultural productions, cassava ranks first (42%), followed by taro (30%), sweet potato (18%) and yam (10%) the least cultivated due to lack of knowledge of its cultivation method, which allows us to affirm that roots and tubers have a primordial place in the nimba zone. The adaptation of these crops to the difficult conditions of the area, their nutritional energy value and their economic contribution deserve the encouragement of these crops despite the difference in yield between these four crops. So for the development of these cultures, authorities at all levels, NGOs, businesses etc. must strengthen the technical and financial capacity of producers, by forming groups or cooperatives, providing them with improved seeds and inputs.

**Keywords:** Study; Importance; Root and tuber plant; Riparian populations; Reserve

### 1. Introduction

FAO's 2015 State of Food Insecurity Report reveals that much remains to be done to end hunger and achieve food security around the world. These are both quantitative and qualitative challenges. In several African countries, these challenges are closely linked to increasing urbanization, demographic growth and rural exodus [1-7].

Agricultural systems in the tropics, where many countries still face population growth, face increasing food demand, uneven food availability, and structural economic conditions that are not conducive to rural employment [8].

The demographic growth of many African cities, and the lack of expertise in mastering the development of inhabited plots have over time reduced the place and role of vegetation in rapidly developing cities [9,10]. Moreover, in recent years, urban growth has created serious problems that countries around the world are unable to cope with [11,12]. Indeed, urban growth is caused by demographic growth within cities and by rural exodus towards cities, which leads to an increase in the food needs of the population and also at the same time, the reduction of green spaces around rapidly urbanizing cities [13].

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Roots and tubers, including cassava, sweet potato, potato and yam, represent the main food crops in Africa intended for human consumption. They are cultivated in agro-ecological environments and according to varied production systems, which range from densely populated high altitude areas to drier lowland areas, prone to droughts or floods [14].

In West Africa and more particularly in the Republic of Guinea, yams (genus *Dioscorea*) are lianescent plants producing tubers and sometimes bulbils (small aerial tubers). They play an important role in human nutrition and in traditional pharmacopoeia [15].

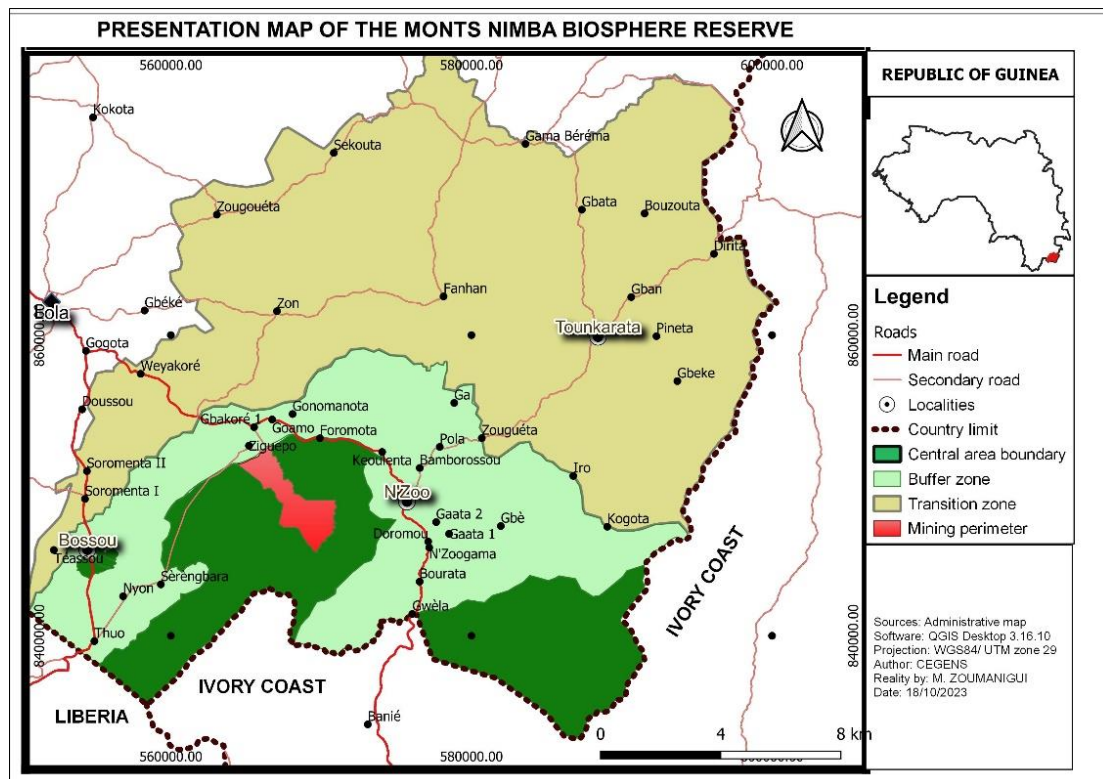
The Nimba Mountains Biosphere Reserve is surrounded by several villages whose main occupation is agriculture, so to promote this practice, our study set itself the objective of promoting the importance of plants with edible tubers and roots. in the villages bordering the Nimba Mountains.

## 2. Methodology

### 2.1. Materials

#### 2.1.1. Presentation of the Study Area

The Nimba Mountains Biosphere Reserve (RBMN) is heir to the Nimba Mountains Strict Nature Reserve (RNIMN) created in 1944. It is the result of numerous scientific research projects and successful approaches by eminent researchers such as Roger Heims, M. Lamotte, R. Schnell, J.C. Leclercq, R. Roy etc. from 1939 to 1944. This integral nature reserve became a Biosphere Reserve in 1980 and its first central area became a UNESCO World Heritage Site in 1981, following the gradual degradation observed in this reserve, the first part of the area central (*world heritage site*) was included on the list of heritage in danger in 1992 by the UNESCO World Heritage Committee.



**Figure 1** Map of the Nimba Mountains Biosphere Reserve (RBMN)

The Monts Nimba Biosphere Reserve covers an area of 145,200ha and corresponds to the Guinean part of the Cavally river basin. It includes three (3) categories of protected areas including:

- A cluster of three (3) central areas of 21,780 ha strictly protected including:
  - The Guinean part of the Nimba Mountains range which constitutes the UNESCO world heritage site of 12,540 ha is our main area of investigation;

- The Bossou chimpanzee hills of 320 ha and,
- The Déré forest of 8920 ha.
  - A buffer zone of 35,140 ha where activities are strictly controlled and,
  - A transition area of 88,280 ha where activities are monitored [16].

## 2.2. Methods

### 2.2.1. Data collection

Using the kobocollect tool, a questionnaire was developed and sent to resource persons individually then focus groups were organized in ten (10) villages bordering the reserve, the villages were chosen in relation to the proximity to central areas; around 10-20 people were surveyed in the targeted villages.

### 2.2.2. Analysis and processing of data

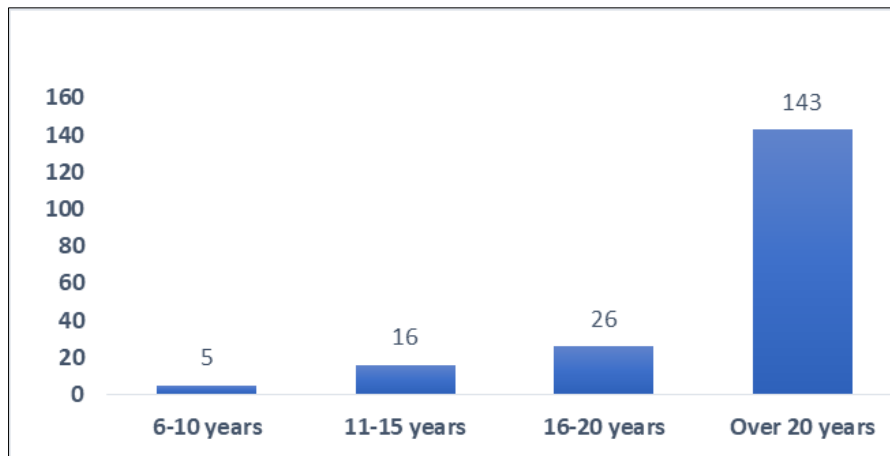
Word, Excel and koboTollbox software allowed us to analyze and process the various data collected in the field, the results of which are mentioned in the results and interpretation section.

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## 3. Results and discussion

### 3.1. Sociodemographic profiles of the people surveyed

Among the people surveyed, 79 women make up 41.58% of respondents, all of the 143 producers are over 20 years old, or 75.26%, we grouped the respondents into age groups with an interval of 5 years thus the age group (over 20 years) was the most interested. These values indicate that able-bodied men have more knowledge in the practice of agriculture. According to the respondents, work considered difficult is reserved for men and the elderly, see figure 2.

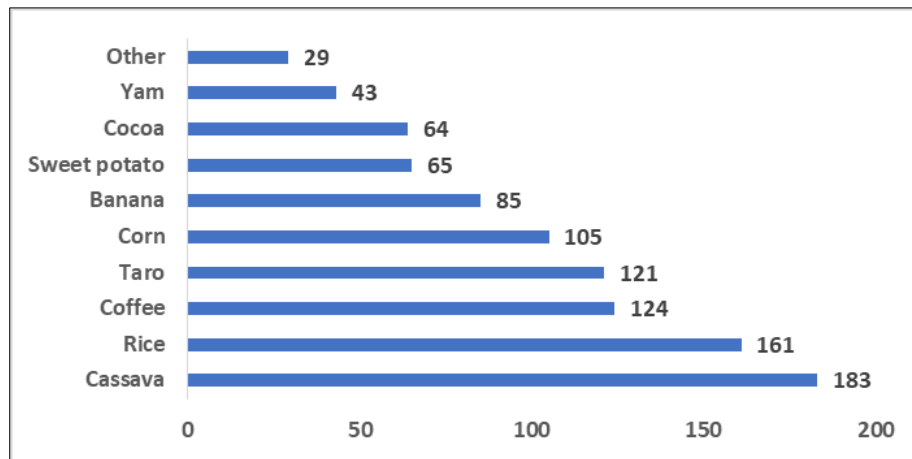


**Figure 2** Age group of people surveyed

### 3.2. Agricultural productivity in the areas bordering the Nimba Mountains

The analysis of the data collected from resource people and local farmers and our field investigations allowed us to know the agricultural production of the local populations of the Nimba Mountains Biosphere Reserve.

Since farmers do not specialize in crops, everyone branches off a little bit of everything so that the different products can complement each other. Of all these productions, edible roots and tubers feature and carve out significant places ; in the Nimba Mountains area, cassava occupies first place, see figure 3.



**Figure 3** Agricultural production in the villages bordering the Nimba Mountains

### 3.3. Cultivation and production of roots and tubers

Cultivation of root and tuber plants must be taken into consideration for the high yield that they can provide in small spaces, thus providing the necessary food production in more difficult conditions.



**Figure 4** Cassava field in Séringbara



**Figure 5** Pile of fresh cassava on sale in N'Zoo

Cassava, for its ease of adaptation anywhere in tropical regions, can survive in dry conditions for quite long periods. It is cultivated from its cutting which is buried in the ground, for its maturity it needs a life cycle of eight to nine months depending on the varieties encountered in the locality. Cassava cultivation can yield high yields to serve both local consumption and a significant portion for sale. Of considerable flexibility, cassava is consumed in various forms, the time of its conservation after harvest remains very limited and cannot exceed a week, the drying of cassava allows its conservation for a period of 4-6 months depending on the place of storage according to the respondents. Its economic contribution remains remarkable and means that cassava is starting to be a main crop for certain producers, see figures (4-6).



**Figure 6** Dried cassava for conservation in Kèoulenta

Taro is cultivated for its nutrient-rich tubers, it is a nutritional food whose consumption is very appreciated by local populations. The two varieties found in the nimba area (red taro and white taro) are grown for local consumption, only the surplus is intended for sale for economic needs. The maturity cycle of taro is nine months, beyond its cycle, the tuber begins to deteriorate, after harvest the tuber can be kept for approximately two weeks. Sensitive to the poverty of the soil, taro gives good yields in soils rich in decomposed organic debris and in swamps with little flooding. It can be grown both near homes and in a crop mix, see figures (7-10)



**Figure 7** Nyon taro field



**Figure 8** Pile of taro at Bossou market

The sweet potato is a supplementary food for the majority of the populations bordering the Nimba Mountains, despite its short cycle for its maturity (three to four months) depending on the varieties and its yield appreciated in tropical regions, it is rarely cultivated in the nimba zone due to its susceptibility to rodents and insect pests which destroy tubers and reduce yield. Sweet potato cultivation adapts to swamps and hillsides mixed with other crops; hillocks are established in which sweet potato cuttings are installed. The leaves of some varieties are intended for human and livestock consumption and are sold more than the tubers, see figures 9,10.



**Figure 9** Sweet potato and corn field in Zougépo

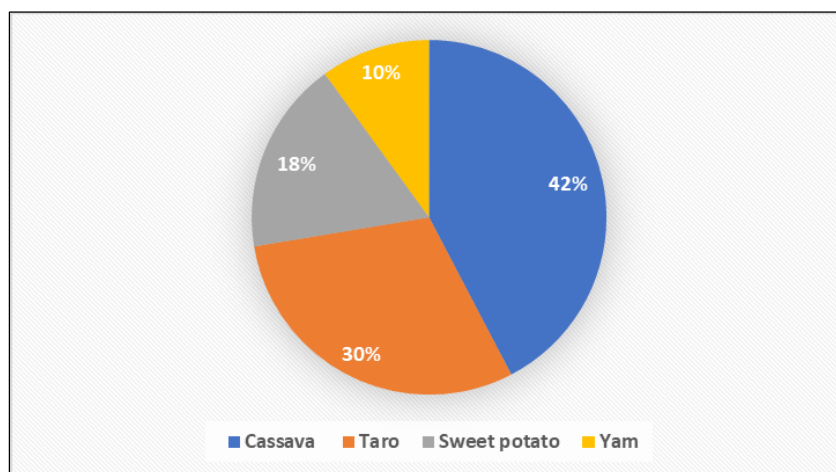


**Figure 10** Sweet potato tuber at N'Zoo market

Yam, like other roots and tubers, is the crop least practiced by the populations living near the Nimba Mountains. Although appreciated by consumers, yam is little cultivated in the Nimba zone due to lack of knowledge of these cultivation methods, and its life cycle which is around ten to twelve months. The few producers in the area recognize the long lifespan of the yam and since cultivation is done using pieces of the tuber, the probability of recovery or germination is low.

In the villages bordering the Nimba Mountains, roots and tubers represent human food crops intended for local consumption. Various agroecological environments are targeted for the cultivation of these root and tuber plants, from poor areas to favorable areas depending on the conditions of adaptation of each species to these environments. Depending on the value and factors linked to the cultivation of this or that plant, we find some modest crops of roots or tubers mixed with other crops in the nimba zone, sometimes not far from homes.

These roots are the staple food in certain localities around the reserve and their ease of adaptation to growing environments must represent a significant advantage for investing in the cultivation of these roots and tubers, see figure 10.



**Figure 11** Production of roots and tubers in the villages bordering the Nimba Mountains

### 3.4. Socio-economic importance of Tubers and Roots in the Nimba zone

Roots and tubers in general are consumed as a staple food for a large number of populations in tropical regions. Cassava is the staple food for a large number of the local population, although the rice in question is considered a staple food in the Nimba zone, tubers and roots are the most consumed according to the respondents. Their energy value and their consumption in different forms place them ahead of cereals, the majority of the production of which is intended for sale, but the high poverty of the population and the multiplicity of financial needs leads to the sale of surplus tubers and root thus, their economic contribution being considerable in family income, tubers and roots are beginning to be considered as the main crop instead of a crop mixture. We are interested in the sale of Tubers and roots, the units of measurement or sale are varied ,see table 1.

**Table 1** Price of different roots and tubers per unit of measurement/sale

N°	Root/tuber	Units of measurement/sale	sale Price in GNF
1	Cassava	Heap of fresh cassava	2000-5000
		Heap of dry cassava	1000-2000
		Bowl measurement of dry cassava	30000-40000
		Measurement of dry cassava powder/kg	2000-3000
2	Taro	Pile of taro	1000-5000
		Bowl measurement	85000-100000
		Heap of sweet potato	1000-5000

3	Sweet potato	Bowl measure	35000-45000
		Sweet potato leaf attachment	500-1000
4	Yam	Pile of yams	3000-5000

Several reasons explain their low production:

- Production intended for local consumption, only surpluses are sold;
- Lack of improved varieties for considerable yields and short cycles;
- Lack of financial and technical support and unavailability of inputs;
- Individual production takes precedence over groups or cooperatives as well as the low technical capacity of producers.

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#### 4. Discussion

The assessment of the energy value of roots and tubers (cassava, taro, sweet potato and yam) shows that these foods are foods with varied and high consumption. Cassava is the most cultivated and consumed, which corroborates with the assertion of [17], which states that rice, although considered the basic food, cassava remains the most consumed food. The nutritional values, the ease of adaptation to growing environments, the economic contribution of roots and tubers, make it possible to encourage the cultivation of edible roots and tubers in order to ensure nutritional balance and sustainable human nutrition as announced by [18]. According to [19], the demand for cassava and potatoes will increase more quickly at a rate similar to that of the main cereals, which makes it possible to say without doubt that with the support, assistance, strengthening of capacity of producers, availability of inputs and improved seeds, roots and tubers will be produced in large quantities for security and food self-sufficiency in the villages bordering the Nimba Mountains in particular and throughout Guinea in general.

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#### 5. Conclusion

At the end of this study we reached the following essential results:

- 190 people were surveyed including 79 women or 41.58% who were grouped into age groups with an interval of 5 years.
- The age group over 20 was the most interested with 143 people or 75.26% of respondents.
- Cassava ranks first (42%), followed by taro (30%), sweet potato (18%) and yam (10%), the least cultivated due to lack of knowledge of its cultivation method.

The adaptability of these roots and tubers to the soils of the area, their contribution to food security in rural households, their economic contribution to family income and their various forms of use, make roots and tubers important foods to ensure and improve the well-being of the mostly poor local populations of the Nimba Mountains.

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#### Compliance with ethical standards

##### *Disclosure of conflict of interest*

The authors declare that there are no conflicts of interest. *Compliance with Ethical Standards:* This article does not contain any studies involving human or animal subjects.

##### *Statement of informed consent*

Informed consent was obtained from all individual participants included in the study.

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