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Floristic Diversity and Vulnerability of Plant Species Providing Non-Timber Forest Products in the Kabadougou Region, Northwestern Côte d'Ivoire

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Authors' contributions

This work was carried out in collaboration among all authors. Author IK was responsible for the study design, methodology, surveys, statistical analyses, and drafting of the manuscript. Author DS was responsible for the study design, supervision, and approval. Author DK was responsible for revising the manuscript and providing approval. Author YK was responsible for processing the map showing the study site and statistical analyses. All authors read and approved the final manuscript.

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Abstract

Objectives: The high demand for wild plants has led to the overexploitation of several species. This raises the issue of conserving plant species in the face of risks of biodiversity loss and extinction. This study aims to promote the sustainable use of species providing non-timber forest products in the Kabadougou region**.**

Methodology and Results: Before the study began, institutional and local ethical approval was required. The interviews were voluntary and conducted after the participants had given their informed consent. An ethnobotanical survey was conducted with 137 participants through focus groups and individual interviews on the uses of exploited non-timber forest products (NTFPs). The analysis mainly focused on the use value (UV) and vulnerability index (VI) of the plants. It made it possible to identify 80 species belonging to 34 botanical families. The Fabaceae (29.88%) and Rubiaceae (9.47%) families were the most frequently mentioned. The majority of NTFPs were used for medicinal purposes (54.73%). Leaves (41.72%) were the most frequently used plant organ. Malaria (15.95%) and ulcers (12.16%) were the most frequently mentioned diseases**.** The study revealed that the most used species were *Parkia biglobosa* (UV = 0.26), *Nauclea latifolia* (UV = 0.22), *and Diospyros mespiliformis* (UV = 0.20), whereas the most threatened species were *Pterocarpus erinaceus* (VI = 3.17), *Parkia biglobosa* (VI = 3.08), and *Khaya senegalensis* (VI = 2.81). The Spearman correlation test between the UV and VI of the inventoried species showed a positive correlation (rho = 0.32; *P*value < 0.05).

Conclusions and Application of the Results: The NTFP source species that are most in demand are also the most threatened in the Kabadougou region. Promoting these species could help improve sustainable and community-based management of these resources by local populations.

Keywords: Kabadougou; NTFPs; promotion; use value; vulnerability.

1. Introduction

Since the dawn of humanity, people have lived off natural resources (N'Guessan *et al*., 2009). These resources play many important socioeconomic and environmental roles, particularly in poverty reduction, food security, and medicine (Vanié-Bi *et al*., 2021; Soro *et al*., 2023; Ouattara *et al*., 2025). These resources directly contribute to the livelihoods of nearly 90% of people living in extreme poverty (Food and Agriculture Organization of the United Nations [FAO], 2010). They play an economic, social, and cultural role (Ehinnou Koutchika *et al*., 2014; Dje *et al*., 2017). The harvesting of NTFPs depends on the floristic composition of plant communities and the intensity of harvesting (Segnon & Achigan-Dako, 2014). It can become harmful if it exceeds the tolerable threshold for the renewal and regeneration of the resources being used (Mehdioui & Kahouadji, 2007).

Recent quantitative ethnobotanical work in the West African Sahel has likewise documented multiple use categories and harvesting pressures affecting a multipurpose tree species, supporting the value of jointly considering local use and conservation concerns (Mourtala et al., 2026). Evidence from medicinal-plant conservation research also emphasises sustainable harvesting from wild populations where valued species face conservation pressure (Rana et al., 2024).

In Côte d'Ivoire, the availability of species that are sources of non-timber forest products (NTFPs) is a cause for concern (Ouattara *et al*., 2016; Kouakou, 2019). High demand has led to overexploitation and unregulated, destructive harvesting of these resources (Ntiamoa-Baidu, 1997; Kouakou *et al*., 2017). Many species of wild plants with practical uses have disappeared or become scarce, primarily over the last century (Betti, 2001; Djaha & Gnahoua, 2014). According to Segnon & Achigan-Dako (2014), their natural regeneration is low.

Recent studies further show that NTFPs can contribute materially to rural livelihoods while requiring management approaches that maintain the resource base: market evidence from Burkina Faso supports local domestication of NTFP-producing species, while forest-conservation research has highlighted the need to target interventions where NTFP-dependent livelihoods and forest loss interact (Nabaloum et al., 2025; Ehara et al., 2023).

However, the available literature does not sufficiently quantify, within the Kabadougou region, how local patterns of NTFP use relate to species-level vulnerability using complementary ethnobotanical indicators. This limits the evidence available for prioritising species that may require locally adapted sustainable-use measures.

In the Kabadougou region, the population is heavily dependent on agriculture. Some of the poorest households continue to rely on wild species to meet their needs by foraging in the bush (High Level Panel of Experts on Food Security and Nutrition, 2017). There is little literature addressing quantitative ethnobotanical aspects, including the use and vulnerability of these species in relation to demand (Ambé, 2001; Ouattara *et al*., 2016; Amani *et al*., 2019). Their status and the habitats where they occur necessitate protection (Ouattara *et al*., 2016). In this context, the valorisation of non-timber forest products (NTFPs) emerges as an alternative strategy to sustainably strengthen efforts to combat food insecurity and the destruction of biodiversity. The current study assumes that species that are heavily used could face even more pressure due to exploitation. The overall objective is to contribute to the development of non-timber forest products (NTFPs) with a view to sustainable and participatory management by local communities. More specifically, the study aims to document the diversity and ethnobotanical value of plant species and to assess the vulnerability of NTFP-producing species in the Kabadougou region.

2. Materials and Methods

2.1 Study Area

The Kabadougou region is one of the components of the Denguélé District in northwestern Côte d'Ivoire. The geographical coordinates are 9.504431 North latitude and -7.561942 West longitude. It borders the Bafing and Worodougou regions to the south and the Folon region to the north (Fig. 1). To the east, it is bordered by the Bagoué region, and to the west by the Republic of Guinea (Pinatibi *et al*., 2015). Its total area is estimated at 13.758 km² (Institut National de la Statistique, 2015). It comprises five (5) departments, namely Odienné, Samatiguila, Madinani, Gbéléban, and Séguélon, and fifteen (15) subprefectures. The climate is of the Sudanese type. It is characterised by a hot, dry wind (the harmattan) that causes dust storms from January to February. Annual rainfall ranges from 1.000 to 1.700 mm, and the mean temperature is around 29 °. The rainy season runs from April to October. The dry season (November to March) is characterised by the harmattan. The study area is located in the sub-Sudanese region. The terrain is mountainous. The vegetation consists of savannas (wooded, shrubby, and grassy) dotted with forest patches. Agriculture is the main source of livelihood for the local population, particularly the production of cotton and cashews for export (Tiécoura, 2023).

2.2 Ethnobotanical Survey

An ethnobotanical survey was conducted with one hundred and thirty-seven (137) participants through sixteen (16) focus groups and individual interviews. Survey forms were used.

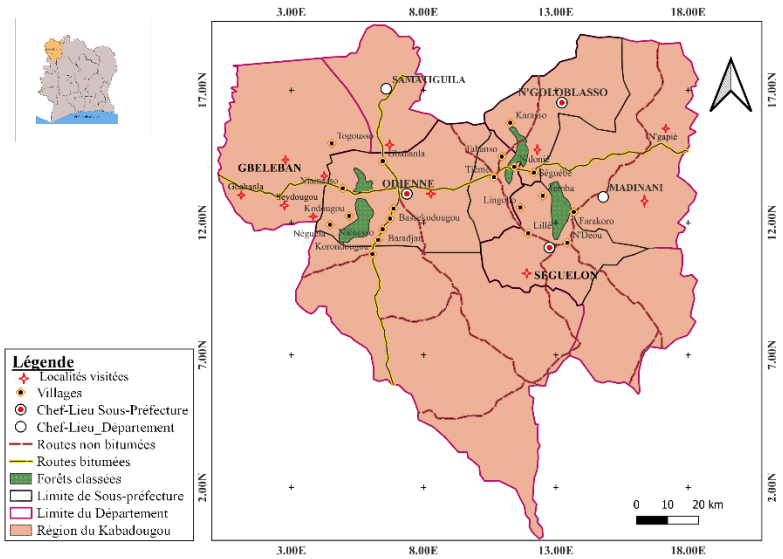

Fig. 1. Map showing the study site. Source: Koné, 2024

The questionnaire was sent to anyone who could provide information on non-timber forest products (NTFPs), including NTFP users, consumers, traders, traditional healers, and/or practitioners of traditional medicine. The questions focused on the uses of the plants; the plant organ used; the species used; the mode of procurement; and the ailments treated. Photographs were taken and samples of certain products were collected for species identification in the laboratory. Identification was performed according to the APG IV phylogenetic classification system. The identification of diseases according to modern medicine was based on clinical symptoms and signs, with the assistance of healthcare professionals (general practitioner, paediatrician, and midwife) from the Odienné Regional Hospital Centre.

2.3 Statistical Analysis

2.3.1 Frequency of Mention of the Species (F)

This measure was used to identify the most significant plants. These plants were mentioned by several informants. It was calculated using Monnet's (2013) formula.

$$F = \frac{n}{N} * 100$$

Where: (n) is the number of respondents who mentioned the species, and (N) is the total number of people surveyed during the study.

2.3.2 Species Vulnerability Index (VI)

This index was used to determine the level of vulnerability of the inventoried species. It is based primarily on the pressures on the species and their organs (Betti, 2001; Traoré *et al*., 2011). It was calculated using the average of four parameters: the frequency of

mention of the species (F); the number of uses in which the species is found (P2); the plant organ used (P3); and the mode of procurement (P4), according to the following formula:

$$VI = \frac{F + P2 + P3 + P4}{4}$$

The value of each parameter (P) ranges from 1 to 3 according to the vulnerability scale (Table 1). The VI is interpreted as follows: for VI < 2, the species is considered to be lowly vulnerable; for 2 ≤ VI < 2.5, the species is moderately vulnerable; and for VI ≥ 2.5, the species is highly vulnerable (Traoré *et al*., 2011).

Table 1. Key parameters used to calculate the vulnerability index (Betti, 2001; Traoré *et al*., 2011)

Selected parameter	Lowly (Scale = 1)	Moderate (Scale = 2)	High (Scale = 3)
Frequency of mention: F	F < 5 %	5 % ≤ F < 15 %	F ≥ 15 %
Number of uses: P2	P2 < 2	2 ≤ P2 ≤ 4	P2 ≥ 5
Plant organ used: P3	leaves, latex	fruits	wood, seeds, bark, roots, flowers
Mode of procurement: P4	curbside pickup		harvesting, butchering

2.3.3 Use Value (UV)

This measure was used to determine the level of exploitation of the inventoried species, which are therefore subject to significant anthropogenic pressure (Dossou *et al*., 2012). Thus, the higher the use value, the more the species is exploited. It was calculated using Cotton's (1996) simplified formula**:**

$$UV = \sum_{i=1}^{in} \frac{Ui}{N}$$

Where, Ui: number of uses mentioned by informants, N: total number of informants.

The Shapiro-Wilk test was used to assess whether the data were normally distributed. Normality was not confirmed. A Spearman correlation analysis was conducted to examine the correlation between use value (UV) and vulnerability index (VI) using R/RStudio 4.5.2, with a significance level of 5%. All 80 species were included in the Spearman correlation test and the regression model.

3. Results

3.1 Diversity of Non-timber Forest Products

The survey identified 80 species belonging to 34 botanical families. The most common family was Fabaceae (29.88%), followed by Rubiaceae (9.47%). The Capparaceae, Asteraceae, and Arecaceae families were the least common, each accounting for 0.15% (Fig. 2).

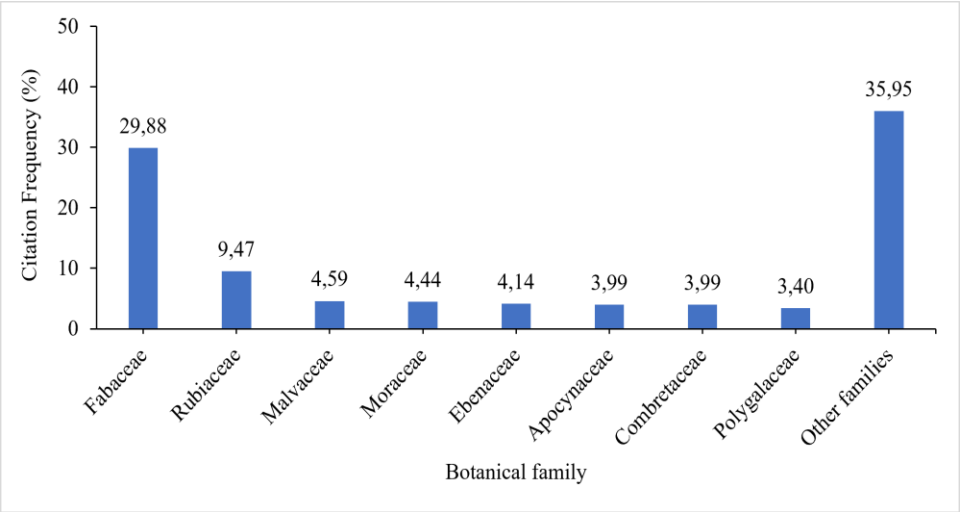

Fig. 2. Citation frequency of the families of species recorded in the Kabadougou region

3.2 Types of NTFPs Collected and Their Uses

The breakdown by plant organ showed that leaves were the most commonly used part, accounting for 41.72%, followed by fruits (21.75%) and bark (13.02%). Sap (0.74%) and flowers (0.30%) were the least frequently cited (Fig, 3).

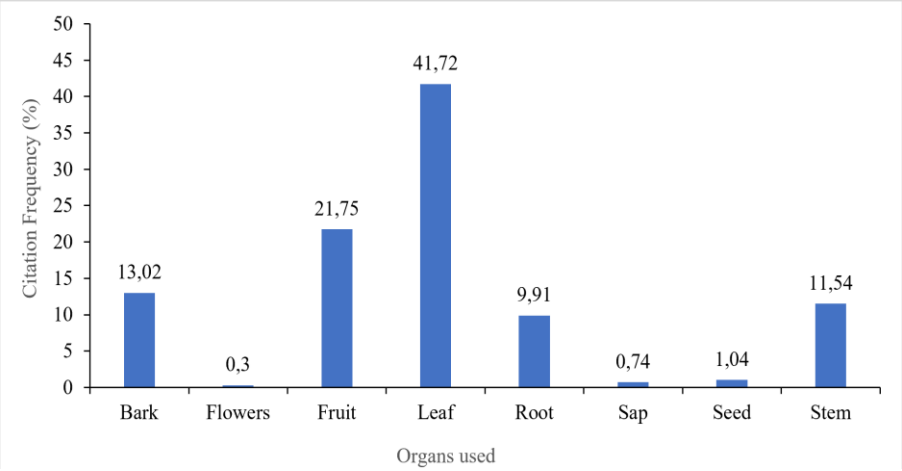

Fig. 3. Proportion of plant organs used

This study identified nine categories of NTFP use. These included medicinal use (54.73%), food (19.81%), and magical-spiritual use (11.24%). Cosmetic use (0.89%) and textile use (1.18%) were the least common (Fig. 4).

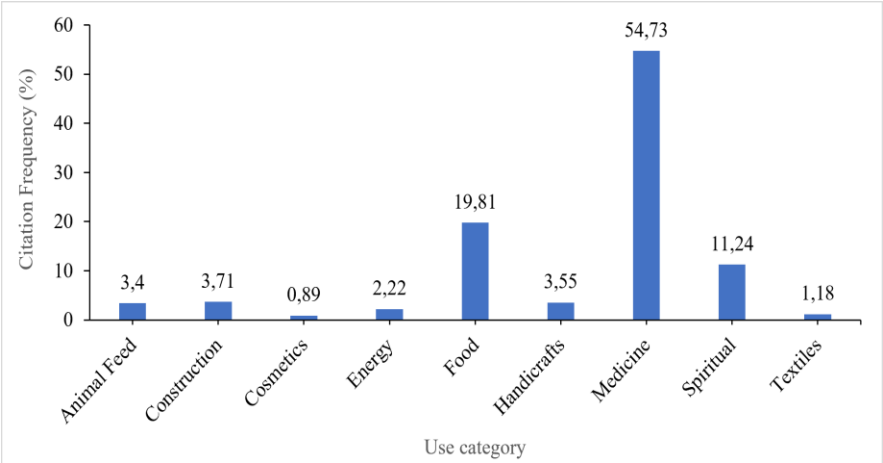

Fig. 4. Proportion of use of various NTFPs by category of use

The predominance of medicinal use allowed for further exploration of medicinal non-timber forest products in the remainder of this study. Thus, when considering therapeutic indications, malaria (15.95%) and ulcers (12.16%) were the most commonly treated conditions. Rheumatism (1.62%) and hypertension (0.54%) were cited less frequently (Fig. 5).

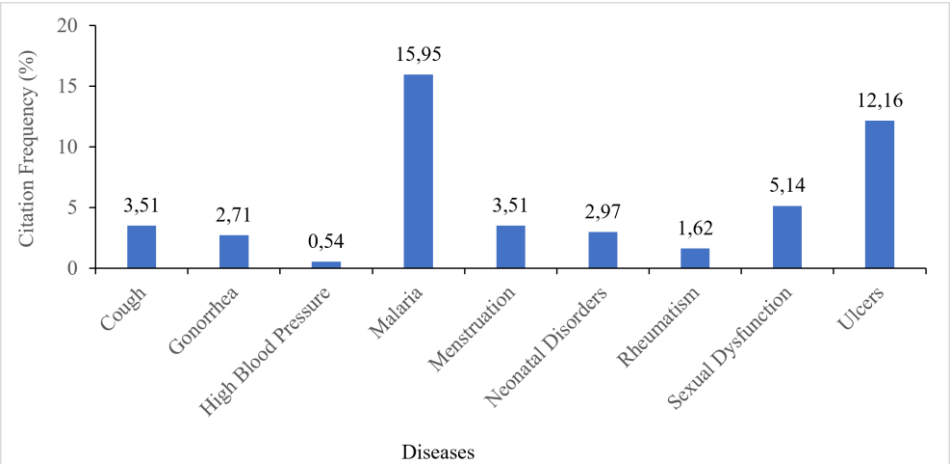

Fig. 5. Main therapeutic indications for non-timber forest products used for medicinal purposes

3.3 Vulnerability and Use Value of Non-timber Forest Product (NTFP) Species

Analysis of the use value of the inventoried species showed that it ranged from 0.01 to 0.26. The species with the highest use values were *Parkia biglobosa* (UV = 0.26), *Nauclea latifolia* (UV = 0.22), and *Diospyros mespiliformis* (UV = 0.20). The other species had a use value of 0.18 or less. As for the vulnerability index, it ranged from 3.17 to 0.79. The most threatened species were *Pterocarpus erinaceus* (VI = 3.17), *Parkia biglobosa* (VI = 3.08), and *Khaya senegalensis* (VI = 2.81). Other species had a vulnerability index of 2.42 or less (Table 2). The study revealed that 58 species were lowly vulnerable, 19 species were moderately vulnerable, and 3 species were highly vulnerable.

Table 2. The frequency of mention and vulnerability indices of the top 10 most heavily exploited NTFP source species in the Kabadougou region

Species	Frequency of mention (F)	Use value (UV)	Vulnerability index (VI)
Parkia biglobosa	5.33	0.26	3.08
Nauclea latifolia	4.44	0.22	2.11
Diospyros mespiliformis	4.14	0.20	2.04
Pterocarpus erinaceus	3.70	0.18	3.17
Xeroderris stuhlmannii	3.55	0.18	1.89
Securidaca longipeduncalata	3.25	0.17	1.81
Blighia sapida	3.25	0.16	2.06
Khaya senegalensis	3.25	0.16	2.81
Opilia celtidifolia	3.25	0.16	1.81
Saba senegalensis	3.11	0.15	1.78

3.4 Correlation between Use Value and Vulnerability Index

Spearman's correlation analysis revealed a positive and significant relationship between the use value of species and their vulnerability index (rho = 0.32; *P*value = 1.11e-6 < 0.05). Each data point represents a surveyed species, and the line indicates the linear regression line. Along the horizontal axis (UV), the most heavily exploited species are located further to the right, while along the vertical axis (VI), the most threatened species are located higher up. The species most heavily utilised by local populations and exhibiting a higher level of vulnerability are *Khaya senegalensis, Parkia biglobosa,* and *Pterocarpus erinaceus*. The other species exhibit relatively low levels of pressure and vulnerability (Fig. 6). Overexploitation resulting from the use of these species contributes to their decline.

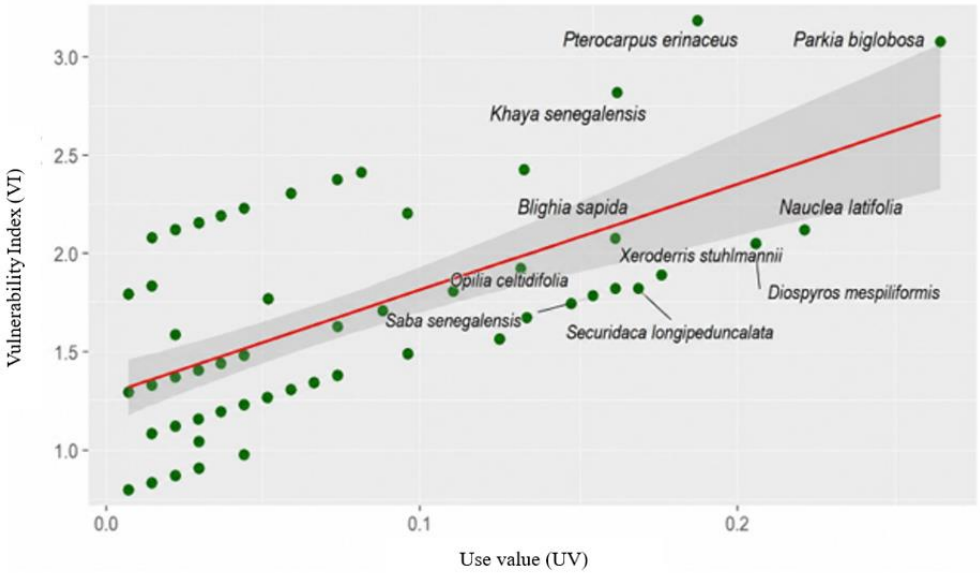

Fig. 6. Correlation matrix between use value and vulnerability index of NTFP source species inventoried in the Kabadougou region

(rho = 0.32; Pvalue = 1.11^{e-6} < 0,05)

4. Discussion

The survey identified eighty (80) species of non-timber forest products. This high number may be explained by the fact that local communities in the Kabadougou region have a good understanding of the natural environment. Similar findings have been reported

by other authors (N'Guessan et al., 2009; Ouattara *et al*., 2016). However, the work of Portères (1935) reported a higher number of species.

Studies on non-timber forest products (NTFPs) in Côte d'Ivoire have reported that the Fabaceae family and its leaves are highly represented (Ouattara *et al*., 2016; Kouakou *et al*., 2017; Bédiakon *et al*., 2018; Ouayogodé *et al*., 2021; Ouattara *et al*., 2025). The harvesting of leaves is justified by the fact that they serve as storage sites for the secondary metabolites responsible for the plant's properties and by their ease of access for users (Konan, 2012).

The fact that medicinal use is predominant may explain why, in Côte d'Ivoire, traditional medicine serves as the cornerstone of primary health care for the majority of the population (Organisation mondiale de la Santé & United Nations Children's Fund, 2005) and why malaria remains a major public health problem (Programme National de Lutte contre le Paludisme, 2005). As for gastroduodenal ulcers, they are conditions regularly treated by traditional healers (Béné *et al*., 2016; Sidio & N'Guessan, 2019).

The high ethnobotanical use value (UV) of *Parkia biglobosa*, *Nauclea latifolia*, and *Diospyros mespiliformis* could be explained by their ability to meet the needs of local populations across various categories of use. Elsewhere in Africa and in Côte d'Ivoire, these species have been reported as being much more heavily utilised across various use categories. According to Guigma *et al*. (2012) and Yaovi *et al*. (2021), each specimen collected has a negative impact on the species' survival.

In ecological terms, the predominance of the Fabaceae family could be explained by its strong presence in the Kabadougou region. The region features shallow, iron-rich soils that are low in organic matter. Despite these constraints, the ability to fix atmospheric nitrogen through symbiosis with soil bacteria gives the Fabaceae a competitive adaptive advantage over species from other botanical families. From an ethnobotanical perspective, this may be attributed to indigenous perceptions and knowledge. Several species in this family, such as *Parkia biglobosa*, *Pterocarpus erinaceus,* and *Khaya senegalensis,* have multiple parts and offer a wide range of uses, including food, medicine, timber, and fodder. Similar results have been reported in several studies in West Africa (Traoré *et al*., 2011; Samaké *et al*., 2023). According to these authors, the Fabaceae family plays a central socio-ecological role in Sudanese agricultural systems.

The calculation of vulnerability indices revealed that 3.75% of the species surveyed were at high risk of vulnerability. This could be explained by the fact that when the ethnobotanical use value of a species with low abundance is high, it may reflect high pressure on that species (Allabi *et al*., 2011). These species are cited in several medicinal recipes. This analysis is corroborated by several authors (Dro *et al*., 2013; Ouattara *et al*., 2016; Yaovi *et al*., 2021). The significant and positive correlation does indeed show that use value influences the species' vulnerability. Thus, the overexploitation of non-timber forest products is a major factor contributing to vulnerability. This could lead to the depletion and/or extinction of these wild plants. Similar observations have been made in Tunisia and the DRC (Jdaidi *et al*., 2023; Mbuli Boliko *et al*., 2026).

This study has several limitations. The surveys were conducted over a single period, which did not account for seasonal variations in the availability and use of NTFPs. The ethnobotanical data, based on respondents' statements, may be subject to memory bias or overestimation of certain species with high symbolic value. The vulnerability index used is based on community perceptions and exploitation patterns. To address these limitations, field ecological data such as species density and regeneration rates could refine the assessment of the actual risk of extinction.

5. Conclusion

The ethnobotanical survey documented 80 plant species from 34 botanical families that provide non-timber forest products in the Kabadougou region. Medicinal applications constituted the largest use category, and leaves were the plant organs most frequently harvested. Parkia biglobosa, Nauclea latifolia, and Diospyros mespiliformis had the highest reported use values, whereas Pterocarpus erinaceus, Parkia biglobosa, and Khaya senegalensis had the highest vulnerability indices. The positive relationship between use value and vulnerability indicates that species subject to greater local use may also experience greater harvesting pressure. These findings provide baseline ethnobotanical evidence for identifying species that warrant attention in local resource management. Sustainable harvesting and participatory management should therefore consider both the intensity of use and the vulnerability of NTFP-producing species. Within the scope of the study, such an approach may help maintain the availability of plant resources over the longer term while supporting their continued use by local communities in the Kabadougou region.

6. Limitation

The study was conducted during a single survey period and therefore did not capture seasonal variation in NTFP availability or use. The ethnobotanical information was based on respondents' statements and may be affected by memory bias or overestimation of species with high symbolic value. In addition, the vulnerability index reflects community perceptions and exploitation patterns. Complementary field data on species density and regeneration rates could strengthen future assessments of species vulnerability.

Consent

The interviews were conducted with the free and informed consent of the participants.

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Declaration of AI Use

This manuscript was prepared through the combined contributions of all author(s), including contributions to the study design, data, content development, results, interpretation, and related scholarly work. The author(s) acknowledge the use of Grammarly and ChatGPT to assist with grammar checking, language refinement, and reference formatting. These AI-assisted tools were not used as authors and did not replace the intellectual contributions or scholarly judgment of the author(s). All AI-assisted outputs, including content, references, and interpretations, were carefully reviewed, revised, verified, and approved by the author(s). The author(s) accept full responsibility for the accuracy, integrity, and final content of the manuscript.

Competing Interests

Authors have declared that they have no known competing financial interests or non-financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

Allabi, A. C., Busia, K., Ekanmian, V., & Bakiono, F. (2011). The use of medicinal plants in self-care in the Agonlin region of Benin. *Journal of Ethnopharmacology, 133*(1), 234–243. https://doi.org/10.1016/j.jep.2010.09.028

Amani, K. D. S. S., Kouassi, F. A., & Aké-Assi, E. A. (2019). Floristic diversity of plants with ornamental potential from natural vegetation formations in northern Côte d'Ivoire. *European Scientific Journal, 15*(15), 46–63. https://doi.org/10.19044/esj.2019.v15n15p46

Ambé, G.-A. (2001). Edible wild fruits of the Guinean savannas of Côte d'Ivoire: State of knowledge among a local population, the Malinké. *Biotechnologie, Agronomie, Société et Environnement, 5*(1), 43–58. https://popups.uliege.be/1780-4507/index.php?id=15005

Bédiakon, B. K. D., Beugré, G. A. M., Yao, K., & Ouattara, D. (2018). Ethnobotanical survey of wild edible plants in the Agboville department (Côte d'Ivoire). *International Journal of Scientific & Engineering Research, 9*(11), 1843–1856. https://www.ijser.org/research-paper-publishing-november-2018_page5.html

Béné, K., Camara, D., Fofie, N. B. Y., Kanga, Y., Yapi, A. B., Yapo, Y. C., Ambé, S. A., & Zirihi, G. N. (2016). Ethnobotanical study of medicinal plants used in the Transua Department, Zanzan District (Côte d'Ivoire). *Journal of Animal & Plant Sciences, 27*(2), 4230–4250. https://www.m.elewa.org/Journals/japs-27-2-december-2015/

Betti, J. L. (2001). Vulnerability of plants used as anti-malarials in the Mintom district south of the Dja Biosphere Reserve (Cameroon). *Systematics and Geography of Plants, 71*(2), 661–678. https://doi.org/10.2307/3668709

Cotton, C. M. (1996). *Ethnobotany: Principles and applications*. John Wiley & Sons.

Djaha, A. J. B., & Gnahoua, G. M. (2014). Contribution to the inventory and domestication of wild food species in Côte d'Ivoire: The case of the Agboville and Oumé departments. *Journal of Applied Biosciences, 78*, 6620–6629. https://doi.org/10.4314/jab.v78i1.8

Dje, B. D. P. V., Koffi, J. K., Vroh, B. T. A., Kpangui, K. B., & Adou Yao, C. Y. (2017). Exploitation and socio-economic importance of Chinese bamboo, *Bambusa vulgaris* Schrad. ex J. C. Wendl. (Poaceae), in the Agnéby-Tiassa region: The case of the Azaguié Sub-prefecture (southeastern Côte d'Ivoire). *International Journal of Biological and Chemical Sciences, 11*(6), 2887–2900. https://doi.org/10.4314/ijbcs.v11i6.26

Dossou, M. E., Houessou, G. L., Lougbégnon, O. T., Tenté, A. H. B., & Codjia, J. T. C. (2012). Ethnobotanical study of woody forest resources in the Agonvè swamp forest and adjacent areas in Benin. *Tropicultura, 30*(1), 41–48.

Dro, B., Soro, D., Koné, M. W., Bakayoko, A., & Kamanzi, K. (2013). Assessment of the abundance of medicinal plants used in traditional medicine in northern Côte d'Ivoire. *Journal of Animal & Plant Sciences, 17*(3), 2631–2646. https://www.m.elewa.org/JAPS/2013/17.3/Abstract6-kone.html

Ehara, M., Matsuura, T., Gong, H., Sokh, H., Leng, C., Choeung, H. N., Sem, R., Nomura, H., Tsuyama, I., Matsui, T., & Hyakumura, K. (2023). Where do people vulnerable to deforestation live? Triaging forest conservation interventions for sustainable non-timber forest products. *Land Use Policy, 131*, 106637. https://doi.org/10.1016/j.landusepol.2023.106637

Ehinnou Koutchika, R. I., Salako, V. K., Tenté, B., Onodjè Agbani, P., Chougourou, D. C., Boco Adjakpa, J., & Sinsin, B. (2014). Ecological study of the sacred groves in the communes of Glazoué, Savè, and Ouessè in Benin. *Journal of Animal & Plant Sciences, 21*(3), 3313–3323. https://m.elewa.org/Journals/wp-content/uploads/2014/05/1.pdf

Food and Agriculture Organization of the United Nations. (2010). *Global forest resources assessment 2010: Main report* (FAO Forestry Paper No. 163). https://www.fao.org/4/i1757e/i1757e00.htm

Guigma, Y., Zerbo, P., & Millogo-Rasolodimby, J. (2012). Use of wild plant species in three contiguous villages in southern Burkina Faso. *Tropicultura, 30*(4), 230–235. https://biblio.ugent.be/publication/4080301

High Level Panel of Experts on Food Security and Nutrition. (2017). *Nutrition and Food Systems (Report No. 12). Committee on World Food Security*. https://www.fao.org/cfs/cfs-hlpe/publications/hlpe-12/en

Institut National de la Statistique. (2015). *Directory of Localities: Kabadougou Region* (RGPH 2014). https://ins.ci/documents/rgph/KABADOUGOU.pdf

Jdaidi, N., Selmi, H., Aloui, F., Jedidi, S., & Chaabane, A. (2023). Assessment of potential threat and vulnerability factors for medicinal and aromatic plants in northwestern Tunisia. *Moroccan Journal of Agronomic and Veterinary Sciences, 11*(1), 14–21. https://www.agrimaroc.org/index.php/Actes_IAVH2/article/view/1287

Konan, A. (2012). *The Role of Traditional Medicine in Primary Health Care in Abidjan (Côte d'Ivoire) [Doctoral Thesis]*, Université Toulouse III–Paul Sabatier].

Kouakou, K. A. (2019). *Availability and vulnerability of plant species yielding non-timber forest products in the Haut-Sassandra Classified Forest and its periphery following the decade-long crisis in the Centre-West region of Côte d'Ivoire [Doctoral thesis, Jean Lorougnon Guédé University]*. https://hdl.handle.net/20.500.12177/2613

Kouakou, K. A., Barima, Y. S. S., Zanh, G. G., Traoré, K., & Bogaert, J. (2017). Inventory and availability of non-timber forest products used by communities living near the Haut-Sassandra Classified Forest following the period of armed conflict in Côte d'Ivoire. *Tropicultura, 35*(2), 121–136. https://doi.org/10.25518/2295-8010.1219

Mbuli Boliko, V., Lubini Ayingweu, C., Biloso Moyene, A., Belesi Katula, H., & Mbala Mavinga, B. (2026). Plant-based non-timber forest products sold in the main markets of Kinshasa (DRC): Diversity, socio-economic importance, and sustainable management issues. *Revue Africaine d'Ethnobiologie & Ethnomédecine, 4*(1), 179–192. https://doi.org/10.65857/raee.026.v4.i1.48

Mehdioui, R., & Kahouadji, A. (2007). Ethnobotanical study among the population living near the Amsittène Forest: The case of the Imi n'Tlit Commune (Essaouira Province). Bulletin of the Scientific Institute, Rabat, Life Sciences Section*, 29*, 11–20. https://www.israbat.ac.ma/?page_id=257

Monnet, T. M. S. (2013). *Ethnobotanical study of antidiabetic medicinal plants sold in the markets of the Abobo commune, Abidjan District (Côte d'Ivoire)* [Mémoire de DEA, Université Félix Houphouët-Boigny].

Mourtala, Y. A., Hamissou, I. S. M., Abdoul-Latif, H. N., Soulé, M., Laouali, I. A. M., Adamou, M., Douma, S., & Idrissa, S. (2026). Ethnobotanical uses and vulnerability factors of *Vitex doniana* Sweet. in the Dosso Partial Wildlife Reserve, Niger. *Asian Journal of Research in Agriculture and Forestry, 12*(3), 139–154. https://doi.org/10.9734/ajraf/2026/v12i3519

N'Guessan, K., Tra Bi, F. H., & Koné, M. W. (2009). Ethnopharmacological study of antimalarial plants used in traditional medicine by the Abbey and Krobou peoples of Agboville (Côte d'Ivoire). *Ethnopharmacologia, 44*, 42–50. https://www.ethnopharmacologia.org/recherche-dans-prelude/?plant_id=149

Nabaloum, A., Sabo, P., Goetze, D., Sehoubo, Y. J., Ouédraogo, A., & Thiombiano, A. (2025). Availability and trade values of some non-timber forest products in local markets: Implications for the conservation of savanna ecosystems in Burkina Faso. *Economic Botany, 79*(1), 79–99. https://doi.org/10.1007/s12231-024-09627-9

Ntiamoa-Baidu, Y. (1997). *Wildlife and food security in Africa* (FAO Conservation Guide No. 33). Food and Agriculture Organization of the United Nations. https://www.fao.org/4/w7540e/w7540e00.htm

Ouattara, D., Kouamé, D., Tiébré, M. S., Cissé, A., & N'Guessan, K. E. (2016). Floristic diversity and plant uses in the Sudanian zone of northwestern Côte d'Ivoire. *Journal of Animal & Plant Sciences, 31*(1), 4815–4830. https://www.m.elewa.org/JAPS/2016/31%281%29-November.html

Ouattara, G. N. L., Silué, P. A., & Soro, D. (2025). Diversity and traditional uses of antifungal medicinal plants in the Poro region (northern Côte d'Ivoire). *International Journal of Advanced Research, 13*(12), 571–582. https://doi.org/10.21474/IJAR01/22386

Ouattara, N. D., Gaille, E., Stauffer, F. W., & Bakayoko, A. (2016). Floristic and ethnobotanical diversity of wild edible plants in the Bondoukou Department (Northeast Côte d'Ivoire). *Journal of Applied Biosciences, 98*, 9284–9300. https://doi.org/10.4314/jab.v98i1.5

Ouayogodé, A. A., Kouakou, L., Ahmont, C. L. K., N'Dri, M. A., Ayoman, T. D., Kouakou, S. G., Bamba, D. K., & Champy, P. (2021). Micrographic study and evaluation of the in vivo antiplasmodial activity of the fruit of *Picralima nitida* (Stapf) T. Durand & H. Durand (Apocynaceae). *RAMReS Journal – African Pharmacopoeia and Traditional Medicine Series, 20*(2), 1–8. https://publication.lecames.org/index.php/pharm/article/view/2471

Pinatibi, H., Coulibaly, N., Coulibaly, T. J. H., & Savané, I. (2015). Mapping Groundwater Potential Using Multicriteria Analysis and GIS: The Case of the Denguélé District (Nord-Ouest de la Côte d'Ivoire). *European Scientific Journal, 11*(35), 106–122. https://eujournal.org/index.php/esj/article/view/6785

Portères, R. (1935). Toxic plants used by the Dan and Guéré peoples of Côte d'Ivoire. Bulletin of the Committee for Historical and Scientific Studies of French West Africa*., 18*(1), 128–140.

Programme National de Lutte contre le Paludisme. (2005). *National Policy Document on Malaria Control*.

Rana, E., Sumthane, Y. Y., Attri, I., & Dhiman, B. (2024). *Picrorhiza kurrooa*: A promising Himalayan medicinal plant with therapeutic research and conservation challenges. *Journal of Biology and Nature, 16*(2), 9–18. https://doi.org/10.56557/joban/2024/v16i28789

Samaké, A., Samaké, S., Sissoko, S., Keïta, B., Dembélé, P., Coulibaly, D., Diawara, M. O., & Karembé, M. (2023). Ethnobotanical use of three woody species in the Sudan-Sahel zone of Mali (Kolokani). *IOSR Journal of Environmental Science, Toxicology and Food Technology, 17*(10, Series 1), 60–66. https://doi.org/10.9790/2402-1710016066

Segnon, A. C., & Achigan-Dako, E. G. (2014). Comparative analysis of diversity and utilization of edible plants in arid and semi-arid areas in Benin. *Journal of Ethnobiology and Ethnomedicine, 10*, Article 80. https://doi.org/10.1186/1746-4269-10-80

Sidio, S. R., & N'Guessan, K. (2019). Ethnobotanical study of medicinal plants used to treat gastrointestinal disorders among the populations of the Gagnoa department, in the central-western region of Côte d'Ivoire. *European Scientific Journal, 15*(36), 320. https://eujournal.org/index.php/esj/article/view/12651

Soro, D., Kanga, Y., & Ouattara, G. M. L. (2023). Medicinal plants used in traditional medicine for the control of fungal diseases in the Korhogo department (Côte d'Ivoire). *Tanganyika Journal of Sciences, 3*(1), 47–59. https://www.tanganyikajournalofscience.org/index.php/tjs/article/view/61

Tiécoura, Y. F. A. (2023). *Bushmeat supply chain and sustainable management of wildlife biodiversity in the Bandama Valley, Savanes, and Denguélé districts (Central, Northern, and Northwestern Côte d'Ivoire)* [Thèse de doctorat, Université Jean Lorougnon Guédé]. https://hdl.handle.net/20.500.12177/11786

Traoré, L., Ouédraogo, I., Ouédraogo, A., & Thiombiano, A. (2011). Perceptions, uses, and vulnerability of woody plant resources in southwestern Burkina Faso. *International Journal of Biological and Chemical Sciences, 5*(1), 258–278. https://doi.org/10.4314/ijbcs.v5i1.68103

Vanié-Bi, I. G., Béné, K., & Zouzou, M. (2021). Ethnobotanical study of wild edible plants in the Zuénoula department (central-western Côte d'Ivoire). *European Scientific Journal, 17*(29), 242. https://doi.org/10.19044/esj.2021.v17n29p242

World Health Organization & United Nations Children's Fund. (2005). *World malaria report 2005*. https://www.who.int/publications/i/item/9241593199

Yaovi, C. R., Hien, M., Kaboré, S. A., Sehoubo, Y. J., & Somda, I. (2021). Use and vulnerability of plant species and adaptation strategies of communities living near the Kou Classified Forest (Burkina Faso). *International Journal of Biological and Chemical Sciences, 15*(3), 1140–1157. https://doi.org/10.4314/ijbcs.v15i3.22

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