Jordan Journal of Natural History, 10 (2), 2023 Pages: 52-68

Checklist of Trees and Shrubs and their Uses from the Dairy Farm Pasture at the Piedmont of the Barva Volcano, Costa Rica

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Received: November 14, 2023; Revised: November 28, 2023; Accepted: December 5, 2023

Abstract

On the slopes of Barva Volcano in the Central Volcanic Mountain Range of Costa Rica, numerous farms are primarily dedicated to dairy cattle farming. This area belongs to the Lower Montane Tropical Forest life zone, a biome typically found at elevations ranging from approximately 1000 to 2000 meters above sea level. Among the farms located on the slopes of the Barva volcano, where striking remnants of the flora that once populated these areas can still be found, lies La Concordia. This farm measures approximately 400 hectares and varies in altitude between 1800 and 2000 meters above sea level. This farm was selected as study site to conduct a comprehensive survey of all trees and shrubs in the pastures and their uses by the local people. Roads and trails of the farm were walked opportunistically, recording all the trees and shrubs observed in the pastures. Ten one-day surveys were conducted in 1981, and ten more were performed between 1990 and 2000, to include sites not checked during the first ten surveys. After that, then five more were performed between 2001 and 2018, and two in 2023. On at least ten occasions, a local resident took part in these explorations to provide both the local name of the species and their most common uses. At least 141 taxa were identified, but some genera included more than one species totaling about 150 species. 105 taxa were determined at the species level, although nine of those were identified only in terms of genus. All species found belong to ninety-three genera in sixty families. The main uses identified for these species include bearing edible fruits, being valuable for wildlife, charcoal production, providing shade for cattle, being useful as construction materials, and living fences and as a source for firewood, in addition to their ecological benefits. Some species are used for special purposes such as making tool handles, ox yokes, and for medicinal purposes. Trees and shrubs, even as elements outside the forest, continue to be of great importance to the inhabitants of a particular area. It is a priority to care for and sustainably exploit this valuable resource of trees outside forests to continue to benefit from their riches and ecological services.

Key words: Alajuela, *Hamelia patens,* Heredia, La Concordia, vegetation, wildlife

Introduction

On the slopes of Barva Volcano in the Central Volcanic Mountain Range of Costa Rica, numerous farms are primarily dedicated to dairy cattle farming (Boza, 1968; Cascante, 2018). The area, characterized by a cold and rainy climate, is often classified as part of the highlands or cold lands. Authors including Standley (1937) have set the lower limit of these lands at an elevation of 1500 meters. Wercklé (1909) also categorized them as within the cold region or cold lands, although Pittier (1957) argued that the cold lands are those above 2600 meters (which he referred to as alpine). Fournier (1965) recommended discontinuing the use of the term 'alpine' since it is of European origin and is used only due to similarity in climate and vegetation with the Alps. The region above 1500 meters was considered by Wercklé (1909) to have the richest and most interesting flora of all.
This area belongs to the Lower Montane

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Tropical Forest life zone, a biome typically found at elevations ranging from approximately 1000 to 2000 meters above sea level. The climate exhibits moderate temperatures, and there may be a distinct dry season, with variations based on specific geographic locations (Hartshorn, 1983). These forests are renowned for their high biodiversity, hosting a wide variety of plant and animal species. The diverse topography and climate at different elevations contribute to this richness. The vegetation is characterized by a mix of both tropical and temperate species, allowing for a transition from tropical rainforest species to those adapted to cooler conditions. Evergreen broadleaf trees are prevalent, and the forest structure varies from a closed canopy to a more open one, influenced by factors such as elevation and disturbance (Hartshorn, 1983).

Among the farms located on the slopes of the Barva volcano, where striking remnants of the flora that once populated these areas can still be found, lies La Concordia. This farm measures approximately 400 hectares and varies in altitude between 1800 and 2000 meters above sea level. This farm was selected as study site for a comprehensive survey of all trees and shrubs in the pastures. Forest remnants, such as riverine forests, were not surveyed. Trees and shrubs remaining in the pastures may have been common species in the original forests of the area before the region was deforested. Additionally, the uses of these species by the local people were recorded.

Plants are of vital importance for life as they produce the oxygen we breathe and the nutrients we consume (Flagler and Poincelot, 2018). Additionally, they fulfill basic needs such as food, ornamentation, fuel production, insulation, medicine, personal grooming, construction, and dye production, among others (Levy and Aguirre, 1999; Castañeda and Castillo, 2016; Jorquera and Brenes, 2019). The trees in the pastures of La Concordia, whether they are only remnants of the original vegetation or have been planted, continue to provide significant benefits to the people. It is important to understand their uses to help preserve culture and traditions.

Materials and Methods

Study site

The work was carried out at La Concordia, located on the border of the provinces of Alajuela and Heredia, Costa Rica (10.122 N, 84.155 W); its main access is through Cinco Esquinas de Carrizal, province of Alajuela (Figure 1). At an elevation of approximately 1900 m (Cascante, 2018), the farm receives an average annual precipitation of 2906.5 mm, an average relative humidity of 71.7% with minimum and maximum temperatures of 7 °C and 31.5 °C respectively (Cascante, 2018). The farm pasture consists of Kikuyu grass, *Kikuyuocloa clandestine* (Figures 1), which was introduced from Africa to Costa Rica between 1911 and 1922 (Peters, 2008; Cascante, 2018). La Concordia is situated on the piedmont of the Barva Volcano (Figure 2) at the Central Mountain Range of Costa Rica

Trees and shrubs survey

Information was collected over several years by exploring various areas on the farm. Roads and trails of the farm were walked opportunistically, recording all trees and shrubs observed in the pastures. Ten one-day surveys were conducted in 1981, each involving walking from 08:00 to 16:00. Between 1990 and 2000, ten additional sites were surveyed that were not checked during the initial surveys. The farm was visited five more times between 2001 and 2018, and twice in 2023. On at least ten occasions, a local resident took part in these explorations. The elderly participant was able to provide both the local names of the species and their most common use or uses. The observations were recorded along with the species when it was possible to identify the species on-site. For species that could not be identified in the field, a sample was taken for a later identification in the herbarium. However, it was not possible to identify some of the species, nor was it possible to obtain a botanical sample.

Results are presented in separate tables based on the main use of each species. Each species is included only once when possible.

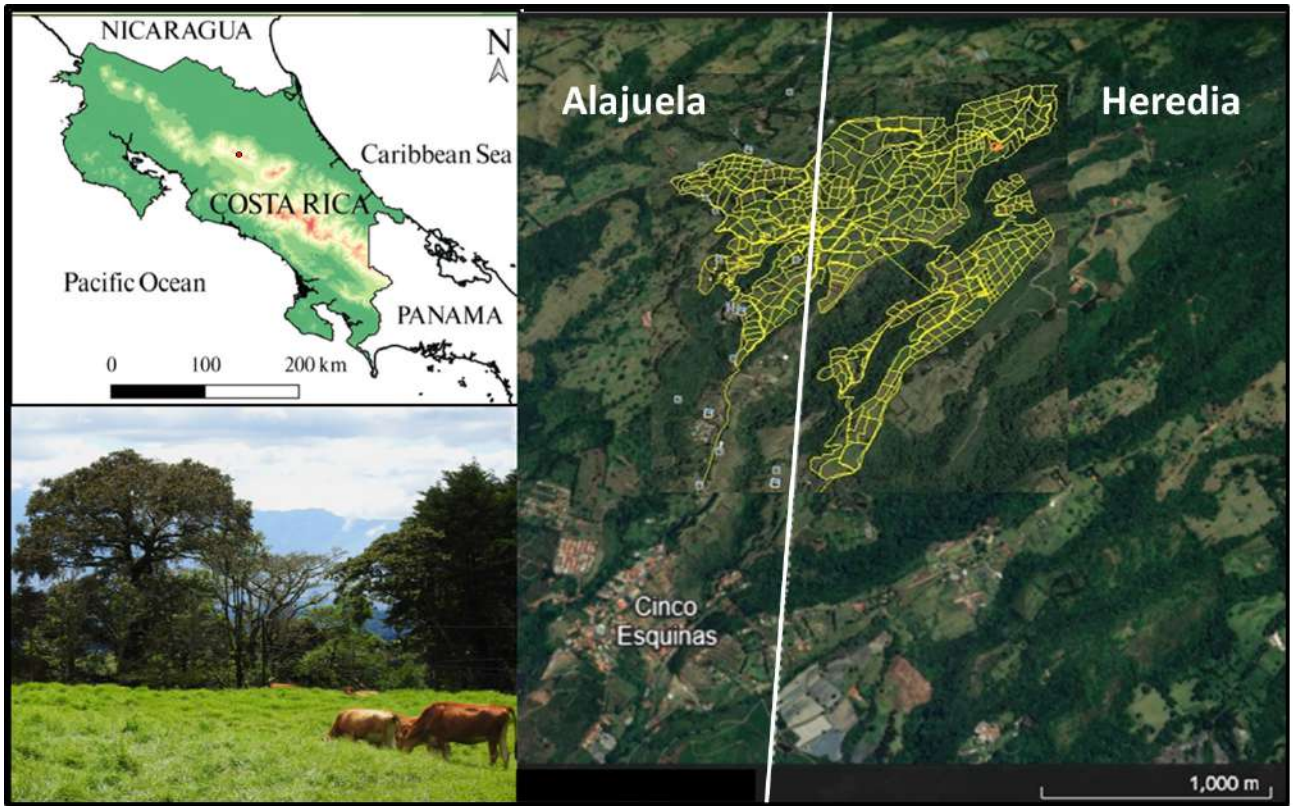

Figure 1. Location of La Concordia dairy farm (red dot) in Costa Rica. The farm pastures (yellow lines) are located at the Barva volcano piedmont on the provinces of Alajuela and Heredia. The pastures are of Kikuyu grass, *Kikuyuocloa clandestina* (lower left).

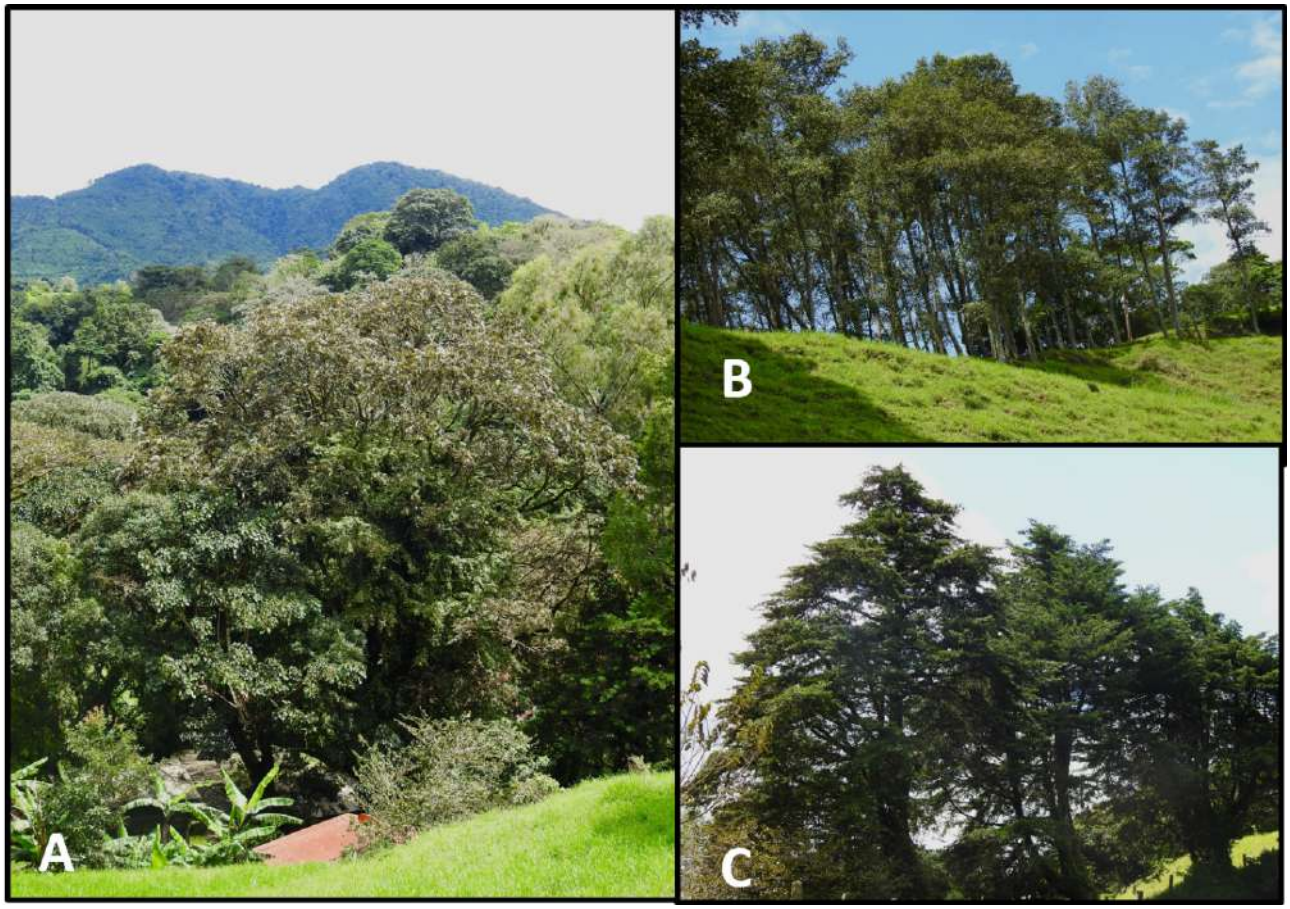

Figure 2. A: View of Barva volcano (background) from one of the westernmost and lowest point of La Concordia dairy farm. B: A stand of jaúl, *Alnus acuminata*, at a nearby farm. C: Ciprés, *Hesperocyparis iusitanica*, at a fence at another dairy farm in the La Concordia area. Costa Rica. Photos by José M. Mora.

However, for some species with multiple uses, they are included in at least two tables. Even if some species have edible fruits, wood, or are valued for firewood or posts, they are listed in the tables only under their main use or their two main uses if included in more than one table.

Results

At least 141 taxa were identified, but some genera included more than one species totaling about 150 species. 105 taxa were determined at the species level, although nine of those were identified only in terms of genus. All species found belong to ninety-three genera in sixty families.

Several of the species found in the pastures of La Concordia are cultivated species. Some of these trees were planted because they bear edible fruits, including peaches (*Prunus persica*), avocado (*Persea americana*), and cherimoya (*Annona cherimola*) (Table 1).

Several of these fruits are also utilized by wildlife, mainly birds (Figure 3). Simultaneously, various other wild species bear fruits highly sought after by wildlife, particularly birds (Table 2).

The production of charcoal has been diminishing in importance in the area and in Costa Rica in general. Although charcoal production was still occurring when this project began, today this practice is almost non-existent in the zone where La Concordia farm is located. Nevertheless, several species, with oaks (genus *Quercus*) being prominent, have been used for charcoal production (Table 3).

Although these species were widely used to produce high-quality charcoal, they still persist in La Concordia's pastures today and are left to provide shade for cattle. There are also other trees with this function that simultaneously serve other additional purposes (Table 4). Some of the species listed in Table 4 are introduced into this region and are mainly used in fence making.

Certainly, one of the most traditional benefits of trees in the region where La Concordia is located is their use in construction. In this regard, there are several tree species on the farm and generally in the area that can be rationally exploited for their timber (Table 5). At the same time, most of these trees have other benefits including their edible fruits, being useful in crafts and making posts in addition to being utilized by wildlife.

Other shrubs and trees in La Concordia and the surrounding areas have been used in particular ways, and that is why they have been classified as special. These uses are important and are still valid, although others

Table 1. Species of shrubs and trees and their local common names at La Concordia, classified as having edible value. Costa Rica.

Scientific name	Family	Local Name
Annona cherimola Mill.	Annonaceae	Anona
Casimiroa tetrameria Millsp.	Rutaceae	Matasano
Satyria spp.	Ericaceae	Muelas
Citrus spp.*	Rutaceae	Several
Eriobotrya japonica (Thunb.) Lindl.*	Rosaceae	Níspero
Panopsis suaveolens (Klotzsch) Pittier	Proteaceae	Papa de Palo
Persea americana Mill.	Lauraceae	Aguacate
Persea schiedeana Nees	Lauraceae	Yas
Prunus persica (L.) Stokes*	Rosaceae	Durazno
Psidium guajava L.	Myrtaceae	Guayaba
Psidium guineense Sw.	Myrtaceae	Güisaro
Saurauia montana Seem	Actinidiaceae	Mocos
Yucca gigantea Lem.	Asparagaceae	Itabo

* Introduced

Figure 3. Fruits of some tree species taken by birds and other wildlife at La Concordia, Costa Rica. A: *Bocconia frutescens*, B: *Oreopanax xalapensis,* C: *Trema micranthum*, D: *Citharexylum donnell-smithii*, E: *Ficus* sp. 1, F: *Ficus* sp. 2 photos by José M. Mora.

are much less common than in the past. However, they are significant because they demonstrate a special characteristic of each species or its use that makes it unique and beneficial for a particular function (Table 6). The targuá, *Croton draco*, (Figure 3) is used in human medicine and to make ox yokes among other uses. The burío, *Heliocarpus appendiculatus*, has a great ecological value, and its bark is also used to wash sugar mills and basketry (Figure 4).

Although few households currently cook using firewood, this has been a very traditional use of several species in the past. However, some of these species continue to be highly important for this purpose (Table 7). A traditional practice that is still in use is to prune the trees in the pastures of the farms to use the branches for firewood. At the same time, most of these trees are useful for making posts, for crafts, and also for their edible fruits.

Some trees and shrubs from La Concordia might be useful for firewood or other purposes, but their primary value is ecological. This is because these trees and shrubs have been left as windbreaks, especially for protection along the edges of streams (Table 8).

Similar to the previous ones (Table 8), several species of trees and shrubs from La Concordia are not highly valued because they do not have a particular use for people. However, many of these species are crucial in the ecological process as they are pioneer species in areas affected by landslides and other natural or anthropogenic events, such as the case of the jaúl, *Alnus acuminata* (Table 9), which is also a species of importance used in silvopastoral practices.

Many other species are used for posts, requiring only that they are hard to ensure

Table 2. Species of shrubs and trees and their local common names at La Concordia, classified as having high value for wildlife. Costa Rica.

Scientific name	Family	Local Name
Ardisia revoluta Kunth	Myrsinaceae	Tucuico
Blakea grandiflora Hemsl*	Melostomaceae	San Miguel
Bocconia frutescens L.	Papaveraceae	Guacamaya
Casearia arguta Kunth.	Salicaceae	Manga larga
Chiococca pachyphylla Wernham	Rubiaceae	Comenegro
Citharexylum caudatum Walp.	Verbenaceae	Dama
Citharexylum donnell-smithii Greenm	Verbenaceae	Flor de dama
Dendrophthora costaricenses Urb.	Viscaceae	Matapalo
Drymis granadensis L.f.	Winteraceae	Chile muelo
Ficus spp.	Moraceae	Higo, higuerón, matapalo, chilamate
Frangula oreodendron (L.O.Williams) A.Pool	Rhamnaceae	Duraznillo
Iochroma arborescens J.M.H.Shaw	Solanaceae	Güitite
Mauria heterophylla Kunth.	Anacardiaceae	Manguillo, cirrí
Miconia oerstediana (O.Berg ex Triana) Michelang.	Melastomataceae	María
Miconia spp.	Melostomataceae	Lengua de vaca
Myrcia splendens DC.	Myrtaceae	Murta
Ocotea spp.	Lauraceae	Aguacatillo
Quercus lancifolia Schltdl. & Cham.	Fagaceae	Roble
Quercus laurina Bonpl.	Fagaceae	Encino
Struthanthus cansjerifolius (Oliv.) Eichler	Loranthaceae	Matapalo
Turpinia sp.	Staphyloceae	No one
Xylosma sp.	Salicaceae	Espino

* Vulnerable (Rodríguez *et al*., 2021)

durability. However, several species root and become trees, forming living fences. Thus, some species like the cedro, *Cedrela odorata*, and poró trees, *Erythrina* spp. (Figure 5), among others (Table 10), are highly valued. Still, other species are important for fences, even as dead posts (Table 10).

Discussion

Forests have provided humanity with multiple goods and ecological services, such as wood, other forest products, and clean air, among other economic and cultural benefits (Jorquera and Brenes, 2019). Forests are essential for climate balance, water reserves, and soil conservation (Ma *et al.,* 2021).

Once the forests are exploited, these lands are converted into farms, some dedicated, as in this case, to dairy production (Boza, 1968). Many trees have disappeared more slowly, but depending on their use, they have been maintained and possibly will be for a long time. Among these, are trees that have been introduced into this area as ornamentals or for their edible fruits, as well as others that grow naturally and are appreciated and maintained for their fruits (Table 1). Some of these species were found in places where houses existed, surely planted by their inhabitants. The loquat or níspero (*Eriobotrya japonica*) and citrus trees (*Citrus* spp.) stand out as a good example, among many others (Table 1). Other trees also bear fruits used by wildlife,

Table 3. Species of shrubs and trees and their local common names at La Concordia, for charcoal production. Costa Rica.

Scientific name	Family	Local Name	Other uses
Chiococca pachyphylla Wernham	Rubiaceae	Comenegro	Posts, fauna
Cleyera theoides (Sw.) Choisy	Pentaphylacaceae	Sierrilla	Fauna Medicine
Mimosa platycarpa Benth.	Mimosaceae	Carboncillo	Firewood
Myrsine coriacea (Sw.)R.Br. ex Roem. &Schult.	Primulaceae	Ratoncillo	Fauna
Oreopanax capitatus (Jacq.) Decne. & Planch.	Araliaceae	Higuerilla	Firewood, posts
Oreopanax xalapensis (Kunth) Decne.&Planch.	Araliaceae	Cacho de venado	Fauna
Quercus lancifolia Schltdl. & Cham	Fagaceae	Roble	Timber, fauna
Quercus laurina Bonpl.	Fagaceae	Encino	Timber, fauna
Roupala montana Aubl.	Proteaceae	Danto	Timber
Sciodaphyllum pittieri (Marchal ex T.Durand & Pittier) Lowry,G.M.Plunkett & M.M.Mora	Araliaceae	Higuerilla	Firewood, posts
Styrax argenteus C. Presl	Styracaceae	Quicirrí	Firewood
Tapirira mexicana Marchand	Anacardiaceae	Dantisco	Firewood
Ulmus mexicana (Liebm.) Planch.	Ulmaceae	Tirrá	Bases and forks

Table 4. Species of shrubs and trees from La Concordia that provide shade for livestock or are used for ornamental purposes, fences, or windbreaks, Costa Rica.

Scientific name	Family	Local Name
Alnus acuminata Kunth	Betulaceae	Jaúl
Cojoba costaricensis Britton & Rose	Fabaceae	Lorito
Erythrina spp.	Fabaceae	Poró
Hesperocyparis lusitanica (Mill.) Bartel.*	Cupressaceae	Ciprés
Hibiscus rosa-sinensis L.	Malvaceae	Amapolón
Inga spp.	Fabaceae	Guajiniquil
Malvaviscus arboreus Dill. ex Cav.	Malvaceae	Amapola de río
Salix humboldtiana Willd.*	Salicaceae	Sauce
Spathodea campanulata P.Beauv.*	Bignoniaceae	Llama del bosque
Syzygium jambos (L.) Alston*	Myrtaceae	Manzana rosa

* Introduced

Table 5. Species of shrubs and trees in La Concordia that were heavily exploited for construction and still have representatives in the pastures where they have other important uses, Costa Rica.

Scientific name	Family	Local Name
Cedrela odorata L.	Meliaceae	Cedro
Citharexylum caudatum Walp.	Verbenaceae	Flor de dama
Cornus disciflora Moc. & Sessé ex DC.	Cornaceae	Llorón
Guarea guidonia (L.) Sleumer	Meliaceae	Cedro macho
Hesperocyparis lusitanica (Mill.) Bartel.*	Cupressaceae	Ciprés
Lippia myriocephala Schltdl. & Cham.	Verbenaceae	Caragra
Myrcianthes storkii (Standl.) McVaugh	Myrtaceae	Murta
Ocotea sp.	Lauraceae	Quizarrá colpachí
Persea schiedeana Nees	Lauraceae	Yas
Phoebe sp.	Lauraceae	Quizarrá
Phoebe spp.	Lauraceae	Aguacatillos
Quercus lancifolia Schltdl. & Cham	Fagaceae	Roble
Quercus laurina Bonpl.	Fagaceae	Encino
Sloanea ampla I.M.Johnst.	Eleocarpaceae	Peine´mico

* Introduced

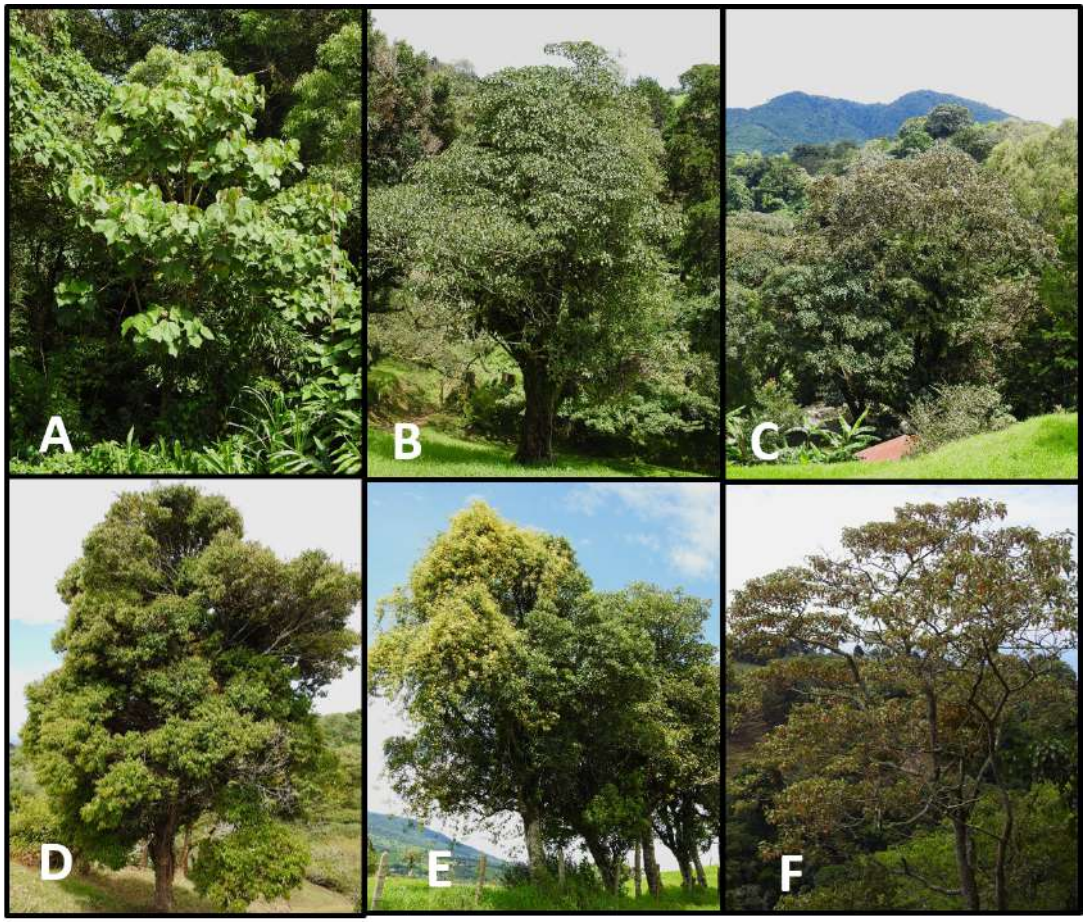

Figure 4. Some selected trees of La Concordia. A: Burío, *Heliocarpus appendiculatus*. B: Higuerilla, *Sciodaphyllum pittieri*. C: Cedro, *Cedrela odorata*. D: Murta, *Myrcianthes storkii.* E: Chile muelo, *Drymis granadensis* (the yellow flowers are from a climbing vine). F: Targuá, *Croton draco*. Photos by José M. Mora.

Table 6. Species of shrubs and trees in the pastures of La Concordia along with their particular use(s), Costa Rica.

Scientific name	Family	Local Name	Uses
Brugmansia arborea (L.) Sweet*	Solanaceae	Floripón	Medicine
Calyptranthes pallens Griseb.	Myrtaceae	Cacique	Handles for hammers, picks, and axes.
Cestrum spp.	Solanaceae	Zorrillo	Medicine
Clusia sp.	Clusiaceae	Copey	Medicine
Croton draco Schltdl.	Euphorbiaceae	Targuá	Ox yokes
Drymis granadensis L.f.	Winteraceae	Chile muelo	Medicine
Ehretia latifolia Loisel	Boraginaceae	Raspaguacal	Washing dishes
Eugenia costaricensis O.Berg	Myrtaceae	Murta	Ox goads, cattle prods
Hedyosmum mexicanum Cordem. ex Baill.	Acanthaceae	Vara de agua	Road protection (corduroy)
Heliocarpus appendiculatus Turcz.	Tiliaceae	Burío	Washing sugar mills, basketry
Ocotea sinuata (Mez) Rohwer	Lauraceae	Quizarrá caca	Yokes
Roupala montana Aubl.	Proteaceae	Danto	Axe handles
Sambucus nigra L.*	Adoxaceae	Sauco	Medicine
Sapium glandulosum (L.) Morong	Euphorbiaceae	Yos	Matches, boxes, rubber
Sciodaphyllum pittieri (Marchal ex T.Durand & Pittier) Lowry,G.M.Plunkett & M.M.Mora	Araliaceae	Higuerilla	Benches
Sloanea ampla I.M.Johnst.	Eleocorpaceae	Peine´mico	Wash tables
Trema micranthum (L.) Blume	Ulmaceae	Capulín	Yokes
Ulmus mexicana (Liebm.) Planch.	Ulmaceae	Tirrá	Bases
Verbesina turbacensis Kunth	Asteraceae	Tora	Bird cages

* Introduced

Table 7. Species of shrubs and trees from La Concordia highly sought after for producing high-quality firewood, Costa Rica.

Scientific name	Family	Local Name	Other key uses
Casearia sylvestris Sw.	Salicaceae	Poipute	Posts
Citrus spp.*	Rutaceae	Limon and others	Edible fruits
Cornus disciflora Moc. & Sessé ex DC.	Cornaceae	Llorón	Timber
Diphysa americana (Mill.) M.Sousa	Fabaceae	Guachepelín	Timber
Eriobotrya japonica (Thunb.) Lindl.*	Rosaceae	Níspero	Edible fruits
Eugenia costaricensis O.Berg	Myrtaceae	Murta	Arches, ox goads, cattle goads
Freziera candicans Tul.	Theaceae	Sierrilla	Fauna
Hesperocyparis lusitanica (Mill.) Bartel.*	Cupressaceae	Ciprés	Timber
Inga spp.	Mimosaceae	Guajiniquil-Guaba-Juaniquil	Edible fruits
Myrcianthes storkii (Standl.) McVaugh	Myrtaceae	Murta	Posts
Psidium guajava L.	Myrtaceae	Guayaba	Edible fruits
Sideroxylon sp.	Sapotaceae	Poipute	Posts

* Introduced

Table 8. Species of shrubs and trees as important components of natural windbreaks and protective forest strips along streams and rivers in La Concordia, Heredia, Costa Rica.

Scientific name	Family	Local Name
Bocconia frutescens L.	Papaveraceae	Guacamaya
Clethra mexicana DC.	Clethraceae	Nance macho
Fuchsia arborescens Sims	Onagraceae	Fucsia
Guatteria sp.	Annonaceae	Anonillo
Heliocarpus appendiculatus Turcz.	Tiliaceae	Burío
Mollinedia viridiflora Tul.	Monimiaceae	Limoncillo
Morus insignis Bureau	Moraceae	Recino
Palicourea sp.	Rubiaceae	Cafecillo
Phenax angustifolius (Kunth) Wedd.	Urticaceae	Yuquilla
Piper spp.	Piperaceae	Anicillo, cordoncillo
Siparuna gesnerioides (Kunth) A.DC.	Siparunaceae	Limoncillo
Urera spp.	Urticaceae	Ortiga

Table 9. Species of shrubs and trees from La Concordia classified as pioneer species, Costa Rica.

Scientific name	Family	Local Name
Alnus acuminata Kunth	Betulaceae	Jaúl
Cestrum spp.	Solanaceae	Zorrillo
Clethra mexicana DC.	Clethraceae	Nance macho
Croton micans Sw.	Euphorbiaceae	Targuacillo
Myrcia splendes DC	Myricaceae	Roblecillo de montaña
Ricinus communis L.*	Euphorbiaceae	Higuerilla
Vernonanthura patens (Kunth) H.Rob.	Compositae	Tuete
Wigandia urens (Ruiz & Pavon) Kunth	Hydrophylaceae	Ortigo

* Introduecd

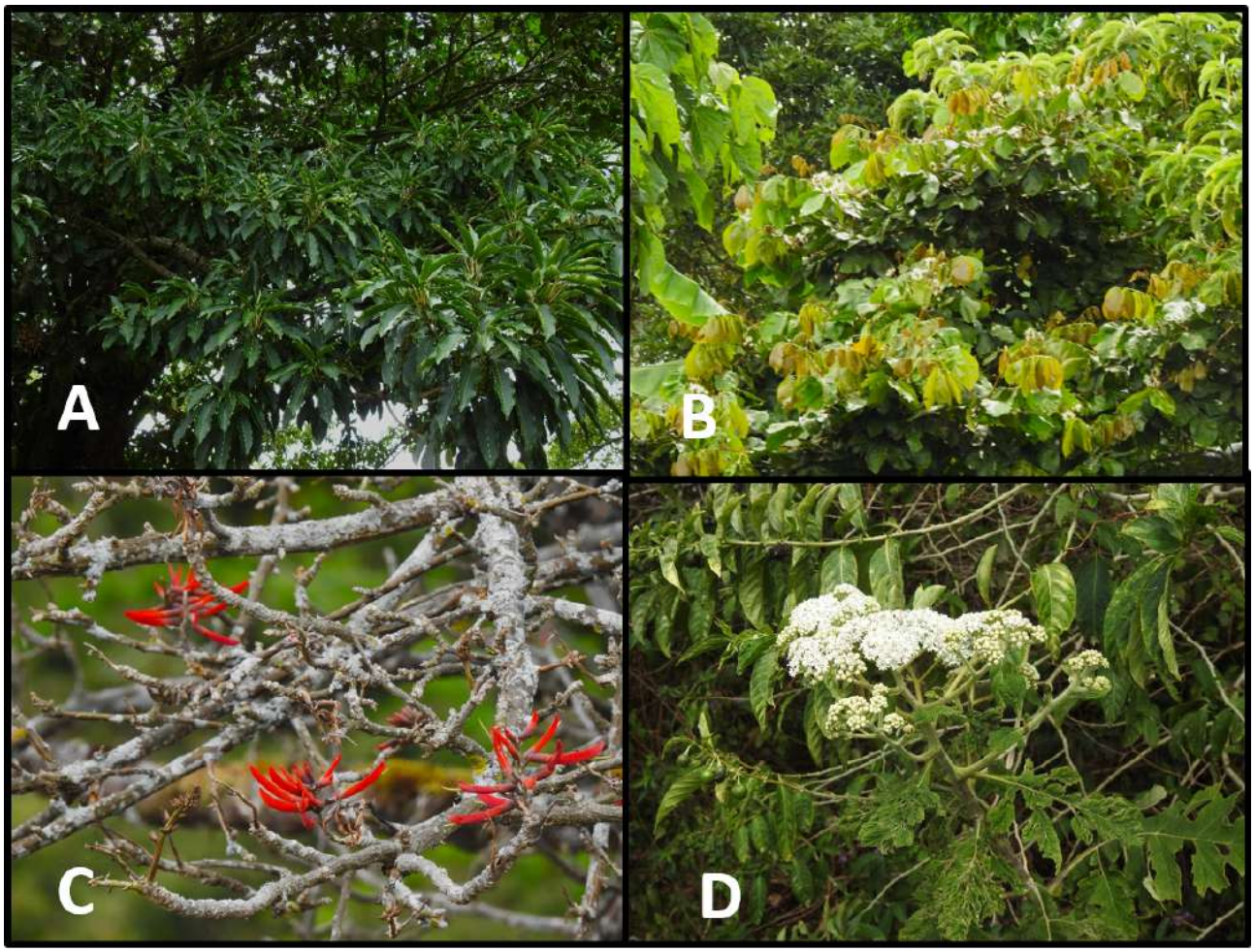

Figure 5. A: Among its other uses, Yos, *Sapium glandulosum*, is sometimes used for making fence posts. B: Guajiniquil, *Inga* sp., has edible fruits and is highly appreciated as a source for firewood. C: Poró, *Erythrina* spp., provides the most favorite posts for living fences, and their knife-like red flowers are eaten by people. D: Tora, *Verbesina turbacensis*, was used to construct bird cages. Photos by José M. Mora.

Table 10. Species of trees from La Concordia used mostly for making posts in living fences (L) and dead fences (D), Costa Rica.

Scientific name	Family	Local Name
Aiouea brenesii (Standl.) R.Rohde	Lauraceae	Ira
Alfaroa costaricensis Standl.	Juglandaceae	Cedro blanco (D)
Billia rosea (Planch. & Linden) C.Ulloa & P.M.Jørg.	Sapindaceae	Cucaracho (D)
Cedrela odorata L.	Meliaceae	Cedro (L)
Miconia oerstediana (O.Berg ex Triana) Michelang.	Melastomataceae	Plomillo (L)
Croton glabellus L.	Euphorbiaceae	Copalchi (L)
Diphysa americana (Mill.) M.Sousa	Fabaceae	Guachepelín (L)
Drymis granadensis L.f.	Winteraceae	Chile-Muelo (L)
Erythrina spp.	Fabaceae	Poró (L)
Ficus spp.	Moraceae	Higuerón (L)
Tecoma stans (L.) Juss. ex Kunth	Bignoniaceae	Vainillo (L)
Terminalia sp.	Combretaceae	Sura
Trichilia havanensis Jacq.	Meliaceae	Uruca (D)
Viburnum costaricanum (Oerst.) Hemsl.	Adoxaceae	Sauco de montaña (D)
Yucca gigantea Lem.	Asparagaceae	Itabo (L)
Zinowiewia costaricensis Turcz.	Celestraceae	Raíz dorada (D) (Zamora, 2021)

such as bats, but they were not included because they were not observed in that regard. However, striking species, including the quetzal (*Pharomachrus mocinno*), primarily feed on aguacatillos (Lauraceae). The duraznillo (*Frangula oreodendron*) attracts the Golden-browed Chlorophonia (*Chlorophonia callophrys*) and the euphonias or agüíos (*Euphonia* spp.), species that were, at least previously, heavily pursued to be kept in cages at homes. However, many small and not so conspicuous species use the flowers of various trees such as *Myrcia splendens*, *Frangula oreodendron*, *Chiococca pachyphylla*, and *Turpinia* sp. (Table 2). The Band-tailed pigeon (*Patagioenas fasciata*) constantly visits the dama (*Citharexylum donnell-smithii*) trees, being one of its main food sources (Alfaro, 2019). In the United States, this pigeon is considered one of the main game birds (Alfaro, 2019), which continues to be hunted in Costa Rica although this is prohibited.

A common use in the area for the güitite (*Iochroma arborescens*) is to have it in house yards as support for orchids; this is one of the most frequent uses cited in the literature for this species (León and Poveda, 2000; Jorquera and Brenes, 2019). However, the güitite has other various uses, including personal hygiene, human food, decoration, human medicine, and animal medicine (Jorquera and Brenes, 2019), and it produces lots of fruits readily taken by birds and other wildlife (Figure 6).

The wildlife value of three Araliaceae species is worth highlighting, even though they were included in Table 3 due to their use in charcoal production. These species, *Oreopanax capitatus*, *Oreopanax*

Figure 6. A female Flame-colored Tanager (*Piranga bidentata*) feeding on güitite fruits (*Iochroma arborescens*) at La Concordia, Costa Rica. Photo by José M. Mora.

xalapensis, and *Sciodaphyllum pittieri*, bear a large number of fruits and are especially appreciated by the Black guan (*Chamaepetes unicolor*) and other bird species.

Charcoal production was once essential here, but it is a practice that has almost disappeared today. Several species had that utility at some point (Table 3), but they were left in the pastures, to provide shade for livestock. Other species also serve this function (Table 4) and can be used as ornamentals or windbreaks. Very few artificial windbreaks (planted exotic species) were observed. However, small forest blocks, used as windbreaks, mainly composed of species of little use to people, were observed. However, these have great ecological importance as they protect the small streams and springs between pastures (Table 8). Specific species play similar roles, such as the jaúl, *Alnus acuminata* (Table 9), which grows in large quantities in areas where landslides have occurred and is also a nitrogen fixer (Guariguata and Ostertag, 2001). In such areas, other species grow, including the ortigo (*Wigandia urens*), nance macho (*Clethra mexicana*), and capulín (*Trema micranthum*).

The jaúl remains very important as it is exploited for its wood and firewood since it is cultivated in pastures for its rapid growth and regeneration.

The purpose or use of wood varies widely depending on the species. For example, the caragra (*Lippia myriocephala*, Table 5) is used to make boards. The Meliaceae species, like the cedro (*Cedrela odorata*), is used for making furniture due to their fine wood; however, as it is now scarce in the area, its primary use is making posts for living fences. Although not a timber species, the coralillo *Hamelia patens* Jacq. (Rubiaceae) was once a very rare shrub species. It is primarily found near some creeks and rivers and, mainly, in open areas with lower lands, that are up to

1700 m in elevation (Estrada and Sánchez, 2012). During the latest observations in 2023, it was clear that this shrub has become widely common and is now found along roadsides, in gardens, and on fences throughout the area, specifically in areas at a bit lower altitude, such as at the village of Cinco Esquinas de Carrizal. The species is appreciated as an ornamental (Figure 7), and its flowers attract a high number of insects and hummingbirds; the fruits are taken by several bird species. It finds application in traditional medicine for various ailments, including athlete's foot, skin issues, insect stings, psychiatric disorders, rheumatism, headaches, asthma, dysentery, menstrual concerns, and ovarian and uterine disorders (Noor *et al.,* 2020).

Although the use of firewood, here as in other parts of the country, has gradually declined, many people still use it, and several species are highly appreciated for this purpose (Table 7). Some of these species, both for timber (Table 5) or firewood (Table 7), were abundant in the past. This is evident along the banks of larger rivers where highly valued species such as the llorón (*Cornus disciflora*) are common and even abundant. Although oaks (*Quercus* spp.) are scattered in the area, in the past, extensive stands of these two species existed (Table 5). *Quercus laurina* is often found regenerating in open sites (Jerome, 2018). Another common species in La Concordia, which was also possibly abundant in the past, is danto (*Roupala montana*).

The manufacturing of handles for hammers, picks, or axes requires hard and manageable woods, such as that of the aforementioned species of the danto *Roupala montana* (Table 6). This in addition to other species are appreciated for this purpose and other uses as well due to their straight and hard branches fit for making ox goads or cattle prods to herd cattle. Some of these species are called "cacique" because, being hardwood, they were used to make the staffs of indigenous chiefs in pre-Columbian times (Fonseca, 1978).

The chile-muelo (*Drymis granadensis*) has a medicinal value, but it also produces a large number of fruits that are highly sought after by birds, especially the Long-tailed Silky-flycatcher (*Ptiliogonys caudatus*). Likewise, zorrillos (*Cestrum* spp.), very abundant in the pastures, have medicinal value (Table 6). For example, their leaves, when rubbed on exposed skin, repel mosquitoes and midges. The copey (*Clusia* spp.) has pleasantly fragrant flowers, which campesinos collect to scent clothes stored in wardrobes or drawers. Several other species are used for medicinal purposes. In a similar study in the Tilarán mountain range in Costa Rica, Jorquera and Brenes (2018) found that 54.38% of species are used for human medicine. Approximately half of the global population relies entirely on plants for medicinal purposes, with many plants serving as the primary source of active ingredients in many traditional medical products (Noor *et al*., 2020). Although they are medicinal, some of these plants are poisonous, for example, the floripón, *Brugmansia arborea*. Other species found in the pastures of La Concordia are poisonous, such as the zorrillos (*Cestrum* spp.) and the higuerilla *Ricinus communis*. However, no health issues were reported for people or livestock.

The Mexican elm (*Ulmus mexicana*) is still abundant because its wood is very hard, and so it was only occasionally cut to be used in the foundation of houses. Another species that has also remained intact for several years is the Water rod (*Hedyosmum mexicanum*), which has been widely used to protect roads by placing logs across (corduroy) to prevent the sinking of roads and the constant passage of cattle from causing too much mud .

Bird capture is almost non-existent in the area today, but those who still engage in it continue to use some species of shrubs to build cages (Table 6). Similarly, another practice that has also lost its importance is the manufacturing of yokes since oxen are almost no longer used as a means of transportation. However, species like capulín (*Trema micranthum*), quizarrá caca (*Ocotea sinuata*), and targuá (*Croton draco*) were important in this regard (Table 6).

In a cattle farm that has been divided into

Figure 7. The coralillo, *Hamelia patens*. Left: a view of the shrub. Right: two close-ups to appreciate the flowers (top) and fruits (bottom). Photos by José M. Mora.

small pastures, posts are a primary need. Many species of trees are used for this purpose, depending mainly on their availability at the time of needing the posts. However, preferred species include porós (*Erythrina* spp.) that sprout again and save money for the landowners (Table 10). Among these species, the uruca (*Trichilia havanensis*) is prominent because it has various uses, especially in other countries. Its branches, once cut, wither very slowly, and for this reason, they have been used to decorate altars, make arches, and ornament religious sites, to which it also gives a pleasant smell (Fonseca, 1978). This species is used as an ornamental in many places, including urban areas.

The discussion would be too extensive if all the different uses of the shrubs and trees included in the results were noted. However, it can be concluded that where there is a tree, there is a source of satisfaction for both humans who feel and appreciate the beauty of nature and for nature itself, which can thus show its wise gifts and generosity. A representative example, that is worth mentioning in the conclusion, is *Diphysa americana*, which is a forage and an ornamental tree used as in making living fences and creating shade in pastures. Also, its dense hard wood is used in house construction, the manufacturing of tool handles, and as firewood (Table 7). Moreover, its bark is used to treat gastrointestinal problems, in addition to being a nitrogen fixer (López de Buen *et al.,* 2019).

Acknowledgments

This work is dedicated to the memory of Don Alfredo Barrantes from Cinco Esquinas de Carrizal de Alajuela. The authors acknowledge the efforts of José Andrés Mora López in preparing this report, and greatly appreciate the positive comments and great input of an anonymous reviewer. LIL acknowledges Uriel Rojas, Engineering in Food Technology, and Daniel Tobias, Basic Sciences Unit,

Atenas Campus, UTN. JMM acknowledges Emilce Rivera, Department Head, Ecotourism Management, Central Campus, UTN, for providing academic support.

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