Local Community and use of Ceiba petandra in Banwa Province in Burkina Faso

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Abstract:- Regardless of the continent, man has a relationship with plants, but each community ritualizes its relationship with its environment according to various factors. This relationship is often distinct from the practices of other neighboring communities and influenced by the language of communication. This research aims to analyze the relationship between sociolinguistic communities of the Banwa province in the western part of Burkina Faso, and the species Ceiba pentandra (L.) Gaertn. The fieldwork based on an ethnobotanical survey involved 267 people chosen at random and divided into three age groups comprising men and women, most of whom are illiterate. It essentially emerges from the study that the values of the indices of diversity and equitability of knowledge are low according to gender, and according to age. These values indicate an unequal distribution of knowledge of the species between respondents. In addition, the study revealed 6 forms of uses of the products of the species and among the different parts of the species, the leaves are more in demand than the bark and the fruit.

Keywords:- Ceiba Pentandra, Communities, Banwa, Burkina Faso.

I. INTRODUCTION

Humans use elements of the environment such as plants for survival. Indeed, as noted by [1], the plant world that surrounds us and feeds us never ceases to amaze us because man has learned to use what nature puts in his hands, in particular, flowers, leaves, bark, sap, etc. for millennia, not only to eat, but also to heal, clothe and house.

Regardless of the continent, man has a relationship with plants ([2], [3]). As the [4], we live in plants. Just look around us, or around cities, and the observation is there: the landscape is made of plants, they populate our plates, make and retain our soils, adorn our lives and our walks.

Thus, each community ritualizes its relationship with its environment according to various factors. This relationship is often distinct from the practices of other neighboring communities and influenced by the language of communication [5].

It is in this context that the present study aims to analyze the relationship between sociolinguistic communities of the Banwa province in the western part of Burkina Faso, and a plant species (*Ceiba pentandra (L.) Gaertn*).

The species is known to be useful to humans. Indeed, *Ceiba.pentandra (L.) Gaertn* called kapok or cheesemaker in French, is a species well known to certain local communities for its various uses (in traditional medicine, in food, as a source of energy for cooking, in the field of crafts, etc.). The cheese maker has a sacred meaning for local populations in many parts of the world, including in tropical Africa where it often serves as a palaver tree ([6], [7], [8], [9], [10]). At the level of the natural range of *Ceiba pentandra (L.) Gaertn*, a large number of studies relate to its taxonomy ([11], [12]). However, studies devoted to evaluating the ethnobotanical knowledge of the species and its woody potential are rare.

The present study therefore aims, as we have already mentioned, to analyze the relationship that exists between sociolinguistic communities of the Banwa province in the western part of Burkina Faso, and the species *Ceiba pentandra* (L.) Gaertn.

II. METHODOLOGICAL APPROACH

The study area of this investigation is the Banwa province located in the administrative region of Boucle du Mouhoun in Burkina Faso (Map 1). It is part of the country's cotton zone.

Map 1: Geographic location of the study area
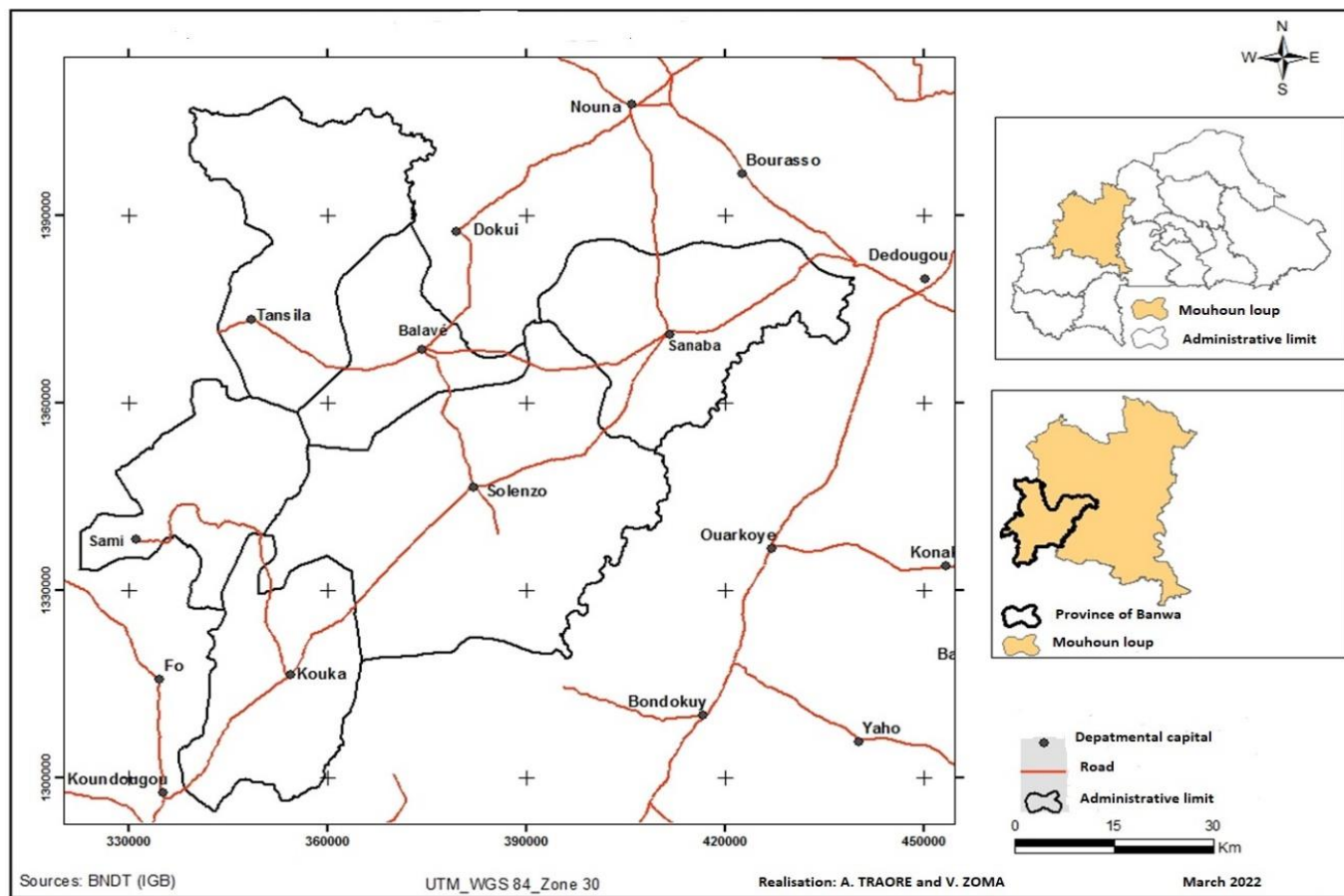
Banwa Province is entirely located in the South Sudanese climatic sub-zone of Burkina Faso. There are 2 seasons there. The rainy season from May to October, with average monthly temperatures varying between 25° and 28°C and a dry season from November to April marked by the harmattan. It is characterized on the one hand by a dry and cold wind with low temperatures (around 25°) from November to the end of January and on the other hand, by a dry and hot wind with high average monthly temperatures often exceeding 40° C from March to April. Precipitation, which varies from 700 to 1000 mm per year, is irregular and poorly distributed in space. Hydrographically, the province of Banwa has a very dense hydrographic network, especially in its western half. The hydrographic network falls within the watersheds of the Mouhoun River and the Kossi River. This province is largely a flat area. The relief is quite monotonous and altitudes rarely exceed 360m [13].

For data collection in the field, a semi-structured survey questionnaire was developed. Before its use, a test made it possible to assess its applicability in the field. This contributed to better planning of the field data collection process. Then it was administered to the populations to collect information on the uses of the species. The main data collected relate to the identity of the respondent, the respondent's knowledge of the species and its uses. Two categories of ethnobotanical studies were used. These are the descriptive ethnobotanical study and the causal ethnobotanical study. These two approaches are

complementary in the sense that they make it possible to answer different specific questions in a given area [14].

Regarding sampling, the random method was used. It consisted in selecting within the surveyed population, a sample of size having knowledge on the use of the species so that each element of the sample has the same probability of being selected and that all elements of the population have the same chance of belonging to the sample ([15], [16]). The following mathematical formula established by [17] was used to estimate the size of the sample to be considered:

$$n = \frac{U_{1-\frac{\alpha}{2}}^2 \times P(1-p)}{d^2}$$

$-n$: the size of the sample to be considered.

$- p$: the proportion of informants who declared having knowledge about the use of the plant. This proportion p of informants was determined a posteriori.

$- U_{1-\frac{\alpha}{2}}^2$: the value read on the standard normal law distribution table, this value is 1.96, a value most often rounded to 2 (with α=5%) for a sample size greater than or equal to 30 individuals;

$- d$: this is the margin of error of the estimate which has been set at a value according to the desired precision; its value can be between 5% and 10%.

In the context of this study, it was set at 5%. The method thus adopted has already been used in several ethnobotanical studies in West Africa ([18], [19], [20]).

For the choice of people to be surveyed during data collection, the so-called "snowball effect" method was applied. It consisted of initially identifying a competent informant for the subject of study and then the latter after his passage of the survey, in turn indicates another competent informant from the same community. This process continued until the investigation of all the informants competent for the subject of the study in each locality concerned. At the end of the survey, the size of the sample of informants was 267 people. Given this number, the application of the previous formula made it possible to determine the proportion p=0.21.

Concerning the analysis, the survey data were summarized in tables using the EXCEL 2010 software. After the data entry operations, the same software was used to generate the graphs illustrating the results obtained. To assess the uses and importance of *Ceiba pentandra (L.) Gaertn* according to ethnic groups, three statistical parameters were calculated:

− The Diversity Index (DI) of respondents' knowledge. [21] ecological diversity index was used to estimate the diversity of uses of *Ceiba pentandra (L.) Gaertn*. This index was calculated using the following formula:

$$ID = -\sum \left(\frac{Ni}{N}\right) log2(\frac{Ni}{N})$$

Ni= is the number of uses cited by the respondent and N is the total number of uses recorded by the survey.

- If all respondents have the same knowledge of the species, the value of the index is maximum and equal to DImax=Log2n where log designates the natural logarithm and n is the total number of respondents. Diversity is low when DI≤3; average if DI is between 3 and 4; then raised when DI≥4.
- The Fairness Index (EI) of knowledge of respondents. By equity index, we mean the ratio between real diversity and maximum theoretical diversity [22]. According to the same source, this index is calculated from the following formula:

$$EI = DI/DImax$$

DImax=log2n
EI= Index of equitability of knowledge of respondents
DI=Diversity index of knowledge of respondents
Max DI=Maximum Knowledge Diversity Index

The EI varies between [0; 1] and makes it possible to measure the degree of homogeneity of the knowledge of the respondents. If IE <0.5 the diversity of respondents' knowledge is not homogeneous but if IE≥0.5 this diversity is homogeneous; this means an equitable distribution of knowledge within the populations surveyed for the use of the species.

These indices were calculated according to the gender and age groups of the population surveyed. The age classes proposed by [23] were used.

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$$RCF = S/N \times 100$$

- *S: the number of people who provided an answer in relation to a given use of products from the species studied.*
- *N: total number of people interviewed.*
- *The Use Value of [24] modified by [25]. This index makes it possible to evaluate the importance of a plant in a community of populations surveyed. The use value of each organ was calculated by the said formula which is*:

$$UV = \sum_{i=1}^{In} Ui/n$$

Ui = the number of uses that each respondent knows per organ of the species studied.
n= the total number of informants interviewed.

III. RESEARCH RESULTS

The results of the research presented in this study relate respectively to the age structure and distribution according to the ethnic groups of the people surveyed, the ethnobotanical knowledge of the populations on the species and the product uses of *Ceiba pentandra (L.) Gaertn.*

A. Age structure and distribution according to the ethnic groups of the people surveyed

The number of people surveyed is 267 people, 33% of whom are women and 77% men. These respondents belong to the following ethnic groups: Bobofing, Bobowulé or Bwaba, Bobodioula, Peulh, Mossi. They have an average age of 57 years old and 89.51% of them are illiterate. In addition to the representatives of local authorities and forest services, the people surveyed are divided into several socio-professional categories. These are traditional leaders, blacksmiths, breeders, traditional healers and religious leaders.

In addition to the results related to the age structure and the distribution according to the ethnic groups of the people surveyed, the study deals with the ethnobotanical knowledge of the populations on the species.

B. Ethnobotanical knowledge of the populations on the species

The results (Table 1) show that the value obtained (DI = 0.44) for men is higher than that for women (DI = 0.23).

Table 1: Diversity Indices (DI) and Equitability Indices (EI) of knowledge on the use of the species by respondents

Sex	DI	EI
Men	0,44	0,18
Women	0,23	0,1
Global	0,67	0,28
Age		
Youth (≤30years)	0,16	0,07
Adult (31-60 years)	0,22	0,09

Source : study data

Knowledge about the use of the species is considerable for men (EI=0.18) compared to women (EI=0.1). The overall values of diversity of use of the species studied as well as those of the equitability of knowledge on the use of the species according to sex are respectively 0.67<0.5.

Table 2 allows us to know the local names of the space according to the ethnic groups in our research area.

Table 2: Local names of Ceiba pentandra (L.) Gaertn according to ethnic groups in the study area

Ethnic groups	Local names	Meaning
Bobodioula	Prêe-Prôo	fast growing tree
Bobofing	Prêe-Prôo	fast growing tree
Bobowulé	Djâa	Big tree
Bwaba	Tchâamou	Tree indicating a village by its height
Bwaba	Tchônou	Big tree
Dafing	Banan yiiri	Tree that cures many diseases
Dafing	Bamba	Big tree
Mossi	Gunga	
Peulh	Bâtinée	

Source : study data

According to Table 2 above, the local names of the species vary from one ethnic group to another in the study environment.

Apart from taking into account the ethnobotanical knowledge of the populations on the species, the study addresses the uses of the products of *Ceiba pentandra (L.) Gaertn.*

C. Uses of Ceiba pentandra (L.) Gaertn products

The uses made of the products of *Ceiba pentandra (L.) Gaertn,* by the local populations are diverse and varied (figure 1).

Fig 1: Proportions of responses related to the different categories of use of *Ceiba pentandra (L.) Gaertn* products in Banwa province
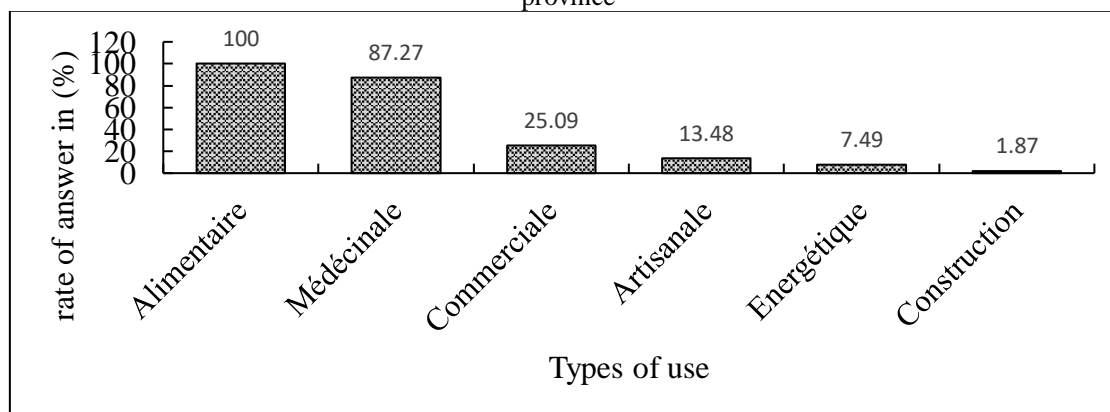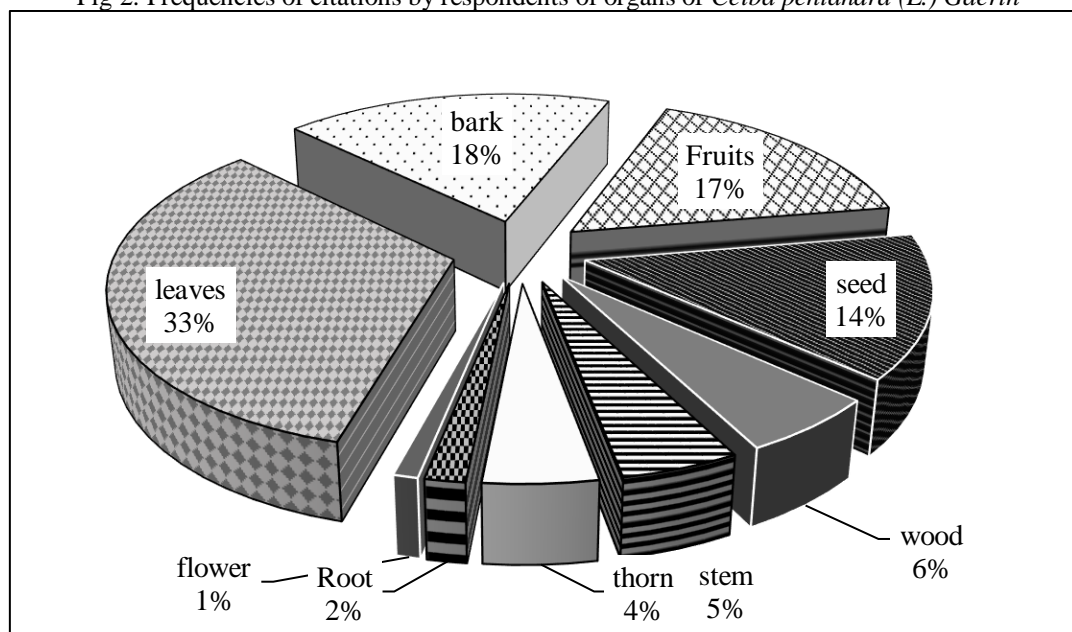

Source : study data

6 categories of uses of *Ceiba pentandra (L.) Gaertn* were mentioned by the respondents. Furthermore, the frequencies of citation of the uses of each vegetative organ of *Ceiba pentandra (L.) Gaertn* made it possible to highlight the most used organs (figure 2).
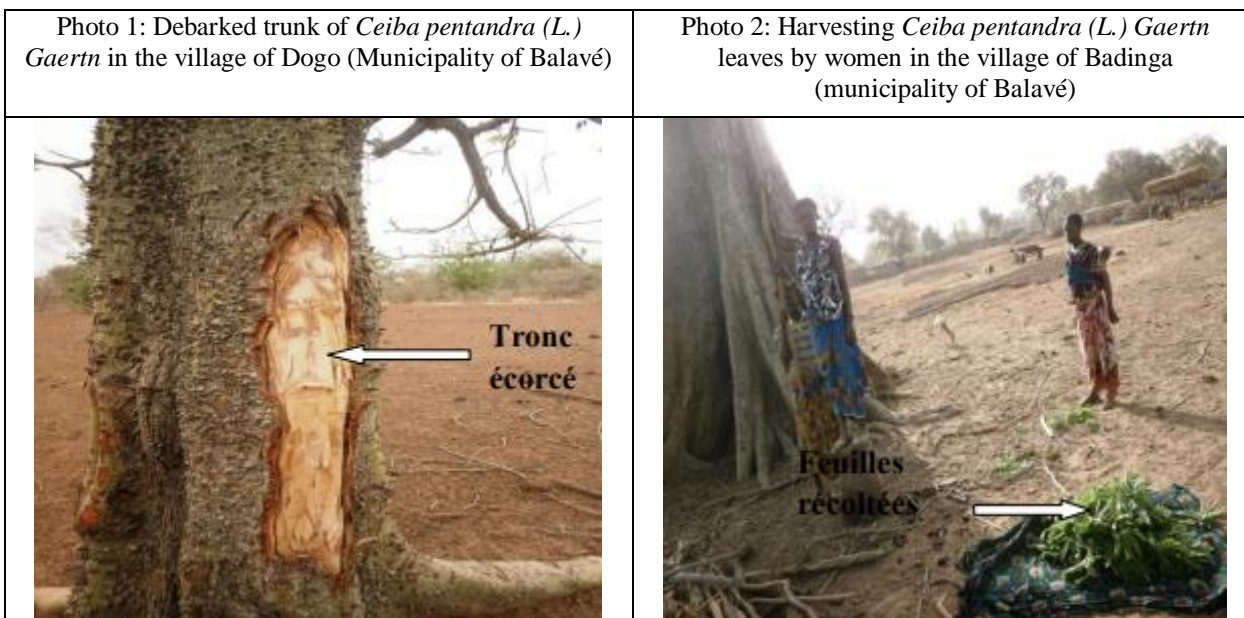
Fig 2: Frequencies of citations by respondents of organs of *Ceiba pentandra (L.) Gaertn*

Source: study datav

The results in Figure 2 show that the leaves (33.13%) and the bark (18.47%) are the most used. The results show that the organs of *Ceiba pentandra (L.) Gaertn* most cited by the respondents and therefore the most removed by the population, are the bark (photo 1) and the leaves (photo 2).

Photo 1: Debarked trunk of *Ceiba pentandra (L.) Gaertn* in the village of Dogo (Municipality of Balavé)	Photo 2: Harvesting *Ceiba pentandra (L.) Gaertn* leaves by women in the village of Badinga (municipality of Balavé)
A. Traoré's cliche	*Tronc écorcé means debarked trunk*

The results of the study reveal that the most used organs of *Ceiba pentandra (L.) Gaertn* are the leaves (VUorg =1.40) and the barks (VUorg =0.78) as shown in Table 3.

Table 3: Values of the indices of use of the different organs of *Ceiba pentandra (L.) Gaertn* cited by the respondents

Organs	Values of use
Leaves	1,4
Bark	0,78
Fruits	0,7
Seed	0,6
Wood	0,24
Stems	0,2
thorn	0,19
roots	0,07
Flowers	0,04

Source : study data

Table 3 which presents the values of the indices of use of the various organs of *Ceiba pentandra (L.) Gaertn* cited by the respondents according to the use values. The use of certain organs such as flowers, fruits (pods) and seeds can be harmful to the survival of the species if their harvest is not accompanied by precaution. The people met are in favor of the rehabilitation of *Ceiba pentandra (L.) Gaertn* in the Banwa province because of its socio-cultural, socio-economic and ecological importance.

The results of the study presented in this part are the subject of a discussion in relation to the literature review in the rest of the study.

IV. DISCUSSION OF THE RESEARCH RESULTS

The discussion of the results of the study concerns on the one hand, the diversity of knowledge on the species, and on the other hand, the health and food orientation of the uses of the species studied.

A. Varieties of knowledge about the species

The values of the indices of diversity and equitability of community knowledge of the species are low. This indicates an unequal distribution of knowledge among respondents. Indeed, a small group of respondents retain most of the knowledge about the species. The values of the diversity and equitability indices reveal that men have more knowledge about the species than women. Thus, knowledge of *Ceiba pentandra (L.) Gaertn* in the study area varies widely according to gender and age.

These results are comparable to those of [26], by [27] and [28] obtained with other species that have been the subject of similar studies. These are respectively *Artocarpus* altilis, Mansonia altissina and *Chrysophyllum albidum*. For example, [26] revealed that informants know about *Artocarpus* altilis with an unequal distribution of knowledge from a gender perspective (DI and EI men=0.05 and 0.53 versus DI and EI women=0.04 and 0.49).

Moreover, in the study area, the elderly (age >60 years) have more knowledge of the species, as evidenced by the values of the relatively high diversity and equitability indices. This knowledge could be explained by the long experience accumulated on the plant by the elderly. According to [29], the experience accumulated with age is the main source of information at the local level about the use of plants.

As for the local names of *Ceiba pentandra (L.) Gaertn*, each ethnic group gives at least one name to designate the species. These names symbolize many realities and assume the existence of a long history with the species in the study area. The literature reports that other localities take their name from plants. The case of Vudome or Hountigome, a locality in the Ouatchi environment whose name means "under *Ceiba pentandra (L.) Gaertn*." [30]. This is also the case of the village of Bananrodougou (village of cheesemakers) located in the municipality of Bama, about twenty kilometers from Bobo-Dioulasso in Burkina Faso.

B. Health and food orientation of uses

The uses made of *Ceiba pentandra (L.) Gaertn* by the populations in the province of Banwa are diverse. All the interviewees report the food use of the species. This may be linked to the interest in this use. On this point, [12] report similar findings from this food use. These authors report the use of the leaves of the species in cooking.

As for the types of diseases treated by the species, they are varied in the study area. This could be related to its spectrum of use and for the diversity of its parts taken for medicinal purposes. Moreover, several of these diseases (fever, mental illnesses, conjunctivitis, abscess, paronychia, cough, malaria, diarrhea, hemorrhoids, female sterility) are cured by the plant as mentioned by [31] and [32]. However, the literature indicates other diseases cured by parts of the species and which are not revealed by the present study. According to [33], the plant treats growth retardation in children. Also, studies have listed *Ceiba pentandra (L.) Gaertn* as a plant used by the population in Congo Brazzaville in the treatment of gastroduodenal ulcers [34].

Regarding ethnobotanical use values, leaves and bark are used more. This could be explained by the preference of the organs sought. This result is confirmed by [32] who reveal that the leaves of *Ceiba pentandra (L) Gaertn* are used as vegetables in cooking. The same source reports that the bark is galactagogue, febrifuge and aphrodisiac. It can treat female sterility, cough, malaria, diarrhea, gastralgia, dental caries, gingivitis, etc.

These results presented above show that *Ceiba pentandra (L) Gaertn* is a very useful plant with regard to its wide range of uses.

V. CONCLUSION

This study on the use of *Ceiba pentandra (L.) Gaertn* by the sociolinguistic communities of the province of Banwa, in Burkina Faso reveals the interest that these groups give to the species.

Knowledge of the species is linked to the profile of the person interviewed. Thus, people of advanced age, especially men, know the species. This shows the work that needs to be done so that young people also know about the species and especially its virtues. Indeed, the study also shows that *Ceiba pentandra (L.) Gaertn* is used by sociolinguistic communities for food, health care, commerce, crafts, energy needs and construction. These different solicitations concern organs of the species. These are the leaves, barks, fruits, seeds, wood, stems, thorns, roots and flowers. The use of certain organs such as flowers, fruits (pods) and seeds can be harmful to the survival of the species if their harvest is not accompanied by precaution. Consequently, the people met are in favor of the rehabilitation of *Ceiba pentandra (L.) Gaertn* in the Banwa province because of its importance on the socio-cultural, socio-economic and ecological levels.

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