World Journal of Advanced Research and Reviews
eISSN: 2581-9615 CODEN (USA): WJARAI
Cross Ref DOI: 10.30574/wjarr
Journal homepage: https://wjarr.com/

(RESEARCH ARTICLE)

Check for updates

Impact of land use type on the diversity of flora in the village of Akoikro in the department of Abengourou (Eastern Côte d'Ivoire)

Kanga Justin KOUASSI [1,*], Franck Placide Junior PAGNY [2], Affia Sonmia Francia KOSSONOU [1] and Kouadio Henri KOUASSI [1]

[1] *Department of Genetics, Biology and Physiology, Jean LOROUGNON GUEDE University, Daloa, Côte d'Ivoire.*
[2] *Department of Biodiversity and Sustainable Ecosystem Management, Jean LOROUGNON GUEDE University, Daloa, Côte d'Ivoire.*

World Journal of Advanced Research and Reviews, 2026, 29(03), 741-748

Publication history: Received on 17 January 2026; revised on 25 February 2026; accepted on 27 February 2026

Article DOI: https://doi.org/10.30574/wjarr.2026.29.3.0364

Abstract

In many African countries, particularly in Côte d'Ivoire, development policies often lead to the destruction of forest areas. Faced with this problem, environmental assessment is increasingly recommended to prevent potential bio-ecological and climatic imbalances. This study, conducted in the village of Akoikro, the construction site for the University of Abengourou, aims to evaluate the floristic potential of different land cover types in order to identify potential impacts related to the project. An inventory of woody plant species with a diameter at breast height (DBH) of at least 10 cm and a height of 2 m was compiled using a combination of surface survey and mobile sampling methods. The main results indicate the presence of numerous ecosystems, including lowland areas, forest remnants, gallery forests, and plantations. The study's flora comprises approximately 142 plant species, including 13 species of special status listed on the IUCN Red List. The flora is dominated by the Apocynaceae, Euphorbiaceae, and Rubiaceae families. Microphanerophytes are the most abundant, while Guinean-Congolese (GC) species constitute the majority of the inventoried flora. Well-preserved areas have the highest concentration of tree species, unlike areas subject to high human pressure.

Keywords: Land Use; Flora; Abengourou; Côte d'Ivoire

1. Introduction

The disappearance of Côte d'Ivoire's forests is a major and growing concern. This situation is the result of numerous human-induced factors, the main ones being intensive agriculture, deforestation, uncontrolled urbanization, and climate change. These threats lead to habitat loss, a reduction in biodiversity in general, and, in particular, the extinction of many plant species. These plants disappear every year without any real conservation measures. Yet, forest resources play a crucial role in the daily lives of rural populations. They generate many goods and services essential to their well-being [1]. Faced with this biological crisis, given the number of species now threatened with extinction, and the social, economic, and environmental challenges confronting Côte d'Ivoire, the implementation of a sustainable forest management policy is essential. Achieving this objective necessarily requires environmental diagnosis and assessment, coupled with participatory communication involving all political, economic, and social stakeholders [2]. It is within this framework that the present study was conducted, with the overall objective of evaluating the impact of land use type on the distribution of plant species. This involves, firstly, assessing the plant potential of different vegetation formations and, secondly, comparing them.

* Corresponding author: KOUASSI Kanga Justin

2. Materials and methods

2.1. Study site

The village of Akoikro is located approximately three kilometers from the town of Abengourou in eastern Côte d'Ivoire, between 6° 44′ 00″ N and 3° 29′ 00″ W (Figure 1). From a floristic perspective, the logging area belongs to the Guinean domain, dominated by dense, semi-deciduous humid forest. Its location as a border town, the numerous socio-economic opportunities favorable to agricultural development, and urbanization have contributed to the massive destruction of this forest area.

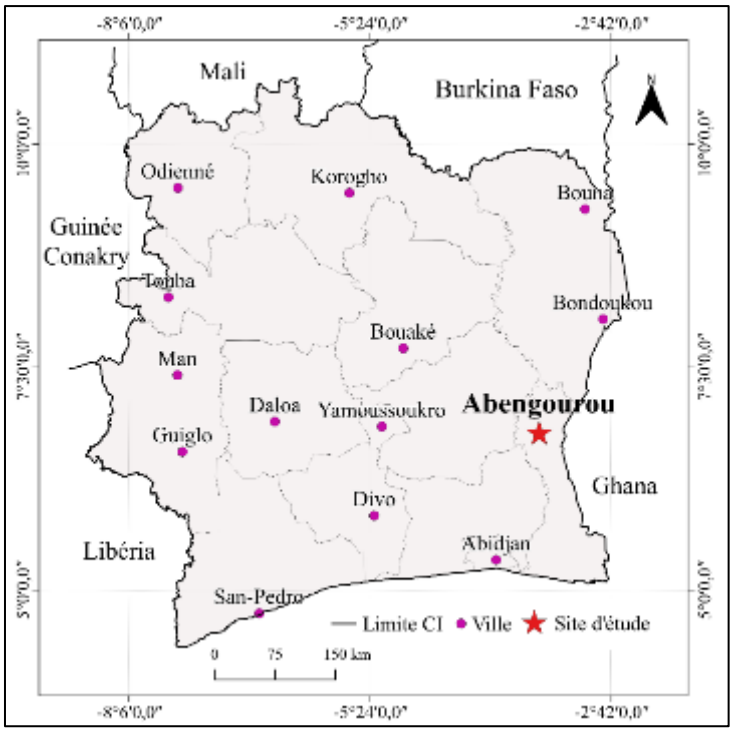


Figure 1 Geographical location of the study sites

2.2. Data collection methods

Numerous methods are used for inventorying the flora of ecosystems. However, for this study, three methods were combined to conduct the inventories : the plot method, the mobile survey method, and the transect method. The plot method [3] consisted of inventorying plant species in areas approximately 20 m square, aligned with the four cardinal directions, with precise spacing and orientation for each land cover type. The mobile survey method involved recording all species encountered along paths laid out perpendicular to the different inventory plots. Regarding the linear transect method, transects 500 m long and 10 m wide were delineated. In all these visited areas, all woody plant species with a diameter at breast height (DBH) of at least 10 cm and a height of 2 m were recorded, and their names noted on a data sheet. Combining these methods made it possible to compensate for the limitations of each method. The identification of the inventoried plant species was carried out on site. However, samples of species not identified in the field were collected and identified with the support of the National Floristic Center (CNF) of the University of Félix Houphouët-Boigny (UFHB) and the Atlas of the Flora of Côte d'Ivoire.

2.3. Data analysis

The quality and quantity of flora were the parameters analyzed. Flora quantity was defined by parameters such as the number of species, families, and genera recorded in each land cover type. The works of [4] and Raunkaier [5] served as the basis for compiling all these lists. From a qualitative perspective, the characteristic elements addressed primarily concerned species with special status (endemic, emblematic, threatened, etc.).

2.3.1. Species with Special Status

Two lists were used to define species with special status: the Aké Assi classification [4] and the [6] list. Based on these two references, a list of species with special status inventoried on the site, along with their geographic coordinates, was compiled.

3. Results

3.1. Ecosystem diversity

Numerous ecosystems have been identified in the area. These ecosystems can be classified into two groups : sensitive ecosystems and other vegetation formations. The sensitive ecosystems encountered are primarily the lowlands (Figure 2), the two forest remnants (Figure 3 A and B), and the gallery forests bordering the river. These ecosystems are adjacent to other ecosystems such as industrial crop plantations, fallow land, and secondary forests. The various geographic coordinates of the forest remnants are recorded in table 1.

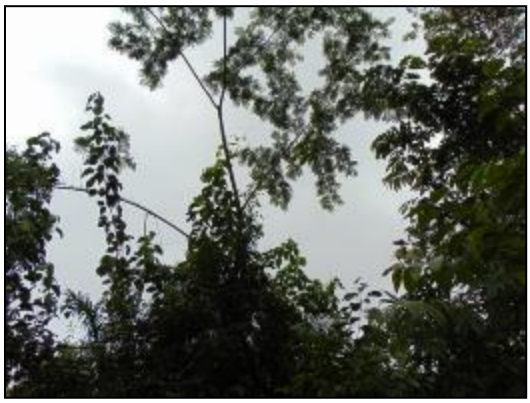
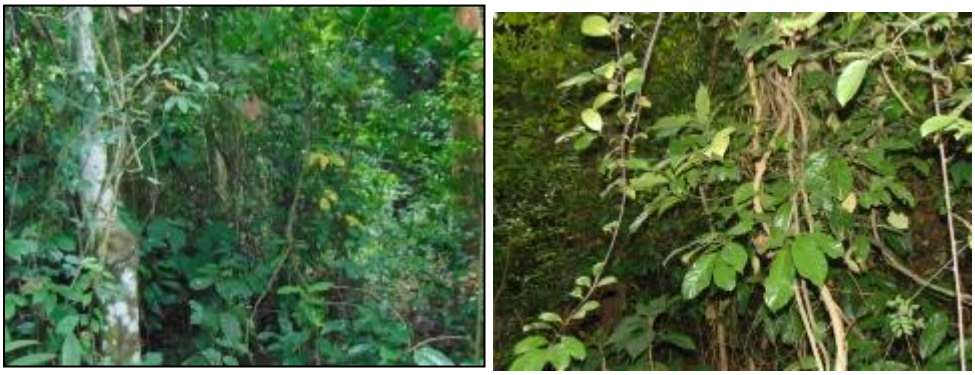


Figure 2 Low-lying area at the Akoikro site



A B

Figure 3 Forest relics at the Akoikro site

Table 1 Location of the two relict forests of the site

X	Y	Type de biotope
-3.49391	6.79998	Relict forest 1
-3.49391	6.79956	Relict forest 2

3.2. Specific richness and diversity of the site

The flora of the study comprises approximately 142 plant species distributed among 118 genera and 56 families. The most abundant genera, each with 3 species, are Blighia, Cola, Diospyros, Morinda, Salacia, and Trichilia.

3.3. Characterization of the ecosystems visited

3.3.1. Lowlands area

Lowlands are characterized by species such as *Harungana madagascariensis*, *Iodes liberica*, *Hymenostegia afzelii*, *Hypselodelphis violaceae, Leptoderis* sp, *Leucaniodiscus cupanioides, Lomariopsis guineensis, Manotes expansa, Macaranga barteri, Vismia guineensis, Maniophyton fulvum, Raphia hookeri,* etc.

3.3.2. Gallery forest

Numerous species colonize riverbanks. Among those found along the river at the northern edge of the site are : *Baphia nitida*, *Cola gabunensis*, *Pterocaepus santalinoides, Cola lateritia, Cola millenii, Combretum racemosum, Combretum zenkeri, Carapa procera, Uapaca guineensis, Chrysophyllum pentagonocarpum, etc.*

3.3.3. Forest plantations and food crop fields identified on the site

Fields identified on the site include : cocoa field (Figure 4), rubber fields (Figure 5), and food crop plantations found include banana fields, cassava fields (Figure 6), and yam fields (Figure 7).

Figure 4 Cocoa field

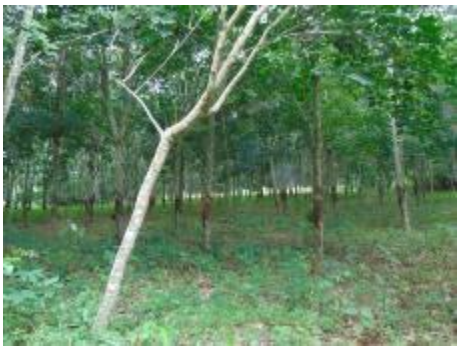


Figure 5 Rubber field

Figure 6 Cassava field

Figure 7 Yam field

3.3.4. Species with special status inventoried on the site

The inventoried flora comprises eleven (11) species with special status (Table 2), predominantly *Entandrophragma angolense* (Welw.) C. DC. (Figure 8), *Cordia platythyrsa* Bak. (Figure 9), and *Milicia excelsa* (Welw.) Benth. (Figure 10). Most of these plant species are classified as vulnerable: high risk of extinction in the wild.

Table 2 Species with special status inventoried on the site

X	Y	Species	Families	Conservation status (UICN)
-3.51107	6.77638	*Albizia adianthifolia* (Schumach.) W.F. Wright	Mimosaceae	LC
-3.49399	6.79327	*Entandrophragma angolense* (Welw.) C. DC.	Meliacea	VU
-3.49216	6.79094	*Baphia nitida* Lodd.	Fabaceae	LC
-3.49247	6.79873	*Cordia platythyrsa* Bak.	Boraginaceae	VU
-3.49103	6.79466	*Diospyros monbuttensis* Gurke	Ebenaceae	LC
-3.49384	6.80013	*Entandrophragma angolense* (Welw.) C. DC.	Meliacea	VU
-3.48709	6.79587	*Entandrophragma angolense* (Welw.) C. DC.	Meliacea	VU
-3.49785	6.79737	*Milicia excelsa* (Welw.) Benth.	Moraceae	LR/nt
-3.49431	6.79946	*Nesogordonia papaverifera* (A. Chev.) R. Capuron	Sterculiaceae	VU
-3.49606	6.79977	Pouteria aningeri Baehni	Sapotaceae	VU
-3.48732	6.79535	*Pterygota macrocarpa* K. Schum.	Sterculiaceae	VU
-3.4901	6.79983	*Terminalia ivorensis* A. Chev.	Combretaceae	VU
-3.48957	6.79933	*Triplochiton scleroxylon* K. Schum.	Sterculiaceae	LR/lc

IUCN= International Union for Conservation of Nature (IUCN) ; VU = Vulnerable: high risk of extinction in the wild; LC = Least Concern; LR/lc = Low Risk of Extinction/Least Concern; LR/nt = Low Risk of Extinction/Near Threatened.

Figure 8 *Entandrophragma angolense*

Figure 9 *Cordia platithyrsa*

Figure 10 *Milicia excelsa*

4. Discussion

Despite significant human pressure, the flora of our study site is rich in 142 plant species. Among these are numerous forest species typically found in protected areas. This demonstrates that the natural regeneration process is indeed effective in this zone. In fact, the lack of environmental management promotes the reconstitution of forest species, according to [7]. Within this floristic assemblage, many tree legumes play a major role in the rapid regeneration of degraded areas in the tropics [8].

The most represented families are Apocynaceae (13 species), Euphorbiaceae and Rubiaceae with 11 species each, and Sterculiaceae with 8 species. Regarding biological types, microphanerophytes are the most abundant with 114 species (80.28 %), followed by nanophanerophytes with 16 species (11.27 %).

The study results showed that the most represented families in terms of species number are the Apocynaceae, Euphorbiaceae, Rubiaceae, and Sterculiaceae. The predominance of these families in the flora of the village of Akoikro is a fairly general phenomenon in the dense humid forests of Côte d'Ivoire ([9] ; [10]). Specifically regarding the Rubiaceae, their abundance can be explained by the fact that the village of Akoikro is located in the Guineo-Congolian forest region, which is the preferred habitat of the Rubiaceae [4]. According to the postulate of [11], this abundance would indicate that the environment has not yet reached the climax stage of regeneration.

Guinean-Congolese (GC) species constitute the majority of the inventoried flora with 102 plant species (71.83%). They are followed by species from the transition zone between the Guineo-Congolian and Sudanian zones (GC-SZ) with 22 plant species (i.e. 15.49 %).

The high proportion of Guinean-Congolese species in the flora of the village of Akoikro confirms that it belongs to the Guinean-Congolese region as defined by [12]. The biological spectrum of the vegetation in the village of Akoikro is characterized by a high number of phanerophytes, reflecting observations made by numerous authors in equatorial and tropical rainforests ([13] ; [14] ; [15] ; [16]). These authors argue that phanerophytes are indicators of favorable ecological conditions within plant formations and reflect edaphic conditions more conducive to forest vegetation. This dominance could also be due to their high capacity for regeneration (perennial, by buds), which constitutes a quantitatively important mode of regeneration towards the original vegetation [17].

Furthermore, the presence of numerous forest ecosystems, including lowland areas, two forest remnants, gallery forests, fallow land, and secondary forests, constitutes a valuable natural heritage due to its multiple biological, ecological, and economic functions. Among these ecosystems, gallery forests are cited by several authors as playing important ecological, social, and economic roles ([18] ; [19]). Indeed, gallery forests generally constitute hotspots of species richness, a refuge for tropical forest species, and key elements in regulating and maintaining landscape biodiversity.

The presence of a high number of species with special status in the studied flora is a sign of good forest conservation. The presence of this category of species could be linked to favorable environmental conditions. Indeed, species with special status are very sensitive to anthropogenic disturbances that do not promote their survival [20]. This is why, according to [21], these kinds of species deserve special attention for conservation. Many anthropogenic activities (agriculture, deforestation, urbanization, etc.) that result in forest destruction negatively impact the survival of these species, hence their low numbers in cultivated areas.

5. Conclusion

The forested area surrounding the village of Akoikro harbors a highly diverse flora, reflecting the variability of its ecological niches. Indeed, each land cover type is characterized by a floristic diversity influenced by edaphic, climatic, and anthropogenic conditions. Thus, the lowlands, the two remaining forest remnants, and the gallery forests are the richest and most diverse, in contrast to the agricultural areas. These different ecosystems are of paramount ecological importance due to the significant number of plant species with special status found there. This study reveals that the Akoikro area abounds with exceptional ecosystems and exceptional biodiversity in this eastern region of Côte d'Ivoire, and therefore deserves special attention during the development projects for the city of Abengourou.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

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

References

[1] Monssou EO, Vroh, BTA, Goné, BZB, Adou Yao CY, N'Guessan KE. Evaluation of diversity and estimation of aboveground biomass of trees in the Bingerville Botanical Garden (District of Abidjan, Côte d'Ivoire). European Scientific Journal. 2016 ; 12(6) : 168-184.

[2] Kouassi KJ. Floristic diversity and viability of urban forest management types in the cities of Daloa and Bouaflé (Central-West of Côte d'Ivoire). Jean LOROUGNON GUEDE University, Daloa, Côte d'Ivoire. 2020.

[3] Gautier L, Chatelain L, Spichiger CVR. Presentation of a releve for vegetation studies based on high resolution satellite imagery. In : Minutes of the thirteenth plenary meeting of AETFAT, Zomba, Malawi. Nat. Herb. Bot. Gard. Malawi. 1994; 2 : 1339-1350.

[4] Aké-Assi L. Flora of Côte d'Ivoire 2, Catalogue, Systematics, Biogeography and Ecology. Conservatory and Botanical Garden : Genève, Suisse, 441 p. 2002.

[5] Raunkiaer C. The life form of plants and statistical plant geography. Clarendon press, Oxford, 632 p ; (1934)

[6] IUCN. International Union for Conservation of Nature (IUCN). Red List of Threatened Species. Version 2020.1. 2020.

[7] Khan F. The regeneration of the rainforest after traditional cultivation, (Southwest of Côte d'Ivoire). ORSTOM, Paris (France) ; 1982.

[8] Arbonnier M. Trees, shrubs and lianas of the dry zones of West Africa. CIRAD, MNHN, UICN. Montpellier, Paris ; 2000.

[9] Adou Yao YC, Blom EC, Denguéadhé KTS, Van Rompay RSAR, N'guessan KE, Wittbolle G, Bongers F. Floristic Diversity and Vegetation in Taï National Park, Côte d'Ivoire. Tropenbos Report, Serie 5, Abidjan (Côte d'Ivoire) ; 2005.

[10] Nusbaumer L, Gautier L, Chatelain C., Spichiger R. Structure and floristic composition of Classified forest of Scio (Côte d'Ivoire). Descriptive and comparative study. Candollea. 2005 ; 60(2) :393-443.

[11] Guillaumet JL, Adjanohoun E. Vegetation Côte d'Ivoire. In Avenard, J-M., M. Edlin, G. Girard, J. Sircoulon, F.P. Touvhebeu., J.L. Guillaumet, E. Adjanohoun, A. Perreaud, (Éd.). Natural environment of Côte d'lvoire, (p. 157-236) ; 1971.

[12] White F. The vegetation of Africa, a descriptive memoir to accompany the UNESCO/AETFAT/UNSO vegetation map of Africa. UNESCO. Natural Resour. Res. 1983 ; 20 : 1-356.

[13] Mangenot G. Study on the forests of the plains and plateaus of Ivory Coast. Ivorian Studies. 1995; 4 : 6-61.

[14] Nguinambaye MM, Nana R, Mbayngone E, Djinet AI, Badiel B, Tamini Z. Distribution and uses of Ampelocissus in the Donia area of southern Tchad. Int. J. Biol Chem. Sci. 2015 ; 9(1) : 186-199.

[15] Ouoba P. Flora and vegetation of the Niangoloko classified forest, Southwest Burkina Faso. Doctoral thesis, Ouagadougou University. 2006.

[16] Yongo OD. Contribution to the floristic, phytogeographical and phytosociological studies of the N'Gotto forest (Central African Republic). Doctoral thesis, Lille 2 University and Bruxelles University. 2002.

[17] Catinot R. Managing the wooded savannas of Africa. Such an objective now seems within our reach. Tropical Woods and Forests. 1994; 241 : 53-67.

[18] Natta AK. Ecological assessment of riparian forests in Benin: phytodiversity, phytosociology and spatial distribution of tree species. Ph.D. Thesis, Wageningen University. The Netherlands. 2003.

[19] Naiman RJ, Decamps H, McClain ME. Riparia: Ecology, Conservation, and Management of Streamside Communities. Burlington, MA: Academic Press, 415 p ; 2010.

[20] Sangne YC, Adou Yao YC, N'Guessan KE. Transformation of the flora of a dense semi-deciduous forest: Impact of human activities (Central West of Côte d'Ivoire). African Agronomy. 2008 ; 20(1) : 1-11.

[21] Myers N, Mittermeier RA, Mittermeier CG, Da Fonseca GAB, Kent J. Biodiversity hotspots for conservation priorities. Nature. 2000 ; 403 : 853-858.