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Maarten Kappelle, Guillaume Avertin, Marta E. Juárez and Nelson Zamora

Useful Plants Within a Campesino Community in a Costa Rican Montane Cloud Forest

An ethnobotanical survey was carried out among a campesino community in a Costa Rican montane cloud forest. Campesino families were interviewed about how they used indigenous and introduced vascular plants along an altitudinal gradient (2000–3000 m). From a total of 590 species known in the area, 23.8% of 189 useful plant species were used for medicinal purposes, 39.7% for food, and 24.3% for construction (timber) or as combustibles (fuelwood, charcoal). Less important uses included dye, ornament (ecotourism), fodder, gum, oil, and poison. A total of 61.9 % of the plants were used for one purpose only. The introduced and exotic woody species *Cupressus lusitanica* and *Eucalyptus globulus* showed the highest diversity in types of use (7), together with the native *Alnus acuminata*. Trunks (53%) and fruits (47%) were the main plant organs used, followed by leaves (33%) and branches (30%). Over 27.5% of all plants were used on a daily basis, while 34.9% were used occasionally. About 11.6% of the species were rarely used. At present, use of indigenous species is becoming less common; the trend is to favor introduced and economically important species. In the short or medium term, local knowledge of medicinal plants will probably disappear in this rural community that is undergoing modernization, with a focus on new undertakings such as fruticultural export, rainbow trout hatcheries, and ecotourism.

Keywords: Tropical forests; montane cloud forest; ethnobotany; mountain rural economy; campesino communities; plant resources; indigenous knowledge; Costa Rica.

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Introduction

Most articles dealing with ethnobotany in tropical lowlands stress the importance of tropical lowland flora for the subsistence and survival of local populations and their cultures. Similar data are available for highlands in subtropical regions such as the Himalayas. But until now, hardly any ethnobotanical studies of the upland tropics have been conducted, and there is an almost complete lack of information on montane forests and knowledge about how their populations use these rich resources.

In an effort to begin filling this gap, the authors made an inventory of useful plants in the upland belt of the Costa Rican Los Santos Forest Reserve, a protected area in which a large percentage of the surface is still covered by fragmented but mature tropical montane cloud forest. This study aims to identify useful indigenous and introduced plant species that are known to representatives of a rural community of settlers. This community is presently undergoing an abrupt change from traditional subsistence agriculture toward a modern economy based on fruticulture, trout export, and ecotourism.

Study Area

Topography and administrative status

The study area is located in the montane belt (from 2000 to 3000 m) of the Los Santos Forest Reserve (Chinchilla 1987), a protected area with a surface of 62,000 ha in the Costa Rican Cordillera de Talamanca (Figure 1). The reserve was established in 1975 (Meza and Bonilla 1990) and now serves as a buffer zone for the 612,570 ha of the Amistad Biosphere Reserve (Kappelle and Juárez 1994). It has also been defined as a World Heritage Site and a Centre of Plant Diversity (Whitmore 1990; Groombridge 1992). Today this biosphere reserve harbors the last large tract of undisturbed neotropical montane forest in Central America. The area is administered by MINAE and belongs to the Central Pacific Conservation Area (ACOPAC). At present, due to increasing human pressure, only half of the reserve's area is still covered by dense natural oak forest. A study of a 1987 Landsat satellite image revealed that about 27,000 ha (ie, 43.6%) of the reserve had been cleared by that year (Díaz, personal communication).

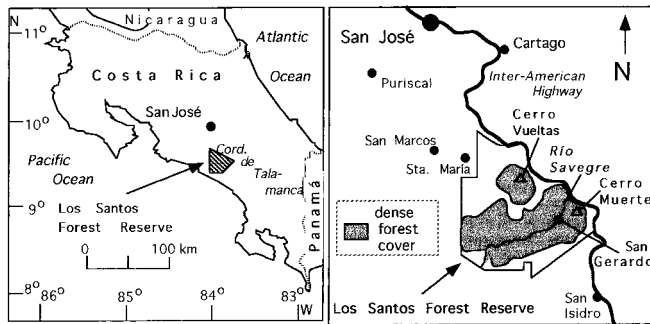
Environmental setting

The study area is characterized by a rugged terrain with a dendritic drainage pattern. Mean annual rainfall values range from 2000 to 3000 mm. A marked dry season occurs between December and April. The mean annual temperature is approximately 9°C on mountain peaks (3200–3491 m) and about 16°C in the valley bottom at 2000 m. January is the coldest month. Soils (Inceptisols) are peaty and rocky on the peaks and clay with litter and humus on the slopes (Kappelle 1996).

Ecosystems in the upper watershed of the Savegre River range from natural tropic alpine *páramo* bamboo scrub on the summits, gnarled subalpine dwarf forests along the upper slopes, and 30–35-m-tall mature montane oak forests on intermediate slopes to disturbed communities (grasslands, fern brakes, scrub, successional forests, agricultural lands; Kappelle et al 1994; Figure 2).

Botanical exploration over the past 12 years has made it possible to produce a checklist for vascular plant species that includes 590 species in 122 families

FIGURE 1 Location of the Los Santos Forest Reserve in central Costa Rica (left) with the reserve's dense forest cover as estimated in 1992 (right). The village of San Gerardo de Dota is indicated with a black dot.



for this watershed (Kappelle et al 2000). Species-rich flowering plant families include Araliaceae, Asteraceae, Ericaceae, Lauraceae, Melastomataceae, Myrsinaceae, Poaceae, Rubiaceae, and Solanaceae. Most abundant and dominant are Asteraceae, Poaceae, and Fagaceae. The montane cloud forest is characterized by oaks 30–40 m tall, festooned with epiphytes. Bamboo thrives in the understory, together with palms, tree ferns, shrubs, and herbs. The structure and composition of the major natural and human-induced vegetation types have been described in previous studies (Kappelle et al 1994, 1995a,b).

Socioeconomy and land use history

The study area was colonized and greatly deforested by coffee farmers who migrated southeastward in the 19th century from Costa Rica's Central Valley into Talamanca's montane forests (Rodríguez and Vargas 1988; Ureña 1990; Carrière 1991). Migrating *campesinos* in search of land established small settlements (*caserios*), which in the 1940s grew into villages (*pueblos*) as markets became accessible due to the construction of the Inter-American Highway (Schubel 1980). In the 1950s, more remote areas were colonized, for example, the Savegre valley, where San Gerardo de Dota is situated in the middle of the Los Santos Forest Reserve (Siles de Guerrero 1980).

Forty years ago, the first settlers in this town (the *moradores*) practiced slash-and-burn techniques. They extracted timber for fence posts, fuelwood, and charcoal and cultivated crops (maize, legumes) for domestic use. They gathered blackberries and edible palm hearts and raised dairy cattle and pigs (Chacón, personal communication).

Throughout the 1950s, 1960s, and early 1970s, uncontrolled clearing reached its peak in the area (Van Omme et al 1997). Because the deforestation front was moving westward at an alarming rate, the Costa Rican government created the Los Santos Forest Reserve in 1975 with the aim of controlling the area's natural resources. As clearing of forested land became illegal, loggers (*madereros*), charcoal producers (*carboneros*), and cattle farmers (*ganaderos*) were forced to take up other land use practices.

Only a few *campesinos* were able to successfully develop new socioeconomic activities by growing apples, peaches, and plums. Most other *campesinos* lacked the technical knowledge and skills needed for alternative land use practices, the capital needed for initial investment, and appropriate social networks to achieve their goals. Today, the charcoal-producing *campesinos* in the upper part of the watershed area are still seeking new remunerative agricultural activities in order to improve their standard of living (Kappelle and Juárez 1995).

Methods

Based on a study of the area's agroecological zonation by Kappelle and Juárez (1995), in 1996, we randomly selected a total of 14 farms, stratified along a 1000-m elevational gradient (at altitudes between 2000 and 3000 m) and parallel to the Savegre River in San Gerardo de Dota. Two complementary survey methods were employed to assess each farm, (1) interviews using formal questionnaires addressed to each *campesino* and their relatives and (2) informal visits in the field with the same interviewees. Farms and *campesinos* were visited several times (multivisit approach, after Von Platen et al 1982). Often, as they became more accustomed to the researchers' visits, *campesinos* shared more detailed knowledge of plant use during one of the later visits.

Campesinos, their families, and the authors collected ethnobotanical plant specimens. Vouchers were identified on the basis of Hammel et al (1994) and fertile specimens stored at Costa Rica's National Museum and at INBio. Names of common species were annotat-

FIGURE 2 Panoramic view of the valley of San Gerardo de Dota showing natural oak forest (top), secondary forest, pastureland, and fruit tree plantations (bottom). (Photo by M. Kappelle)



ed and cross-referenced (Standley 1937–1938; Burger 1971–1996; Morales 1971; Fournier et al 1973; León 1987; Kappelle et al 1991; Ocampo 1994).

Ethnobotanical parameters of farms and *campesinos*' households, that is, the effective social units, included (1) useful plant species known, (2) the particular use of plant species, (3) the species' origins (indigenous and introduced), (4) the species' status (wild and cultivated), (5) the plant organ used (root, tuber, shoot, stem/trunk, bark, branch, leaf, flower/inflorescence, fruit, seed, exudate [sap, latex], entire plant), and (6) the actual state of use (used in the past, still in use, used very recently).

The following 10 use categories were distinguished: (1) combustible (fuelwood, charcoal, matches), (2) construction (fence, fiber, handicraft, paper, rope, timber, work tool), (3) dye (color), (4) fodder (forage for cattle), (5) gum, (6) medicinal (remedies, drugs, stimulants), (7) nutritional (food, beverage, food colorant, aromatic flavoring, antioxidant), (8) oil, (9) ornamental/ecotourism-related/scenic beauty (eg, attractive for birds), and (10) poisonous (against rodents).

Subsequently, the data sets on useful plants were analyzed and interpreted in order to reveal patterns in plant species' uses and origins, species' status, plant organs used, and actual use state. Results were then compared with results from other ethnobotanical studies.

Results

A total of 189 vascular species were classified as useful plants known by 14 families in San Gerardo. A full list of these plants is provided in the appendix at the end of this article. Over 95% of these species (ie, 180) were identified taxonomically down to species level. The plant families that had the greatest number of species classified as useful plants were Poaceae (13 species), Asteraceae (12), Rosaceae (9), Lauraceae (8), Solanaceae (8), Apiaceae (6), Cucurbitaceae (6), Verbenaceae (6), Brassicaceae (5), and Fabaceae (5).

The number of useful plant species listed per farm ranged from 22 to 117, depending mainly on the origin of the *campesino* family, the age of the interviewees, and the time elapsed since the family's arrival in the Savegre valley. In general, older *campesinos* who came from neighboring valleys and had been living in the area for several decades had a greater knowledge of useful plants than recent and younger settlers who immigrated from regions further away. Similarly, about 57% of the useful plant species were known to only 1 or 2 *campesino* families, while widely known species were few and corresponded mainly to introduced fruit trees (Figure 3) and timber species.

Nutritional plants constituted the largest proportion of plant species used in the area (39.7%), while almost a quarter (24.3%) of the plant species were used

FIGURE 3 Peasant showing his peach plantation to researcher Marta E. Juárez. The peach is an introduced useful plant species of major commercial value to the peasant community. (Photo by M. Kappelle)



for medicinal purposes, half of which were locally introduced and cultivated species (Figure 4). Another quarter (23.8%) was used for construction (timber), and a similar proportion was referred to as ornamental plants. Other, less abundant uses of species included combustion (fuelwood and charcoal species), dye (eg, the tinctoreous *Justicia*; see Acuña and Rivera 1990), fodder (graminoids for cattle), gum, oil (palm), and poison. Among the plants used for nutritional purposes, the largest proportion was made up of plants from which beverages, edible fruit, vegetables, and aromatic spices are derived. Only 15 plant species were used for producing handicrafts. A total of 5 plants were mentioned as useful in killing rodents, a practice no longer much applied. Over 12 species were particularly important as ornamental plants and were cultivated for purposes related to ecotourism. Other plants included the trees *Nectandra* and *Ocotea*, which are planted because their avocado-like fruit attracts the splendid quetzal.

A total of 117 plants, or 61.9% of the total number of species, were used for only one purpose (Figure 5). At the other end of the spectrum, 3 woody species (0.02% of the total number) were each used for 7 different purposes: cypress, eucalyptus, and alder. Plant organs from these multipurpose species were produced in forest plantations (reforestation) and used for combustion (fuelwood, charcoal), for construction (living fences, handicraft, timber), and for medicinal purposes. While cypress and eucalyptus are introduced species used for reforestation, alder also flourishes as an indigenous species along rocky river beds and on recent landslides.

Figure 6 shows that over 50% of the useful plants were used for their stems (mainly woody trunks), which are gathered for construction (timber). Most of these timber species have become locally rare and are out of use (eg, *Magnolia*, *Podocarpus*). The second most important plant organ was the fruit, which is used in 46 plant

species (47%). Many of these plants were introduced for their sweet dessert fruit (apple, pear, peach, plum, strawberry) or for their bitter fruit, which serves as a vegetable (eg, cucumber, tomato). Blackberry (*Rubus*) was one of the few native fruit species to be commercially cultivated. Other species were used for their leaves (33%), branches (30%), or other plant organs, such as flowers (ornamental), shoots and, to a lesser extent, tubers and bark. It appeared that different plant organs (root, stem, bark, leaf, fruit) may be used from merely one species. A total of 132 plant species had only 1 useful plant organ, while 29 species had 2 or 3 different useful plant organs.

With regard to the frequency of use, it appeared that most plant species were used on a daily basis (27.5%) or occasionally, that is, less than once every 2 weeks (34.9%). The latter group comprised plant species that are requested for construction (timber) or when sick relatives are taken care of (medicinal plants). About 11.6% of the species were rarely used. Some 23 species have been used in the past but are out of use today. Among these were a number of medicinal plants, which had been replaced by pharmaceuticals, as well as a series of timber species that had become locally extinct (*Guatteria*, *Hyeronima*). There is a small set of native plant species that has never been used by San Gerardo's *campesinos*, although their usefulness is locally well known (eg, the medicinal *Wercklea lutea*). Several species of nutritious plants were harvested by a limited number of *campesino* families for their own use. An example is the wild variety of the native avocado species *Persea rigens* (Lauraceae), which still grows under natural conditions but is also cultivated. The in situ conservation of viable populations of this tree species in the Cordillera de Talamanca, one of its centers of origin, is of prime importance, as the species constitutes the genetic resource base for the global avocado market.

Commercially cultivated plants made up 18.5% of the total number of useful plants. Ten of these produced fruit, 10 were vegetables, and a few provided aromatic or medicinal products. Other commercial plants included native tree species that are in strong demand among the urban population because of their excellent charcoal. Charcoal-producing *campesinos* (*carboneros*) in San Gerardo usually maintain several pits at different stages of burning in order to have continuous production for the weekly pick-up by charcoal buyers. Charcoal is mainly produced from three species of oak (*Quercus*). According to CITES, trade in *Quercus copeyensis*, oaks that are still abundant locally, "needs to be subjected to strict regulation in order to avoid utilization incompatible with their survival" (Schouten 1990). At present, the timber species in Savegre valley are not exploited commercially, as most of Costa Rica's timber still comes from lowland rain forests.

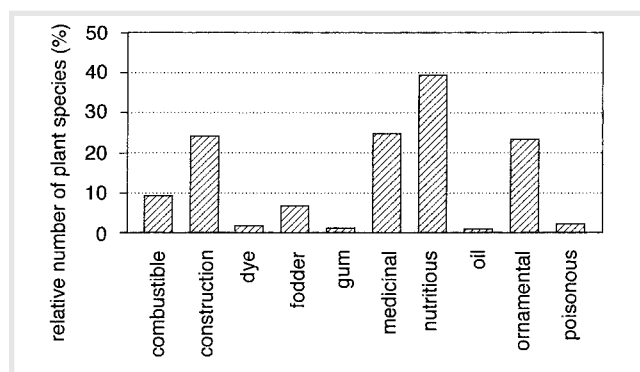


FIGURE 4 Relative distribution of 189 vascular plant species over 10 different use type categories.

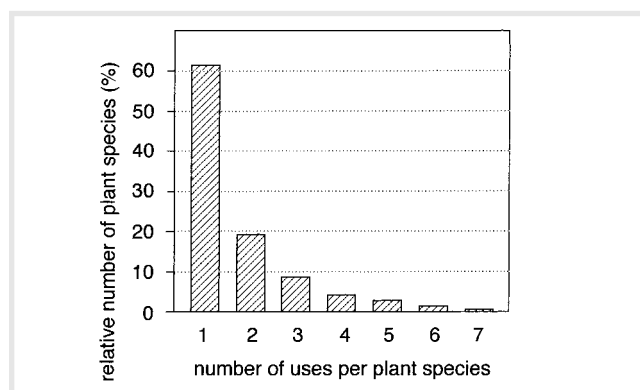


FIGURE 5 Relative distribution of 189 vascular plant species according to number of uses per plant species.

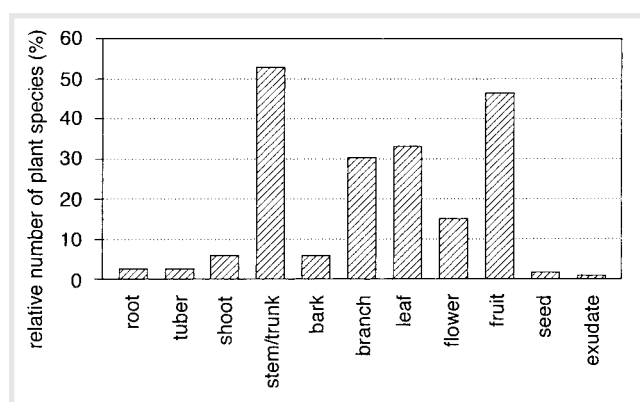


FIGURE 6 Relative distribution of 189 vascular plant species according to 11 different kinds of useful plant organs.

In general, knowledge about useful plants appeared to be inherited from the *campesino* families' ancestors and transferred from generation to generation (Chacón, personal communication). Thirty-nine species whose uses were formerly unknown turned out to be

quite useful in the period following the arrival of San Gerardo's colonizing *campesinos* in the 1950s. According to the *campesinos*, much of this "new" knowledge was derived from recommendations from neighboring villages, from advice provided by governmental extension workers on field visits, and from simple trial-and-error experience obtained by the local *campesinos* themselves. A particular example in this respect is the introduction of exotic apple trees (*Malus pumila*) in the early 1970s. The area's environmental conditions were excellent for the commercial exploitation of apples, which has helped to slow the rate of deforestation in the area over the last 15 years (Van Omme et al 1997). However, more study is needed to clarify the past intensity of plant use (monitoring through time) and the way in which local knowledge is transferred from one generation to the next.

Discussion and conclusion

This study revealed the presence of 189 vascular plant species used by Costa Rican *campesinos* in San Gerardo de Dota. A total of 48.8% is native to the area and is collected in the wild (Kappelle 1996). The remaining proportion of the species has been introduced and is presently being cultivated. Earlier studies have revealed the presence of at least 590 vascular plant species in the entire upper watershed (ca 5000 ha) of the Savegre River (Kappelle et al 2000). This implies that only 15% of the valley's vascular flora are actually being used by its inhabitants. The greater part of this proportion is made up of species sought for timber, fuelwood, and the production of charcoal.

One of the reasons the number of native plant species used is limited is the relative lack of knowledge of uses within San Gerardo's *campesino* community. This is partly due to the fact that the community is relatively young, as the first settlers arrived and colonized the area

only some 50 years ago (Van Omme et al 1997). At present, the *campesinos'* dependence on useful plant species is minimal by comparison with other *campesino* communities in the Cordillera de Talamanca (LaFranchi 1996) and with indigenous populations in more remote areas of the Cordillera. Indigenous tribes (Bri-Bri and Cabécar), who live along the Cordillera's wet Atlantic slopes, have acquired a high level of ethnobotanical knowledge over the centuries (Nuñez 1986; Ammour et al 1994; Ocampo et al 1994). Today, San Gerardo's *campesino* community depends economically on a few agricultural products including apples, peaches, plums, rainbow trout, and charcoal (Kappelle and Juárez 1995). Thus, unlike local indigenous and immigrant populations in many other tropical areas (Schultes and Von Reis 1995), local people do not depend on nontimber forest products.

Apart from this trend, use of San Gerardo's wild and cultivated medicinal plants is decreasing in favor of easily available pharmaceuticals. This pattern is rather different from the situation in other Central American regions, for example, Atlantic Nicaragua (Barrett 1994), where, in spite of centuries of increasing exposure to Western medicine and a decade of rapidly expanding medical services, rural communities continue to use medicinal plants as a mainstay in their struggle for health.

In conclusion, use of traditional and native species is becoming less common in San Gerardo. Trends in frequency of use are in favor of introduced and economically important species. Local knowledge of useful native plants, especially medicinal plants, may therefore disappear in the short or medium term, as San Gerardo is rapidly changing from a rural community dependent on agricultural subsistence into a booming center for fruticultural export, trout production, and ecotourist activities. A future diachronic study of local knowledge transfer within this rural community would be useful.

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REFERENCES

- Acuña L, Rivera G.** 1990. *Plantas Tintoreas y Otros Colorantes de Costa Rica*. Cartago: Ed. Tecnológico de Costa Rica.
- Ammour T, Ocampo RA, Robles G.** 1994. *Caracterización de los Sectores Asociados a la Producción, Comercialización y Transformación de Plantas Medicinales en Costa Rica*. Proyecto Conservación para el Desarrollo Sostenible en América Central (Proyecto Olafo). Turrialba: CATIE (Tropical Agricultural Research and Higher Education Center).
- Barrett B.** 1994. Medicinal plants of Nicaragua's Atlantic coast. *Economic Botany* 48:8–20.
- Burger W, editor.** 1971–1996. *Flora Costaricensis. Fieldiana Botany (New) Series*. Chicago: Field Museum of Natural History.
- Carrière J.** 1991. The political economy of land degradation in Costa Rica. In: Jilberto AE, editor. *Latin American Development: Rethinking Social Theory*. *International Journal of Political Economics* 21(special issue):10–31.
- Chinchilla E.** 1987. *Atlas Cantonal de Costa Rica*. San José. Costa Rica: Instituto de Fomento y Asesoría Municipal, Imprenta Nacional.
- Fournier LA, Salas S, Jiménez A.** 1973. *Nombres Vernaculares de la Flora Arborescente de Costa Rica*. San José: Universidad de Costa Rica, Ministerio de Agricultura y Ganadería.
- Groombridge B, editor.** 1992. *Global Biodiversity: Status of the Earth's Living Resources*. Compiled by the World Conservation Monitoring Centre. London: Chapman and Hall.
- Hammel BE, Grayum M, Zamora N.** 1994. *Manual de la Flora de Costa Rica*. St. Louis, MO: Missouri Botanical Garden, and Santo Domingo de Heredia, Costa Rica: Instituto Nacional de Biodiversidad, Museo Nacional de Costa Rica.
- Kappelle M.** 1996. Los Bosques de Roble (*Quercus*) de la Cordillera de Talamanca, Costa Rica: Biodiversidad, Ecología, Conservación y Desarrollo. Amsterdam: University of Amsterdam, and Santo Domingo de Heredia, Costa Rica: Instituto Nacional de Biodiversidad.
- Kappelle M, Juárez ME.** 1994. The Los Santos Forest Reserve: a buffer zone vital for the La Amistad Biosphere Reserve. *Environmental Conservation* 21:166–169.
- Kappelle M, Juárez ME.** 1995. Agroecological zonation along an altitudinal gradient in the montane belt of the Los Santos Forest Reserve in Costa Rica. *Mountain Research and Development* 15:19–37.
- Kappelle M, Kennis PAF, De Vries RAJ.** 1995a. Changes in diversity along a successional gradient in a Costa Rican upper montane *Quercus* forest. *Biodiversity and Conservation* 4:10–34.
- Kappelle M, Van Ommen E, Juárez ME.** 2000. Lista de la flora vascular terrestre de la cuenca superior del Río Savegre, San Gerardo de Dota, Costa Rica. *Acta Botanica Mexicana*. In press.
- Kappelle M, Van Uffelen JG, Cleef AM.** 1995b. Altitudinal zonation of montane *Quercus* forests along two transects in the Chirripó National Park, Costa Rica. *Vegetatio* 119:119–153.
- Kappelle M, Van Velzen HP, Wijtzes WH.** 1994. Plant communities of montane secondary vegetation in the Cordillera de Talamanca, Costa Rica. *Phytocoenología* 22:449–484.
- Kappelle M, Zamora N, Flores T.** 1991. Flora leñosa de la zona alta (2000–3819 m) de la Cordillera de Talamanca, Costa Rica. *Brenesia* 34:121–144.
- LaFranchi S.** 1996. *Los Productos Vegetales no Maderables en los Robledales de Altura y sus Alrededores (Cordillera de Talamanca, Costa Rica)*. Proyecto CATIE/COSUDE (Tropical Agricultural Research and Higher Education Center/Swiss Agency for Development and Cooperation). Turrialba, Costa Rica: CATIE.
- León J.** 1987. *Botánica de los Cultivos Tropicales*. San José: IICA.
- Levy Hynes A, Brown AD, Grau HR, Grau A.** 1997. Local knowledge and the use of plants in rural communities in the montane forests of northwestern Argentina. *Mountain Research and Development* 17:263–271.
- Meza T, Bonilla A.** 1990. *Áreas Naturales Protegidas de Costa Rica*. Cartago: Ed. Tecnológica de Costa Rica.
- Morales R.** 1971. *Nombres Comunes y Científicos de las Especies Arbóreas de Costa Rica*. Turrialba, Costa Rica: CATIE.
- Núñez E.** 1986. *Plantas Medicinales de Costa Rica y su Folclore*. San José: Universidad de Costa Rica.
- Ocampo RA.** 1994. *Situación Actual de los Productos no Maderables del Bosque en Costa Rica*. Doc. Trab. 7. Proyecto Conservación para el Desarrollo Sostenible en América Central (Proyecto Olafo). Turrialba: CATIE.
- Ocampo RA, Palma T, Hidalgo N.** 1994. Diagnóstico de Costa Rica. In: Ocampo RA, editor. *Domesticación de Plantas Medicinales en Centroamérica*. Colección Diversidad Biológica y Desarrollo Sustentable. Especies Nativas. Informe Técnico 245. Proyecto Conservación para el Desarrollo Sostenible en América Central (Proyecto Olafo). Turrialba: CATIE, pp 50–66.
- Rodríguez S, Vargas E.** 1988. *El Recurso Forestal en Costa Rica: Políticas Públicas y Sociedad*. Heredia: EUNA.
- Schouten K.** 1990. *A Checklist of the Animal and Plant Species Covered by the Convention on International Trade in Endangered Species of Wild Fauna and Flora*. Lausanne, Switzerland: CITES.
- Schubel RJ.** 1980. *The Human Impact on a Montane Oakforest, Costa Rica* [PhD thesis]. Los Angeles, CA: University of California.
- Schultes RE, Von Reis S.** 1995. *Ethnobotany: Evolution of a Discipline*. Portland, OR: Dioscorides Press and Timber Press.
- Siles de Guerrero G.** 1980. *Estudio Socioeconómico y Técnico de Productos de Carbón, Recolectores de Mora y Lana en las Reservas de Río Macho y Los Santos*. Informe Técnico 10. San José: Ministerio de Agricultura y Ganadería.
- Standley PC.** 1937–1938. *Flora of Costa Rica. Field Museum of Natural History* 18(1–4), Publication 391.
- Ureña A.** 1990. *Reseña Histórica del Cantón de Dota*. San José. Costa Rica: Ed. Serrano Elizondo.
- Van Ommen E, Kappelle M, Juárez ME.** 1997. Land cover/use changes and deforestation trends over 55 years (1941–1996) in a Costa Rican montane cloud forest watershed area. In: ISSS, AISB, IBG, and ITC, editors. *Abstracts of the 1997 Conference on Geo-Information for Sustainable Land Management*. Enschede, The Netherlands: ITC.
- Von Platen H, Rodríguez G, Lagemann J.** 1982. *Farming Systems in Acosta-Puriscal, Costa Rica*. Turrialba: CATIE, MAG, GTZ.
- Whitmore TC.** 1990. *An Introduction to Tropical Rain Forests*. Oxford: Clarendon.

Within each family, data are organized as follows: species / common name (language: [SP] Spanish, [EN] English) / origin (native to Costa Rica, introduced) / status (wild, cultivated) / plant organ (root, tuber, shoot, trunk [stem], bark, branch, leaf, inflorescence [flower(s), reproductive organ], fruit, seed, exudates [sap, latex], entire plant): use (combustible [fuelwood, charcoal, matches], construction [fence, fiber, handicraft, paper, rope, timber, work tool], dye [color], ecotouristic [bird attracting], fodder [forage for cattle], gum, medicinal [remedies, drugs, stimulants], nutritional [food, beverage, food colorant, flavoring {aromatic}, antioxidant], oil, ornamental, poisonous [against rodents]) / collector and collection number (Herbarium of storage) / code number of farm at which species was registered.

PTERIDOPHYTA

LYCOPODIOPSIDA

Lycopodiaceae

Huperzia sp, *Lycopodium* sp / licopodio [SP], clubmoss [EN] / native / wild / reproductive organ: medicinal / Wijtzes & Spreuwenberg 502 (CR) / farm 4.

SPHENOPSIDA

Equisetaceae

Equisetum bogotense Kunth / cola de caballo [SP], horsetail [EN] / native / wild / shoot, leaf: medicinal / Burger 4032 (CR) / farm 1, 3, 4, 7, 8.

FILICOPSIDA

Dennstaedtiaceae

Pteridium caudatum (L) Maxon / helecho [SP], bracken [EN] / native / wild / leaf: poisonous / Mehltreter 329 (CR) / farm 3, 5.

Polypodiaceae

Polypodium spp / helecho macho [SP] / native / wild / leaf: poisonous [against rodents] / Van Velzen 793 (CR) / farm 1.

SPERMATOPHYTA

GYMNOSPERMAE

Cupressaceae

Cupressus lusitanica Mill / ciprés [SP], cypress [EN] / introduced / cultivated / trunk, branch: combustible [fuelwood, charcoal], construction [living fence, handicraft, timber]; branch, seed: medicinal / Grayum 7300 (CR) / farm 1, 3, 4, 5, 6, 8, 9, 10, 12, 14.

Podocarpaceae

Podocarpus macrostachyus Parl / cipresillo [SP], lorito [SP] / native / wild / trunk, branch: combustible [fuelwood, charcoal], construction [timber] / Kappelle 1446 (CR) / farm 1, 4.

ANGIOSPERMAE

MAGNOLIOPSIDA

Acanthaceae

Justicia pectoralis Jacq / tilo [SP] / introduced / cultivated / leaf: medicinal / Maas 7826 (CR) / farm 6.

Justicia tinctoria (Oerst) D N Gibson / azul de mata [SP] / native / cultivated / trunk [stem]: dye [blue] / Hammel 18464 (CR) / farm 4.

Aizoaceae

Lamprantus emarginatus var *emarginatus* (L) NE Br / clavelina [SP] / introduced / cultivated / entire plant: ornamental / Avertin & Kappelle 123 (CR) / farm 2.

Anacardiaceae

Tapirira brenesii Standl / cirrí [SP] / native / wild / trunk, branch: construction [timber] / Kappelle 5845 (INB) / farm 4.

Annonaceae

Guatteria oliviformis Donn Sm / anonillo [SP] / native / wild / construction [timber] / Burger et al 12014 (CR) / farm 4, 12.

Apiaceae

Apium graveolens L / apio [SP], celery [EN] / introduced / cultivated / shoot, leaf: nutritional [food, flavoring]; shoot, leaf: medicinal / Kappelle 5846 (INB) / farm 1, 2, 3, 5, 6, 10, 11, 14.

Arracacia xanthorrhiza Bancr / arrecacha [SP] / introduced / cultivated / root, tuber: nutritional [food] / Avertin & Kappelle 116 (CR) / farm 1, 2, 3, 7, 10, 13.

Coriandrum sativum L / culantro (de castilla) [SP], coriander [EN] / introduced / cultivated / shoot, leaf: nutritional [food, flavoring] / Lépez 256 (CR) / farm 2, 3, 6, 10, 13, 14.

Daucus carota L / zanahoria [SP], carrot [EN] / introduced / cultivated / tuber: nutritional [food] / Kappelle 5847 (INB) / farm 1, 2, 3, 5, 6, 10, 14.

Eryngium foetidum L / culantro coyote [SP] / introduced / cultivated / leaf: nutritional [flavoring] / Morales 861 (CR) / farm 1.

Petroselinum crispum (Mill) Nym / perejil [SP], parsley [EN] / introduced / cultivated / leaf: nutritional [flavoring] / Kappelle 5848 (INB) / farm 3.

Araliaceae

Oreopanax xalapensis (Kunth) Decne & Planch / papayillo [SP] / native / wild / trunk, branch: combustible [matches] / Kappelle 2618 (CR) / farm 4.

Asteraceae

Achillea millefolium L / lechugo [SP] / native / wild / root, inflorescence: medicinal / Grayum 10684 (CR) / farm 3.

Ambrosia cumanensis Kunth / gotas amargas [SP] / introduced / cultivated / leaf: medicinal / Herrera 1816 (CR) / farm 6, 11.

Bidens reptans (L) G Don / moriseco [SP], muriseco [SP] / native / wild / leaf: medicinal / Burger & Baker 10076 (CR) / farm 11.

Chrysanthemum parthenium (L) Bernh / altamiso [SP], artemisa [SP] / introduced / cultivated / leaf: medicinal / Avertin & Kappelle 69 (CR) / farm 3, 9, 11.

Chrysanthemum indicum L / margarita [SP] / introduced / cultivated / entire plant: ornamental / Kappelle 5849 (INB) / farm 2, 4, 11.

Dahlia sp / dalia [SP] / native / cultivated, wild / entire plant: ornamental / Morales 192 (CR) / farm 2, 3, 7.

Hypochaeris radicata L / llervera [SP] / native / wild / entire plant: ornamental / Van Velzen & Kappelle 771 (CR) / farm 2.

Lactuca sativa L / lechuga [SP], lettuce [EN] / introduced / cultivated / leaf: nutritional [food] / Kappelle 5850 (INB) / farm 1, 3, 10, 11.

Matricaria chamomilla L / manzanilla [SP], chamomile [EN] / native / wild / branch, leaf: medicinal, nutritional [beverage] / Rodríguez 4014 (INB) / farm 1, 2, 3, 4, 7, 8, 10, 11, 13, 14.

Sonchus oleraceus L / lechuguilla (de monte) [SP] / native / wild / leaf: fodder [forage for cattle], nutritional [food]; root, leaf: medicinal / Robles 1788 (CR) / farm 3, 5, 7, 8.

Taraxacum officinale L / diente de león [SP], dandelion [EN] / introduced / wild / root, leaf: medicinal / Rodríguez 2510 (INB) / farm 1, 3, 4, 5, 7, 8, 12, 13.

Balsaminaceae

Impatiens balsamina L / china [SP] / introduced / cultivated / entire plant: ornamental / Grant 1648 (CR) / farm 1, 3, 6, 11, 12.

Begoniaceae

Begonia udilvestris C DC / begonia, felicidad [SP] / native / wild / entire plant: ornamental / Kappelle 445 (CR) / farm 2, 10.

Betulaceae

Alnus acuminata Kunth / jaúl [SP], alder [EN] / native / wild / trunk, branch: combustible [fuelwood, charcoal], construction [fence, handicraft, timber] / Horn 165 (CR) / farm 1, 3, 4, 5, 8, 9, 10.

Boraginaceae

Borago officinalis L / borraja [SP], borage [EN] / introduced / cultivated / branch: medicinal / Avertin & Kappelle 110 (CR) / farm 10.

Brassicaceae

Brassica juncea (L) Czerniak / mostaza [SP] / introduced / cultivated / leaf: nutritional [food] / Grayum 8541 (CR) / farm 4, 7.

Brassica oleracea L / repollo [SP], cabbage [EN] / introduced / cultivated / shoot, leaf: nutritional [food] / Kappelle 5851 (INB) / farm 1, 2, 6, 10, 11.

Brassica oleracea L var *botrytis* / coliflor [SP], cauliflower [EN] / introduced / cultivated / inflorescence: nutritional [food] / Kappelle 5852 (INB) / farm 1, 5, 14.

Nasturtium officinale R Br / berro [SP], watercress [EN] / introduced / cultivated / shoot, leaf: nutritional [food] / Avertin & Kappelle 2 (CR) / farm 1, 4, 8.

Raphanus sativus L / rábano [SP], radish [EN] / introduced / cultivated / tuber: nutritional [food] / Grayum 9109 (CR) / farm 1, 3, 6, 7, 10, 13.

Caprifoliaceae

Sambucus canadensis L / sauco [SP], elder [EN] / native / wild / inflorescence: medicinal / Mata 271 (CR) / farm 7.

Caricaceae

Carica pennata Heilborn / papaya chilena [SP], papaya china [SP], papaw [EN] / introduced / cultivated / fruit: nutritional [food, beverage] / Avertin & Kappelle 3 (CR) / farm 1, 7, 10.

Caryophyllaceae

Dianthus caryophyllus L / clavel [SP] / introduced / cultivated / entire plant: ornamental / Avertin & Kappelle 75 (CR) / farm 4, 14.

Casuarinaceae

Casuarina equisetifolia JR Frost / casuarina [SP], carnation [EN] / introduced / cultivated / trunk, branch: combustible [fuelwood, charcoal], construction [fence, timber] / Jiménez 84 (CR) / farm 1.

Celastraceae

Crossopetalum tonduzii (Loes) Lundell / guayabillo [SP] / native / wild / trunk, branch: combustible [charcoal] / Morales 3394 (CR) / farm 11.

Zinowiewia costaricensis Lundell / siete cueros [SP] / native / wild / trunk, branch: construction [timber] / Jiménez 225 (CR) / farm 4.

Chenopodiaceae

Beta vulgaris L / remolacha [SP], beet [EN] / introduced / cultivated / tuber: nutritional [food] / Avertin & Kappelle 64 (CR) / farm 1, 10.

Chenopodium ambrosioides L / apazote [SP], worm-seed [EN], Mexican tea [EN] / native / wild / shoot, trunk, leaf: medicinal / Morales 1977 (CR) / farm 4, 10.

Spinacia oleracea L / espinaca [SP], spinach [EN] / introduced / cultivated / leaf: nutritional [food] / Avertin & Kappelle 105 (CR) / farm 11.

Clusiaceae

Clusia palmana Standl / azahar [SP] / native / wild / entire plant: ornamental / Van Velzen & Wijtzes 844 (CR) / farm 1.

Cornaceae

Cornus disciflora Mociño & Sessé / lloró [SP] / native / wild / trunk, branch: combustible [fuelwood, charcoal], construction [timber]; fruit: nutritional [food] / Kappelle 997 (CR) / farm 1, 2, 3, 4.

Crassulaceae

Echeveria australis Rose / oreja de burro [SP] / native / wild / entire plant: ornamental / Haber 6884 (CR) / farm 6.

Sedum griseum Praeger / repollito [SP] / introduced / cultivated / entire plant: ornamental / Avertin & Kappelle 131 (CR) / farm 6, 15.

Sedum morgianum E Walther / bananito [SP] / introduced / cultivated / entire plant: ornamental / Avertin & Kappelle 58 (CR) / farm 7.

Cucurbitaceae

Cucumis sativus L / pepino [SP], cucumber [EN] / introduced / cultivated / fruit: nutritional [food] / Ocampo 3132 (CR) / farm 1.

Cucurbita ficifolia Bouché / chiverre [SP] / introduced / cultivated / fruit: nutritional [food] / Avertin & Kappelle 13 (CR) / farm 1, 3.

Cucurbita maxima Duch ex Lam / zapallo [SP], pumpkin [EN] / introduced / cultivated / fruit: nutritional [food] / Avertin & Kappelle 42 (CR) / farm 5.

Cucurbita pepo L / ayote [SP], zucchini [SP], squash [EN] / introduced / cultivated / fruit: nutritional [food] / Soto 20 (INB) / farm 5.

Sechium edule (Jacq) Sw / chayote [SP] / native / cultivated / fruit: nutritional [food] / Kappelle 5853 (INB) / farm 5.

Sechium villosum (Wunderlin) C Jeffrey / tacaquillo [SP] / native / wild / fruit: medicinal / Morales 2169 (CR) / farm 1.

Cunoniaceae

Weinmannia pinnata L / arrayán [SP] / native / wild / trunk: construction [timber]; trunk, branch: combustible [fuelwood] / Van Velzen & Geuze 10 (CR) / farm 1, 2, 14.

Weinmannia wercklei Standl / arrayán mora [SP] / native / wild / trunk: construction [timber] / Aguilar & Schmidt 1114 (CR) / farm 4.

Ericaceae

Comarostaphylis arbutoides Lindl / arrayán [SP] / native / wild / entire plant: ornamental / Kappelle 2474 (CR) / farm 4.

Macleanea rupestris (Kunth) A C Sm / salvia, arrayán [SP] / native / wild / fruit: nutritional [food] / Kappelle & Widmer 2472 (CR) / farm 8.

Pernettya prostrata (Cav) DC / arrayancillo [SP] / native / wild / fruit: dye [blue, purple]; fruit: poisonous [against rodents] / Wijtzes & Spreuwenberg 175 (CR) / farm 3.

Vaccinium consanguineum Klotzsch / arrayancillo, madroño [SP] / native / wild / trunk, branch: combustible [fuelwood], construction [paper]; fruit: dye [blue, purple] / Kappelle & Salazar 485 (CR) / farm 3.

Escalloniaceae

Escallonia myrtilloides Lf / madroño [SP] / native / wild / trunk, branch: combustible [fuelwood], construction [paper] / Kappelle et al 2391 (CR) / farm 3, 13.

Euphorbiaceae

Croton schiedeana Schltdl / targuá [SP] / native / wild / exudate: medicinal / Vargas 709 (CR) / farm 4.

Hyeronima poasana Standl / arenillo [SP] / native / wild / trunk: construction [timber] / Davidse 24238 (CR) / farm 4.

Ricinus communis L / higuerilla [SP] / native / cultivated / bark: oil / Aguilar 1426 (INB) / farm 4.

Sapium pachystachys K Schum & Pittier / yos [SP] / native / wild / trunk, bark, branch: construction [paper]; exudate: medicinal / Utley & Utley 2125 (CR) / farm 4.

Fabaceae**Caesalpinioideae**

Senna reticulata (Willd) Irwin & Barneby / saragundi [SP] / introduced / cultivated / branch: medicinal / Kernan 63 (CR) / farm 10.

Papilionoideae

Erythrina berteroana Urb / poró [SP] / introduced / cultivated / trunk, branch: construction [living fence, timber] / Induni 227 (CR) / farm 1, 4, 5, 6, 10, 11.

Phaseolus coccineus L / cubá [SP], scarlet runner [EN] / native / cultivated / seed: nutritional [food] / Avertin & Kappelle 106 (CR) / farm 1.

Trifolium repens L / trébol [SP], clover [EN] / introduced / cultivated / leaf: fodder [forage for cattle] / Hammel 18004 (CR) / farm 1.

Vicia villosa Roth / alherja [SP] / introduced / cultivated / poisonous [against rodents] / Avertin & Kappelle 115 (CR) / farm 10.

Fagaceae

Quercus copeyensis Mueller / roble [SP], white oak [EN] / native / wild / trunk, branch: combustible [fuelwood, charcoal], construction [timber] / Kappelle 1 (CR) / farm 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 13, 14.

Quercus costaricensis Liebm / encino [SP], black oak [EN] / native / wild / bark: medicinal; trunk, branch: combustible [fuelwood, charcoal], construction [timber] / Kappelle 2551 (CR) / farm 1, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14.

Quercus seemannii Liebm / encino [SP], black oak [EN] / native / wild / trunk, branch: combustible [fuelwood, charcoal], construction [timber] / Kappelle 905 (CR) / farm 1, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14.

Geraniaceae

Pelargonium graveolens L'Her / malva rosa [SP] / introduced / cultivated / leaf: nutritional [flavoring] / Kappelle 5854 (INB) / farm 3.

Pelargonium hortum L H Bailey / geranio [SP], geranium [EN] / introduced / cultivated / entire plant: ornamental / Khan 1019 (CR) / farm 2, 3, 6, 11, 14, 15.

Gesneriaceae

Columnnea polyantha (Wiehler) LE Skog / alas de ángel [SP] / native / wild / entire plant: ornamental / Hammel 16827 (CR) / farm 6.

Hydrangeaceae

Hydrangea macrophylla (Thunb) DC / hortensia [SP] / introduced / cultivated / entire plant: ornamental / Rivera 152 (CR) / farm 1, 8.

Juglandaceae

Alfaroa costaricensis Standl / gavilancillo [SP] / native / wild / trunk, branch: construction [timber] / Kappelle 1220 (CR) / farm 4.

Lamiaceae

Mentha citrata Ehrh / yerbabuena [SP], menta [SP], mint [EN] / introduced / cultivated / shoot, leaf: medicinal, nutritional [beverage] / Ocampo 3839 (CR) / farm 1, 4, 5, 8, 11, 14.

Origanum vulgare L / oregano [SP], oregano [EN] / introduced / cultivated / leaf: nutritional [flavoring] / Avertin & Kappelle 95 (CR) / farm 3.

Rosmarinus officinalis L / romero [SP], rosemary [EN] / introduced / cultivated / leaf: medicinal / Ocampo 3442 (CR) / farm 1, 3, 6, 10.

Thymus vulgaris L / tomillo [SP], garden thyme [EN] / introduced / cultivated / shoot, leaf: nutritional [flavoring] / Avertin & Kappelle 84 (CR) / farm 1, 3.

Lauraceae

Aiouea costaricensis (Mez) Kosterm / manglillo [SP] / native / wild / trunk, branch: construction [timber] / Gómez et al 12155 (CR) / farm 10.

Nectandra cufodontisii (OC Schmidt) CK Allen / aguacatillo [SP], ira amarillo [SP] / native / wild / trunk, branch: construction [timber]; entire plant: ecotouristic [bird attracting] / Jiménez 228 (CR) / farm 1, 2, 3, 8, 9, 11, 13.

Ocotea mollicella (SF Blake) van der Werff / ira amarillo [SP], quizarra [SP] / native / wild / trunk, branch: combustible [fuelwood, charcoal], construction [timber]; entire plant: ecotouristic [bird attracting] / Kappelle 895 (CR) / farm 1, 3, 7, 13.

Ocotea pittieri (Mez) van der Werff / ira (rosa) [SP] / native / wild / trunk, branch: combustible [fuelwood, charcoal], construction [timber]; entire plant: ecotouristic [bird attracting] / Kappelle & Monge 4998 (CR) / farm 2, 7, 11.

Persea americana Mill / aguacate [SP] / native / cultivated / fruit: nutritional [food] / Van Velzen & Kappelle 943 (CR) / farm 12.

Persea rigens CK Allen / aguacate de anís [SP] / native / wild / fruit: nutritional [food]; trunk, branch: construction [timber] / Gómez-Laurito et al 12157 (CR) / farm 3.

Persea schiedeana Nees / aguacate de altura [SP] / native / wild / fruit: nutritional [food]; trunk, branch: construction [timber] / Zamora 735 (CR) / farm 1, 4.

Persea vesticula Standl & Steyerl / aguacate asca [SP], zapotillo [SP] / native / wild / trunk, branch: construction [timber], combustible [fuelwood, charcoal] / Kappelle 2555 (CR) / farm 1, 3.

Loganiaceae

Buddleja nitida Benth / muela [SP], salvia [SP] / native / wild / leaf: fodder [forage for cattle]; trunk, branch: construction [living fence]; leaf: medicinal / Kappelle 2481 (CR) / farm 1, 2, 3, 4, 7, 8.

Loranthaceae

Psittacanthus schiedeana Schldtl / matapalo [SP] / native / wild / fruit: nutritional [food] / Kuijt 2485 (CR) / farm 4.

Magnoliaceae

Magnolia sororum Seibert / magnolia [SP] / native / wild / trunk, branch: combustible [fuelwood, charcoal], construction [handicraft, timber] / Kappelle 493 (CR) / farm 1, 2, 3, 4, 5, 7, 10, 11.

Malvaceae

Malva parviflora L / malva [SP], mallow [EN] / introduced / cultivated / entire plant: ornamental / Grayum 10217 (CR) / farm 1, 3, 8, 10, 12.

Malva silvestris L / malva [SP], mallow [EN] / introduced / cultivated / branch, leaf: medicinal; entire plant: ornamental / Kappelle 5855 (INB) / farm 1, 3, 8, 10, 12.

Malva sp / marylindo [SP], mallow [EN] / introduced / cultivated / entire plant: ornamental / Avertin & Kappelle 54 (CR) / farm 6.

Wercklea lutea Rolfe / burío, buriolo [SP] / native / wild / bark: medicinal; entire plant: ornamental / Van Velzen & Kappelle 556 (CR) / farm 4, 12.

Melastomataceae

Leandra subseriata (Naudin) Cogn / lengua de vaca [SP] / native / wild / fruit: nutritional [food] / Van Velzen & Kappelle 568 (CR) / farm 4.

Monochaetum floribundum (Schldtl) Naudin / sanmiguelito [SP] / native / wild, cultivated / entire plant: ornamental / Hahn 6327 (CR) / farm 6.

Meliaceae

Cedrela odorata L / cedro amargo [SP] / native / wild / trunk: construction [timber] / Kernan 652 (CR) / farm 5, 8.

Cedrela toduzii C DC / cedro dulce [SP] / native / wild / trunk: construction [timber] / Delgado 75 (CR) / farm 5, 8.

Trichilia havanensis Jacq / uruca [SP] / native / wild / trunk: construction [timber] / Kappelle & Monge 3641 (CR) / farm 13.

Monimiaceae

Mollinedia pinchotania Perkins / curilla [SP] / native / wild / leaf: medicinal / Kappelle & Monge 3599 (CR) / farm 8.

Moraceae

Ficus carica L / higo [SP], fig [EN] / introduced / cultivated / fruit: nutritional [food] / Avertin & Kappelle 12 (CR) / farm 1, 12.

Morus insignis Bureau / el mora [SP] / native / wild / trunk: construction [timber] / Mora 8 (CR) / farm 4.

Myrsinaceae

Ardisia compressa Kunth / tucuico [SP] / native / wild / fruit: nutritional [food]; entire plant: ecotouristic [bird attracting] / Kappelle & Monge 3704 (CR) / farm 2, 3.

Myrtaceae

Eucalyptus globulus Labill / eucalipto [SP], gum tree [EN] / introduced / cultivated / shoot, leaf: nutritional [beverage], medicinal; trunk, branch: combustible [fuelwood, charcoal], construction [fence, timber] / Hammel 17440 (CR) / farm 1, 6, 8, 9, 11.

Myrcianthes rhopaloides (Kunth) McVaugh / guayaba de monte [SP], guayabilla peruana [SP], mountain guava [EN], guayabillo [SP] / native / wild / fruit: nutritional [food, beverage] / Jiménez 692 (CR) / farm 1, 3, 4, 12.

Onagraceae

Fuchsia boliviana Carriere / chilindrín [SP], fucsia [SP] / introduced / cultivated / entire plant: ecotouristic [bird attracting], ornamental / Avertin & Kappelle 97 (CR) / farm 1, 4, 11.

Fuchsia paniculata Lindl / cenicera [SP] / native / cultivated, cultivated, wild / entire plant: ecotouristic [bird attracting], ornamental / Kappelle & Monge 3216 (CR) / farm 2.

Fuchsia 'Strawberry Sunday' / gurrión [SP], fucsia [SP] / introduced / cultivated / entire plant: ecotouristic [bird attracting], ornamental / Avertin & Kappelle 52 (CR) / farm 2, 3, 11.

Passifloraceae

Passiflora mollissima (Kunth) LH Bailey / gurma [SP] / native / wild / fruit: nutritional [food] / Bittner 1065 (CR) / farm 2, 3.

Passiflora quadrangularis L / granadilla [SP] / native / wild / fruit: nutritional [food]; leaf: medicinal / Chacón 2449 (CR) / farm 1, 4.

Passiflora vitifolia Kunth / estococa [SP] / native / wild / fruit: nutritional [food, beverage] / Herrera 1533 (CR) / farm 1.

Phytolaccaceae

Phytolacca rugosa A Braun & Bouché / jaboncillo [SP] / native / wild / leaf: fodder [forage for cattle] / Kappelle & Monge 3844 (CR) / farm 3, 5.

Plantaginaceae

Plantago mayor L / llantén [SP], greater plantain [EN] / introduced / wild / root: medicinal / INBio 59 (INB) / farm 1, 7, 12.

Polygonaceae

Muehlenbeckia tamnifolia (Kunth) Meisn / bejuco colorado [SP] / native / wild / shoot, branch, leaf: fodder [forage for cattle] / Wijtzes & Spreuwenberg 144 (CR) / farm 3.

Rumex acetosella L / coloradillo [SP] / native / wild / leaf: fodder [forage for cattle] / Oosterhoorn 185 (CR) / farm 3.

Rumex crispus L / ruibarbo [SP] / introduced / wild / root: medicinal / Rivera 119 (CR) / farm 3, 4, 6, 8.

Ranunculaceae

Delphinium ajacis L / delfinio [SP], espuela [SP] / introduced / cultivated / entire plant: ornamental / Avertin & Kappelle 59 (CR) / farm 7.

Rosaceae

Fragaria vesca L / fresa [SP], strawberry [EN] / introduced / cultivated / fruit: nutritional [food, beverage]; leaf: medicinal / Kappelle 5856 (INB) / farm 1, 10.

Lachemilla standleyi (Perry) Rothm / culantrillo [SP] / native / wild / leaf: fodder [forage for cattle] / Van Velzen 1041 (CR) / farm 14.

Malus pumila Mill / manzana [SP], apple [EN] / introduced / cultivated / fruit: nutritional [food, beverage] / Avertin & Kappelle 4 (CR) / farm 1, 3, 4, 5, 7, 10, 11.

Prunus domestica L / ciruela [SP], plum [EN] / introduced / cultivated / fruit: nutritional [food, beverage] / Avertin & Kappelle 16 (CR) / farm 1, 2, 3, 4, 5, 10, 13, 14.

Prunus persica (L) Batsch / durazno [SP], melocotón [SP], peach [EN] / introduced / cultivated / fruit: nutritional [food, beverage] / Avertin & Kappelle 17 (CR) / farm 1, 4, 5, 10, 11.

Pyrus communis L / pera [SP], pear [EN] / introduced / cultivated / fruit: nutritional [food] / Avertin & Kappelle 25 (CR) / farm 4.

Rosa bracteata Wendl / rosa enredadera [SP] / introduced / cultivated / entire plant: ornamental / Avertin & Kappelle 46 (CR) / farm 2, 3, 4, 5, 6, 11, 14.

Rubus adenotrichus Schldtl / la mora de vino [SP], blackberry [EN] / native / wild / fruit: nutritional [food, beverage] / Lent 3928 (CR) / farm 2, 5, 13, 14.

Rubus eriocarpus Liebm / la mora [SP], blackberry [EN] / native / wild / fruit: medicinal, nutritional [food, beverage] / Horn 212 (CR) / farm 1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 13, 14.

Rutaceae

Citrus aurantium L / naranja [SP], naranjilla ácida [SP], naranjilla mandarina [SP], orange [EN], mandarin orange [EN] / introduced / cultivated / fruit: nutritional [food, beverage, flavoring, antioxidant] / Wieman 82 (CR) / farm 1, 5, 10.

Citrus grandis (L) Osb / limón ácido [SP], acid lemon [EN] / introduced / cultivated / fruit: nutritional [food, beverage, flavoring, antioxidant] / Kappelle 5857 (INB) / farm 1, 10, 11.

Ruta chalapensis L / ruda [SP] / introduced / cultivated / leaf: medicinal / Lépez 257 (CR) / farm 3, 6, 10.

Zanthoxylum limoncello Planch & Oerst / limoncillo [SP] / native / wild / trunk, branch: construction [timber] / Mora 253 (CR) / farm 13.

Saurauaceae

Saurauia vaguasensis Seem / moco [SP], moquillo [SP] / native / wild / shoot, leaf: fodder [forage for cattle]; fruit: nutritional [food] / Van Velzen & Wijtzes 894 (CR) / farm 3, 8.

Solanaceae

Acnistus arborescens (L) Schtdl / güitite [SP] / native / wild / leaf: detergent / Tonduz 11647 (CR) / farm 4.

Brugmansia candida Pers / reina de noche [SP] / native / wild / leaf: medicinal; inflorescence: poisonous; entire plant: ornamental / Grayum 9852 (CR) / farm 1, 10, 11, 12.

Capsicum annuum L / chile dulce [SP], chilly [EN] / introduced / cultivated / fruit: nutritional [food, flavoring] / Haber 7977 (CR) / farm 1, 11.

Capsicum frutescens L / chile picante [SP], chilly [EN], red pepper [EN] / native / cultivated / fruit: nutritional [food, flavoring] / Avertin & Kappelle 11 (CR) / farm 1.

Cestrum irazuense Kuntze / zorrillo [SP] / native / wild / entire plant: ornamental / Kappelle & Monge 4855 (CR) / farm 3.

Cyphomandra betacea (Cav) Sendtn / tomate de palo [SP], tomatillo [SP] / introduced / cultivated / fruit: nutritional [food, beverage] / Avertin & Kappelle 14 (CR) / farm 1, 3, 10, 11.

Lycopersicon esculentum Mill / tomate [SP], tomato [EN] / introduced / cultivated / fruit: nutritional [food] / Avertin & Kappelle 117 (CR) / farm 5, 10.

Solanum rupeanum Dunal / berenjena [SP], naranjilla [SP] / native / wild / fruit: nutritional [food, beverage] / Poveda 787 (CR) / farm 1, 6.

Solanum tuberosum L / papa [SP], potato [EN] / introduced / cultivated / tuber: nutritional [food] / Kappelle 5858 (INB) / farm 1, 5, 13, 14.

Styracaceae

Styrax argenteus C Presl / resina [SP] / native / wild / trunk, branch: combustible [fuelwood, charcoal], construction [timber]; entire plant: ecotouristic [bird attracting], ornamental / Kappelle & Monge 2800 (CR) / farm 3, 4, 15.

Theaceae

Cleyera theaeoides (Sw) Choisy / titora [SP] / native / wild / trunk, branch: construction [timber]; entire plant: ecotouristic / Kappelle 1240 (CR) / farm 3, 10, 15.

Gordonia fruticosa (Schrad) H Keng / campano, ira colorado [SP] / native / wild / trunk: construction [timber] / Fernández 361 (CR) / farm 10, 11.

Tiliaceae

Helicarpus popayanensis Kunth / burío [SP] / native / wild / exudate: nutritional [beverage]; trunk: construction [fiber, handicraft] / Jiménez 1449 (CR) / farm 4, 8.

Ulmaceae

Trema micrantha (L) Blume / tucó [SP] / native / wild / trunk: construction [fiber] / Saborio 22 (CR) / farm 4.

Verbenaceae

Citharexylum donnell-smithii Greenm / dama [SP] / native / wild / trunk: construction [living fence] / Grant & Ramírez 91-01529 (CR) / farm 4.

Lippia alba (Mill) N E Br ex Britton & P Wilson / juanilama [SP] / native / cultivated / branch: medicinal / Avertin & Kappelle 88 (CR) / farm 10.

Lippia torresii Standl / caragra [SP] / native / wild / trunk: construction [timber] / Wijtzes & Spreuwenberg 793 (CR) / farm 4, 7.

Stachytarpheta jamaicensis (L) Vahl / chirrite [SP] / native / cultivated / entire plant: ecotouristic [bird attracting], ornamental / Kernan 8 (CR) / farm 4.

Verbena littoralis Kunth / verbena [SP] / native / wild / branch, leaf: medicinal / Grant & Grayum 90-00871 (CR) / farm 1, 2, 3, 8, 10, 11, 12, 13, 14.

Winteraceae

Drimys granadensis Lf / quiebramuelas [SP] / native / wild / trunk, branch: construction [living fence, timber]; bark, leaf: medicinal / Kappelle 464 (CR) / farm 1, 7, 9.

LILIOPSIDA**Agavaceae**

Furcraea cabuya Trel / cabuya [SP] / introduced / cultivated / leaf: construction [fiber, rope]; entire plant: ornamental / Hammel 17703 (CR) / farm 2.

Alliaceae

Allium cepa L / cebolla [SP], cebollino [SP], onion [EN] / introduced / cultivated / tuber, shoot: nutritional [food, flavoring] / Kappelle 5859 (INB) / farm 1, 3, 10.

Allium sativum L / ajo [SP], garlic [EN] / introduced / cultivated / tuber: nutritional [flavoring] / Kappelle 5860 (INB) / farm 1, 10, 13.

Araceae

Monstera spp / mimbre [SP] / native / wild / root, trunk [stem]: construction [handicraft] / Avertin & Kappelle sn (CR) / farm 8.

Zantedeschia aethiopica (L) Spreng / cala [SP] / introduced / wild / entire plant: ornamental / Morales 1826 (CR) / farm 1, 8.

Arecaceae

Geonoma hoffmanniana H Wendl ex Spruce / sùrtuba [SP] / native / wild / leaf, trunk: construction [fiber, handicraft] / Rivera 184 (CR) / farm 4, 8.

Prestoea acuminata (Willd) H E Moore / pacaya [SP], palmito (morado) [SP] / native / wild / shoot (heart), fruit: nutritional [food], oil; entire plant: ornamental / Lent 1218 (CR) / farm 1, 4, 5, 8.

Commelinaceae

Tradescantia navicularis Ortgies / cinco [SP] / introduced / cultivated / entire plant: ornamental / Avertin & Kappelle 127 (CR) / farm 2.

Convallariaceae

Maianthemum paniculatum (M Martens & Galeotti) LaFrankie / guria de montaña [SP] / native / cultivated, wild / entire plant: ornamental / Kappelle 2607 (CR) / farm 10.

Costaceae

Costus sp / caña agria [SP] / native / cultivated / fruit: nutritional [food] / Avertin & Kappelle sn (CR) / farm 4.

Heliconiaceae

Heliconia sp / platanillo [SP] / native / cultivated, wild / entire plant: ornamental / Avertin & Kappelle 30 (CR) / farm 4.

Iridaceae

Orthosanthus chimborascensis (Kunth) Baker / graviola [SP] / native / cultivated, wild / entire plant: ornamental / Kappelle 2498 (CR) / farm 10.

Watsonia meriana (L) Mill / barito San Jose [SP], barsonia [SP] / introduced / cultivated / entire plant: ornamental / Avertin & Kappelle 120 (CR) / farm 3, 10.

Liliaceae

Aloé vera L / sábila (amarga) [SP] / introduced / cultivated / exudate: medicinal / Avertin & Kappelle 56 (CR) / farm 7, 10.

Lilium longifolium Thunb / asucena [SP] / introduced / cultivated / entire plant: ornamental / Avertin & Kappelle 93 (CR) / farm 3.

Orchidaceae

Telipogon billeyi Schltr / mosca [SP], mosquillo [SP], orquídea [SP] / native / wild / entire plant: ornamental / Morales 4046 (CR) / farm 10, 13.

Poaceae

Axonopus scoparius (Fluegge) Kuhlman / pasto imperial, zacate imperial [SP] / native / cultivated / shoot, leaf: fodder [forage for cattle] / Grayum 9515 (CR) / farm 1, 13, 10.

Chusquea subtessellata Hitchc / batamba [SP] / native / cultivated / entire plant: ornamental / Kappelle 2477 (CR) / farm 1.

Chusquea tomentosa Y Widmer & LG Clark / cañuela [SP] / native / wild / entire plant: ornamental / Kappelle 482 (CR) / farm 1, 13.

Cymbopogon citratus (DC) Stapf / zacate de limón [SP] / introduced / cultivated / leaf: medicinal / Ocampo 3260 (CR) / farm 4, 10.

Cynodon plectostachyus (K Schum) Pilg / estrella [SP] / introduced / cultivated / leaf: fodder [forage for cattle] / Kappelle 5861 (INB) / farm 3.

Festuca tolucensis Kunth / festuque [SP] / native / wild / shoot, leaf: fodder [forage for cattle] / Gómez-Laurito 5346 (CR) / farm 1.

Holcus lanatus L / mielcillo [SP] / native / wild / shoot, leaf: fodder [forage for cattle]; leaf: medicinal / Davidse 24904 (CR) / farm 1, 3, 5, 11.

Lolium perenne L / kingras [SP], raígra inglés [SP] / native / wild / shoot, leaf: fodder [forage for cattle] / Pohl 12833 (CR) / farm 1, 10.

Melinis minutiflora P Beauv / calinguera [SP] / native / wild / shoot, leaf: fodder [forage for cattle] / Haber 8882 (CR) / farm 1.

Pennisetum clandestinum Hochst ex Chiov / kikuyo [SP] / introduced / cultivated / leaf: medicinal; shoot, leaf: fodder [forage for cattle] / Bumby 405 (CR) / farm 1, 3, 5, 8, 11, 14.

Triticum aestivum L / trigo [SP], wheat [EN] / introduced / cultivated / shoot, leaf: fodder [forage for cattle] / Grayum 10226 (CR) / farm 1.

Zea mays L / maíz [SP] / introduced / cultivated / seed: nutritional [food] / Gómez 20241 (CR) / farm 1.

Smilacaceae

Smilax kunthii Killip & CV Morton / bejuco (de canasto) [SP], zarzaparrilla [SP] / native / wild / branches: construction [handicraft] / Kappelle & Monge 3737 (CR) / farm 7, 11.

Zingiberaceae

Zingiber officinale Rosc / jenjibre [SP], ginger [EN] / introduced / cultivated / root, tuber: nutritional [flavoring] / Carballo 285 (CR) / farm 10.