

Knowledge, Use, and Importance of Non-Timber Product-Generating Plants among the Pijao Ethnic Group: Natagaima-Tolima, Colombia

Conocimiento, uso e importancia de plantas generadoras de bienes no maderables en la etnia Pijao: Natagaima-Tolima, Colombia

 Gloria Estefanía Pastrana-Aguirre ^a

 Ciro Ortiz-Valdes ^b

 Miguel Angel Quimbayo-Cardona ^a

^a Universidad del Tolima, Grupo de Investigación en Biodiversidad y Dinámica de Ecosistemas Tropicales (GIBDE), Colombia

^b Universidad Internacional del Trópico Americano (UNITROPICO), Yopal-Colombia

How to Cite: Pastrana-Aguirre, G. E., Ortiz-Valdes, C., & Quimbayo-Cardona, M. A. (2026). Knowledge, Use, and Importance of Non-Timber Product-Generating Plants among the Pijao Ethnic Group: Natagaima-Tolima, Colombia. *Revista Kawsaypacha: Sociedad Y Medio Ambiente*, (18), A-006. <https://doi.org/10.18800/kawsaypacha.202602.A006>



Abstract: Non-timber forest products (NTFPs) from the tropical dry forest (TDF) are essential for the livelihoods of the Pijao Indigenous community in Natagaima, Tolima. However, their use is limited by ecosystem degradation and the loss of local ecological knowledge. Therefore, this study examines the knowledge, use, and cultural importance of non-timber product-generating plants among the Pijao ethnic group of Natagaima-Tolima, Colombia. Semi-structured interviews were conducted with 95 Indigenous participants, exploring sociocultural and ethnobotanical variables. A total of 66 species belonging to 34 taxonomic families were identified. They are used across eight categories, mainly medicinal (55 records), food (16), and domestic (12). Among the medicinal species, 55 are used to treat ailments, which can be grouped into nine categories, with gastrointestinal (21%), skin, and respiratory uses (13%) being the most prominent. The number of uses reported per species ranged from 1 to 4, with citation frequencies below 0.5 and cultural value indices ranging from 0 to 0.117. In conclusion, ethnobotanical knowledge related to the use of non-timber product-generating plants is extensive.

However, the low cultural valuation results suggest there might be a risk of losing ancestral knowledge and the associated ecosystem.

Keywords: Indigenous. Ethnobotanical. Tropical dry Forest. Cultural Importance. Natagaima-Tolima, Colombia.

Resumen: Los bienes no maderables del bosque seco tropical (BST) son esenciales para los medios de vida de la comunidad indígena Pijao en Natagaima, Tolima. Sin embargo, su aprovechamiento se ve limitado por el deterioro ecosistémico y la pérdida del conocimiento ecológico local. Por lo tanto, se estudió el conocimiento, uso e importancia cultural de plantas generadoras de bienes no maderables en la etnia Pijao de Natagaima-Tolima, Colombia. Se aplicaron entrevistas semiestructuradas a 95 personas indígenas, explorando variables socioculturales y etnobotánicas. Se identificaron 66 especies pertenecientes a 34 familias taxonómicas, empleadas en 8 categorías de uso, principalmente medicinal (55 registros), alimentaria (16) y doméstica (12). De las especies medicinales, 55 se utilizan para tratar afecciones agrupadas en 9 categorías, destacándose los usos gastrointestinales (21%), de la piel y respiratorios (13%). El número de usos reportados por especie varió entre 1 y 4, con una frecuencia de citación menor a 0.5 e índices de importancia cultural entre 0 y 0.117. En conclusión, el conocimiento etnobotánico en torno al uso de plantas generadoras de bienes no maderables es amplio. Sin embargo, la baja valoración cultural indica un riesgo de pérdida del saber ancestral y del ecosistema asociado.

Palabras clave: Indígena. Etnobotánica. Bosque seco tropical. Importancia cultural. Natagaima-Tolima, Colombia.

1. Introduction

Colombia has approximately 58.5 million hectares of natural forest, 47% of which are located within legally recognized Indigenous territories (Organización de las Naciones Unidas para la Alimentación y la Agricultura [FAO] y Fondo para el desarrollo de pueblos indígenas de América Latina y el Caribe [FILAC], 2021). This distribution reflects the profound relationship between Indigenous peoples and ecosystems, which provide resources, identity, and spiritual connection with Mother Earth. Thanks to their traditional ecological knowledge, these communities have sustainably managed species for medicinal, fodder, artisanal, and ritual purposes, highlighting their essential role in ecosystem conservation and balance (Pastrana-Aguirre et al., 2025).

Although Indigenous communities represent about 4.4% of Colombia's population (Departamento Administrativo Nacional de Estadística de Colombia [DANE], 2018), their territories stand out for high levels of conservation and biodiversity. Studies have shown that these areas exhibit lower rates of land transformation and deforestation compared

to those inhabited by non-Indigenous populations (FAO & FILAC, 2021). In this context, Indigenous peoples not only preserve cultural practices linked to forests but also play a key role in their protection. Their traditional ecological knowledge, sustainable management, and understanding of territory as a living and sacred being make them fundamental allies in addressing the environmental crisis and conserving ecosystems.

In Colombia, the original extent of tropical dry forest (TDF) was about 9 million hectares (Ministerio de Ambiente y Desarrollo Sostenible de Colombia [MinAmbiente], 2021). However, due to anthropogenic actions such as deforestation, agricultural expansion, land-use changes, and the effects of climate change, around 92% of this forest has been lost, equivalent to more than 8.2 million hectares. Currently, only about 720 000 hectares remain, of which approximately 348 480 hectares correspond to fragmented areas of pastures, crops, and other land uses, while only 371 520 hectares correspond to remnants of tropical dry forest in various states of conservation.

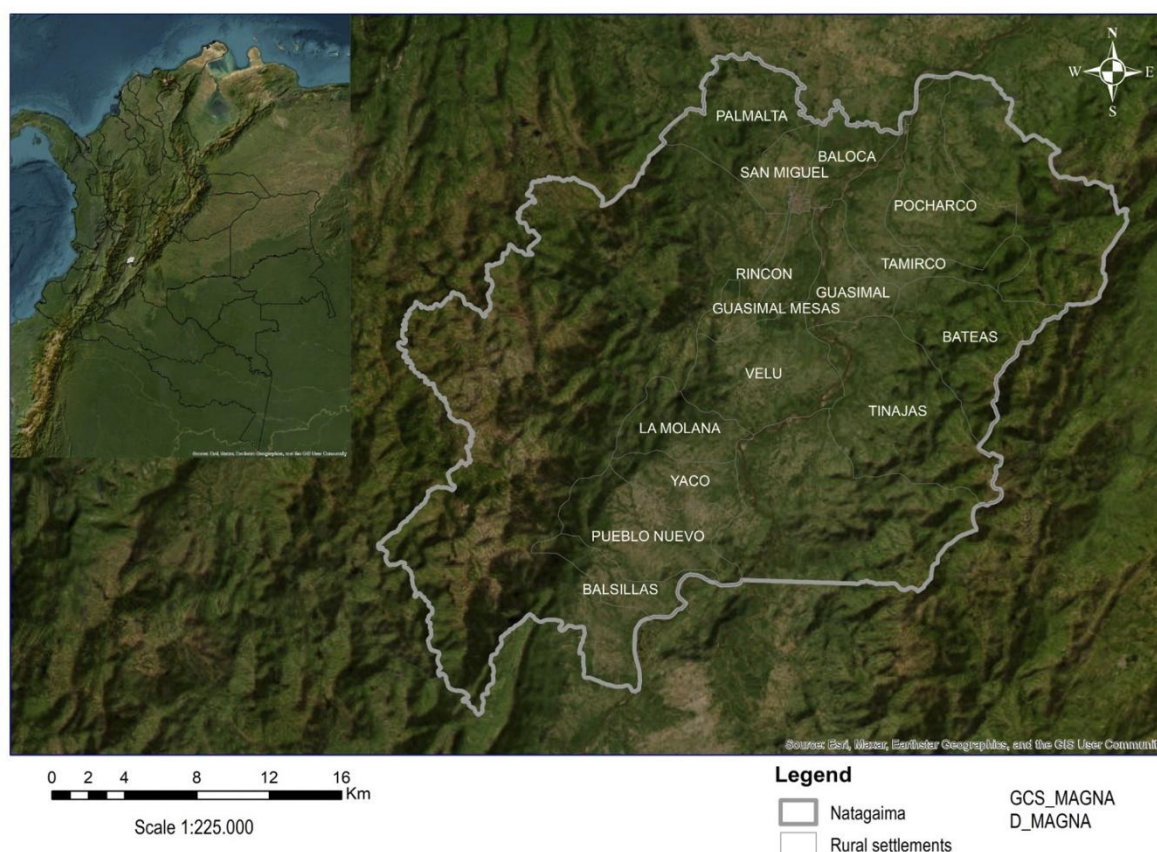
The Andean region and TDF of Colombia are home to Indigenous communities belonging to the Pijao ethnic group (Ortiz Gordillo et al., 2023). Their history reflects more than 500 years of resistance in defense of their territory and the preservation of ancestral legacies (Velásquez Arango, 2021). However, in Natagaima-Tolima, their ways of life have been transformed by the influence of Western culture, modernization and globalization processes, the loss of tropical dry forest, and the effects of climate change (Ortiz Gordillo et al., 2023; Pastrana-Aguirre et al., 2025). These transformations have weakened sociocultural ties, favoring the loss of ancestral identity and the abandonment of traditional practices, thus suggesting a progressive deterioration of local ecological knowledge.

Local beliefs and practices rooted in traditional knowledge, together with the species that provide non-timber goods, are key to sustainable forest management. Integrating this knowledge into conservation policies can help mitigate the loss of both forest and culture, reducing pressure from monocultures and unsustainable livestock practices (FAO & FILAC, 2021; MinAmbiente, 2021). This research studied the knowledge, use, and cultural importance of plants providing non-timber goods among the Pijao people of Natagaima-Tolima, Colombia.

2. Methodology

2.1 Study Area

This study was conducted in the municipality of Natagaima, Tolima (Colombia) (Figure 1). This area lies within the tropical dry forest (TDF) ecosystem, with altitudes ranging from 0 to 1000 meters above sea level. The climate is characterized by an annual rainfall ranging from 1000 to 1500 mm, distributed bimodally in two periods: a) a dry season, from June to August and from December to March; and b) a rainy season, from April to May and from September to November. The average annual temperature is approximately 32 °C.

Figure 1. Location of the Study Area, Municipality of Natagaima – Tolima, Colombia

2.2 Field Study and Data Collection

This research was carried out between January and June 2023. A sample of 95 individuals was selected using random sampling (Singh, 2003), to ensure representation of the Indigenous population of the municipality of Natagaima, Tolima, estimated at 6802 people. The sample size was calculated with a 95% confidence level and a 10% margin of error.

A culturally appropriate approach was developed, complemented by a participatory strategy (Calleros Rodríguez, 2022); initial contact was made with Indigenous leaders, presenting the purpose of the study. With their approval, the identification and participation of the target population were facilitated through three settings: community *mingas*, scheduled interview gatherings, and home visits. Participants included individuals legally recognized as Indigenous, residents of rural areas.

Semi-structured interviews were conducted to explore social variables, including age, gender, education level, location, and occupation. Ethnobotanical variables were also examined, which included species name and type of use (medicinal, food, ornamental, artisanal, domestic, fodder, magical-religious, oil-producing, and construction).

Additionally, data were collected on plant part used (leaves, branches, stems, bark, roots, fruits, seeds, flowers, and exudates), preparation methods (decoction, infusion, and maceration), and administration methods (direct use, external application, in beverages, and baths).

2.3 Data Analysis

An exploratory analysis using descriptive statistics was conducted for both social and ethnobotanical variables. To conduct a quantitative analysis highlighting the most used species, three ethnobotanical indices were estimated: a) use reports (URs), b) frequency of citation by species (FCs), and c) cultural value index (CVe). The ethnobotanical indices were calculated using the statistical software R with the ethnobotanyR package in R-Studio ((Whitney, 2019). In addition, Sankey diagrams were created using the online tool SankeyMATIC (<https://sankeymatic.com/>).

3. Results

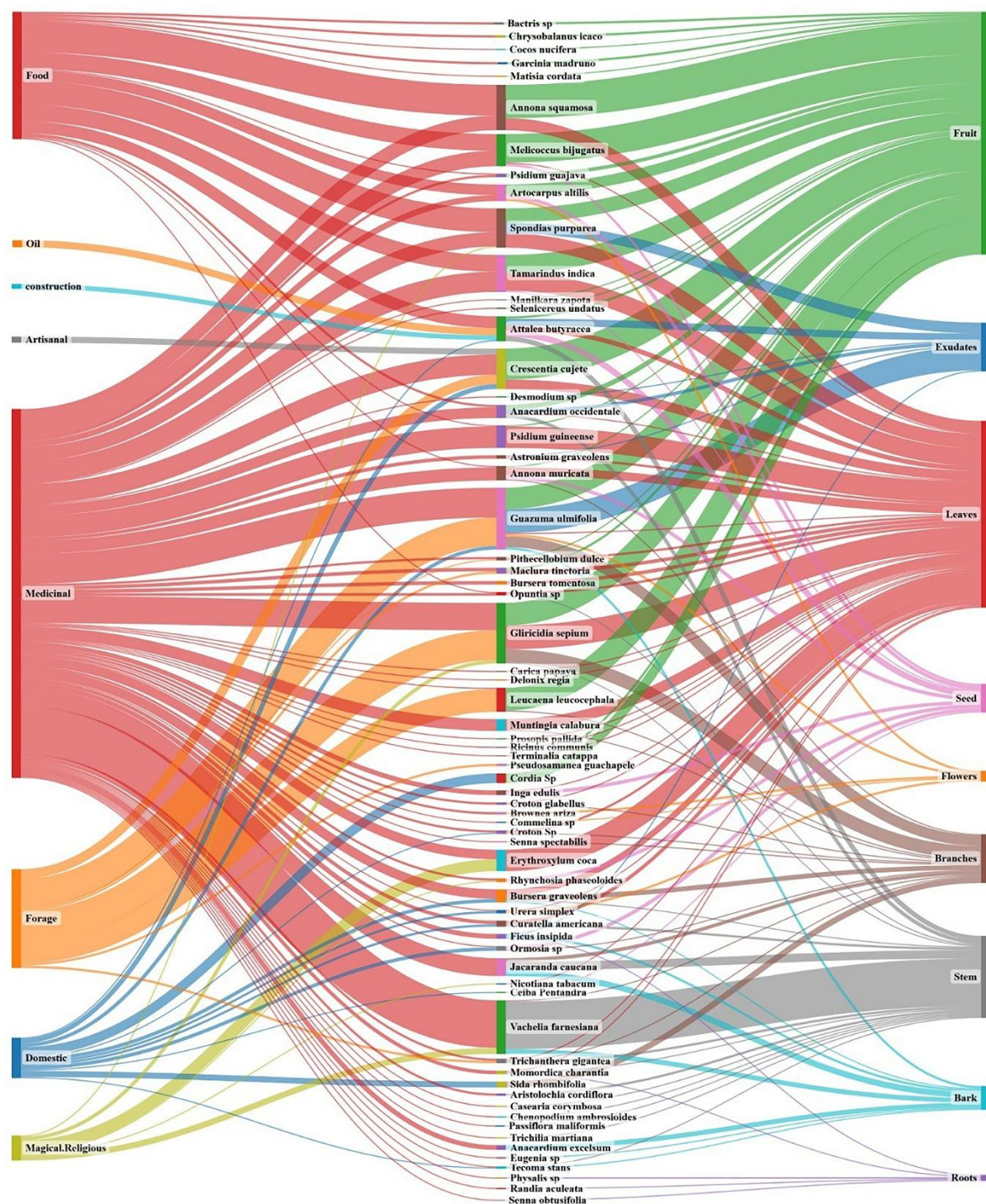
3.1 Sociodemographic Characteristics

The sample consisted of 95 individuals: 55% men and 45% women, reflecting a relatively balanced gender distribution. Older adults predominated, with 30.51% aged 44 to 53 years old, 24.30% aged 54 to 63, and 23.11% aged 64 years or older, indicating extensive experience and accumulated traditional knowledge. About 89% had basic education (primary or secondary), and only 6.3% had technical or professional training, revealing a potential educational gap. Regarding occupation, 50.53% were farmers, 26.32% livestock producers, and 10.53% merchants. Other notable occupations included artisans, construction workers, agricultural workers, teachers, and one traditional healer.

3.2 Botanical Diversity and Local Ecological Knowledge

The ethnobotanical study recorded a total of 570 reports on the use of 66 species belonging to 34 botanical families. Most informants reported using these species mainly for medicinal purposes, as well as for human and animal consumption. Figure 2 illustrates the various ethnobotanical uses of the 66 species, classified into categories such as food, medicine, fodder, domestic use, oil production, construction, artisanal activities, and magical-religious practices. Regarding the frequency of reports per category, 55 medicinal uses were recorded, followed by 16 related to food, 12 to domestic purposes, 8 were used as fodder, 6 for magical-religious purposes, and one report in each of the oil, artisan, and construction categories.

Figure 2. Species of NTFPs Exploited by the Indigenous Pijao Population of Natagaima, Tolima



The species *Attalea butyracea* plays an important role in the Pijao culture. Its leaves are used for roof construction, and its fruits are processed to extract oil. Meanwhile, the fruit of *Crescentia cujete* is mainly used to craft decorative household items such as keychains, jewelry, and souvenirs. Species such as *Erythroxylum coca* and *Vachelia farnesiana* also hold significant magical-religious value for the Pijao people, evidencing their symbolic and spiritual importance within traditional practices.

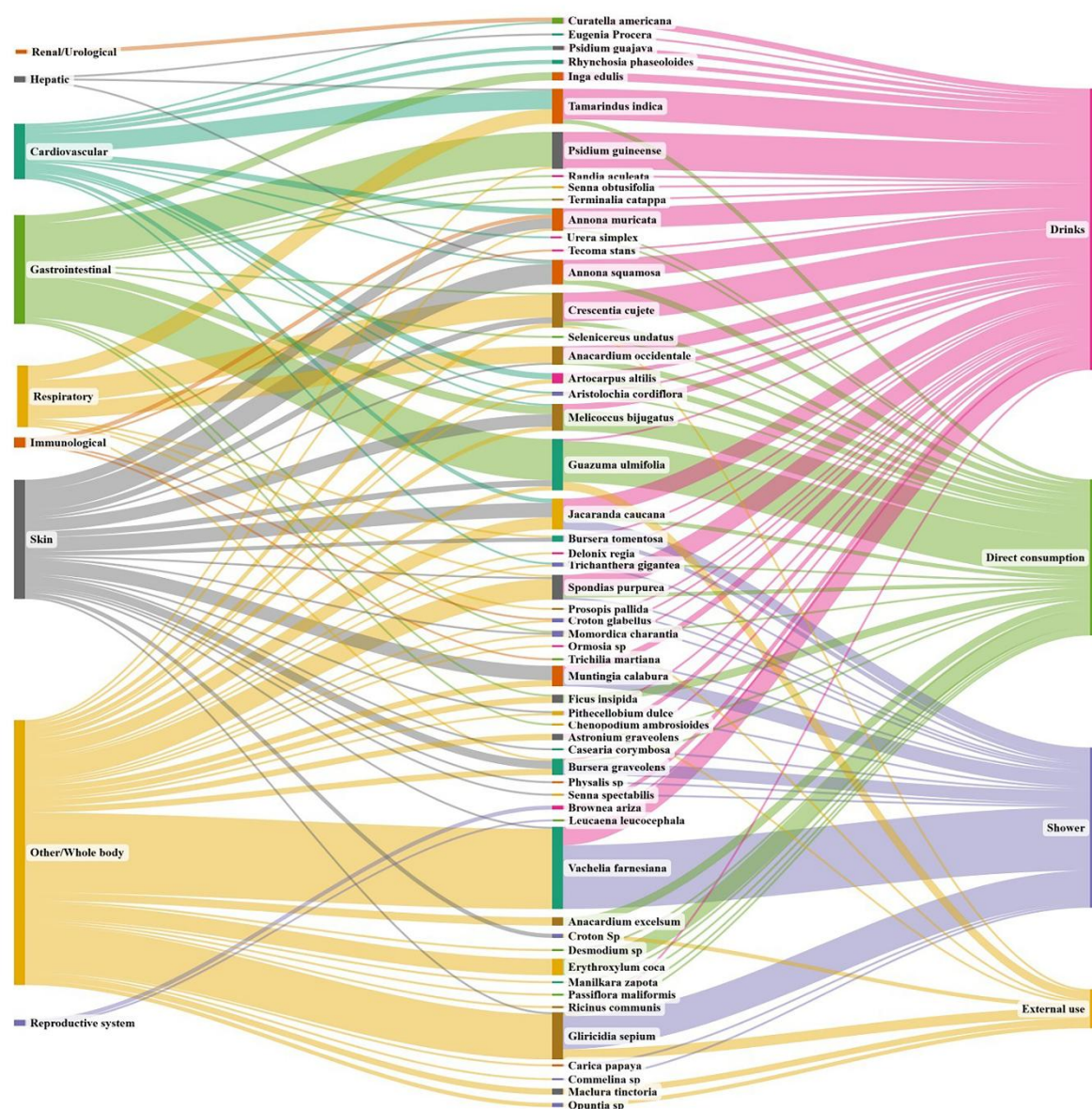
The species *Gliricidia sepium* and *Guazuma ulmifolia* stood out for their high functionality in animal feeding, serving as valuable nutritional supplements. Due to local climatic conditions, cattle producers often need to adjust their feeding systems by replacing grazing with browsing in forested areas. In contrast, for smaller livestock such as hens, broilers, and sheep, plant material is manually collected and supplied fresh, adapting management practices to local conditions.

Domestic use plants were represented by 12 species identified in the community. *Cordia* sp. is used to make adhesives; *Sida rhombifolia*, *Croton* sp., and *Crotón* sp. are used to make brooms; *Guazuma ulmifolia* and *Urera simplex* are used for hair care. Likewise, branches of *Bursera graveolens* are used to prepare a refreshing tonic during hot weather. *Ormosia* sp., *Ceiba pentandra* sp., and *Attalea butyracea* are used in soap making. Leaves of *Curatella americana* are used as sponges for dishwashing. Additionally, the fruits of *Crescentia cujete* and the bark of *Tecoma stans* are used to make kitchen utensils and tools, respectively.

Food-use plants within the studied ethnic communities were mainly represented by tree species that provide fruits for direct consumption or juice preparation. The most common species included *Annona squamosa*, *Spondias purpurea*, *Tamarindus indica*, and *Melicoccus bijugatus*. Other species are used in more elaborate preparations, such as *Opuntia* sp. and *Attalea butyracea*, which are used in salads and stews. The fruit of *Artocarpus altilis* is processed into flour for making porridges and bread.

Nevertheless, medicinal plants were reported as the most commonly used group among the Pijao people of Natagaima-Tolima. These plants are used to treat a variety of ailments, including cardiovascular, gastrointestinal, hepatic, immunological, dermatological, renal, respiratory, reproductive, and general health conditions. The most frequent use was for treating gastrointestinal disorders (21%), followed by dermatological and respiratory conditions (13% each), while the remaining 45% corresponded to general or unspecified uses (Figure 3).

Figure 3. Pathologies or Symptoms Treated with Medicinal Plants, Grouped by Body System Treated as Reported by Indigenous People of the Pijao Ethnic Group



Note: Cardiovascular: Heart diseases, high blood pressure, circulation; Gastrointestinal: Irritable bowel syndrome, diarrhea, vomiting, abdominal cramps, gastritis, parasites; Hepatic: Fatty liver; Immune: Cancer; malaria, roseola, chickenpox; Skin: Wounds, dermatitis; Renal/Urological: Urinary infections; Respiratory: Flu, dyspnea, sore throat, cough; Reproductive system: Menstrual cramps, contraception, fertility; Other/Whole body: Fever, headache, diabetes, inflammations, allergies, toothache, hernias.

Among the most prominent medicinal species were *Vachelia farnesiana* and *Gliricidia sepium*, whose leaves are used to prepare infusions administered orally, mainly to treat fever. A particularly traditional use was documented for *Anacardium excelsum* and *Ficus insipida* in the treatment of umbilical hernias in children: the child's foot is traced on the tree bark, and as the tree heals, it is believed that the patient will heal as well. Additionally, the leaf of *Erythroxylum coca* is used to relieve pain; *Guazuma ulmifolia* and *Psidium guineense* have antidiarrheal properties; leaves of *Annona squamosa* and *Melicoccus*

bijugatus are used for treating gastritis; *Crescentia cujete* is used for cough; and *Muntingia calabura* is recommended for treating rashes.

3.3 Quantitative Ethnobotanical Analysis

The ethnobotanical indicators analysis identified a total of twenty-two plant species with the most relevant values (Table 1). The number of uses (NU) recorded for each of the identified species ranged from 1 to 4, corresponding to the eight use categories previously reported in Figure 2. The lowest values were attributed to the medicinal species *Muntingia calabura* and *Jacaranda caucana*, while *Cordia sp.* was reported exclusively for domestic purposes. In contrast, *Crescentia cujete* showed the greatest versatility in the livelihoods of the Pijao people, as it is used for artisanal, medicinal, fodder, and domestic purposes. Likewise, *Attalea butyracea* exhibited multifunctionality, as it is used for oil extraction, food, construction, and domestic purposes.

Table 1. Forest Species with the Highest Ethnobotanical Indexes according to Reports from the Indigenous Pijao in Natagaima-Tolima

Scientific name	URs	Nus	RFCs	CVe
<i>Guazuma ulmifolia</i>	52	3	0.559	0.117
<i>Gliricidia sepium</i>	51	3	0.548	0.113
<i>Melicoccus bijugatus</i>	45	2	0.29	0.035
<i>Vachelia farnesiana</i>	45	3	0.484	0.059
<i>Annona squamosa</i>	38	2	0.409	0.042
<i>Crescentia cujete</i>	34	4	0.366	0.067
<i>Spondias purpurea</i>	33	3	0.355	0.047
<i>Tamarindus indica</i>	31	2	0.333	0.028
<i>Attalea butyracea</i>	21	4	0.226	0.025
<i>Leucaena leucocephala</i>	20	2	0.215	0.012
<i>Psidium guineense</i>	19	2	0.204	0.010
<i>Erythroxylum coca</i>	18	2	0.194	0.009
<i>Jacaranda caucana</i>	15	1	0.161	0.003
<i>Artocarpus altilis</i>	14	2	0.151	0.004
<i>Annona muricata</i>	12	2	0.129	0.003
<i>Anacardium occidentale</i>	11	2	0.116	0.003
<i>Bursera graveolens</i>	11	2	0.116	0.003
<i>Muntingia calabura</i>	10	1	0.105	0.001
<i>Cordia Sp</i>	8	1	0.084	0.001
<i>Curatella americana</i>	5	2	0.053	0.001
<i>Maclura tinctoria</i>	5	2	0.053	0.001

URs: Use report; NUs: Number of uses for the species; RFCs: Relative frequency of citation; CVe: Cultural Value index.

The species with the highest Relative Frequency of Citation (RFCs) were *Guazuma ulmifolia* (0.559), *Gliricidia sepium* (0.548), *Vachelia farnesiana* (0.484), and *Annona squamosa* (0.409). In contrast, the rest of the species presented values below 0.4. The RFCs values behaved similarly to the URs, as RFCs is calculated based on use reports. The Cultural Value Index (CVe), on the other hand, showed low values ranging from 0 to 0.117, considering a maximum possible score of 1.

4. Discussion

The Pijao ethnic group has historically faced multiple challenges related to adaptation and survival, which have transformed their ways of life and aspects of their ancestral legacy (Ortiz Gordillo et al., 2023). Nevertheless, in Natagaima-Tolima, traditional practices persist, reflecting a living connection with their cultural heritage, particularly in the diverse use of non-timber forest products (NTFPs) from the Tropical Dry Forest (TDF), as documented in this study. This bond demonstrates a close relationship between the Pijao people and the TDF. Furthermore, the number of species reported by the participants indicates that, despite its degradation, the TDF continues to be a key resource for local livelihoods. Therefore, its loss represents a direct threat to the well-being and survival of these Indigenous communities.

The use of non-timber forest products -particularly, medicinal species- is a key subsistence strategy for Pijao communities. Ancestral knowledge plays a fundamental role in this preference, reinforced by intercultural health policies implemented at the local level (Anju & Kumar, 2024). In Natagaima-Tolima, the healthcare provider «Pijao Salud» has integrated traditional medicine practices by incorporating ancestral doctors (Mohanes) in health brigades and implementing dual-care systems. This approach allows users to simultaneously access ancestral and Western medicine, thereby strengthening respect for the Indigenous worldview and also promoting the appreciation and transmission of the Pijao people's ethnobotanical knowledge.

Species such as *Annona squamosa*, *Spondias purpurea*, *Tamarindus indica*, and *Melicoccus bijugatus* are important in the diets of Indigenous communities, particularly among farmers and livestock producers. Their integration into sustainable production systems presents an opportunity to diversify production and strengthen food security. Emerging models such as food forests, syntropic agriculture, and analog forestry promote food production in harmony with ecological patterns, regenerating soil and fostering biodiversity (Albrecht & Wiek, 2021). In livestock farming, silvopastoral and agrosilvopastoral systems are increasingly being adopted as sustainable strategies that improve animal welfare and contribute both to food production and ecosystem services (Tapasco et al., 2019).

The use of fodder species such as *Guazuma ulmifolia*, *Gliricidia sepium*, *Leucaena leucocephala*, and *Crescentia cujete* reflects the integration of agroforestry and livestock systems within Indigenous production units. This integration evidences advances in

adaptation and the strengthening of climate resilience. Considering current productive challenges, it is essential to strengthen the use of local fodder resources, particularly as drought events and extreme temperatures become more frequent. In livestock farming, these conditions could reduce milk and meat production by up to 7.6% and 2.2%, respectively, affecting the food security and livelihoods of these communities (Tapasco et al., 2019).

Although species used for crafting, construction, cosmetics, and oil extraction are less frequently mentioned, they remain relevant to the livelihoods of Indigenous communities. It is likely that, with the recovery of the tropical dry forest and the revitalization of local ecological knowledge, these species will become more prominent. Their use could more effectively contribute to sociocultural processes of the Pijao people, strengthening cultural identity and supporting local economies based on the sustainable use of forest resources.

This study highlights the relationship between the reported species and their Cultural Value Index (CVe), which showed low values ranging from 0 to 0.117, with a maximum possible score of 1. This outcome is likely associated with the limited diversification of uses per species and the number of citations. This pattern may reflect the current state of forest degradation, which contributes to the erosion of local ecological knowledge (Sena et al., 2022). However, it is important to highlight the enduring value of these species, which continue to support community livelihoods under current conditions. Furthermore, there is an urgent need for collaborative scientific and institutional efforts to amplify traditional knowledge and promote the recovery of the TDF through the sustainable use of local plant resources.

This study provides a list of forest species that should be prioritized in conservation strategies. These species not only offer opportunities for production diversification and ecosystem restoration but also serve as identity markers for the peoples who inhabit these territories. Their inclusion enables the integration of scientific knowledge, local ecological wisdom, and public policy frameworks, fostering more inclusive and sustainable approaches to managing the TDF (Anju & Kumar, 2024).

5. Conclusions

The Pijao ethnic group possesses extensive knowledge regarding the use of non-timber forest products (NTFPs) from the tropical dry forest of Natagaima-Tolima. Such knowledge is reflected in the identification of 66 plant species that provide important resources for the livelihoods of Pijao communities, primarily for medicinal, food, and fodder purposes, with comparatively minimal use for crafts, construction, rituals, and other domestic applications. However, the Cultural Value Index of these species was low, which may be associated with the erosion of traditional knowledge and the degradation of the tropical dry forest.

Referencias

- Albrecht, S. & Wiek, A. (2021). Food forests: Their services and sustainability. *Journal of Agriculture, Food Systems, and Community Development*, 10(3), pp. 91-105. <https://doi.org/10.5304/jafscd.2021.103.014>
- Anju, T. & Kumar, A. (2024). Traditional ecological knowledge and medicinal plant diversity usage among the Mullu Kuruman tribes of Wayanad district of Kerala, India and its implications for biodiversity conservation in the face of climate change. *Trees, Forests and People*, 16, Article 100595. <https://doi.org/10.1016/j.tfp.2024.100595>
- Calleros Rodríguez, H. (2022). Investigación cualitativa, pueblos indígenas y procesos políticos. *Revista Mexicana de Ciencias Políticas y Sociales*, 245, pp. 371-394. <https://doi.org/http://dx.doi.org/10.22201/fcpys.2448492xe.2022.245.75283>
- Departamento Administrativo Nacional de Estadística de Colombia (DANE). (2018). *Población indígena de Colombia*. <https://bit.ly/3HOZWof>
- Ministerio de Ambiente y Desarrollo Sostenible de Colombia [MinAmbiente] (2021). *Programa nacional para la conservación y restauración del bosque seco tropical en Colombia*. Plan de Acción 2020-2030. https://archivo.minambiente.gov.co/images/BosquesBiodiversidadyServiciosEcosistemicos/pdf/Zonas-Secas/PROGRAMA_BOSQUE_SECO_TROPICAL_EN_COLOMBIA.pdf
- Organización de las Naciones Unidas para la Alimentación y la Agricultura [FAO] & Fondo para el desarrollo de pueblos indígenas de América Latina y el Caribe [FILAC] (2021). *Los pueblos indígenas y tribales y la gobernanza de los bosques en América Latina y el Caribe. Una oportunidad para la acción climática en América Latina y el Caribe*. <https://www.filac.org/wp-content/uploads/2021/03/pi-gobernanza2021.pdf>
- Ortiz Gordillo, A. F., Villalba Yate, D. I., Guzmán, J. J., Guzmán Yate, A. M., Villalba Yate, I., Villalba Yate, I. Y., Patiño Flores, P., Céspedes, N. & Torres, J. E. (2023). «Ahí está la diferencia, en el joke...»: el joke Pijao como actante en el proceso de recuperación de Ima. *Boletim Do Museu Paraense Emilio Goeldi: Ciências Humanas*, 18(2), pp. 1-20. <https://doi.org/10.1590/2178-2547-BGOELDI-2022-0062>
- Pastrana-Aguirre, G. E., Ortiz-valdes, C., Velásquez-Penagos, J. G., & Quimbayo-Cardona, M. A. (2025). Valoración económica de productos forestales no maderables del bosque seco tropical: Etnia-Pijao, Natagaima-Tolima, Colombia. *Agronomía Mesoamericana*, 36, artículo 61822. <https://doi.org/https://doi.org/10.15517/am.2025.61822>
- Sena, P. H. A., Gonçalves-Souza, T., Gonçalves, P. H. S., Ferreira, P. S. M., Gusmão, R. A. F., & Melo, F. P. L. (2022). Biocultural restoration improves delivery of ecosystem services in social-ecological landscapes. *Restoration Ecology*, 30(5), Article e13599. <https://doi.org/https://doi.org/10.1111/rec.13599>
- Singh, S. (2003). *Advanced Sampling Theory with Applications* (Springer, Ed.). <https://doi.org/https://doi.org/10.1007/978-94-007-0789-4>
- Tapasco, J., Rivas, J. & Ortiz, J. (2019). The Livestock Sector in Colombia: Toward a Program to facilitate large-scale adoption of mitigation and adaptation practices. *Frontier in Sustainable Food Systems*, 3, Article 61. <https://www.frontiersin.org/journals/sustainable-food-systems/articles/10.3389/fsufs.2019.00061/full>
- Velásquez Arango, J. J. (2021). Nuevas perspectivas para la historia del pueblo pijao, siglos XVI y XVII. *Fronteras de La Historia*, 26(1), pp. 256-279. <https://doi.org/10.22380/20274688.1125>
- Whitney, C. (2019). *Quantitative ethnobotany analysis with ethnobotanyR*. CRAN. https://cran.r-project.org/web/packages/ethnobotanyR/vignettes/ethnobotanyr_vignette.html

Acknowledgments

The authors gratefully acknowledge the Indigenous communities for their valuable contributions and for sharing the knowledge and information that made this study possible.

Declaration of use of artificial intelligence (AI) tools

This article was entirely prepared by the authors, with the support of the artificial intelligence tool ChatGPT exclusively for linguistic editing and translation into English; this tool was not used for the generation of scientific content, data analysis, or literature search. The authors have reviewed and verified the validity of the information presented and assume full responsibility for the final content of the manuscript.

Declaration of potential conflicts of interest

The authors declare that they have no conflict of interest.

Role of each author in the research according to the classification (CRediT)

- **Gloria Estefanía Pastrana Aguirre:** Conceptualization, data management, formal analysis, research, methodology, resources, software, writing, review and editing.
- **Ciro Ortiz Valdes:** Conceptualization, data management, formal analysis, research, methodology, resources, software, writing, review and editing.
- **Miguel Angel Quimbayo Cardona:** Conceptualization, data management, formal analysis, research, methodology, resources, software, writing, review and editing.

Gloria Estefanía Pastrana Aguirre

Forestry engineer with a master's degree in Sustainable Tropical Production. She is affiliated with the Research Group on Biodiversity and Dynamics of Tropical Ecosystems (GIBDE) at the University of Tolima, Colombia.

Email: gloria.pastrana@unillanos.edu.co

Ciro Ortiz Valdes

Veterinarian and Animal Scientist, Master in Sustainable Systems of Tropical Animal Health-Production, Research Professor at the International University of the American Tropics (UNITROPICO) in Yopal, Colombia.

Email: ciroortiz@unitropico.edu.co

Miguel Angel Quimbayo Cardona

Biologist, PhD in Forest Sciences, Research Professor in the Forestry Engineering program at the University of Tolima in Ibagué, Colombia. Director of the Research Group on Biodiversity and Dynamics of Tropical Ecosystems (GIBDE).

Email: miguelq@ut.edu.co

Revista Kawsaypacha: Sociedad y Medio Ambiente.

N° 18 julio – diciembre 2026. E-ISSN: 2709 – 3689

How to Cite: Pastrana-Aguirre, G. E., Ortiz-Valdes, C., & Quimbayo-Cardona, M. A. (2026). Knowledge, Use, and Importance of Non-Timber Product-Generating Plants among the Pijao Ethnic Group: Natagaima-Tolima, Colombia. *Revista Kawsaypacha: Sociedad Y Medio Ambiente*, (18), A-006.
<https://doi.org/10.18800/kawsaypacha.202602.A006>

