RESEARCH ARTICLE
AGROBIOLOGICAL RECORDS
ISSN: 2708-7182 (Print); ISSN: 2708-7190 (Online)
Open Access Journal

ETHNOBOTANICAL KNOWLEDGE AND DYNAMICS OF NEGLECTED AND UNDERUTILIZED FRUIT SPECIES POPULATIONS AROUND THE MONTS KOUFFE FOREST IN BENIN

Rodrigue Idohou [1,*], Pascal Gbenou [1] and Cocou Aristide Franck Sinsin [2]

[1]Ecole de Gestion et de Production Végétale et Semencière, Université Nationale d'Agriculture, BP: 43 Kétou, Benin
[2]Ecole de Foresterie Tropicale, Université Nationale d'Agriculture, BP 43: Kétou, Bénin

**Corresponding author*: rodrigidohou@gmail.com

ABSTRACT

Wild edible plants are essential for food security in Africa. However, some species have not been well studied in their habitat, and their potential remains largely unexplored. This study aims to evaluate local populations' ethnobotanical knowledge of these plants and to assess the spatio-temporal dynamics of different land-use patterns in the Wari-Maro classified forest. Surveys were conducted through semi-structured interviews with men and women from the study area. To analyze the spatio-temporal dynamics, three different dates were selected for analysis: 1990, 2005, and 2020. Data were processed by calculating several indices. The main results show that *Parkia biglobosa*, *Diospyros mespiliformis,* and *Vitellaria paradoxa* are recognized as the most important species by the local populations. Dynamic analysis of land use patterns revealed a regressive trend in savannah and forest habitats, while fields and bare soil showed greater progression. Future projections confirmed these trends. Timely actions, including raising awareness, assisted regeneration, and co-management, are essential for better management of the species and their habitats.

***Keywords*:** Fruit trees, Conservation, Ethnobiology, Spatio-temporal dynamics, West Africa

Article History (ABR-25-057) || Received: 24 Jun 2025 || Revised: 22 Jul 2025 || Accepted: 26 Jul 2025 || Published Online: 30 Jul 2025

1. INTRODUCTION

Several regions in sub-Saharan Africa have tropical or subtropical climates and offer a wide range of goods and services to the local population. These resources, comprising wild edible plants and food trees (WEFT), are crucial for rural livelihoods, providing food, medicine, fuel, materials, and items of cultural significance (FAO 2020; Kingbo et al. 2022). They are particularly important in areas where famine and malnutrition are prevalent, providing economic and socio-cultural benefits to the local population (Ingram et al. 2021). Wild edible food trees are nowadays gaining recognition for their role in ensuring food availability, generating revenue for traders, and preserving biological diversity (Amusa et al. 2024). Local knowledge about the use of species reveals the long-standing relationship between how different people use species and provides key information for understanding the links between people and their immediate environment (Heubach et al. 2011; Koukou et al. 2022).

Nevertheless, many of these resources are under threat due to human activities (particularly deforestation) and climate change. Like most developing countries, particularly in sub-Saharan Africa, Benin is experiencing severe deforestation, probably due to an increase in farmland, unauthorized tree logging, and fires (Houessou et al. 2013). This has resulted in a considerable loss of plant and animal life (Schulte to Bühne et al. 2017; FAO 2020). Several investigations have been carried out into the dynamics of habitats in Benin (Oloukoi 2017; Ayenikafo and Wang 2021). The results are alarming, revealing a loss of more than 56,000 hectares of forest per year (Guidigan et al. 2019), especially over the period 1990-2010. Protected areas are therefore refuges that must be safeguarded at all costs, as are traditional agroforestry systems (Assede et al. 2023). This is the case for the Monts Kouffe forest, located in the transition Sudano-Guinean zone in Benin, and encompasses most of these species. Despite being designated a protected area, forest decline continues in the ecosystem, partly due to historical management practices that excluded local communities. However, unauthorized harvesting and fraudulent logging still occur within the ecosystem (Tonouéwa et al. 2024), which threatens the survival of several valuable species (Siebert and Elwert 2004).

Citation: Idohou R, Gbenou P and Sinsin CAF, 2025. Ethnobotanical knowledge and dynamics of neglected and underutilized fruit species populations around the Monts Kouffe forest in Benin. Agrobiological Records 21: 19-27. https://doi.org/10.47278/journal.abr/2025.030

ISSN: 2708-7182 (Print); ISSN: 2708-7190 (Online)
Open Access Journal

This study aims to understand the current state of knowledge of the local people of fruit tree species in this ecosystem and the dynamics of the ecosystem.

2. MATERIALS AND METHODS

2.1. Study Area

The Classified Forest of Monts Kouffe is located in the Sudano-Guinean zone, spanning the longitudes 1°40′ and 2°15′ East and the latitudes 8°25′ and 8°50′ North (Fig. 1). The area has a classic Sudano-Guinean climate with a rainy season from mid-May to early October, and a dry season that last from November to early April (Soglo and Nonvide 2019). These seasonal variations affect the growth and diversity of plants and other organisms in the forest (Adomou 2005).

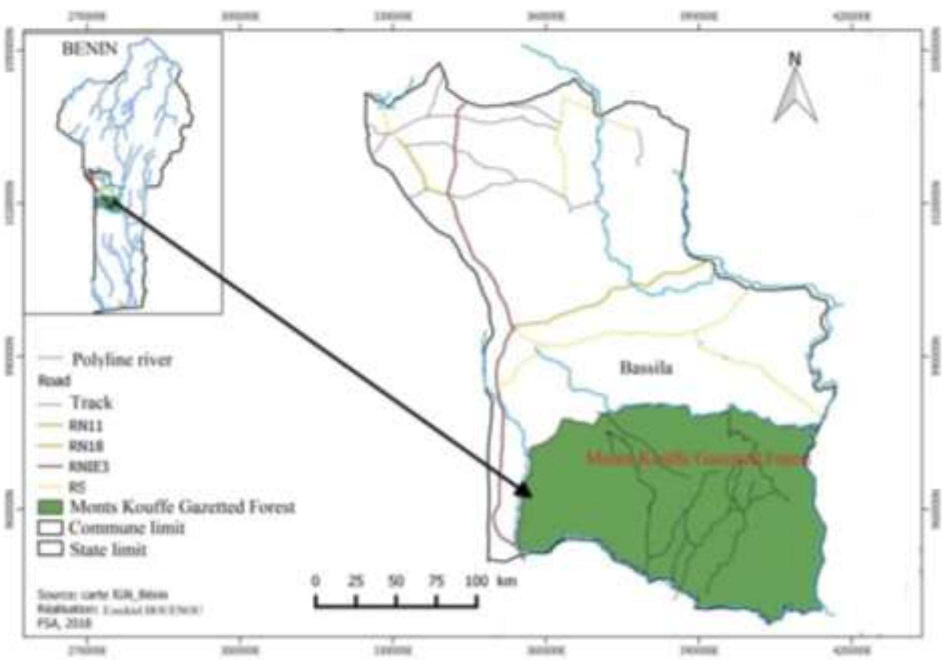

Fig. 1: Geographical location of the study area.

The Monts Kouffe Forest is a unique ecosystem, combining natural and human-assisted vegetation (PAMF 2002; Adomou et al. 2006). The natural forest includes wooded and shrub savannas, gallery forests, and dry dense forests with associated biodiversity. As Assede et al. (2023) pointed out, the forest is home to a variety of wild edible species. These provide local people with goods and services for their daily needs.

2.2. Sampling and Data Collection

Semi-structured interviews were conducted with local people of both genders from three major socio-linguistic groups: Peulh, Lokpa and Nago. Prior to this, an exploratory survey was carried out involving a randomly selected sample of 90 individuals, drawn from all sociolinguistic groups in the area. The aim of this preliminary investigation was to estimate the proportion (p) of respondents possessing knowledge related to the social and cultural values of Wild Edible and Forest Tree (WEFT) species.

This estimated proportion was then used to calculate the sample size (n) for the main study to ensure adequate representation of informed individuals. This calculation was based on the standard formula for determining the sample size of the survey population, as proposed by Dagnelie (1998):

$$n = \frac{Pi(1 - Pi)U^2_{1-\alpha/2}}{d^2}$$

Pi is the fraction of people who recognize and make use of the species

$U^2_{1-\propto/2}$= 1,96; it constitutes the value of the standard normal variable with an α level risk equal to 0.05. Following prior investigation on the field, pp ≈ 0.68. Moreover, d is the error margin set at 0.08. All this yields a total sample size of 130 informants

The questionnaire was originally written in French, and administered in the respondents' local languages with the assistance of a translator when necessary. The main data collected included the following:

ISSN: 2708-7182 (Print); ISSN: 2708-7190 (Online)
Open Access Journal

(i) respondent identification information, (ii) their knowledge of WEFT species, (iii) the various uses of these species and specific plant parts utilized and (iv) their perceptions of the population status of the species, particularly whether the species are perceived as increasing or declining.

For this study, three Landsat satellite images from 1990, 2005, and 2020 were analyzed**.** To facilitate interpretation based on the spectral signatures of land cover types, a false-color composite was created for each image by assigning three spectral bands of the multispectral images to the primary colors: red, green, and blue (RGB). Specifically, the 4-3-2 (RGB) standard band combination was used for TM and ETM+ sensors, and the 5-4-3 combination was used for OLI-TIRS data.

2.3. Data Processing

2.3.1. Assessing the Sociocultural Importance of WEFT: The Cultural Importance Index (CI), proposed by Tardío and Pardo-de-Santayana (2008), is a valuable metric for evaluating variation in ethnobotanical knowledge among different communities. This index reflects not only how widely a plant species is known and how diversely it is used across multiple categories. Therefore, this index can be used to depict probable differences in plant knowledge and use, both between and within cultures. Although CI is similar to use value, it provides a broader understanding of a species' cultural adaptability.
The calculation is as follows:

$$\sum_{U=1}^{U_{NC}} \sum_{U=1}^{I_N} \frac{UR_{ui}}{N}$$

with U represents the category of a particular application of a species, UR_{ui} is the total of different categories of uses mentioned by the informants, N is the total number of participants in the study.

The Fidelity Level (FL) is one of the most widely used indices for measuring the cultural significance of plant species. It quantifies the level of consensus among informants. Informant consensus is a reliable indicator of the importance of a given resource within a cultural context. FL emphasizes the precision with which a species is linked to a specific purpose, revealing the level of its perceived usefulness and highlighting the degree of specificity with which a species is associated with a particular use category. It provides insight into the strength of its perceived utility. The formula for calculating FL is as follows (Friedman et al. 1986):

$$FL\ (\%) = \frac{Ip}{Iu} * 100$$

where Ip is the number of informants who cited the species for a specific use category; Iu is the total number of informants who mentioned the species for any use category.

2.3.2. Spatio-temporal Dynamics of WEFT Population: To achieve this, we performed a supervised classification. First, we selected and delineated the training region. Then, we used the Maximum likelihood algorithm for classification. The goal was to approximate the descriptive statistics parameters (mean and variance) for each training zone and establish a correspondence between pixels and the appropriate class using the calculated parameters. We used this procedure based on its strength as recognized elsewhere (Bousquet et al. 2013; Tahir et al. 2025).

Furthermore, to assess the dynamics of land use and land cover, we produced transition matrices for the different periods (1990-2004 and 2005-2015). To do so, we employed the method proposed by Rovainen (1996). This method helped us extract annual probability values, which facilitated comparison among periods. We performed the diagonal method recommended by Çinlar (1975). We incorporated the different outputs into ENVI 5.1 software for vectorization and exported the appropriate findings using ArcMap 10.5. To predict how different land use types will expand or retract in the future, a Markov chain analysis was performed using the available annual transition probability matrices. The first scenario considered the first-time lag using the 1990–2004 matrix, and the second scenario focused on the second time lag using the 2005–2020 matrix. A chi-square test was applied to assess the reliability of the model by comparing the projected land cover for each period with the available actual data. This validation step ensures the robustness of the Markov model in capturing land use dynamics over time.

2.3.3. Degradation Rate Analysis**:** The rate of land cover degradation was calculated for the three periods: 1990–2004, 2005–2020, and 1990–2020. This computation used land cover class area data and the formula proposed by the Food and Agriculture Organization (Latham 2002). All land cover classes were included because each exhibited conversion to a different land use type during the study periods.

The annual degradation rate (D), expressed as the percentage of area lost per year, was calculated as:

$$D=(A1\times tA1-A2)\times 100$$

Where:

A_1 is the initial area of the land cover class, A_2 is the final area of the land cover class, and t is the number of years over which the change occurred

Citation: Idohou R, Gbenou P and Sinsin CAF, 2025. Ethnobotanical knowledge and dynamics of neglected and underutilized fruit species populations around the Monts Kouffe forest in Benin. Agrobiological Records 21: 19-27. https://doi.org/10.47278/journal.abr/2025.030

ISSN: 2708-7182 (Print); ISSN: 2708-7190 (Online)
Open Access Journal

3. RESULTS

3.1. Socio-cultural Importance of WEFT

Among all the categories of use, food use had the highest cultural importance for all Wild Edible and Forest Tree (WEFT) species recognized by the community, with a Cultural Importance Index for food (CiF) equal to 1 for each species (Table 1). This finding underscores the central role of WEFT species in local food systems and daily subsistence.

Table 1: Cultural Importance Index (CI) values per use category for each species

Species	CiF	CiM	CiC	CiL	CiFw	CiMe
Parkia biglobosa	1	0.22	-	0.02	-	0.02
Vitellaria paradoxa	1	0.34	0.05	0.03	-	-
Gardenia erubescens	1	0.10	-	-	-	-
Vitex doniana	1	0.02	-	-	-	-
Annona senegalensis	1	0.01	-	-	-	-
Tamarindus indica	1	0.16	-	-	-	-
Parinari curatellifolia	1	0.06	-	-	-	-
Detarium microcarpum	1	0.01	-	0.01	-	-
Borassus aethiopum	1	-	-	0.01	0.11	-
Adansonia digitata	1	0.14	0.02	-	-	-
Sarcocephalus latifolius	1	0.03	-	-	-	-
Strychnos spinosa	1	0.10	-	-	-	-
Marantes polyandra	1	-	-	-	-	-
Diospyros mespiliformis	1	0.16	-	-	-	0.03

CiF: Cultural importance for food use, CiM: Medicinal use, CiC: Cosmetic use, CiL: Lumber use, CiFw: Firewood, CiMe: Magic-medicinal use.

In addition to being an essential food source, *Vitellaria paradoxa* appeared to be the most culturally important species, with a score of 0.44 excluding the food use. Conversely, *Marantes polyandra* had the lowest CI value, indicating its lesser cultural significance to locals.

Other species such as *Parkia biglobosa* (CI = 0.26) and *Diospyros mespiliformis* (CI = 0.20) also demonstrated notable multifunctional value among respondents, especially for medicinal and firewood purposes. The remaining species showed relatively low cultural importance for non-food uses, with CI_2 values ranging between 0 and 0.16. These results underscore the uneven distribution of cultural knowledge and perceived utility across different species and reinforce the dominant role of food-related functions in shaping communities' valuation of WEFT resources.

The analysis of Fidelity Level (FL) calculation revealed that only *Vitellaria paradoxa* (FL = 60.76%), *Diospyros mespiliformis* (FL = 50.76%), and *Parkia biglobosa* (FL = 50.1%) had fidelity levels exceeding 50% (Table 2). This indicates that these species are widely recognized and specifically associated with particular uses by a significant portion of the community.

Table 2: Variation of the Fidelity Level (FL) index (%) per species in the forest

Species	FL (%)
Vitellaria paradoxa	60.76
Diospyros mespiliformis	50.76
Parkia biglobosa	50.10
Tamarindus indica	30.76
Adansonia digitata	20.00
Gardenia erubescens	15.38
Annona senegalensis	14.61
Borassus aethiopum	14.61
Parinari curatellifolia	12.30
Vitex doniana	11.53
Strychnos spinosa	10.76
Sarcocephalus latifolius	7.69
Detarium microcarpum	6.92
Marantes polyandra	4.61

In contrast, *Tamarindus indica* (FL = 30.76%), *Adansonia digitata* (FL = 20%), and *Gardenia erubescens* (FL = 15.38%) showed moderate fidelity levels, suggesting that these species are somewhat known and used, though not as widely as the top three species. The remaining species, including *Anona senegalensis*, *Borassus aethiopum*, *Parinari curatellifolia*, *Vitex doniana*, *Strychnos spinosa*, *Detarium microcarpum*, and *Marantes polyandra*, exhibited low fidelity levels (FL <15%). These results indicate limited specific knowledge or less consistent use of these species within the local communities. The relatively low FL values may reflect declining familiarity, marginal use, or lesser perceived importance in traditional practices.

3.2. Land Cover Maps and Changes

The composition and distribution of land cover types in the Monts Kouffe Classified Forest changed significantly between 1990 and 2020. In 1990, the dominant land cover types were Tree savanna (56.27%) and Woodland (28.78%), which together accounted for over 85% of the total area (Table 3). Other land cover types—Gallery Forest (4.93%), Dry dense forest (2.35%), and Shrub savanna (2.45%)—occupied smaller portions of the landscape.

By 2005, Woodland had expanded significantly to 45.21% while the area covered by Tree savanna had sharply declined to 28.24%, marking a major transition in the landscape structure. During the period 1990–2005, the areas of Gallery Forest, Dry dense forest, Tree savanna, and mosaic of croplands and fallows all declined. Conversely,

ISSN: 2708-7182 (Print); ISSN: 2708-7190 (Online)
Open Access Journal

Woodland, Shrub savanna, and Bare soil areas increased, indicating a shift toward more open or degraded vegetation types.

By 2020, the dominant land cover types had changed once again, with Shrub savanna (23.66%) and Woodland (20.36%) now prevailing. Notably, Tree savanna continued to decline drastically, accounting for only 8.93% of the total area. Over the entire 30-year period (1990–2020), Dry dense forest, Shrub savanna, Bare soil, and Croplands/Fallows showed substantial increases in area, while Forest Gallery, Woodland, and Tree savanna experienced significant reductions. These changes reflect ongoing processes of land degradation, deforestation, and agricultural expansion within the forest ecosystem.

Table 3: Dynamic of the land cover class for the period 1990-2020

Land Cover Class	Area (km²) 1990	% 1990	Area (km²) 2005	% 2005	Area (km²) 2020	% 2020
Gallery forest	129.13	4.93	97.60	3.73	48.46	1.85
Dry dense forest	61.53	2.35	25.75	0.98	105.47	4.03
Woodland	753.65	28.78	1183.68	45.21	533.12	20.36
Tree savanna	1473.31	56.27	739.43	28.24	233.87	8.93
Shrub savanna	64.13	2.45	443.29	16.93	619.58	23.66
Bare soil	38.68	1.47	128.29	4.89	239.90	9.16
Mosaic of croplands and fallows	97.97	3.74	0.36	0.014	838.00	32.00
Total	2618.4	100	2618.4	100	2618.4	100

Table 4: Land Use/Land Cover transition matrices (Area in km²)

(a) Transition Matrix: 1990–2004

From / To	Gallery forest	Dry dense forest	Woodland	Tree savanna	Shrub savanna	Bare soil	Croplands & Fallows
Forest Gallery	23.04	30.54	11.86	30.94	0.82	0.04	0.36
Dry dense forest	7.90	13.71	1.56	2.32	0.20	0.02	0.04
Woodland	57.65	10.50	145.94	945.05	11.25	1.71	11.58
Tree savanna	27.67	5.72	295.37	329.88	31.62	15.53	33.64
Shrub savanna	9.61	0.79	231.88	130.80	14.57	17.74	37.90
Bare soil	3.26	0.27	67.04	33.97	5.68	3.62	14.45
Croplands and Fallows	0.00	0.00	0.01	0.35	0.00	0.00	0.00

(b) Transition Matrix: 2005–2020

From / To	Forest Gallery	Dry dense forest	Woodland	Tree savanna	Shrub savanna	Bare soil	Croplands & Fallows
Forest Gallery	26.83	3.06	15.63	2.79	0.05	0.10	0.00
Dry dense forest	39.03	18.67	37.97	9.16	0.38	0.24	0.02
Woodland	12.56	3.55	140.69	165.00	155.48	55.84	0.01
Tree savanna	7.46	0.14	72.45	108.00	34.71	10.84	0.27
Shrub savanna	4.60	0.01	64.83	339.24	169.98	40.92	0.00
Bare soil	6.12	0.32	53.02	87.57	73.88	18.99	0.01
Croplands and Fallows	0.99	0.00	799.10	27.68	8.80	1.36	0.07

3.3. Changes in Land Use and Land Cover (1990–2004 and 2005–2020)

The analysis of transition matrices for the periods 1990–2004 and 2005–2020 revealed significant trends in land use and land cover (LULC) dynamics (Table 4). During the first period (1990–2004), most land cover types exhibited a high level of persistence. Specifically, Dry dense forest and Tree savanna had the highest annual persistence rates of 96.8 and 96.3%, respectively. Likewise, Gallery Forest (94.9%), Woodland (94.1%), Shrub savanna (93.5%), Bare soil (93.3%), and Mosaic of croplands and fallows (93.3%) also demonstrated considerable stability.

Despite this persistence, some transitions occurred. A portion of the Gallery Forest was converted into Dry dense forest (2.1%), Woodland (0.8%), Tree savanna (2.1%), Shrub savanna (0.06%), and Croplands and Fallows (0.02%). Dry dense forest itself was mainly converted into Gallery Forest (2%), followed by Woodland (0.4%), Tree savanna (0.6%), and smaller portions into other classes. Similarly, Woodland was partly transformed into Tree savanna (5.3%), with minor shifts to Forest Gallery, Dry dense forest, and Croplands and Fallows.

In the second period (2005–2020), persistence rates remained high across most land cover types. Gallery forest showed the highest annual persistence at 97%, followed closely by Tree savanna (96.4%), Shrub savanna (95.2%), Woodland (95%), and Dry dense forest (94.5%). Bare soil also maintained a relatively high persistence of 93%.

During this time, the Gallery Forest was primarily converted into Woodland (2.1%), Dry dense forest (0.4%), and Tree savanna (0.38%). Dry dense forest showed transitions mainly to Gallery Forest (2.5%), Woodland (2.4%), and minor shifts to Shrub savanna and Bare soil. Woodland underwent noticeable transformations, converting to Tree savanna (2.1%), Shrub savanna (1.9%), and Bare soil (0.7%), with limited transitions to other classes.

These findings suggest that while certain land cover types retained high persistence, pressures from land

ISSN: 2708-7182 (Print); ISSN: 2708-7190 (Online)
Open Access Journal

degradation and anthropogenic influence have progressively reshaped the landscape, primarily through the expansion of shrublands and cropland-fallow mosaics.

3.4. Future Land Cover Scenarios

Projected future land cover changes in the Monts Kouffe region are projected based on the trends observed during two key periods: 1990–2004 and 2005–2020. Fig. 2 illustrates the dynamics of past land use/land cover (LULC) changes, along with the estimated projections for 2020–2033. These projections reveal contrasting trends depending on the reference period used. In both historical periods, Woodland areas consistently declined, while Gallery Forest and Shrub savanna exhibited a general trend of expansion. However, other land cover types such as Tree savanna and Bare soil showed divergent patterns. Both decreased during the 1990–2004 period but expanded during 2005–2020.

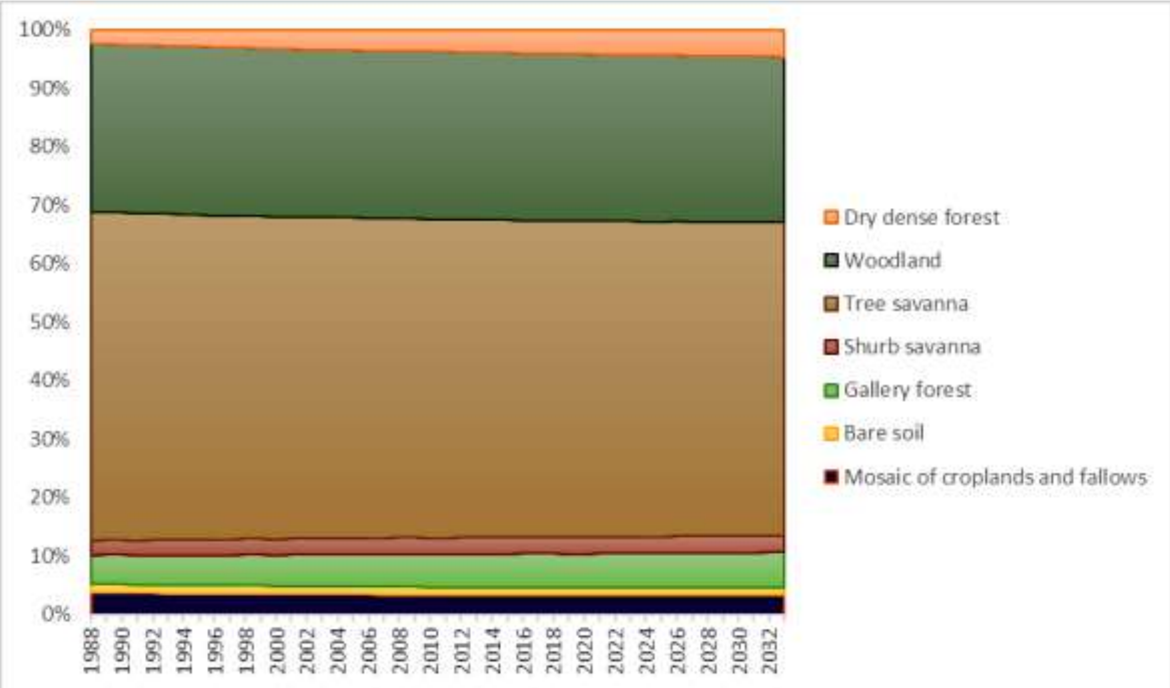

Fig. 2: Simulation of evolution for the seven land cover classes under future scenarios of 1988-2003 period 2003–2018.

The highest rate of land cover degradation was recorded during the 1990–2004 period for the mosaic of Croplands and Fallows. In contrast, Tree savanna experienced the most significant degradation during the second period, 2005–2020. The Gallery forest exhibited a degradation rate of 1.85% per year in the first period, accelerating to 4.56% per year in the second period. Woodland also declined substantially, losing approximately 650.56km² between 2005 and 2020, equivalent to an annual degradation rate of 5.18%. Dry dense forests experienced a loss of 5.64% per year from 1990 to 2004 and further regressed at an alarming rate of 9.85% during 2005–2020. Conversely, land cover types such as mosaic of Croplands and Fallows, Bare soil, and Shrub savanna showed significant increases during the second period, expanding by 67.67, 4.26, and 2.26%, respectively, annually. These trends reflect the intensification of anthropogenic pressures, including agricultural expansion, uncontrolled logging, and land degradation. These pressures continue to undermine the forest integrity and ecological stability in the Monts Kouffe region (Table 5).

Table 5: Degradation rate of the land cover classes per annum (expressed as percent loss in km²/year)

Class	1990-2004	2005-2020	1990-2020
Gallery forest	1.85	4.56	3.21
Dry dense forest	5.64	-9.85	-1.81
Woodland	-3.05	5.18	1.15
Tree savanna	4.49	7.39	5.95
Shrub savanna	-13.76	-2.26	-7.85
Bare soil	-8.32	-4.26	-6.27
Mosaic of croplands and fallows	31.18	-67.67	-7.42

Citation: Idohou R, Gbenou P and Sinsin CAF, 2025. Ethnobotanical knowledge and dynamics of neglected and underutilized fruit species populations around the Monts Kouffe forest in Benin. Agrobiological Records 21: 19-27. https://doi.org/10.47278/journal.abr/2025.030

Projections based on the 1990–2004 trend suggest a 0.5% decrease in woodland cover by 2033. Similarly, Tree savanna, Bare soil, and Croplands/Fallows are expected to decline by 2.7, 0.2, and 0.5%, respectively. In contrast, Gallery Forest, Dry dense forest, and Shrub savanna are projected to increase by 27.2, 2.3, and 0.4%, respectively. Under the 2005–2020 scenario, the projections indicate a notable decrease in Woodland cover by 17.8%, and a slight decline in Dry dense forest (0.3%). On the other hand, Gallery Forest, Tree savanna, Shrub savanna, and Bare soil are expected to increase by 1.1, 10.7, 4.6, and 1.7%, respectively

4. DISCUSSION

4.1. Ethnobotanical Assessment of the NTFP Biodiversity

The results of this study underscore the critical socio-cultural significance of Wild Edible and Food Tree (WEFT) species in the Monts Kouffe region, with a notable dominance of food use across all assessed species. Species such as *Vitellaria paradoxa, Parkia biglobosa,* and *Diospyros mespiliformis* proved to be the most important from a socio-economic and cultural point of view for the local populations in the areas covered. This is reflected in the relatively high values of the indices calculated. Once again, this trend reflects the deep-rootedness of local resources in the traditional environment and the strong dependence of local people on their resources. These resources are often used for therapeutic, dietary, ornamental, and sometimes cultural purposes. The predominance of food uses (CI = 1 for all species) confirms recent ethnobotanical studies highlighting the central role of wild food plants in rural diets and nutritional resilience in West Africa (Todou et al. 2023). Other equally important species, such as *Adansonia digitata*, *Tamarindus indica*, and Gardenia erubescens, also showed moderate FL values, indicating their complementary role in the local socio-ecological system. In contrast, *Marantes polyandra* and *Strychnos spinosa* exhibited low values for the calculated indices, which in turn implies the very low importance of these resources for local people. This could also be due to their low availability and loss of knowledge transmission regarding their use across generations (Akinnagbe et al. 2019; Derebe et al. 2023; Malapane et al. 2024). Over all the study also suggested a very important discrepancy among the groups regarding the knowledge and use of the available WEFT in the area, thus, corroborating previous findings by Schick et al. (2020). This diversified knowledge could be used in the ongoing and next strategies targeting the conservation of natural resources and the associated landscape (Xie et al. 2022; Oduor et al. 2024). In addition, knowledge transfer and knowledge sharing should not be occulted in the face of the changes in local food systems and community resilience.

4.2. Dynamics of Land Use and Land Cover Change

Important differences were obtained when we analyzed LULC across the period. Over the 30 years, Tree savanna and Woodland, once the dominant land cover types, experienced substantial declines, reflecting ongoing pressures from human activities such as agriculture expansion, logging, and fuelwood collection (FAO 2020). Conversely, increases in Shrub savanna, Bare soil, and Mosaic of croplands and fallows indicate degradation and fragmentation processes that alter habitat quality and biodiversity. The persistence rates derived from transition matrices confirm that while some forested areas maintain stability, others undergo notable conversions, such as Gallery forests transforming partly into Dry dense forest and woodlands into Tree savanna or agricultural lands. These trends correspond with regional patterns of forest degradation and land conversion documented across West Africa (Todou et al. 2023; Masolele et al. 2024; Oduor et al. 2024; Wingate et al. 2024). Results also showed a tendency for the current land use dynamics to persist by the 2033 time-horizon. with a probable expansion of Gallery forests and Shrub savanna. This situation could have important consequences on the ecosystem goods and services provided to local people, such as carbon sequestration, soil quality, and availability of habitat species. On the other hand, the increase of agricultural lands will highly contribute to lessening the soils fertility and increasing the erosion (Oduor et al. 2024). A combination of agroforestry practices added to community implication in reforestation activities and land restoration could help to reverse the tendency (Akinnagbe et al. 2019).

5. CONCLUSION

This research highlights the local significance of wild edible fruit species and the dynamics of land use and land cover over the past three decades. A significant decrease in the forest and savanna dynamics was observed, while croplands and bare soil areas increased. This implies increased pressure on the forests and the associated landscapes, calling for urgent action. Important wild food trees such as the shea, locust bean, and ebony trees are key to the food supply and cultural needs of the locals. Unfortunately, the land hosting these species is changing, thus putting them at risk. Looking ahead, things do not seem to improve much, especially for the remaining parts of the natural ecosystem; thus, calling for timely action. Therefore, it is necessary to combine local ecological knowledge with sustainable conservation actions to protect the remaining species and their ecosystems. Cooperation, the implementation of restoration strategies, and naturally assisted regeneration could be explored.

Citation: Idohou R, Gbenou P and Sinsin CAF, 2025. Ethnobotanical knowledge and dynamics of neglected and underutilized fruit species populations around the Monts Kouffe forest in Benin. Agrobiological Records 21: 19-27. https://doi.org/10.47278/journal.abr/2025.030

ISSN: 2708-7182 (Print); ISSN: 2708-7190 (Online)
Open Access Journal

DECLARATIONS

Funding: This research was conducted without any specific financial support from public, commercial, or non-profit funding agencies.

Acknowledgement: We are indebted to the local population for their assistance during the data collection phase.

Conflicts of Interest: The authors have no relevant financial or non-financial interests to disclose.

Data Availability: Data will be available upon request.

Ethics Statement: Verbal informed consent was obtained prior to the interview.

Author's Contribution: RI conceived and designed the experiment. RI performed the study and carried out the analyses. RI and PG supervised and coordinated the data collection and statistical analyses. RI and CAFS prepared the draft of the manuscript. All authors critically revised the manuscript and approved the final version.

Generative AI Statement: The authors declare that no Gen AI/DeepSeek was used in the writing/creation of this manuscript.

Publisher's Note: All claims stated in this article are exclusively those of the authors and do not necessarily represent those of their affiliated organizations or those of the publisher, the editors, and the reviewers. Any product that may be evaluated/assessed in this article or claimed by its manufacturer is not guaranteed or endorsed by the publisher/editors.

REFERENCES

Adomou AC, 2005. Vegetation patterns and environmental gradients in Benin: implications for biogeography and conservation. Wageningen University and Research.
Adomou AC, Sinsin B and van der Maesen LJG, 2006. Phytosociological and chorological approaches to phytogeography: a meso-scale study in Benin. Systematics and Geography of Plants 76(2): 155-178.
Akinnagbe A, Gailing O, Finkeldey R and Lawal A, 2019. Towards conservation of genetic variation of tropical tree species with differing successional status: the case of Mansonia altissima A. Chev and Triplochiton scleroxylon K. Schum. Tropical Conservation Science 12: 1940082919864267. https://doi.org/10.1177/1940082919864267
Amusa TO, Avana-Tientcheu ML, Awazi NP and Chirwa PW, 2024. The Role of Non-Timber Forest Products for sustainable livelihoods in African multifunctional landscapes. In Trees in a Sub-Saharan Multi-functional Landscape: Research, Management, and Policy: 153-178. Cham: Springer Nature Switzerland.
Assede ES, Orou H, Biaou SS, Geldenhuys CJ, Ahononga FC and Chirwa PW, 2023. Understanding drivers of land use and land cover change in Africa: A review. Current Landscape Ecology Reports 8(2):62-72. https://doi.org/10.1007/s40823-023-00087-w
Ayenikafo OM and Wang YF, 2021. Land use/land cover changes analysis in Sudano-Guinean region of Benin. Applied Ecology and Environmental Research 19(1): 715-726. http://dx.doi.org/10.15666/aeer/1901_715726
Bousquet A, Couderchet L, Gassiat A and Hautdidier B, 2013. Les résolutions des bases de données «occupation du sol» et la mesure du changement. L'Espace géographique 42(1): 61-76. https://doi.org/10.3917/eg.421.0061
Çinlar E, 1975. Exceptional paper—Markov renewal theory: A survey. Management Science 21(7): 727-752.
Dagnelie P, 1998. Statistique théorique et appliquée vol. 2. De Boeck et Larcier: Paris.
Derebe B, Alemu A and Asfaw Z, 2023. Contribution of Non-timber Forest Products earn to livelihood in rural households and the type of use: a systematic review. International Journal of Forestry Research 2023(1): 9643290. https://doi.org/10.1155/2023/9643290
FAO, 2020. Global Forest Resources Assessment 2020. FAO.
Friedman J, Yaniv Z, Dafni A and Palewitch D, 1986. A preliminary classification of the healing potential of medicinal plants, based on a rational analysis of an ethnopharmacological field survey among Bedouins in the Negev Desert, Israel. Journal of Ethnopharmacology 16(2-3): 275-287.
Guidigan MLG, Sanou CL, Ragatoa DS, Fafa CO and Mishra VN, 2019. Assessing land use/land cover dynamic and its impact in Benin Republic using land change model and CCI-LC products. Earth Systems and Environment 3(1):127-137. https://doi.org/10.1007/s41748-018-0083-5
Heubach K, Wittig R, Nuppenau EA. and Hahn K, 2011. The economic importance of non-timber forest products (NTFPs) for livelihood maintenance of rural west African communities: A case study from northern Benin. Ecological Economics 70(11): 1991-2001. https://doi.org/10.1016/j.ecolecon.2011.05.015

ISSN: 2708-7182 (Print); ISSN: 2708-7190 (Online)
Open Access Journal

Houessou LG, Teka O, Imorou IT, Lykke AM and Sinsin B, 2013. Land use and land-cover change at" W" Biosphere Reserve and its surroundings areas in Benin Republic (West Africa). Environment and Natural Resources Research 3(2): 87.

Ingram V, Awono A and Schure J, 2021. NTFPs in West and Central Africa. CIFOR.

Kingbo A, Teka O, Aoudji AK, Ahohuendo B and Ganglo JC, 2022. Climate change in southeast Benin and its influences on the spatio-temporal dynamic of forests, Benin, West Africa. Forests 13(5): 698. https://doi.org/10.3390/f13050698

Koukou E, Hounkpatin W A, Sognigbé, ND, Sounouke CVDP, Ntandou-Bouzitou G and Termote C, 2022. Local knowledge of agricultural biodiversity and food uses of edible plant species in two agroecological zones of southern Benin. Ethnobotany Research and Applications 23: 1-22. http://dx.doi.org/10.32859/era.23.39.1-22

Latham JS, He C, Alinovi L, DiGregorio A and Kalensky Z, 2002. FAO methodologies for land cover classification and mapping. Linking people, place, and policy: a GIScience Approach, 283-316.

Malapane OL, Chanza N and Musakwa W, 2024. Transmission of indigenous knowledge systems under changing landscapes within the vhavenda community, South Africa. Environmental Science & Policy 161: 103861. https://doi.org/10.1016/j.envsci.2024.103861

Masolele RN, Marcos D, De Sy V, Abu IO, Verbesselt J, Reiche J and Herold M, 2024. Mapping the diversity of land uses following deforestation across Africa. Scientific Reports 14(1): 1681. https://doi.org/10.1038/s41598-024-52138-9

Oduor F, Kaindi DM, Abong G, Thuita F and Termote C, 2024. Community-based conservation strategies for wild edible plants in Turkana County, Kenya. Conservation 5(1): 1. https://doi.org/10.3390/conservation5010001

Oloukoi J, 2017. Rate of land cover change and its determinants in the soudano-guinea transition zone of Benin Republic. Ethiopian Journal of Environmental Studies and Management 10(5): 691-704.

PAMF (Projet d'Aménagement des Massifs Forestiers), 2002. Plan d'aménagement de la forêt classée des Monts Kouffé. CENATEL, Bénin.

Rovainen E, (1996). Analysis and standardization of transition matrices. In Forest Resources Assessment 1990. Survey of tropical forest cover and study of change processes. FAO, 130:111-114.

Schick A, Sandig C, Krause A, Hobson PR, Porembski S and Ibisch PL, 2020. People-centered and ecosystem-based knowledge co-production to promote proactive biodiversity conservation and sustainable development in Namibia. Environmental Management 62 : 858-876. https://doi.org/10.1007/s00267-018-1093-7

Schulte to Bühne H, Wegmann M, Durant SM, Ransom C, de Ornellas P, Grange, S. Beatty H and Pettorelli N, 2017. Protection status and national socio-economic context shape land conversion in and around a key transboundary protected area complex in West Africa. Remote Sensing in Ecology and Conservation 3(4):190–201. https://doi.org/10.1002/rse2.47

Siebert U and Elwert G, 2004. Combating corruption and illegal logging in Benin, West Africa: Recommendations for forest sector reform. Journal of Sustainable Forestry 19(1-3): 239-261.

Soglo YY and Nonvide GMA, 2019. Climate change perceptions and responsive strategies in Benin: the case of maize farmers. Climatic Change 155(2): 245-256. https://doi.org/10.1007/s10584-019-02452-3

Tahir Z, Haseeb M, Mahmood SA, Batool S, Abdullah-Al-Wadud M, Ullah S and Tariq A, 2025. Predicting land use and land cover changes for sustainable land management using CA-Markov modelling and GIS techniques. Scientific Reports 15(1): 3271. https://doi.org/10.1038/s41598-025-87796-w

Tardío J and Pardo-de-Santayana M, 2008. Cultural importance indices: a comparative analysis based on the useful wild plants of Southern Cantabria (Northern Spain). Economic Botany 62(1): 24-39. https://doi.org/10.1007/s12231-007-9004-5

Todou G, Komo MY, Danra DD, Nnanga JF, Konsala S, Froumsia M., Tchobasala LM, and Zra DK, 2023. Species diversity and natural regeneration of woody plants in Nyé'été forest, South Region of Cameroon. Journal of Tropical Forest Science 35(3): 260-269. https://www.jstor.org/stable/48737471

Tonouéwa JFMF, Biaou SSH, Assèdé ESP, Agossou H and Balagueman RO, 2024. Timber traceability, determining effective methods to combat illegal logging in Africa: A review. Trees, Forests and People 18: 100709. https://doi.org/10.1016/j.tfp.2024.100709

Wingate VR, Fernández GFC and Speranza CI, 2024. Small forest patches in West Africa: mapping how they are changing to better inform their conservation. Environmental Conservation 51(4): 254-262. https://doi.org/10.1017/S0376892924000171

Xie H, Zhu Z, He Y, Zeng X and Wen Y, 2022. Integrated framework of rural landscape research: Based on the global perspective. Landscape Ecology 37(4): 1161-1184. https://doi.org/10.1007/s10980-022-01401-3

Citation: Idohou R, Gbenou P and Sinsin CAF, 2025. Ethnobotanical knowledge and dynamics of neglected and underutilized fruit species populations around the Monts Kouffe forest in Benin. Agrobiological Records 21: 19-27. https://doi.org/10.47278/journal.abr/2025.030