Revista Cubana de Ciencias Forestales

Volume 14, 2026, January-December

LIBER CIENCIA
EDITORIAL CIENTÍFICA
UNIVERSIDAD DE PINAR DEL RÍO

UNIVERSIDAD DE PINAR DEL RÍO
HERMANOS SAÍZ MONTES DE OCA

CFORES
REVISTA CUBANA DE CIENCIAS FORESTALES

ISSN: 2310-3469 RNPS: 2347
CFORES Journal, January-December, 2026; Volume 14: e905

Original article

Characterization of tree species in agroecosystems of the Guisa integrated soil conservation and improvement polygon, Granma

Caracterización de especies arbóreas en agroecosistemas del polígono integral de conservación y mejoramiento de suelo Guisa, Granma

Caracterização de espécies arbóreas em agroecosistemas do polígono integral de conservação e melhoria do solo Guisa, Granma

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Received: *16/04/2025.*
Approved: *13/04/2026*

ABSTRACT

With the objective of characterizing tree species, research was carried out in agroecosystems of the Demographic Polygon for the Conservation and Improvement of Soil, Water and Forest, of the Guisa municipality, Granma. To list the tree species present, rectangular plots of 20 x 25 m (500 m2) were randomly established. All arboreal individuals were inventoried at the museum sites. The species were classified according to their potential for use, category of presence and state of mildness. It is possible to know that 60 tree species belonging to 52 genera coexist, distributed among 28 botanical families. The best represented families were: Fabaceae with 11 species and 10 genera; Anacardiaceae with 4 species and 3 genera; Meliaceae and Sapotaceae . Endemism represented only 1.6% (1 species), although 7 are categorized as present, but predominantly indigenous, 37 naturalized, 5 non-indigenous but possibly naturalized, 10 widely cultivated and 1 occasionally cultivated on the ground. It was determined that 33.33% fell into some threat category: *Protium cubense* (Rose) Urb., endemic species categorized as Dangerous; *Lysyloma Sabicu* Benth., *Piscidia piscipula* (L.) Sarg., *Malpigia . glabra* L. threatened species; *Calycophyllum candidissimun* (Vahl) DC., which is often threatened, is present in a greater number of species in the category of minor concern. There was a greater wealth of plants with a predominance of medicinal, wooden, food and ecological shade and ornamental functions. The demonstration polygon constitutes another measure for the conservation of in situ biological biodiversity, with functions and services associated with the ecosystems.

Keywords: threat category, endemism, flora, sustainable land management.

RESUMEN

Con el objetivo de caracterizar las especies arbóreas, se realizó la investigación en agroecosistemas del Polígono Demostrativo para la Conservación y Mejoramiento del Suelo, el Agua y el Bosque, del municipio Guisa, Granma. Para listar las especies arbóreas presentes, se establecieron de forma aleatoria parcelas rectangulares de 20 x 25 m (500 m²). En los sitios de muestreo se inventariaron todos los individuos arbóreos. Las especies fueron clasificadas según las potencialidades de uso, categoría de presencia y

estado de amenaza. Se pudo conocer que coexisten 60 especies arbóreas pertenecientes a 52 géneros, distribuidas en 28 familias botánicas. Las familias mejor representadas fueron: Fabaceae con 11 especies y 10 géneros; Anacardiaceae con 4 especies y 3 géneros; Meliaceae y Sapotaceae. El endemismo representó solo el 1.6% (1 especie), mientras que 7 están categorizadas como presentes, pero dudosamente indígenas, 37 naturalizadas, 5 no indígenas, pero posiblemente naturalizadas, 10 cultivadas ampliamente y 1 cultivada solo ocasionalmente. Se determinó que el 33,33 % se encuentra en alguna categoría de amenaza: *Protium cubense* (Rose) Urb., especie endémica categorizada En Peligro; *Lysiloma sabicu* Benth., *Piscidia piscipula* (L.) Sarg., *Malpigia. glabra* L. especies amenazadas; *Calycophyllum candidissimun* (Vahl) DC., casi amenazada, y se presentaron en mayor número especies en la categoría de preocupación menor. Existió una mayor riqueza de plantas con predominio de uso medicinal, maderable, alimenticio y con funciones ecológicas de sombra y ornamental. El polígono demostrativo constituye otra medida de conservación de la biodiversidad biológica *in situ*, con funciones y servicios asociados de los ecosistemas.

Palabras clave: categoría de amenaza, endemismo, flora, manejo sostenible de tierra.

RESUMO

Com o objetivo de caracterizar as espécies arbóreas, foi realizada a investigação em agroecossistemas do Polígono Demonstrativo para a Conservação e Melhoramento do Solo, da Água e do Bosque, do município de Guisa, Granma. Para listar as espécies arbóreas presentes, estabeleça uma forma aleatória de parcelas retangulares de 20 x 25 m (500 m2). Nos locais de museu todos os indivíduos arbóreos eram inventariados. As espécies foram classificadas de acordo com as potencialidades de uso, categoria de presença e estado de amenaza. Se puder descobrir que coexistem 60 espécies arbóreas pertinentes a 52 gêneros, distribuídas em 28 famílias botânicas. As famílias mais representadas são: Fabaceae com 11 espécies e 10 gêneros; Anacardiaceae com 4 espécies e 3 gêneros; Meliaceae e Sapotaceae. O endemismo representou apenas 1,6% (1 espécie), enquanto 7 estão categorizados como presentes, mas dudosamente indígenas, 37 naturalizados, 5 não indígenas, mas possivelmente naturalizados, 10 cultivadas ampliamente e 1 cultivada apenas ocasionalmente. Foi determinado que 33,33% se

encontram em alguma categoria de amenaza: *Protium cubense* (Rose) Urb., espécie endémica categorizada En Peligro; *Lysiloma sabicu* Benth., *Piscidia piscipula* (L.) Sarg., *Malpigia. glabra* L. espécie amenazadas; *Calycophyllum candidissimun* (Vahl) DC., quase amenazada, e é apresentada em maior número de espécies na categoria de menor preocupação. Existia uma grande riqueza de plantas com predomínio de uso medicinal, madeirável, alimentar e com funções ecológicas de sombra e ornamentais. O polígono demonstrativo constitui outra medida de conservação da biodiversidade biológica in situ, com funções e serviços associados aos ecossistemas.

Palavras-chave: categoria de amenaza, endemismo, flora, manejo sustentável da terra.

INTRODUCTION

Biodiversity reflects the number, variety, and variability of living organisms. The concept also encompasses how this diversity changes from place to place and over time. Indicators such as the number of species in a given area can help monitor aspects of biodiversity, and are therefore considered the basis for multiple strategies that address problems related to the production and sustainability of agricultural systems (Ramírez and Chang, 2017).

In this regard, Cuba is one of the island territories with the greatest number of plant species in the world and ranks first in the number of taxa per square kilometer, with an estimated 6,500 species. Around 53% of these are endemic to Cuba. According to the updated Red List of Flora of Cuba, 22 species are reported as extinct, 4 as regionally extinct, 772 as critically endangered, 512 as endangered, 396 as vulnerable, and 518 as threatened (Díaz, Torres, and Berazaín, 2021).

Furthermore, the need to give greater attention and priority to the problem of soil degradation, an aspect that is closely interrelated with the management of water resources and vegetation cover, promoted in 2010 the emergence in Cuba of the Demonstration Polygons for the Conservation and Improvement of Soil, Water and Forest, as sites intended to validate integrated technologies for the management of these resources and create capacities to face the effect of climate change with a sustainable agricultural approach (Calero *et al*., 2015).

Decree Law 83/2024 of the National System of Protected Areas (GOC-2024-EX23) in its article 88 refers to other effective conservation measures based on areas, which achieve, in a sustained manner, positive and lasting results for the conservation of biological biodiversity *in situ*, with associated ecosystem functions and services and, where appropriate, cultural, spiritual, socioeconomic and other values relevant at the local level.

In Granma, this area is located in the foothills of the Sierra Maestra mountain range. Within the municipality are protected areas of national interest, such as the El Gigante Ecological Reserve, La Bayamesa National Park, and the Cupaynicú Natural Forest Managed Floristic Reserve. These areas are notable for their high endemism and areas of natural forest, which contribute to high biodiversity. Consequently, scientific research has focused on more visible ecosystems (Sosa *et al.*, 2019 and Rosales *et al.*, 2024). In contrast, agroecosystems have been less studied, despite their crucial role as biological corridors connecting different habitats (Milan *et al.*, 2018; Rivera *et al.*, 2020).

For this reason, this work aimed to characterize the tree species in agroecosystems of the demonstration polygon for the improvement and conservation of the soil belonging to the municipality of Guisa, Granma.

MATERIALS AND METHODS

Location of the study area

The integrated area is located in the mountainous municipality of Guisa and covers a land area of 85.7 ha. It comprises demonstration farms for soil conservation and improvement (Figure 1). Semi-deciduous forest vegetation predominates in this area, extending across the foothills and up to an altitude of 400–450 m above sea level. The soils are of the typical brown carbonate type, genetically derived from soft limestone, and the typical brown non-carbonate type, derived from acidic igneous rock (Hernández *et al.*, 2015). Conservation measures (live and dead barriers) have been in place for 2 to 10 years. The study was conducted between September and December 2023 on five of the selected farms.

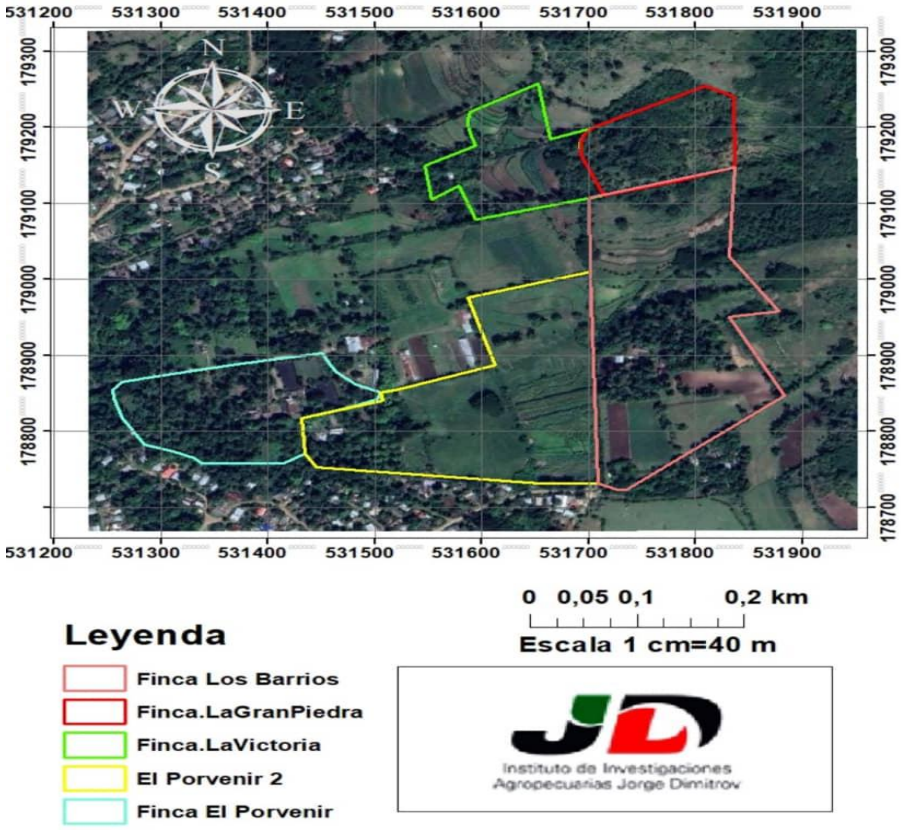

Figure 1. *- Georeferencing of the integral polygon and the properties under study*

Characterization of agroecosystems

The five demonstration farms for sustainable land management are described below (Table 1).

Table 1. - *Description of intervention sites in the Guisa integral soil conservation polygon*

Estate	Area (ha)	Soil (Hernández *et al.*, 2015)	Earring
The Victory	1.6	Brown with carbonate	40%
"The Future" I	23	Brown without carbonate	3%
"El Porvenir " Farm II	4.5	Brown with carbonate	5%
The neighborhoods	5.34	Brown with carbonate	50%
The Great Stone	1.4	Brown with carbonate	70%

Sampling methodology

Field surveys were conducted with the participation of the landowners. Rectangular plots of 20 x 25 m (500 m²) were randomly established. All individual trees were inventoried at the sampling sites, following the criteria of González *et al.* (2017). The species were identified by their common names. For taxonomic updates, the authors Greuter and Rankin (2022) were consulted. The species were classified according to their potential uses (Acevedo and Strong, 2012; Roig, 2014).

To classify the inventoried species according to their presence category, Greuter and Rankin (2022) were consulted, and to determine their threat status, the Red List of Flora of Cuba (González *et al.*, 2016) was taken into account. In the case of trees difficult to identify in the field, specimens were collected, preserved, and identified through consultations with specialists and visits to the herbarium of the Cupaynicú Botanical Garden.

RESULTS AND DISCUSSION

Floristic composition and diversity

The geomorphological and edaphoclimatic characteristics of this area have influenced the development of a wide variety of species. The inventory revealed the coexistence of 60 tree species belonging to 52 genera, distributed among 28 botanical families (Appendix 1).

The best-represented families were: Fabaceae (11 species and 10 genera); Anacardiaceae (4 species and 3 genera); Meliaceae (4 species and 3 genera); and Sapotaceae (4 species and 3 genera). González *et al.* (2016) reported that Fabaceae is one of the most numerous families in the flora of Cuba, with 174 taxa.

In the area, endemism represented only 1.6% (1 species), while 7 are categorized as present but doubtfully native, 37 naturalized, 5 non- native but possibly naturalized, 10 widely cultivated, and 1 cultivated only occasionally. Berazaín *et al.* (2005) report that Cuban flora has approximately 53% endemic species, a figure that places it among the seven islands with the highest percentage of endemism on the planet. The presence of

P. cubense as an endemic species is noteworthy, as are naturalized species, including **Roystonea regia* * OF Cook.

The main threats affecting the conservation status of Cuban flora are associated with human activities, biological invasions, and fragmentation (González *et al.*, 2016a). 14.3% of families and 9.6% of genera are threatened. The Fabaceae family had the highest number of threatened species, constituting 40%.

In this sense, of the tree species inventoried in the area, according to the Red List of Flora of Cuba (González *et al.*, 2016), 8.33% are in some category of threat (5 species):

Protium cubense (Rose) Urb., categorized as Endangered, faces a risk in the wild. Some naturalized species are threatened due to interest in timber, primarily those with economic value, such as *Lysiloma. sabicu* Benth. Others are considered priority species for conservation *Swetenia mahagoni* (L.) (Jacq.) and *Cedrela *Piscidia odorata* * L., whose forest exploitation has led to its categorization as globally vulnerable (Sánchez *et al.*, 2017). This has resulted in these species being included on the Red List of the International Union for Conservation of Nature (IUCN 2017) and on the list of species protected for conservation on international trade in endangered species of wild fauna and flora (CITES 2017) (Gálvez *et al.*, 2020). Similarly, * *Malpighia glabra** L., despite its wide distribution, is a highly exploited species, as it is an economically important alternative, being one of the richest natural sources of vitamin C in the world (Esquivel *et al.*, 2024). In the case of * *Piscidia* piscipula* (L.) Sarg., is a slow-growing species and is found in areas heavily impacted by cedar extraction (González *et al.*, 2020).

Species richness in different agroecosystems

Regarding species richness in the different agroecosystems, it was observed (Table 2) that Finca La Victoria presented the greatest richness with 43 species, which could be due to the predominant use of agroecological practices, dead and live barriers of *Vetiveria zizanioides* (L.) Nash, and soil cover. These aspects confer sustainability, resilience, and relative strength to the agroecosystem, according to Morejón and Catasús (2024). The Porvenir II farm was the area with the lowest species richness, with 13 species; related to the silvopastoral management of the area, the limited use of trees in the pastures, fences, and surrounding area was observed.

Table 2. - *Richness of tree species present in the sampling areas*

Agroecosystems	No. of species	Main production
The Victory	43	Crops Several
The neighborhoods	33	Crops Several
The Great Stone	22	Forest
Future I	21	Agroforestry
Future II	13	Agrosilvopastoral

Potential uses of tree species

The area has a wide diversity of tree species, which fulfill different functions, according to their characteristics and purposes, as well as the management to which they are subjected (Annex 2).

The use of medicinal plants for curative and preventive purposes occupies an important place in traditional Cuban medicine (Sánchez *et al.*, 2018). Among the species with the most attributed uses are: *Protium cubense* , *Eucalyptus saligna* , *Citrus x aurantium, Citrus* × *lemon, Psidium guava, Moringa oleifera, Cassia grandis.* These species were attributed with therapeutic properties for different conditions: digestive, dermatological and respiratory.

Species of great timber value were identified in the area; among these are: *Cordia Geras canthus; Swietenia mahagoni*; *S. macrophylla, E. sal* igna , *Calycophyllum candidissimum* and *Cedrela odorata.* There are others of lesser economic value such as *Colubrina. arborescens; Trichilia hirta*; *Maclura tinctoria; Bursera simaruba* and *Albizia procera*, which have other uses.

Fruit trees are an important food source due to their abundance and variety. The diversity of fruits present is high; the area is notable for the presence of 27 species with nutritional value, representing 45% of the total; among them are: *Mangifera indica; Spondias purpurea; and Anacardium. occidentale, Annona squamosa, A. muricata, Cocos nucifera, Carica papaya, Tamarindus indica, Persea Americana, Theobroma cacao, P. guajava, Averrhoa carambola, Phyllanthus acidus*, *Citrus x aurantium, Citrus* × *lemon, Melicoccus bijugatus; Pouteria sapota, Chrysophyllum olive-shaped* subsp. oliviform, *Chrysophyllum cainite,* which gives the system another use value.

In the different agroecosystems, three fundamental uses of tree species stood out (Figure 2): all of them are used for medicinal purposes, followed by timber, in addition to fulfilling ecological functions. These results coincide with those reported by Millán *et al.* (2018), who suggest that producers prefer to maintain species that can offer multiple important economic functions on the farm. Furthermore, they are particularly effective in providing multiple ecosystem services (Ramírez *et al.*, 2024): food, medicinal resources, climate and air quality regulation, carbon sequestration and storage (provisioning services); erosion prevention and maintenance of soil fertility, pollination, habitats for species (regulating services); and recreation and mental health (cultural services).

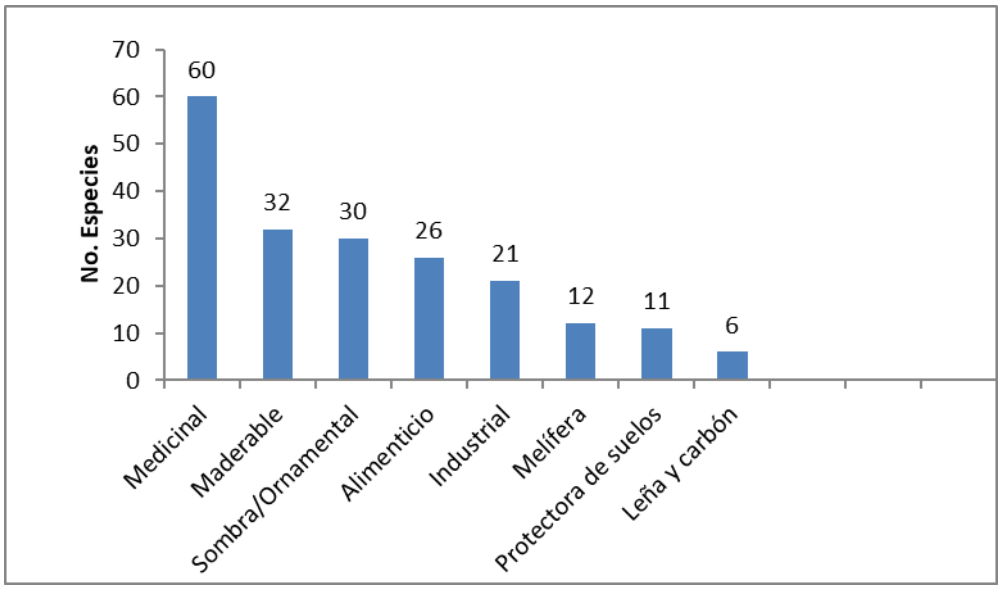

Figure 2. - *Potential uses and ecological functions of forest biodiversity present in the area*

González *et al*. (2024) proposed that the inclusion of melliferous trees in ecosystems degraded by deforestation, habitat fragmentation, pollution, and climate change can provide nesting and overwintering habitats for native pollinators, improve soil structure, capture atmospheric carbon, and attract organisms that provide other ecosystem services and functions. *Ristonea regia* is considered a national flora heritage site in Cuba due to its ecological, environmental, and economic importance, as well as its cultural value. Many Cuban fauna species nest or find food in it, and it exerts a protective effect on water and soil (Moya 2020).

In general, these systems are important in the creation of cultural landscapes that have specific capacities to provide agroecosystem services, as part of integrated and multifunctional agricultural systems (Milián *et al.*, 2018).

CONCLUSIONS

The demonstration area constitutes another measure for the conservation of biological biodiversity *in situ*, with associated ecosystem functions and services.

The different agroecosystems related to biodiversity conservation must be managed practically and comprehensively, through the connectivity of fragments of threatened mountain ecosystems, with a view to integrating economic and conservation interests harmoniously, in order to mitigate the loss of biodiversity and increase the capacity of ecosystems to generate environmental goods and services, to improve the social well-being of the inhabitants of the mountains.

Acknowledgments

We are grateful to the PT131GR004-002 project, Selection of biological soil indicators in areas of the Guisa, Granma integral conservation and improvement polygon, for the financial support for carrying out the study.

Annex 1. Taxes present in agroecosystems of the integral soil conservation polygon, Guisa, Granma

Family and Scientific Name	Common name	Agroecosystems					Presence	Category of threat
		1	2	3	4	5		
Anacardiaceae								
Mangifera indica L.	mango	x	x	x	x	x	N	-
Spondias purpurea L.	ciruela	x	x			x	P	-
Spondias mombin L.	jobo	x					N	LC
Anacardium western L.	marañón		x			x	N	-
Annonaceae								
Annona squamosa L.	anonymous	x	x			x	W	-
Annona muricata L.	guanábana	x	x			x	P	-
Annona cherimoya Mill.	mammon					x	W	-
Arecaceae								
Cocos nucifera L.	coconut	x	x	x	x	x	P	-
Roystonea regia (Kunth) OF Cook	royal palm	x	x	x	x	x	N	LC
Bignoniaceae								

Tabebuia angustata Britton	white oak	x		x			N	LC
Crescentia cujete L.	guira		x				N	-
Boraginaceae								
Cordia gerascanthus L.	varies	x					N	LC
Cordia Collococca L.	ateje		x			x	N	LC
Burseraceae								
Bursera simaruba (L.) Sarg.	almacigo	x		x			N	-
Protium Cuban (Rose) Urb.	copal					x	•	EN
Caricaceae								
Carica papaya L.	bomb fruit			x			W	-
Cecropiaceae								
Cecropia peltata L.	yagruma	x	x	x			N	-
Clusiaceae								
Clusia rosea Jacq.	cupey	x					N	LC
Combretaceae								
Terminalia catappa L.	almond					x	N	-
Fabaceae								
Leucaena leucocephala (Lam.) de Wit	leucaena	x		x	x		N	-
Pithecellobium dulce (Roxb.) Benth	dulce inga	x	x				N	-
Samanea saman (Jacq.) Merr.	algarrobo del país	x		x	x	x	N	-
Cassia grandis L. f.	cañandonga	x					N	-
Delonix regia (Bojer.) Raf.	red raspberry	x		x	x		N	-
Albizia procera (Roxb.) Benth.	Indian carob	x		x			D	-
Tamarindus indica L.	tamarind	x				x	D	-
Lysiloma sabicu Benth.	sabicú	x		x			N	THE
Lysiloma latisiliquum (L.) Benth.	blow	x		x			N	LC
Caesalpinea cubensis Greenm.	yarua	x	x	x			P	-
Piscidia piscipula (L.) Sarg.	guamá candelón					x	N	THE
Lauraceae								
Nectandra coriacea (Sw.) Griseb.	follow	x					N	LC
Persea americana Mill.	avocado	x		x		x	D	-
Lythraceae								
Lagerstroemia indica L.	Jupiter		x			x	W	-
Malpighiaceae								
Malpighia glabra L.	cherry	x	x			x	N	THE
Malvaceae								
Theobroma cacao L.	cacao	x	x			x	N	-
Meliaceae								
Swietenia mahagoni (L.) Jacq.	mahogany of the country	x		x	x	x	N	LC
Swietenia macrophylla King.	Honduran mahogany	x			x		D	-
Cedrela odorata L.	cedar	x		x	x	x	N	LC
Trichilia Hirta L.	jubaban					x	N	LC
Moraceae								

Maclura tinctoria (L.) D. Don ex Steud.	Mora		x			x	N	LC
Ficus auriculata Lour.	higo	x					D	-
Ficus elastica Roxb.	gomero	x					D	-
Moringaceae								
Moringa oleifera Lam.	moringa		x	x	x	x	N	-
Myrtaceae								
Psidium Guajava L.	guava	x	x	x	x	x	P	-
Eucalyptus saligna Sm.	eucalyptus	x					D	-
Oxalidaceae								
Averrhoa carambola L.	Chinese cyrule	x				x	W	-
Phyllanthaceae								
Phyllanthus acidus (L.) Skeels	blackcurrant	x					N	-
Rhamnaceae								
Colubrina arborescens (Mill.) Sarg.	bijáguara	x				x	N	-
Rosaceae								
Eriobotrya Japanese (Thunb.) Lindl.	medlar					x	(W)	-
Rubiaceae								
Coffee Arabica L.	coffee		x			x	W	-
Calycophyllum candidissimum (Vahl) DC.	dagame			x			N	NT
Rutaceae								
Citrus x aurantium L.	orange	x	x			x	N	-
Citrus × *limon* (L.) Osbeck	lemon	x	x			x	W	-
Sapindaceae								
Melicoccus bijugatus Jacq.	mamoncillo	x				x	N	-
Cupania americana L.	guaranus	x					N	-
Sapotaceae								
Sideroxylon salicifolium (L.) Lam.	gourd	x					W	LC
Chrysophyllum oliviforme L. subsp. olive	caimitillo	x					N	LC
Chrysophyllum Cainite L.	caimito	x		x		x	W	-
Pouteria sapota (Jacq.) HE Moore & Stearn	zapote					x	W	-
Sterculiaceae								
Guazuma ulmifolia Lam.	guásima	x		x	x	x	N	LC
Sterculia apetala (Jacq .) H. Karst.	anacahuita				x		N	-

Legend:

1- LaVictoria; 2- Porvenir I; 3- La Gran Piedra; 4- Porvenir II; 5- Los Barrios

Endemic in Cuba (not indigenous in other areas), D- Present but heavily indigenous, N- Naturalized, P- Not indigenous but possibly naturalized, C- Extensively cultivated, (C)- Occasionally cultivated soil that is not cultivated.

EN- En Danger; A- Amenazado; NT- Casi Amenazado; LC- Minor Concern

Annex 2. *Forest biodiversity. Environmental uses and services*

Tree species	**Uses**						**Environmental services**
	THE	BAD	M	LyC	I	Me	
Mangifera indica L.	x	x			x	x	Dark, breakage barrier, ornamental
Spondias purpurea L.	x		x			x	Recover soils, forage
Spondias mombin L.		x	x			x	Ornamental, breakage curtain, soil conservation
Anacardium western L.	x	x			x	x	Food for fauna, ornamental
Annona squamosa L.	x	x			x	x	Food for fauna, ornamental
Annona muricata L.	x				x	x	Barrera ruptures, hedge, food for fauna
Annona cherimoya Mill.	x				x	x	Reforestation, ornamental
Cocos nucifera L.	x	x		x	x	x	Bonus, substrate, forage
Roystonea regia (Kunth) OF Cook	x		x		x	x	Ornamental, food for fauna
Tabebuia angustata Britton		x				x	Ornamental
Crescentia cujete L.		x				x	Ornamental
Cordia gerascanthus L.		x	x			x	Food for wildlife
Cordia Collococca L.		x				x	Forage plant, ornamental
Bursera simaruba (L.) Sarg.		x			x	x	Ornamental, shade
Protium Cuban (Rose) Urb.		x				x	Cultural, hedge
Carica papaya L.	x				x	x	Food for wildlife
Cecropia peltata L.		x			x	x	Agroforestry, forage, reforestation
Clusia rosea Jacq.		x				x	Ornamental
Terminalia catappa L.	x	x			x	x	Ornamental
Leucaena leucocephala (Lam.) de Wit						x	Forage, agroforestry systems, soil improvement
Pithecellobium dulce (Roxb .) Benth				x		x	Reforestation, agroforestry, soil improvement
Samanea saman (Jacq.) Merr .		x				x	Ornamental, forage, soil protection, reforestation
Cassia grandis L. f.			x	x		x	Living fences, forage
Delonix regia (Bojer) Raf.					x	x	Ornamental, food for fauna
Albizia procera (Roxb.) Benth.		x				x	Reforestation, storm curtain, shade, erosion control
Tamarindus indica L.	x				x	x	Forage plant, ornamental
Lysiloma sabicu Benth.		x				x	Ornamental

Lysiloma latisiliquum (L.) Benth.		x	x	x		x	Forage plant, ornamental
Caesalpinea cubensis Greenm.		x				x	Ornamental
Piscidia piscipula (L.) Sarg.		x	x			x	Foragera, hedges, shade
Nectandra coriacea (Sw .) Griseb .		x	x			x	
Persea americana Mill.	x				x	x	Food for wildlife
Lagerstroemia indica L.		x			x	x	Ornamental
Malpighia glabra L.	x		x	x	x	x	Ornamental
Theobroma cacao L.	x				x	x	Agroforestry
Swietenia mahagoni (L.) Jacq.		x			x	x	Ornamental
Swietenia macrophylla King.		x	x			x	Ornamental
Cedrela odorata L.		x				x	Ornamental
Trichilia Hirta L.		x				x	Recovery of degraded areas
Maclura tinctoria (L.) D. Don ex Steud.		x			x	x	Ecological restoration, living fences
Ficus auriculata Lour.	x				x	x	Ornamental
Ficus elastica Roxb.					x	x	Ornamental
Moringa oleifera Lam.					x	x	Forage plants, living fences
Psidium Guajava L.	x				x	x	Food for wildlife
Eucalyptus saligna Sm.		x			x	x	Ornamental
Averrhoa carambola L.	x					x	Ornamental
Phyllanthus acidus (L.) Skeels	x					x	Ornamental
Colubrina arborescens (Mill.) Sarg.		x				x	Shadow
Eriobotrya Japanese (Thunb) Lindl.	x					x	Ornamental
Coffee Arabica L.	x					x	Noise barrier, food for fauna
Calycophyllum candidissimum (Vahl) DC.		x	x			x	Ornamental, fire barrier, land improvement, soil moisture conservation, air purification
Citrus x aurantium L.	x					x	Ornamental
Citrus × *limon* (L.) Osbeck	x					x	Ornamental

Melicoccus bijugatus Jacq.	x	x				x	Shade, ornamental
Cupania americana L.						x	Ecological restoration, soil recovery, food for fauna
Sideroxylon salicifolium (L.) Lam.	x	x	x			x	Slope stabilization
Chrysophyllum oliviforme L. subsp. olive	x					x	Ornamental
Chrysophyllum Cainite L.	x	x				x	Food for fauna, public space
Pouteria sapota (Jacq.) HE Moore & Stearn	x				x	x	Food for the fauna
Guazuma ulmifolia Lam.				x		x	Forage, agroforestry, living fences, recovery of degraded soil
Sterculia apetala (Jacq .) H. Karst.		x				x	Ornamental, shade, food for fauna

Leyenda: A: Alimentario, M/A: Maderable/Artesanal, M: Melífero, LyC : Leña y Carbón, I: Industrial, Me: Medicinal

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Conflicts of interest:

The authors declare no conflicts of interest.

Authors' contribution:

The authors have participated in the writing of the work and analysis of the documents.

ISSN: 2310-3469 RNPS: 2347
CFORES Journal, January-December, 2026; Volume 14: e905