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Original article

The Influence of Socio-economic Factors on Distinct Categories of Use in a Rural Community in Northeastern Brazil

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ABSTRACT

The present study analyzes the relationship between people and plants in the caatinga region of Northeastern Brazil, considering the influence of socio-economic factors on different categories of plant use in the community. Thus, it aims to associate socio-economic factors and knowledge in the use dynamics of medicinal, food and timber plants in Brejo da Conceição community, Currais, Piauí, Brazil. The data set was obtained through semi-structured interviews, interviewing one-hundred-one persons: 46 women and 55 men. A generalized linear model analyzed socio-economic factors influencing the knowledge of plants, built using Poisson distribution and having as explanatory variable age, gender, number of residents in household and education; as a response variable, the number of plants cited per respondent. To better understand the distribution of plants in use categories, we verified which species are the most important locally and, for that, we calculated the plants' Cultural Importance Index and Relative Importance Index. The interviewees cited 126 plant species. Among these species, 74 were native, and 52 were naturalized. Overlapping the categories of use, the most prominent species in the categories medicinal and food, according to the indices of cultural importance (CI) and relative importance (RII), were the buriti palm tree (*Mauritia flexuosa* L.f.), orange (*Citrus sinensis* (L.) Osbeck) and cashew (*Anacardium occidentale* L.). For the overlap of medicinal and timber uses, catinga de porco stood out (*Terminalia brasiliensis* (Cambess.) Eichler) and birro de cangalha (*Diplopterys* sp.). The lemon balm herb stood out as its medical use (*Lippia alba* (Mill.) N.E.Br. ex Britton & P.Wilson). Just the number of residents and gender factors influenced the plants' knowledge of Brejo da Conceição in medicinal use, food and wood resources. Given the complexity of current discussions that guide related to these characteristics, the proposed results can serve as a reference for future research that incorporates more aspects of local ecological knowledge, including analyzing other essential variables that shape the distribution of knowledge in the distinct categories of use.

Keywords: Ethnobotany, Medicinal Plants, Food Plants, Timber Resources, Gender.

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Introduction

Ethnobotanical studies have analyzed the influence of socio-economic variables on the knowledge and use of medicinal plants (Torres-Avilez 2017; Faria & Albuquerque 2018; Aparicio *et al.* 2021), food plants (Cruz *et al.* 2013; Nascimento *et al.* 2013) and timber (Arruda *et al.* 2019; Silva *et al.* 2011). In addition, these variables are commonly considered in research on understanding the dynamics of knowledge and the use of natural resources (Sousa *et al.* 2019). In this sense, the literature points to the influence of age (Cruz *et al.* 2014; Arruda *et al.* 2019), gender (Bortolotto *et al.* 2015; Torres-Avilez *et al.* 2019; Ladio 2021), income (Medeiros *et al.* 2012; Bortolotto *et al.* 2015), occupation (Silva *et al.* 2011; Campos *et al.* 2015), schooling (Saynes-Vásquez *et al.* 2013; Arruda *et al.* 2019) and religion (Bhagwat *et al.* 2011; Sharma & Pegu 2011). Therefore, understanding how different socio-ecological aspects influence the use and knowledge of plants will facilitate the implementation of sustainable management strategies locally, especially for heavily exploited species.

In ethnobiology, among the factors studied, the gender is considered an excellent predictor in studies aimed at studying people's relationships with plants. In Nigeria, Guimbo *et al.* (2011) stated that women know more food plants than men since they are responsible for collecting and preparing these resources. Women also know more medicinal and edible plants in the communities of the municipality of San Miguel el Grande located to the west of the Mixtec high subregion (Aparicio *et al.* 2021). These authors argued that women actively participate in the preparation and have more connection and time with the vegetation than men (Aparicio *et al.* 2021). On the other hand, in Brazil, Santos *et al.* (2019) found no distinctions in the knowledge and use of a vital local food resource, the *Manihot esculenta* Crantz, between men and women. In specific contexts, women have more knowledge about medicinal plants' use than men (Arias-Toledo *et al.* 2009; Costa & Mitja 2010; Lopes & Lobão 2013; Estrada-Castillón *et al.* 2014; Lima *et al.* 2014); other studies have evaluated that men know more food and timber plants when compared to women (Cruz *et al.* 2013; Estrada-Castillón *et al.* 2014; Paniagua-Zambrana *et al.* 2014; Campos *et al.* 2015; Ramos *et al.* 2015). Given the complexity exposed, these variations found in the knowledge of plant resources between genders are hardly explained on a larger scale, and one should consider the social role that people play in each culture (Torres-Avilez *et al.* 2014). However, there are other aspects that must be taken into account when documenting possible knowledge distinctions. Ways of transmitting local knowledge and strategies for collecting and managing natural resources, for example, can be influenced by the social structure of a community (patriarchal hierarchies) and thus bring biases in ethnobiological research (Ladio 2021).

Other factors may also influence the dynamics of knowledge about plants, such as the number of people living in the same residence, the length of residence in a specific location, scholarship and occupation, besides ecological aspects such as local availability, accessibility and distance travelled to obtain desirable resources (Arias-Toledo *et al.* 2009; Blancas *et al.* 2013; Gueze *et al.* 2014; Aparicio *et al.* 2021; Kutal *et al.* 2021). However, most studies focus on people's relationship with a particular category of use, such as medicinal plants. Nevertheless, few studies have evaluated the effects of socioeconomic factors on people's relationship with plants in the same community and for different categories of use. Therefore, studying the relationship between socio-economic characteristics, knowledge, and the use of plants in a community is vital for understanding the knowledge dynamics about using natural resources for various purposes. By studying the influence of socioeconomic factors in the same community, the present study is strengthened by the fact that we consider the same temporal-spatial scales and socioecological context. At this point, it is worth mentioning that this aspect was little considered in previous studies.

Based on the previous considerations, the present research focus on the question: do socioeconomic factors influence the categories of plant use differently? We hypothesize that the socioeconomic factors gender, age, schooling and number of people who share a residence will associate differently to the most studied categories of use (medicinal, food and timber) (Ramos *et al.* 2008; Almeida *et al.* 2012; Cruz *et al.* 2013). The expected results are that knowledge between men and women is different according to the category of use; the older ones will have more in-depth knowledge, regardless of the category of use; that schooling exerts a negative influence on the number of plants cited in all categories; and the more people living in the same house, the greater the knowledge about the plants, regardless of the category of use. Therefore, to better understand the distribution of plants in the main categories of use, the objective was to characterize knowledge among residents of the municipality of Currais, identifying the most important plants locally and thus deepening the use dynamics of these resources. Furthermore, understanding the relationships between the knowledge associated with locally available plant resources can favor conservation plans that consider the particularities of each community (Vieira & Milward-de-Azevedo 2018).

Materials and method

Characterization of the study area

The studied community is in the rural area of the municipality of Currais, South-Central of the State of Piauí, in northeastern Brazil (Fig.1). The municipality of Currais is bordered to the north with Palmeiras do Piauí, to the

south with Bom Jesus, to the east with Santa Luz, and Palmeiras do Piauí, and to the west with Baixa Grande do Ribeiro. The geographical coordinates of the base are 44° 24' 39" south latitude and 9° 00' 25'' longitude west of Greenwich, presenting an altitude of 320m and 648 km from the capital Teresina. The municipality was created by Law N 4,680 of 01/26/1994, with an estimated population of 4,968 inhabitants and population density of 1.49 h/km^2, and about (80%) of them live in the rural area (IBGE 2010).

The climate is part of the semi-arid tropical type, with a six-month drought period, an average annual temperature of 29º C, and average annual precipitation of 944.4 millimetres (CPRM 2004). The vegetation consists of dense, low, twisted trees and shrubs, dry in summer, small and deciduous leaves, presenting deep and thick roots, predominant characteristics of the Caatinga environment (Emperaire 1989; Rodal & Sampaio 2002). On the slopes and tops of the plateaus, the vegetation is very distinct, consisting of humid forests, corral and rocky fields (Tabarelli *et al.* 2018). The study area called Brejo da Conceição, rural area of the municipality of Currais, Piauí, is in the geographical coordinates 8° 54' 42" S and 44°28' 13" W, 15 kilometers from the headquarters. It comprises a range of 2,000 hectares and about 150 families live there. The community has electricity distributed by Equatorial Energy Piauí, a tubular well with piped water supply network and an elementary school, maintained with resources of the municipality. The community's residents are essentially farmers, the vast majority of whom depend on the production of maize, beans, rice and cassava. Some products collected from the vegetation are sold at local street markets, such as buriti (*Mauritia flexuosa L.f.*) and pequi (*Caryocar sp.*). Many residents also depend on social programs to fight poverty maintained by the Federal Government. A smaller portion of the population is made up of merchants and construction workers at the municipal or state level). Family farming and livestock breeding were the predominant socioeconomic activities developed in the community, based on the seasonal production of cassava, beans, sweet potatoes, and sugarcane and subsistence rearing of cattle, pigs, horses, and poultry breeding.

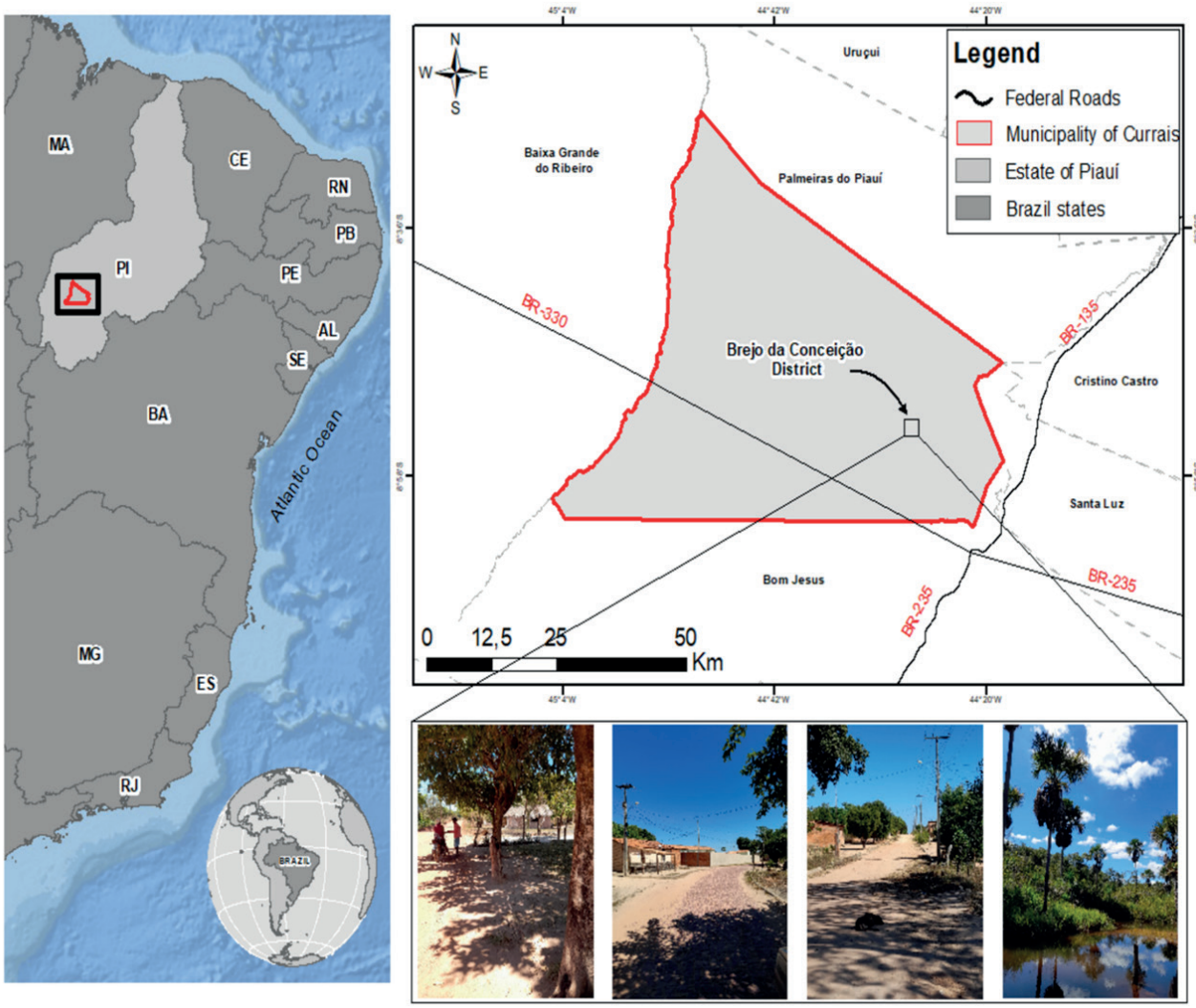

Figure 1. Location map of the District of Brejo da Conceição, municipality of Currais, Piauí, Northeastern Brazil.

It is bathed by a stream (*brejo*, in Brazilian Portuguese), presenting stretches of riparian forest, including in floristic composition, large trees, and specimens of the buriti palm tree (*Mauritia flexuosa* L.f.) and pequi (*Caryocar* sp.). The soils of the region are sandy.

Data Collection

Initially, all residences were visited and those who were present at the time of the visit were invited to participate, making a total of 101 people, all over 18 years old. The research objectives were explained to all informants in the community, and those who agreed to participate in the interviews were subsequently asked to sign the free and informed consent form (Resolution n. 510/2016) of the National Health Council (NHC). The research was approved by the Ethics Committee on Research Involving Human Beings of the Federal University of Piauí – UFPI (CAAE: 46264515.0.0000.5214).

Access to local knowledge occurred through semi-structured interviews (Albuquerque *et al.* 2010), divided into two stages: collection of socioeconomic information and knowledge about all the plants mentioned, such as popular names, types of use, parts used and therapeutic indications, in the case of medicinal plants. The "split field trip" (Titiev 2002) made it possible to add information from different times of the year, as well as to overcome the gaps in previous trips, such as, for example, interviews with informants who were not present at the time of the visit.

Parallel to the interviews, botanical collections were performed to identify the species. Botanical collections were performed through expert consultation and specialized bibliography. The botanical material was properly herborized and identified, being then deposited in the facilities of the Botany Laboratory of the Federal University of Piauí (UFPI), Campus Prof. Cinobelina Elvas – CPCE.

Data Analysis

To verify which species are most important to the community, we calculated the Cultural Importance Index (CI) and the Relative Importance Index (RII), using the CIs() and RIs() functions of the EthnobotanyR package (Whitney 2019). These indices were chosen just to verify the plants that stand out in each use category, as well as being based on information on the presence and absence of use citation. The cultural importance index (CI) was chosen because it considers the use reported by the informants in its calculation, while the relative importance (RI) considers the relative frequency of citation. For more information about function calculations and details about dataframe construction, access Quantitative ethnobotany analysis with ethnobotanyR (r-project.org) (Whitney 2019). For all analyzes used R software version 4.2.2 (R Core Team 2020).

Generalized linear models (GLM) were used to analyze the socio-economic factors that influence the knowledge of medicinal, food, and timber plants in the Brejo da Conceição community. GLM used the Poisson distribution and having as explanatory variables (independent) age, gender, the number of residents in the residence, income (monthly) and scholarship (primary, elementary, high school, or undergraduate); and as a variable response (dependent), the number of plants mentioned per interviewee in each use category. After checking the residues, using the "rdiagnostic" function of the MASS package, we verified the data's overdispersion, being necessary to use the negative Binomial model using the function "glm.nb", also of the MASS package. After GLM, orthogonal contrast analysis (Crawley 2007) was performed to verify significant differences in knowledge between men and women For all analyzes used R software version 4.2.2 (R Core Team 2020).

Results

Socioeconomic profile of the Brejo da Conceição Community

In total, 101 people were interviewed in the community, among those who were in the residence at the time of the visit and who agreed to participate (46 women and 55 men), one person per household. Most respondents (65%) were between 35 and 65 years of age. It is noteworthy that 98% were born in the community. The family income, considering that five people are the average number of residents per household, for 66% of households was less than one minimum wage. In cases, the economic resources came from social programs of the federal government, such as scholarships, family scholarships, and retirements.

Regarding education, most informants (67%) had elementary school I (1st to 4th grade) and elementary school II (5th to 9th grade), followed by analphabets (24%), high school (7%), higher education (2%). Em relação ao gênero, o nível educacional é bem semelhante entre homens e mulheres, seguindo o padrão geral, sendo 67,4% das mulheres e 67,3% dos homens had elementary school I (1st to 4th grade) and elementary school II (5th to 9th grade), followed by analphabets (23,9% das mulheres e 23,6% dos homens), high school (6,5% das mulheres e 7,3% dos homens), higher education (2,2% das mulheres e 1,8% dos homens).

Ethnobotanical survey of plants in the Brejo da Conceição Community

One hundred twenty-six plant species were identified from the use citations, gathered in 47 botanical families, the most representative being: Fabaceae (17 species), Anacardiaceae (6 species), Rutaceae and Arecaceae (5 species each), Meliaceae, Lamiaceae, Euphorbiaceae (4 species each), Asteraceae, Malvaceae and Annonaceae (3 species each).

The interviewees cited 126 plant species. Among these species, 74 were native, and 52 were naturalized. However, 18 of the species mentioned could not be identified due to a lack of botanical material suitable for study (Table 1).

Table 1. List of plant species surveyed in the locality "Brejo da Conceição" indicated by: Botanical family/Species; Popular name; Categories: medicine (MED), human food (ALI); timber (MAD); Habit: arboreal (ARB); shrub (ARS) sub-shrub (SUB); creeper (TRE); herbaceous (HER); Cultural Importance Index (CI); Relative Importance Index (RI); Part of the plant used: bark (CAS); stem (CAU), leaf (FOL), flower (FLO); fruit (FRU); root (RAI); oil (OLE); mesocarp (MES); seed (SEM); complete plant (PC); epidermis (EPI); latex (LAT); branch (RAM); mucilage (MUC); stone (CAR); Number of citations; indications.

Botanical family/ Species	Popular name	Categorie	Habit	Cultural Importance	Relative Importance	Part of the plant used	N° of citations	Indications
Acanthaceae								
Justicia pectoralis Jacq.	Anador	MED	HER	0.099	0.251	FOL	4	**Medicine:** fever, flu, headache, soothing.
Amaranthaceae								
Dysphania ambrosioides (L.) Mosyakin & Clemants	Mastruz	MED	HER	0.129	0.277	MUC	10	**Medicine:** inflammation of the liver, kidneys and uterus, verminosis, dermatitis, muscle pain, flu, healing, blood cleansing.
Amaryllidaceae								
Allium sp.	Cebola branca	MED	HER	0.02	0.184	RAI	3	**Medicine:** flu, chest pain, tiredness.
Nothoscordum bivalve (L.) Britton	Alho bravo	MED	HER	0.02	0.184	PC	3	**Medicine:** rheumatism, fever, headache.
Anacardiaceae								
Anacardium humile A.St.-Hil.	Cajuzinho-do-cerrado	MED	ARB	0,020	0.184	CAS	1	**Medicine:** Stomach pain.
Anacardium occidentale L.	Caju	MED, ALI	ARB	0.564	0.864	CAS, FOL, FRU	8	**Medicine:** Stomach pain, diarrhea, toothache, menstrual cramps, diarrhea, hangover, healing. **Human food.**
Astronium urundeuva (M. Allemão) Engl.	Aroeira	MED, MAD	ARB	0.079	0.401	CAS, FOL, CAU	9	**Medicine:** flu, stomach pain, cancer, inflammation of the uterus. Wood: construction of houses, fences, corrals. **Wood:** construction of houses, fences, corrals.
Mangifera indica L.	Manga	MED, ALI	ARB	0.317	0.571	CAS, FOL, FRU	7	**Medicine:** flu, headache, migraine, inflammation in general, hemorrhage, healing. **Human food.**
Spondias mombin L.	Cajá	MED, ALI	ARB	0.02	0.35	FOL, CAS, FRU	3	**Medicine:** sore throat, bleeding. **Human food**.
Spondias purpurea L.	Seriguela	MED, ALI	ARB	0.059	0.367	FOL	5	**Medicine:** stomach pain, hypertension, diarrhea, emesis. **Human food.**
Annonaceae								
Annona coriacea Mart.	Araticum	MAD	ARB	0.149	0.294	CAU	2	**Wood:** building houses, broomsticks.
Annona crassiflora Mart.	Ata brava	MAD, ALI	ARB	0.03	0.35	CAU, FRU	2	**Wood:** construction of houses. **Human food.**
Annona squamosa L.	Ata	MED, ALI	ARB	0.139	0.619	FOL, FRU	6	**Medicine:** ever, flu, diarrhea, stomach pain, hypertension. **Human food.**
Xylopia emarginata Mart.	Pindaíba	MAD	ARB	0.059	0.218	CAU	2	**Wood:** building houses, broomsticks.
Apiaceae								
Coriandrum sativum L.	Coentro	MED	HER	0.04	0.201	FOL	4	**Medicine:** fever, flu, stomach pain, asthma.

Table 1. Cont.

Botanical family/ Species	Popular name	Categorie	Habit	Cultural Importance	Relative Importance	Part of the plant used	N° of citations	Indications
Pimpinella anisum L.	Erva doce	MED	HER	0.01	0.175	FOL	1	**Medicine:** stomach pain.
Apocynaceae								
Mandevilla velame (A.St.-Hil.) Pichon	Velame	MED	ARS	0	0	FOL	1	**Medicine:** antiseptic.
Tabernae montana hystrix	Pau de leite	MED	ARB	0.04	0.201	CAS	2	**Medicine:** flu, healing.
Arecaceae								
Astrocaryum aculeatum G.Mey.	Tucum	MED, ALI	ARB	0.059	0.367	FRU, FOL	3	**Human food.**
Attalea speciosa Mart. ex Spreng.	Coco babaçu	MED, ALI, MAD	ARB	0.287	0.669	FOL, FRU.	6	**Medicine:** diabetes, toothache. **Human food**. **Wood:** roofing houses.
Cocos nucifera L.	Coco verde	ALI	ARB	0.03	0.35	FRU	1	**Human food.**
Copernicia prunifera (Mill.) H.E.Moore	Carnaúba	MAD	ARB	0.01	0.175	FOL	2	**Wood**: baskets, brooms.
Mauritia flexuosa L.f.	Buriti	MED, ALI, MAD	ARB	1.297	1	FRU, FOL.	13	**Medicine:** snake and scorpion bites, inflammation in the uterus, burns. **Human food. Wood:** baskets, brooms.
Asparagaceae								
Aloe vera (L.) Burm.f.	Babosa	MED	HER	0.05	0.209	FOL	3	**Medicine:** inflammation of the liver, prostate, pneumonia.
Asteraceae								
Bidens pilosa L.	Picão	MED	SUB	0.02	0.184	FOL	2	**Medicine:** anemia, hepatitis.
Gochnatia polymorpha (Less.) Cabrera	Candeia	MED, MAD	ARB	0.089	0.41	CAS, CAU	3	**Medicine:** toothache. **Wood:** manufacture of furniture, fences.
Gymnanthemum amygdalinum (Delile) Sch.Bip. ex Walp.	Boldo baiano	MED	SUB	0.149	0.294	FOL	7	**Medicine:** flu, fever, stomach pain, liver inflammation, menstrual cramps, indigestion, flatulence.
Helianthus annuus L.	Girassol	MED	SUB	0.01	0.175	SEM	3	**Medicine:** flu, chest pain, tiredness.
Piptocarpha rotundifolia (Less.) Baker	Coração-de-negro	MAD	ARB	0.059	0.218	CAU	2	**Wood:** construction of houses, fences.
Vernonanthura ferruginea (Less.) H.Rob.	Assa-peixe	MED	ARS	0.069	0.226	FOL	4	**Medicine:** Medicine: inflammation in the uterus, flu, diarrhea, asthma.
Bignoniaceae								
Anemopaegma arvense (Vell.) Stellfeld ex de Souza	Catuaba	MAD	ARB	0.01	0.175	CAU	1	**Wood:** construction of houses.
Handroanthus impetiginosus (Mart. ex DC.) Mattos	Pau D'arco Roxo	MED, MAD	ARB	0.178	0.469	CAS, CAU	4	**Medicine**: stomach pain, flatulence. **Wood:** building houses, manufacturing furniture.

Table 1. Cont.

Botanical family/ Species	Popular name	Categorie	Habit	Cultural Importance	Relative Importance	Part of the plant used	N° of citations	Indications
Tabebuia sp.	Pau D'arco amarelo	MAD	ARB	0.178	0.469	CAU	1	**Wood:** construction of houses.
Bixaceae								
Bixa orellana L.	Urucum	ALI	ARS	0.03	0.359	SEM	1	**Human food.**
Bromeliaceae								
Ananas comosus (L.) Merril	Abacaxi	MED	HER	0.01	0.175	FRU	1	**Medicine:** flu
Cactaceae								
Cereus jamacaru DC.	Mandacaru	MED	HER	0.02	0.184	RAI, CAU	2	**Medicine:** inflammation in the uterus, neoplasm.
Caricaceae								
Carica papaya L.	Mamão	MED, ALI	ARB	0.238	0.477	FOL, FRU	5	**Medicine:** stomach pain, worm, indigestion, flatulence, back pain. **Human food.**
Caryocaraceae								
Caryocar coriaceum Wittm.	Pequi	MED, ALI	ARB.	0.069	0.534	OLE, FRU	3	**Medicine:** inflammation in the uterus, flu. **Human food.**
Combretaceae								
Combretum duarteanum Cambess.	Vaqueta	MAD	ARB	0.04	0.175	CAU	1	**Wood:** firewood.
Combretum glaucocarpum Mart.	Sipaúba	MAD	ARB	0.01	0.175	CAU	1	**Wood:** firewood.
Terminalia brasiliensis (Cambess.) Eichler	Catinga-de-porco	MED, MAD	ARB	0.545	0.706	FOL, CAS, CAU	9	**Medicine:** diarrhea, stomach pain, indigestion, heartburn, flatulence. **Wood:** construction of houses, fences, posts, stakes.
Convolvulaceae								
Cuscuta sp.	Erva-de-chumbo	MED	HER	0.01	0.175	MUC	1	**Medicine:** back pain.
Ipomoea batatas (L.) Lam.	Batata doce	ALI	TER	0.03	0.192	RAI	1	**Human food.**
Operculina macrocarpa (L.) Urb.	Batata-de-purga	MED	TRE	0.02	0.184	RAI	2	**Medicine:** constipation, flu.
Crassulaceae								
Kalanchoe pinnata (Lam.) Pers.	Folha santa	MED	HER	0.03	0.192	FOL	4	**Medicine:** inflammation in the liver, kidneys and uterus, healing.
Cucurbitaceae								
Momordica charantia L.	Melão S. Caetano	MED	HER	0.01	0.175	FOL	2	**Medicine:** gastritis, flu.

Table 1. Cont.

Botanical family/ Species	Popular name	Categorie	Habit	Cultural Importance	Relative Importance	Part of the plant used	N° of citations	Indications
Euphorbiaceae								
Jatropha gossypiifolia L.	Pinhão-roxo	MED	HER	0.02	0.184	SEM	3	**Medicine:** inflammation in the uterus, epilepsy, toothache.
Manihot esculenta Crantz	Mandioca	ALI	ARS	0.099	0.251	RAI	1	**Human food.**
Manihot carthagenensis (Jacq.) Müll.Arg.	Maniçoba	MED	ARB	0.01	0.175	SEM	1	**Medicine: snake bite.**
Ricinus communis L.	Mamona	MED	HER	0.01	0.175	SEM	2	**Medicine:** indigestion, dizziness.
Fabaceae								
Amburana cearensis (Allemão) A.C.Sm.	Umburana	MED	ARB	0.139	0.285	CAS, SEM	7	**Medicine:** stomach pain, headache, flu, sinusitis, fever, dizziness, asthma.
Anadenanthera peregrina var. falcata (Benth.) Altschul	Angico vermelho	MED, MAD	ARB	0.079	0.393	CAS, CAU	5	**Medicine:** stomach pain, flu, dermatitis, blood purifying. Wood: firewood.
Diptychandra sp1	Birro cangalha	MED, MAD	ARB	0.436	0.630	CAS, CAU	6	**Medicine:** flu, blood cleansing, anemia, kidney infection, appetite stimulant, stomach pain.
Diptychandra sp2	Birro branco	MED	ARB	0.05	0.376	CAS	1	**Medicine:** kidney infection.
Diptychandra sp3	Birro vermelho	MED, MAD	ARB	0.188	0. .486	CAS, CAU	5	**Medicine:** inflammation in the kidneys, spine, heartburn. **Wood:** construction of houses, fences.
Pterodon emarginatus Vogel	Birro preto	MAD	ARB	0.02	0.184	CAU	1	**Wood:** construction of houses.
Bowdichia virgilioides Kunth	Sucupira	MED	ARB	0.01	0.175	SEM	1	**Medicine:** sore throat.
Cajanus sp.	Feijão	ALI	HER	0.01	0.175	SEM	1	**Human food.**
Cenostigma bracteosum (Tul.) Gagnon & G.P.Lewis	Pau-de-rato, catingueira	MED	ARB	0.03	0.192	FOL	3	**Medicine:** stomach pain, expectorante, diarrhea.
Cenostigma macrophyllum Tul.	Canela-de-velho	MED	ARB	0.149	0.452	CAS	3	**Medicine:** back pain. **Wood:** firewood, construction of corrals
Copaifera langsdorffii Desf.	Pau D'óleo	MED	ARB	0.168	0.477	CAS, CAU, LAT	9	**Medicine:** epilepsy, stroke, cancer, diarrhea, flu, appetite stimulant, seizures.
Dalbergia sp	Jacarandá	MED	ARB	0.02	0.184	CAS	2	**Medicine:** spine and appetite stimulant.
Dimorphandra gardneriana Tul.	Fava D'anta	MED, MAD, ALI	ARB	0.158	0.302	CAS, FRU, CAU	6	**Medicine:** stomach pain, flatulence, indigestion. **Wood:** construction of houses. **Human food.**
Dipteryx sp.	Fava-de-morcego	MED, ALI	ARB	0.059	0.542	FRU, SEM, CAU	4	**Medicine:** spine, muscle pain. **Human food**.

Table 1. Cont.

Botanical family/ Species	Popular name	Categorie	Habit	Cultural Importance	Relative Importance	Part of the plant used	N° of citations	Indications
Hymenaea stigonocarpa var. pubescens Benth.	Jatobá	MED, MAD, ALI	ARB	0.386	0.78	CAS, FRU, CAU	14	**Medicine:** appetite stimulant, stomach pain, flu, prostate, anemia, blood clearance, kidney, liver and uterus inflammation, STDs. **Wood:** construction of houses and corrals, stable, firewood. **Human food.**
Libidibia ferrea (Mart. ex Tul.) L.P.Queiroz	Pau-ferro	MED	ARB	0.079	0.234	CAS, SEM, CAU	5	**Medicine:** inflammation in the uterus, kidneys and liver, sinusitis, muscle pain.
Mimosa verrucosa Benth.	Jurema branca	MED, MAD	ARB	0.04	0.367	CAS, CAU	3	**Medicine:** stomach pain, flatulence. **Wood:** firewood.
Senna obtusifolia (L.) H.S.Irwin & Barneby	Fedegoso	MED	ARB	0.01	0.175	RAI	2	**Medicine:** stomach pain, flu.
Stryphnodendron adstringens (Mart.) Coville	Barbatimão	MED	ARB	0.03	0.35	CAS, RAI	2	**Medicine:** stomach pain, neoplasms.
Tamarindus indica L.	Tamarindo	MED	ARB	0.01	0.175	FOL	2	**Medicine:** diarrhea, weight control.
Lamiaceae								
Coleus amboinicus Lour.	Malvão	MED	SUB	0.198	0.336	FOL	9	**Medicine:** stomach pain, earache, gastritis, diarrhea, asthma, cramps, fever, expectorant, dermatitis.
Mentha sp1	Hortelã	MED	HER	0.158	0.302	FOL	7	**Medicine:** stomach pain, sore throat, fever, diarrhea, gastritis, tranquilizer, emesis.
Mentha sp2	Poejo	MED	HER	0.01	0.175	FOL	1	**Medicine:** soothing.
Ocimum americanum L.	Manjericão	MED	SUB	0.01	0.175	FOL	1	**Medicine:** insomnia.
Lauraceae								
Persea americana Mill.	Abacate	MED, ALI	ARB	0.059	0.534	FOL, FRU	3	**Medicine:** kidney inflammation, hangover. **Human food.**
Lecythidaceae								
Cariniana rubra Miers	Cachimbeira	MAD	ARB	0.01	0.175	CAU	1	**Wood:** furniture manufacturing
Loganiaceae								
Strychnos pseudoquina A.St.-Hil.	Quina	MAD	ARB	0.05	0.367	CAU	2	**Wood:** house building, ax handle.
Lythraceae								
Lafoensia replicata Pohl	Mangabeira	MED	ARB	0.356	0.472	CAS, FOL,RAI	13	**Medicine:** kidney, liver and uterus infection, blood cleansing, healing, gastritis, back pain, indigestion, dandruff, hypertension, cancer, prostate inflammation, flu.

Table 1. Cont.

Botanical family/ Species	Popular name	Categorie	Habit	Cultural Importance	Relative Importance	Part of the plant used	N° of citations	Indications
Malpighiaceae								
Byrsonima verbascifolia (L.) DC.	Cereja	ALI	ARB	0.01	0.175	FRU	1	**Human food.**
Malpighia emarginata DC.	Acerola	ALI	ARS	0.059	0.542	FRU	1	**Human food.**
Malvaceae								
Abelmoschus esculentus (L.) Moench	Quiabo	MED	HER	0.01	0.175	SEM	1	**Medicine:** asthma.
Gossypium hirsutum L.	Algodão	MED	ARS	0.119	0.268	FOL	5	**Medicine:** Stomach pain, muscle pain, inflammation in the uterus, flu, worm.
Luehea candicans Mart.	Açoita-cavalo	MED	ARB	0.01	0.175	CAS	2	**Medicine:** spine, headache.
Sida glomerata Cav.	Malva-relógio	MED	HER	0.02	0.02	RAI, PC	2	**Medicine:** kidney inflammation.
Melastomataceae								
Mouriri pusa Gardner	Puçá	MED	ARB	0.03	0.192	CAS	2	**Medicine:** stomach pain, muscle pain.
Meliaceae								
Cedrela fissilis Vell.	Cedro	MED, MAD	ARB	0.03	0.359	CAS, CAU	2	**Medicine:** toothache. **Wood:** furniture construction.
Moraceae								
Brosimum gaudichaudii Trécul	Inharé	MED, MAD	ARB	0.248	0.537	CAS, CAU, LÁT	7	**Medicine**: blood cleansing, toothache, inflammation in the uterus, anemia, dermatitis. **Wood:** construction of houses, fences**.**
Brosimum rubescens Taub.	Cunduru	MAD	ARB	0.02	0.218	CAU	3	**Wood:** construction of houses, fences, broomsticks.
Brosimum sp	Cunduru Branco	MAD	ARB	0.01	0.175	CAU	1	**Wood:** construction of houses.
Morus nigra L.	Amora	MED	ARB	0.03	0.192	FOL	3	**Medicine:** diabetes, cholesterol, shorter break.
Musaceae								
Musa paradisiaca L.	Banana	ALI	HER	0.119	0.435	FRU	1	**Human food.**
Myrtaceae								
Campomanesia pubescens (Mart. ex DC.) O. Berg.	Guabiraba	MAD	ARB	0.01	0.175	CAU	1	**Wood:** construction of houses.
Eucalyptus globulus Labill.	Eucalipto	MAD	ARB	0.059	0.218	FOL	4	**Medicine:** hypertension, fever, flu, sinusitis.
Psidium guajava L.	Goiaba	MED, ALI	ARB	0.168	0.444	FOL, FRU	5	**Medicine:** stomach pain, fever, diarrhea, hangover, emesis. **Human food.**

Table 1. Cont.

Botanical family/ Species	Popular name	Categorie	Habit	Cultural Importance	Relative Importance	Part of the plant used	N° of citations	Indications
Oxalidaceae								
Averrhoa carambola L.	Carambola	ALI	ARS	0.01	0.175	FRU	1	**Human food.**
Passifloraceae								
Passiflora edulis Sims	Maracujá	MED, ALI	TRE	0.089	0.41	FOL, FRU	2	**Medicine:** hipertension. **Human food.**
Passiflora sp.	Maracujá do mato	MED,ALI	TRE	0.099	0.41	FOL, FRU	2	**Medicine:** hipertension. **Human food.**
Pedaliaceae								
Sesamum indicum L.	Gergelim	MED	HER	0.01	0.175	SEM	2	**Medicine:** flu, asthma.
Phyllanthaceae								
Phyllanthus niruri L.	Quebra-pedra	MED	HER	0.02	0.184	FOL, RAI	1	**Medicine:** kidney inflammation.
Phytolaccaceae								
Petiveria alliacea L.	Tipi, Gambá	MED	HER	0.01	0.175	FOL	3	**Medicine:** flu, headache, epilepsy.
Plantaginaceae								
Scoparia dulcis L.	Vassourinha	MED, MAD	HER	0.04	0.367	FOL, PC	3	**Medicine:** flu, neoplasm. **Wood:** making brooms.
Poaceae								
Cymbopogon densiflorus (Steud.) Stapf	Capim santo	MED	SUB	0.05	0.209	FOL	3	**Medicine:** hypertension, tranquilizer, fever.
Saccharum officinarum L.	Cana de açúcar	MED, ALI	HER	0.129	0.418	FOL, CAU	3	**Medicine:** hypertension, tranquilizer. **Human food.**
Rutaceae								
Citrus aurantiifolia (Christm.) Swingle	Lima	MED, ALI	ARB	0.109	0.418	FOL, FRU	5	**Medicine**: hypertension, insomnia, headache, soothing. **Human food.**
Citrus limon (L.) Osbeck	Limão	MED, ALI	ARB	0.099	0.418	FOL, FRU	5	**Medicine:** stomach pain, diarrhea, flu, indigestion **Human food.**
Citrus sinensis (L.) Osbeck	Laranja	MED, ALI	ARB	0.703	0.791	FOL, FRU	7	**Medicine:** hypertension, fever, flu, indigestion, stomach pain, emesis. **Human food.**
Citrus sp.	Tangerina	MED, ALI	ARB	0.069	0.376	FOL, FRU	5	**Medicine:** hypertension, fever, headache, soothing .**Human food.**
Spiranthera odoratissima A.St.-Hil.	Manacá	MED	ARS	0.02	0.184	FOL	1	**Medicine:** column.
Salicaceae								
Casearia sylvestris Sw.	Folha de carne	MED	ARB	0.099	0.251	FOL, CAS, RAI	5	**Medicine:** stomach pain, flu, pneumonia, gastritis, emesis.

Table 1. Cont.

Botanical family/ Species	Popular name	Categorie	Habit	Cultural Importance	Relative Importance	Part of the plant used	N° of citations	Indications
Sapindaceae								
Magonia pubescens A.St.-Hil.	Timbó	MED	ARB	0.02	0.35	CAS, SEM	2	**Medicine:** toothache, burns.
Talisia esculenta (Cambess.) Radlk.	Pitomba	ALI	ARB	0.04	0.201	FRU	1	**Human food.**
Solanaceae								
Solanum physalis L.	Bobola	MED	HER	0.01	0.175	RAI	2	**Medicine:** flu, neoplasm.
Urticaceae								
Cecropia glaziovii Snethl.	Embaúba	MED	ARB	0.089	0.243	FOL	5	**Medicine:** inflammation of the kidneys, liver and uterus, hypertension, weight control.
Verbenaceae								
Lippia alba (Mill.) N.E.Br. ex Britton & P.Wilson	Erva-cidreira	MED	HER	0.406	0.514	FOL	5	**Medicine**: stomach pain, headache, fever, diarrhea, soothing.
Lippia gracilis Schauer	Alecrim-da-chapada	MED	HER	0.02	0.184	FOL	3	**Medicine:** headache, tranquilizer, sinusitis.
Ximeniaceae								
Ximenia americana L.	Ameixa-do-Cerrado	MED	ARB	0.297	0.421	CAS, FOL	7	**Medicine:** spine, blood purification, inflammation in the uterus, kidney infection, prostate, rheumatism, healing.
Zingiberaceae								
Curcuma alismatifolia Gagnep.	Açafrão	MED	HER	0.01	0.175	RAI	2	**Medicine:** smallpox, measles.
Zingiber officinale Roscoe	Gengibre	MED	HER	0.01	0.175	RAI	1	**Medicine:** sore throat.
Indeterminate								
Inderteminate	Cachamorra	MAD	ARB	0.01	0.175	CAU	1	**Wood:** fences.
Inderteminate	Camaçari	MAD	ARB	0.01	0.175	CAU	1	**Wood**: fences.
Inderteminate	Cana branca	MED	HER	0.02	0.175	FOL	1	**Medicine:** hypertension.
Inderteminate	Escada-de-macaco	MED	TRE	0.02	0.175	CAU	1	**Medicine:** spine.
Inderteminate	Pereira preto	MAD	ARB	0.01	0.175	CAU	1	**Wood**: furniture manufacturing.
Inderteminate	Pindaibinha	MAD	ARB	0.01	0.175	FRU	2	**Medicine:** liver and kidney inflammation.
Inderteminate	Sete dores	MED	SUB	0.01	0.175	FOL	1	**Medicine:** pain in general.
Inderteminate	Umburaninha	MED	SUB	0.02	0.184	RAI	1	**Medicine:** prostate.

The medicinal use displayed the highest number of quoted species (88). Among these, 54% were native and 46% of spontaneous occurrence. Data analysis pointed out an overlap of use in 20 species cited for feeding and 11 other species cited for wood.

Among the native plants cited for medicinal use, the most cited were Jatoba (*Hymenaea stigonocarpa var. pubescens* Benth.) (14%), mangaba tree (*Lafoensia replicata* Phol) (13%), catinga de porco (*Terminalia brasiliensis* (Cambess.) Eichler) (9%), savannah plum (*Ximenia americana* L.) (7%) and oil stick (*Copaifera langsdorffi* Desf.) (3%). The most cited naturalized plants were mallow (*Coleus amboinicus* Lour.) (9%), orange (*Citrus sinensis* (L.) Osbeck) (7%), lemon balm (*Lippia alba* (Mill.) N.E.Br. ex Britton & P.Wilson) (5%) and cotton (*Gossypium hirsutum* L.) (5%).

The medicinal use categories (88 spp.), human food (32 spp.), and construction (21 spp.) presented the highest number of species mentioned by the interviewees in the community. By listing the species raised in the community, the species that stood out through the indexes of cultural and relative importance in the Brejo da Conceição community were verified (Table 1).

In general, we recorded 126 plant species, performing a cut-out of the six species with greater biological and cultural importance. Overlapping the categories of use, the species with most prominent in the categories medicinal and food, according to the indices of cultural importance (CI) and relative importance (RII), were the buriti palm tree (*Mauritia flexuosa* L.f.) (CI= 1,297 and RII= 1), orange (*Citrus sinensis* (L.) Osbeck) (CI= 0.723 and RII= 0.791) and cashew (*Anacardium occidentale* L.) (CI= 0.564 and RII= 0.614). For the overlap of medicinal and timber uses, catinga de porco stood out (*Terminalia brasiliensis* (Cambess.) Eichler) (CI= 0.545 and RII= 0.623) and birro de cangalha (*Diplopterys sp.*) (CI= 0.495 and RII= 0.403). The lemon balm herb stood out as its medical use (*Lippia alba* (Mill.) N.E.Br. ex Britton & P.Wilson) (CI= 0.406 and IR= 0.431).

The identified medicinal plants (88) obtained together 363 use's indications for the most varied therapeutic purposes. Therefore, 67 diseases and symptoms were recorded: about 53% of the therapeutic indications aimed at treating digestive system disorders (indigestion, gastritis, heartburn, diarrhea, stomach pain, constipation, gallstone, liver inflammation, flatulence, parasitosis), followed by 39.1% of therapeutic indications for kidney and urogenital diseases (fever, kidneys inflammation, renal calculus, hemorrhage, menstrual cramps, uterus inflammation, prostate, sexually transmitted diseases) and 38.2% of the therapeutic indications of respiratory diseases (fever, cough, flu, sinusitis, toothache, headache, chest pain, asthma, and bronchitis).

Regarding food use, 32 plant species distributed in 19 families were recorded, and 21 species had indications for use also for therapeutic purposes in the treatment of gastrointestinal disorders, respiratory diseases, and urogenital diseases. Of these, 28 species of fruit trees arboreal (18 naturalized and ten natives), the most cited species were cashew (*Anacardium occidentale* L.), orange (*Citrus sinensis* (L.) Osbeck), mango (*Mangifera indica* L.), guava (*Psidium guajava* L.), lime (*Citrus aurantiifolia* (Christm) Swingle); and papaya (*Carica papaya* L.).

The interviewees reported that the use of 12 native plants' species for feeding, being the eight most cited species: buriti palm tree (*Mauritia flexuosa* L.f.), pequi (*Caryocar coriaceum* Wittm.), babassu palm coconut (*Attalea speciosa* Mart. ex Spreng.), tucum (*Astrocaryum aculeatum* Meyer), bat bean (*Dipteryx* sp.), Jatoba (*Hymenaea stigonocarpa* var. *pubescens* Benth.), passion fruit (*Passiflora* sp.) and pitomba (*Talisia esculenta* (Cambess.) Radlk); the fruit being the part of the plant most used in food.

The cultivated fruits are used as sweets, jellies, and juices. The inhabitants sell some species' fruits, mainly buriti palm tree, pequi, and bat bean. Fibers are removed from the buriti palm tree leaves for domestic use basketry and commercialization. Basketry is developed with the participation of people from the community. Men collect buriti palm tree leaves in the forest, and women participate in the processing and making baskets (Fig. 2).

Regarding wood use, 25 plant species were used for construction. Among these species, 12 also had medicinal purposes. The most commonly used species were Jatoba (*Hymenaea stigonocarpa* var. pubescens Benth.), catinga de porco (*Terminalia brasiliensis* (Cambess.) Eichler), mastic (*Astronium urundeuva* (M. Allemão) Engl.), followed by birro de cangalha (*Diplopterys* sp.), red birro (*Diplopterys pubipetala* (A.Juss.) W.R.Anderson & C.C.Davis), candeia (*Gochnatia polymorpha* (Less.) Cabrera), black heart (*Piptocarpa rotundifolia* (Less.) Baker), old cinnamon (*Cenostigma macrophyllum* Tul.) and purple bow stick (*Handroanthus impetiginosus* (Mart. ex DC.) Mattos). Among these, the Jatoba of the savannah (14 indications), the catinga de porco (9 indications), and the mastic (9 indications) had therapeutic indications.

The community uses logging resources for various purposes. The most cited use of wood was for household building elements (41% of the indications for plant use), followed by the construction of corrals (18%), fences (17%), and firewood (12%). Other uses (furniture and tools) accounted for 12% of citations (Fig. 3).

Going deeper into the relationship between people and medicinal and timber resources, differences were found regarding gender when considering exclusive citations of certain species and their collection sites. With regard to wood resources, ten species were cited exclusively by men, while only three species were reported exclusively by women. In all cases, the timber resource is extracted from the vegetation area close to the community. Only four species were cited in common by both genera. Considering medicinal plants, men and women mentioned 44 plants in common. Exclusively, men cited 15 plants, while women cited 19. It is noteworthy

that of the medicinal species cited exclusively by women, 13 are collected in backyards, with the remaining 6 taken from the vegetation area. The opposite was observed for men, with the 15 species mentioned exclusively, 10 collected in the vegetation area and five in backyards. This information shows that in addition to the difference in the number of plants mentioned, the socioecological context in which men and women are inserted influences the relationship with resources, with men being more connected with the domain of the vegetation area, possibly because they develop more activities in this environment, while the women act and experience the domain of the residences, manipulating the species found in the backyards.

Influencing factors on plant knowledge

The association between categories of use and socioeconomic factors found that gender, age, and the number of people in homes have a positive relationship with the number of plants known for medicinal purposes. Regarding gender, the number of medicinal plants mentioned by women was higher, differing significantly from the amount mentioned by men according to contrast analysis. The timber use of plants showed a positive relationship with the number of residents, being quite significant. The gender also presented a relationship and influenced the number of known plants. Contrast

Figure 2. Processing of Buriti leaves for making baskets by the community of Brejo da Conceição in the municipality of Currais, Piauí, for (**A**) buriti leaves, (**B**) community man collecting the resource, (**C**) drying the fibers, (**D**) basket braiding, (**E**) basket production. Photographs by Arcilon Alves.

analysis revealed that men know more plants for timber use when compared to women (Table 2). Regarding the food plants, gender was a key factor because men had a deeper food-use plants' knowledge than women (Table 2). The income variable did not present significant differences in the richness of known plants ($p > 0.05$). Schooling was represented in the model, but there without significance. Moreover, there was a positive relationship between the number of people who share the residence and the number of plants mentioned, without discrimination by use categories (Table 2).

Discussion

Most important plant species for the Brejo da Conceição Community

In the community, six species had the highest cultural and relative importance values, being identified as frequently consumed species and with various uses in the community. Among these uses, the medicinal and food use of the buriti palm tree (*M. flexuosa* L.f.), orange (*C. sinensis* (L.) Osbeck) and cashew (*A. occidentale* L.) plants, in the wood and medicinal use, the catinga de porco (*T. brasiliensis* (Cambess.)

Figure 3. Use of wood resources by the Brejo da Conceição community in the municipality of Currais, Piauí, for (**A**) resident preparing wood for home construction, (**B**) fence, (**C**) roof, (**D**) corral, (**E**) firewood and (**F**) cable of axe. Photographs by Arcilon Alves.

Table 2. Estimate of generalized linear models (GLMs) to evaluate the effects of using plants for medicinal use, food and construction on gender and number of residents in the community of Brejo da Conceição, located in the municipality of Currais, Piauí.

Use category	Variables	Estimate	Std. Error	Z-value	P-value	Contrast analysis (5 %)
Medicinal	Intercept	0.941087	0.262069	3.591	**0.000329** ***	Men (= 6,25) ≠ Women (=7,83)
	Gender (Women)	0.274164	0.097501	2.812	**0.004925** **	
	Age	0.006046	0.004318	1.400	0.161505	
	Income (month)	0.243348	0.160686	1.514	0.129917	
	Eschooling (illiterate)	-0.223007	0.129155	-1.727	0.084230 .	
	Eschooling (High school)	-0.077574	0.218546	-0.355	0.722623	
	Number of residents	0.073651	0.024000	3.069	**0.002149** **	
Timber	Intercept	-0.088700	0.625054	-0.142	0.8872	Men (=3,69) ≠ Women (= 1,89)
	Gender (Men)	0.6071212	0.239960	2.530	**0.0114** *	
	Age	0.0002275	0.010511	0.022	0.9827	
	Income (month)	0.0164204	0.413528	0.040	0.9683	
	Eschooling (illiterate)	-0.100955	0.317656	-0.318	0.7506	
	Eschooling (High school)	0.4471314	0.484950	0.922	0.3565	
	Number of residents	0.1460351	0.058105	2.513	**0.0120** *	
Food	Intercept	0.695948	0.555612	1.253	0.210360	Men (=4,85) ≠ Women (= 2,24)
	Gender (Men)	0.775300	0.215296	3.601	**0.000317** ***	
	Age	-0.007532	0.009350	-0.806	0.420495	
	Income (month)	0.134490	0.363636	0.370	0.711496	
	Eschooling (illiterate)	0.206667	0.280659	0.736	0.461510	
	Eschooling (High school)	0.400111	0.432049	0.926	0.354406	
	Number of residents	0.042685	0.052810	0.808	0.418927	

Eichler) and birro de cangalha (*Diplopterys sp.*) plants stood out in the medicinal and food use. Among all the plants the residents of the Brejo da Conceição community mentioned, the buriti palm tree (*M. flexuosa* L.f.) was the native species that stood out most for its food, medicinal, and timber potential. Its fruits, the leading resource extracted, are widely consumed in the community as an essential source of fresh food, or prepared in juices, jams, ice cream, and sweets (Balick 1986; Ribeiro *et al.* 2014). A study developed earlier in another rural community of the same municipality documented 40 uses for this species (Ribeiro *et al.* 2014). Thus, this significant amount of use for a single plant points out a high degree of knowledge and intimate relationship with this plant.

The versatility of *M. flexuosa* L.f. has given it a prominent role due to its multiple benefits for food, medicinal use, basketry production, and home coverings. According to Blancas *et al.* (2013), people manage plant resources within a community according to their role in family subsistence and valuable products' available quantity and quality. Therefore, it is essential to balance the availability and demand of resources. Ethnobotanical studies on *M. flexuosa* L.f. highlight its economic, cultural, and biological importance in rural communities using its leaves in the home covering and for handicrafts, braiding straw to produce basketry and toys, ensuring families' income (Santos *et al.* 2005; Santos & Coelho-Ferreira 2011). The studied community pointed out the same situation. In this sense, the buriti palm tree is

an income generator, being a source of subsistence for local populations. Martins *et al.* (2012) described that products made with buriti palm tree leaves and fruit pulp represented the main income source for the inhabiting families in a quilombola community.

Other food species that were highlighted for their versatility of uses were orange (*Citrus sinensis* (L.) Osbeck) and cashew (*Anacardium occidentale* L.): their fruits are used in food and leaves, and bark for therapeutic purposes. Locals consume cashew and orange raw or as sweets, chestnuts, cakes, jams, or drinks. For Johns (1990), a food species can be preferred because of its food potential and because it is used to meet nutritional needs and disease prevention. Regarding the categories of medicinal use and construction, the most common species were catinga de porco (*Terminalia brasiliensis* (Cambess.) Eichler) and birro de cangalha (*Diplopterys* sp.). The versatility of these species may apply to the fact that people use their leaves and barks to treat gastrointestinal and respiratory diseases and the trunk and branches in constructing houses, corrals, moors, fences, etc piles and tool cables in the community.

According to Campos *et al.* (2015), issues related to the versatility of uses of a species can culminate in a greater appreciation and preservation of knowledge related to it. Thus, the consumption and sustainable management of species recognized as important to the community entail greater appreciation, conservation, and distribution of knowledge of these natural resources being essential in the subsistence of the local population.

Relationships between plant knowledge and socioeconomic characteristics

Most studies analyze the influence of socioeconomic factors for a given category of use, such as the relationship with medicinal plants (Almeida *et al.* 2012; Torres-Avilez *et al.* 2016; Kutal *et al.* 2021; Melo *et al.* 2021), others about food plants (Cruz *et al.* 2013; Bortolotto *et al.* 2015; Campos *et al.* 2015), and others for logging resources (Ramos *et al.* 2008; Medeiros *et al.* 2012; Paniagua-Zambrana *et al.* 2014; Aparicio *et al.* 2021). Gender and age proved to be significant predictors of medicinal plant knowledge and use (Voeks 2007; Camou-Guerrero *et al.* 2008; Guimbo *et al.* 2011; Almeida *et al.* 2012; Torres-Avilez 2017; Faria & Albuquerque 2018). The same is for food species (Cruz *et al.* 2013; Campos *et al.* 2015; Bortolotto *et al.* 2019; Medeiros *et al.* 2021). Concerning timber resources, other studies highlighted that the influencing factors of these plants' knowledge in rural communities include gender, age, income, occupation, and scholarship (Ramos *et al.* 2008; Medeiros *et al.* 2012; Paniagua-Zambrana *et al.* 2017; Arruda *et al.* 2019). Our study pointed out socio-economic differences that influence the dynamics of knowledge distribution and use of plant species for medicinal, food, and logging purposes in the same community. In the Brejo da Conceição community, plants' knowledge and use forms vary according to the number of residents, age, and gender. Regarding the number of people living in the same residence, our results indicated a higher demand for the consumption of medicinal resources because the higher the number of people in each household, the greater the demand for treatments, and the availability of medicinal plants is essential to meet the needs of larger families. In a study conducted by Cruz *et al.* (2020) in a rural settlement in northeastern Brazil, the authors found that the higher the number of residents, the higher the consumption of plant resources. Although the number of residents per household is a crucial factor, it is outstanding that the present work did not analyze the consumption of firewood, but the results corroborate the general idea that larger families imply a higher demand for resources (Gavin & Anderson 2007; Medeiros *et al.* 2012). A greater number of people in a household means higher expenses and this can interfere with family decisions. A family with budget constraints may prefer to collect wood for construction rather than buy it in warehouses or even look for firewood in the forests rather than buy cooking gas (Medeiros *et al.* 2014). Another aspect is the difficulty of collecting reliable data on income. Many families may not say/hide the real value of their income, due to some discomfort or fear of losing some government benefit (Medeiros *et al.* 2014).

The age influenced the knowledge and use of medicinal plants: older people knew the medical use of a wider variety of plants. This broader knowledge may be associated with longer contact time with these resources. Hanazaki *et al.* (2013), for example, argued that the sum of experiences that older people acquire throughout life about the collection of resources explains the increase in knowledge about medicinal plants in local populations compared to younger ones.

In addition, there is a greater tendency for the elderly to be affected by more diseases, which can help to increase the repertoire of plants and their indications. In addition, the elderly prepare their own home remedies and also for their children and grandchildren, favoring the retention of knowledge. This can lead to the use of the medicine by young people without necessarily having knowledge of the plant, the medicine or even its preparation (Almeida *et al.* 2012). However, Aparicio *et al.* (2021) argued that the greater knowledge about medicinal and edible plants by the elders of the Mixtec people, Mexico, might signal a process of transformation. The authors showed that some plants used in past daily activities have been replaced or no longer used. For example, *Equisetum hyemale* L. was used to wash dishes and now they use plastic scrubbers instead. This may suggest disinterest in traditional usage. Therefore, more studies and information are needed to understand this scenario of current change in communities.

Regarding gender, women in the community were the holders of knowledge of medicinal plants because they significantly described a higher number of species than men. On the other hand, men had greater knowledge about timber plants. This result is corroborated by studies

conducted in Mexico, in the semi-arid region of Brazil, in French Guiana and Ouro Preto, Minas Gerais (Camou-Guerrero *et al.* 2008; Estrada-Castillón *et al.* 2014; Ogeron *et al.* 2018; Prado *et al.* 2019). Women are responsible for the homegardens and primary family health care in the community studied, according Arias-Toledo *et al.* (2009) and Arias-Toledo and Trillo (2018). Thus, they develop activities that include cultivation of medicinal and fruit plants in backyards, harvesting, exchanging, and processing home remedies, enabling an excellent knowledge of the therapeutic uses of plants. In contrast, men perform other activities not necessarily linked to using these resources for this purpose, these mainly use plant species for timber and fuel purposes, which explains the differences in knowledge in the use of plants between genera (Voeks 2007; Momsen 2009; Torres-Avilez 2017).

In addition, the management of women of these resources in the vicinity of residences outlines the female domain of these spaces, which may be explaining the more excellent knowledge (Pfeiffer & Butz 2005; Voeks 2007). On the other hand, studies conducted in Ethiopia indicated the most knowledgeable men of medicinal plants (Giday *et al.* 2009; Kidane *et al.* 2014). In the study conducted by Giday *et al.* (2009), the authors report that in the Ethnic Bench communities in southwestern Ethiopia, boys are preferred for the knowledge transfer about medicinal plants along the family line, usually from parents to children. Hence, men are more knowledgeable of medicinal plants in these communities. These studies highlight that the social roles developed by genders are determinants in the distribution of knowledge about medicinal plants (Torres-Avilez *et al.* 2016). In a study conducted with Fulni-ô population in northeastern Brazil, all genders contributed to the flow of information in local medical systems. However, men had a broader contribution to the structure and function of the system because they knew a greater number of medicinal plants and therapeutic targets than women. However, women socialize more knowledge about medicinal plants, contributing to the conservation of knowledge and maintenance of the functions of the local medical system (Torres-Avilez *et al.* 2019). According to Torres-Avilez *et al.* (2019), both men and women can stand out as connoisseurs of these resources, and the influence of gender on the richness of known species is not a global standard. Albuquerque *et al.* (2011) argue that this form of knowledge transmission is not due to a global pattern but to the effect of the social role played by gender in local socio-ecological systems.

Our study did not verify the transmission of knowledge. However, we observed that social organization is being represented in the relationship with local biodiversity. In contrast, in this community, the women dominated the medicinal knowledge related to family health care. This knowledge distribution may be a trend in rural communities in northeastern Brazil because women are responsible for maintaining the medicinal resources present in backyards and gardens or nearby forest environments.

The men of the Brejo da Conceição community also demonstrated broader knowledge about food plants. This broader knowledge may be related to the activities of collecting these resources in the native vegetation. The food plants known to men are mostly fruit trees found in raids in vegetation near the community, where there is a timely encounter with plants that serve them as immediate food and complement the family diet. An analogous situation was observed in the study by Campos *et al.* (2015) in which extractive communities tend to consume species found during forest incursions, with the primary purpose of satisfying hunger.

This study found that the most widespread knowledge about logging resources among men is associated with the construction of houses, firewood, fences, and tools, which was also observed in other socio-ecological systems (Ramos *et al.* 2008; Beltrán-Rodríguez *et al.* 2014; Paniagua-Zambrana *et al.* 2017). However, some studies indicate women as holders of knowledge about woody plants. For example, the wood gathering is women's responsibility in the study conducted by Biran *et al.* (2004) for African communities. Similarly, in India, in villages in the Kullu valley where women are the primary collectors of forest products, being responsible for the construction of wood deposits for the winter months (Bingeman 2003). In the Brejo da Conceição community, women use firewood to store food prepared for their families, but men are more knowledgeable about woody plants because they collect these resources in vegetation environments. However, in a study conducted by Arruda *et al.* (2019), the authors observed uniformity of knowledge between genders because both men and women develop wood collection together in the Atlantic Forest region, although men are more involved in field activities and women in domestic activities.

In the Brejo da Conceição community, because there is no similarity of functions, the activities performed by people are distinct. Thus, the knowledge and use of plants are also different, indicating that people manage plant resources according to their role in the socio-ecological system, whether for local medicine, food security, or family subsistence. Thus, this study verified that local knowledge distributed by the utilitarian categories differs according to the variation of gender. Therefore, it is possible to observe that knowledge is not homogeneous, evidencing an intra- and intercultural variation (Torres–Avilez 2017). Acknowledging gender differences and social roles in the knowledge and use of plant resources is fundamental for biodiversity conservation, cultural revitalization, and access and resources management (Pfeiffer & Butz 2005).

There are other considerations to be made about intracultural distinctions in knowledge. Many studies do not consider the different social contexts and learning opportunities that each social actor has had throughout his or her life (Ladio 2021). Ways of transmitting local

knowledge and strategies for collecting and managing natural resources, for example, can be influenced by the social structure of a community (patriarchal hierarchies) and thus bring biases in ethnobiological research (Ladio 2021). Conservatism in rural areas, structured in a patriarchal society, leads to the distinction of daily tasks, whose women perform activities close to their property (caretakers), such as collecting medicinal and food plants in backyards, for example. Men, on the other hand, have knowledge about the species of timber used, external to the property, and this accumulates more profitability, bringing 'losses' to women (Vieira & Milward-de-Azevedo 2018).

In some patriarchal societies, the production and collection of food resources is carried out by women, however, when it comes to eating, men are satiated first, then women and children. In times of scarcity, it can lead to food insecurity and serious damage, compromising their way of life (Bain 1993; Ladio 2021). Ethnobotanical results arising from this situation can certainly bring biases, since the learning and transmission of traditional knowledge can be compromised.

Conclusions

This research deals with the knowledge and use of plants in a community investigating the influence of socio-economic factors in the variation of this knowledge about the categories of medicinal, food, and timber use. In this sense, our results can serve as a reference for future research that incorporates more aspects of local ecological knowledge, including analyzing other essential variables that shape the distribution of knowledge in the distinct categories of use.

These results also indicate that there are different levels of knowledge within a community, and this could be interesting for directing studies that aim to discover new drugs, for example, and to suggest conservation strategies for some locally demanded species. Information arising from ethnobotanical/ethnobiological studies, collaborative projects between traditional communities/researchers/managers, can signal important policies aimed at management and conservation (Baldauf 2019).

In this sense, it is paramount emphasizing the importance of natural resources in the most different ecosystems so that adequate measures are taken, prioritizing sustainable use, avoiding overexploitation and inadequate handling of forest products, and thus preserving the plant richness of the region.

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Declarations

We worked following the recommendations of the Code of Ethics of the International Society of Ethnobiology. The research objectives were explained to the person of the Brejo da Conceição community. The Ethics Committee on Research Involving Human Beings of the Federal University of Piauí – UFPI endorsed the present research (CAAE: 46264515.0.0000.5214).

Conflict of interest

The authors declare no competing interests.

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