Ecological Apparency Hypothesis and Availability of Useful Plants: Testing different use values

João Everthon da Silva Ribeiro, Thamires Kelly Nunes Carvalho, João Paulo de Oliveira Ribeiro, Natan Medeiros Guerra, Núbia da Silva, Kamila Marques Pedrosa, Carlos Antônio Belarmino Alves, Severino Pereira de Sousa Júnior, Jacob Silva Souto, Alissandra Trajano Nunes, José Ribamar de Farias Lima, Rodrigo Silva de Oliveira, and Reinaldo Farias Paiva Lucena

Research

Abstract

The present study tested the ecological apparency hypothesis in a Brazilian rural community. It used the use value to test the information gained through three types of calculations (UV_{change}, $UV_{general}$, $UV_{potential}$). A vegetation inventory was performed in two areas near Capivara, Paraíba, Brazil, and 112 informants were interviewed. For the hypothesis test, the Spearman correlation coefficient was used to correlate the phytosociological (vegetation) and ethnobotanical data (use value). The study recorded 25 useful species in the first site and 20 in the second site. Positive correlations were found in the first site, between the UV_g to basal area and dominance, and between the UV_c and basal area, dominance, and importance value. In the second site, between the UV_g and both basal area and dominance and between UV_c and basal area, density, and dominance. Apparency explained the local importance of useful plants in construction, technology, and fuel, but was not explanative of medicine. Also, important responses were observed for the different use values.

Introduction

In the last decades, many ethnobotanical studies were performed, focusing on biodiversity conservation in several parts of the world and showing results in different perspectives (Begossi *et al*. 2002, Dhar *et al*. 2000, Gavin & Anderson 2005, Jiménez-Escobar & Rangel-Ch 2012, Kristensen *et al*. 2003, Lucena *et al*. 2008, Lucena *et al*. 2011, Lucena *et al*. 2012a, Lykke *et al*. 2004, Nascimento *et al*. 2009, Paré *et al*. 2010, Reyes-García *et al*. 2007).

Following this global trend in ethnobiological studies, surveys are being conducted in Brazil, mostly in the semi-arid region of northeastern Brazil, seeking to record and analyze the dynamics involved in the knowledge and use of natural resources by traditional populations. These have recorded a wide diversity of species known for their potential utility, both timber use and non-timber uses (Albuquerque 2009, Florentino *et al*. 2007, Lucena *et al*. 2012b, 2012c, Monteiro *et al*. 2008, Nascimento *et al*. 2012, Ramos & Albuquerque 2012, Ramos *et al*. 2008a, 2008b, Sá e Silva *et al*. 2008). Based on information from the mentioned studies, further studies are required that seek to record knowledge about useful species in regions that have not been investigated yet, as well as the dynamics of use and extraction of plant resources, with the prospect of examining the frequency and extent of collection and the distribution and availability of these plants in the local vegetation.

Correspondence

João Everthon da Silva Ribeiro, Thamires Kelly Nunes Carvalho, João Paulo de Oliveira Ribeiro, Natan Medeiros Guerra, Núbia da Silva, Kamila Marques Pedrosa, Severino Pereira de Sousa Júnior, Alissandra Trajano Nunes, José Ribamar de Farias Lima, Rodrigo Silva de Oliveira, Reinaldo Farias Paiva de Lucena, Centro de Ciências Agrárias, Universidade Federal da Paraíba, Areia, Paraíba, BRAZIL.
reinaldo@cca.ufpb.br, j.everthon@hotmail.com

Carlos Antônio Belarmino Alves, Centro de Humanidades, Universidade Estadual da Paraíba, Guarabira, Paraíba, BRAZIL.

Jacob Silva Souto, Centro de Saúde e Tecnologia Rural, Universidade Federal de Campina Grande, Patos, Paraíba, BRAZIL.

Ethnobotany Research & Applications 12:415-432 (2014)

Published: 25 September 2014

www.ethnobotanyjournal.org/vol12/i1547-3465-12-415.pdf

Assuming the existence of a relationship between use and availability of a plant resource, several models have emerged that emphasize the ecological apparency hypothesis proposed by Feeny (1976) and Rhoades and Cates (1976). The authors of this hypothesis have organized the plants into two distinct groups according to the insect herbivore process: apparent plants (those easily visible due their large size, such as trees, shrubs, and large herbaceous plants) and non-apparent plants (smaller herbaceous plants and plants in early stages of succession). In the nineties, Phillips and Gentry (1993a, 1993b) adapted this hypothesis for use and testing in ethnobotanical studies, assuming that traditional populations would present the same dynamics of foraging as herbivores. In this way, apparent plants would be the main targets for collection and use by humans, due their visibility and availability in the vegetation. According to these authors, the most abundant species were more easily seen and therefore grouped to people's systems of use.

Phillips and Gentry (1993a, 1993b), in order to test ecological apparency, proposed in their study a quantitative index, the use value (UV), which is used to evaluate the relative importance of plant resources used by traditional populations based on uses cited by the informant. This index has been adopted and tested in subsequent studies (Albuquerque & Lucena 2005, Ayantude *et al*. 2009, La Torre-Cuadros & Islebe 2003, Lucena *et al*. 2007, Marín-Corba *et al*. 2005, Trujillo-C & Correa-Múnera 2010). Some authors (Albuquerque & Lucena 2005, La Torre-Cuadros & Islebe 2003, Lucena *et al*. 2007, 2012a, Stagegaard *et al*. 2002) observed a deficiency in this index: the fact that it does not distinguish between citations of current use and potential use. This limitation could result in interference in the final considerations of the research, with the main focus being on the conservation of plant species.

In studies about ecological apparency in rural communities from the Brazilian semi-arid region, Lucena *et al*. (2012a) showed the need for differentiating the citations of use and suggested that subsequent studies should use three calculations (general-UV_g, current-UV_c, and potential-UV_p) which are calculated relative to the time of the interview. The UV_g calculation takes into account all citations, the UV_c only the citations of current use (the informant knows and actually uses the plant resources), and UV_p considers only uses that the informant knows but does not use.

Ecological apparency has been tested in dry forests; in Brazil, it has been tested in Caatinga and Cerrado and has shown different results for the use and local availability of plant resources (Albuquerque *et al*. 2005, Ferraz *et al*. 2006, Lozano *et al*. 2014, Lucena *et al*. 2007, 2012a, 2012b, 2014, Ribeiro *et al*. 2014, Tunholi *et al*. 2013).

Based on these results, this study tested the application of ecological apparency in an area in Caatinga to understand the dynamics of local vegetation resources by adopting and testing the calculation of the UV suggested by Lucena *et al*. (2012a), who observed that the relative use and availability responded differently to each UV. Based on these contrary responses, it is necessary to test the apparency ecological in other dry forest areas in order to understand what dynamics are involved in the use of plant resources, verify that this negative trend is repeated, and determine if there is any specific pattern in this region similar to that which exists in the humid forest.

Methods

Local and regional contexts of the study

The city of Solânea is located in the mesoregion of Agreste, in the semi-arid region of the state of Paraíba, northeastern Brazil (Figure 1). It is located at an altitude of 626 m, geographic coordinates 46° 06' 40"S and 35° 41' 49"W, approximately 138 km from the state capital João Pessoa. It has a total population of 26,689 inhabitants (7,357 in the rural area and 19,332 in the urban area) and a land area of 232.094 km², with a population density of 115.01 inhabitants/km² (IBGE 2010). The vegetation is formed by subcaducifólica and caducifólica forests, typical of the Agreste area. The climate is rainy tropical, with drought periods. The annual average temperature is around 25°C.

The rural community selected was Capivara which is approximately 15 km away from the urban center. The economy is predominantly considered as subsistence, with an emphasis on traditional agriculture through cultivation of corn and beans. Livestock consists mainly of cattle, although goats and sheep are being explored. The community is aided by a health agent who visits each family unit every month.

Collection of ethnobotanical data

The study was carried out from August 2011 to July 2012. One-hundred percent of the householders were recruited to participate in the study, by an intentional and targeted sampling. The two heads of each family (man and woman) were interviewed at different times to avoid interference on the information provided during the conversation, totaling 112 informants (53 men and 59 women). The interviews were conducted on different days with each householder. The purpose of this study was explained to each informant, who was then requested to provide consent following the research requirements of the National Health Council, through the Committee of Ethics in Research (resolution 196/96). This study was approved by the Committee of Ethics in Research with Human Beings (CEP) of the Lauro Wanderley Hospital, Federal Univer-

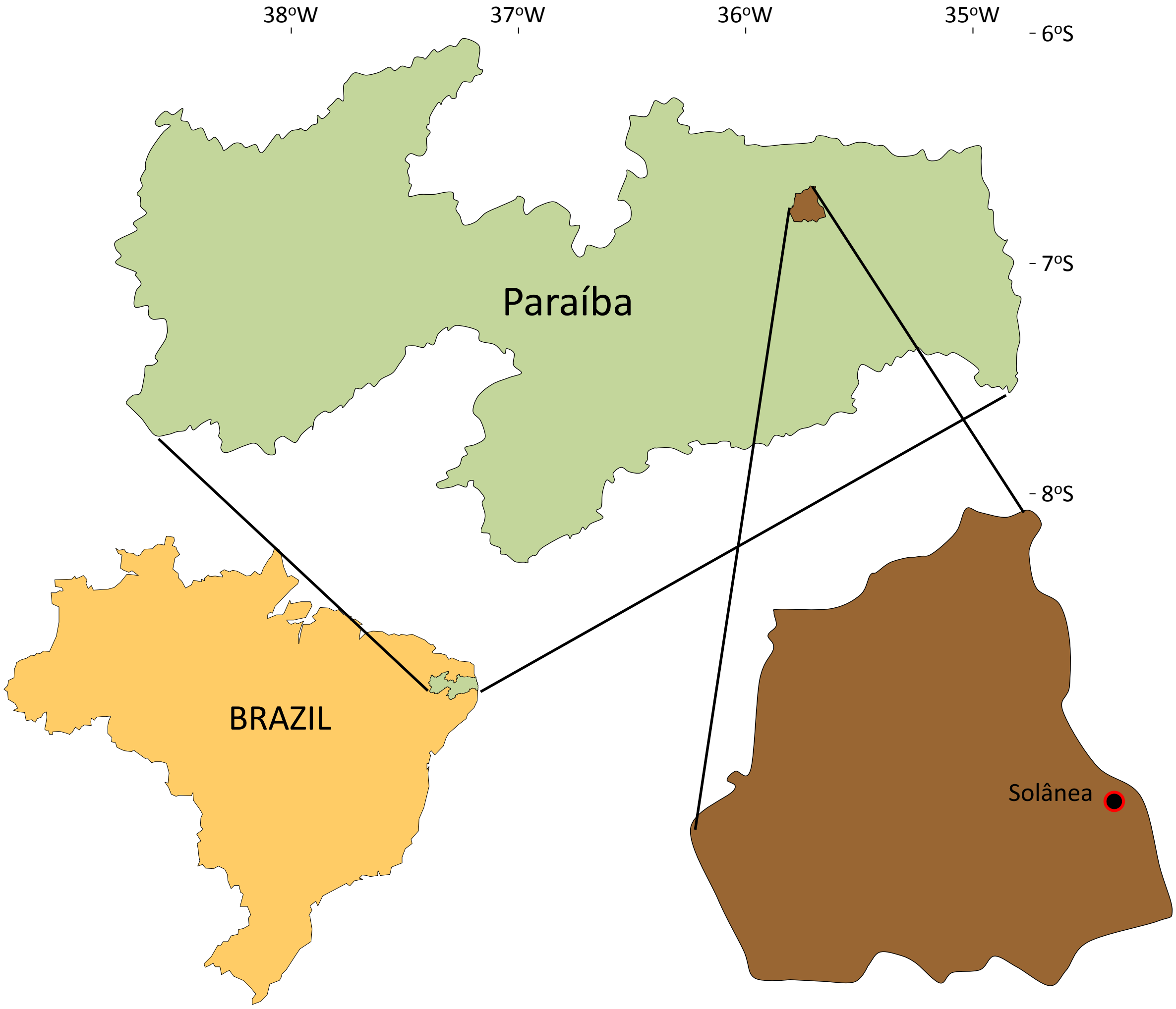

Figure 1. Study region within the community of Capivara in the city of Solânea, Paraíba, Brazil.

sity of Paraíba, registered with CEP/HULW Protocol No. 297/11.

The semi-structured form used in the interviews presented specific questions about the plant species known and used by residents to find out about useful species as well as the categories in which they are classified. These categories were determined according to specialized literature (Albuquerque & Andrade 2002a, 2002b, Ferraz *et al*. 2006, Lucena *et al*. 2007, 2012a), and included food, fuel, fodder, medicinal, construction, technology, poison/abortion, veterinary, magical/religious, ornamental, and other uses. The category "other uses" included citations for personal hygiene (hair washing, teeth brushing, etc.), bioindicators (as a signal for rain) and shade.

Vegetation sampling

In order to test the hypothesis of ecological apparency, two areas of vegetation were demarcated for performing the ecological study of plant species, with sociological data collection. There were 50 continuous plots in each area, each measuring 10 m × 10 m, with 100 plots in total, corresponding to a 1 ha sample of the vegetation. The first area (A1) was degraded and located in a green area considered by the researchers of this study and local experts as the current location of extraction of plant resources. However, the level of intensity of the extraction of this resource could not be measured. A second area (A2) was recognized as an area with a low extent of degradation and represented a conserved state. Information obtained with the help of informants from the community claimed that this area had been used for several years and was in the process of recovery. This was proven by the researchers of this study on visiting the areas of vegetation.

In the phytosociology study we recorded all woody species with a stem diameter at ground level (DNS) equal to or greater than three cm, excluding cacti, bromeliads, climbers, lianas, and small herbaceous plants (Araújo & Ferraz 2010). The phytosociological parameters were relative density (DRt), relative dominance (DoRt), relative frequency (FRt), and importance value (IV), which were analyzed according to Araújo and Ferraz (2010). DRt (%) was estimated as the number of individuals of a particular taxon as a percentage of the total number of sampled individuals; FRt (%) was estimated as the absolute frequency of the species concerned (FAt) as a percentage of the total frequency (FT %), which represented the sum of all the absolute frequencies; and DoRt (%) was estimated as absolute dominance of the species concerned (DoA) as a percentage of the total dominance (DoT).

For the variables calculation, the equations described below were used (Araújo & Ferraz 2010):

Relative Density (DRt) = (species density x 100)/(all species total density)

Relative Dominance (DoRt) = (species absolute dominance x 100)/(all species total dominance)

Relative Frequency (FRt) = (species absolute frequency x 100)/(all species total frequency)

Importance Value (IV) = (FRt + DRt + DoRt).

Interview analysis

The test of ecological apparency was considered for the purpose of ethnobotanical data analysis based on the useful species that were recorded in the phytosociological survey. We disregarded native and exotic species that were cited in the interviews but were not found in the plots.

The UV was calculated using the formulas UV = ∑Ui/n, UVf = ∑UV/nf, and UVc = ∑UV/nc (Rossato *et al*. 1999), where Ui = number of uses of the species listed for each informant, n = total number of informants, UV = use value of each species in the family, nf = number of species in the family, UVc = use value of each species in the category, and nc = number of species in the category. Unlike the traditional calculation that used the formula UV = ∑Ui/n, the calculation was performed taking into consideration three forms of data collection and treatment, following the calculations proposed by Lucena *et al*. (2012a), with calculation of the UV_c, UV_p, and UV_g. The value of current usage (UV_c) considered the effective citations of use; in other words, the uses that informants claimed to be using at the present time. The value of potential use (UV_p) was based on citations of use that informants said that they were aware of, but that they did not use currently. These uses were only in the cultural record and memory of informants. The value of general use (UV_g) recorded all uses, i.e., no distinction was made between current uses and past uses.

Pearson's linear correlation coefficient was used to compare the values of current use and general potential using the program BioEstat 5.0 (Sokal & Rholf 1995). This was to verify whether or not there was a change in the cast of species in each UV.

Analysis of phytosociological data

The relationship between the different use values and the availability of useful plant species was tested using the Spearman rank correlation coefficient using the software BioEstat 5.0 (Sokal & Rholf 1995). We investigated whether there was a relationship between the use values and phytosociological parameters (basal area, DoRt, FRt , IV, and DRt). For analysis by category of use, the species that were included were those with any citation for use for the category in question. Therefore, it was not possible to carry out statistical analysis with the magical/religious and poison/abortion categories, due to the small number of woody species cited by the community.

Results

Inventory of vegetation

In total, 27 woody plant species were identified (26 usable), belonging to 26 genera and 12 botanical families. Analyzing the areas separately, 2468 individuals were recorded in the degraded area (A1), distributed into 26 species (25 usable), 25 genera, and 12 families, and in the conserved area (A2), 2701 individuals were identified, distributed into 21 species (20 usable), 19 genera, and 10 families (Appendix 1).

The species that most stood out in the 100 installed plots was *Croton blanchetianus* Baill. (**marmeleiro**) with 1439 individuals, followed by *Piptadenia stipulacea* (Benth.) Ducke (**amorosa branca**) with 817 and *Aspidosperma pyrifolium* Mart. (**pereiro**) with 668. In A1, *C. blanchetianus* stood out with 735 individuals, followed by *P. stipulacea* (472 individuals) and *Bauhinia cheilantha* (Bong.) Steud. (**Mororó**), with 237. In A2, *C. blanchetianus* also stood out, with 704 individuals, followed by *A. pyrifolium* (598) and *P. stipulacea* (345).

Analyzing the botanical families, it was observed that Fabaceae was the most abundant with 2067 individuals, followed by Euphorbiaceae and Apocynaceae with 668 and 1895 individuals, respectively. In the plots of the degraded area, the most featured family was Fabaceae with 1116 individuals, followed by Euphorbiaceae and Anacardiaceae with 1051 and 96 individuals, respectively. In the plots of the conserved area, the family Fabaceae also stood out with 951 individuals, followed by Euphorbiaceae (844) and Apocynaceae (598).

Among the species cited as useful by informants, the following stood out in A1 as having a high IV: *C. blanchetianus* (72.35), *P. stipulacea* (45.52), and *Poincianella pyramidalis* Tul. (**catingueira**) (30.86). In A2, *A. pyrifolium* (61.83), *C. blanchetianus* (51.99), and *P. pyramidalis* (39.04) had high VIs.

Families with the highest IVs in A1 were Fabaceae (111.64), Euphorbiaceae (105.09), and Anacardiaceae (23.84). Families with the highest IVs in A2 were Fabaceae (87.41), Apocynaceae (68.47), and Euphorbiaceae (66.97). The families that stood out as having the greatest species richness in the two areas were Fabaceae (A1: 12 species; A2: 3 species), Euphorbiaceae (A1: 5 species; A2: 5 species), and Anacardiaceae (A1: 3 species; A2: 3 species).

Ethnobotanical inventory

Comparison of the average and standard deviation for the three types of UV showed substantial variation of the species between the largest and smallest use values, with the average of 0.94 (± 1.46) for UV_g, 0.59 (± 0.97) for UV_c, and 0.35 (± 0.55) for UV_p. The highest UV_g values were shown by *A. pyrifolium* (6.91), *Myracrodruon urundeuva* Allemão (**aroeira**) (4.56), *Ziziphus joazeiro* Mart. (**juazeiro**) (4.23), *C. blanchetianus* (3.70), and *P. pyramidalis* (3.28). The highest UV_c values were shown by *A. pyrifolium* (4.99), *C. blanchetianus* (2.93), *M. urundeuva* (2.67), *Z. joazeiro* (2.40), and *P. pyramidalis* (2.24). The highest UV_p values were shown by *Schinopsis brasiliensis* Engl. (**baraúna**) (2.28), *A. pyrifolium* (1.92), *M. urundeuva* (1.89), *Z. joazeiro* (1.83), and *Commiphora leptophloeos* (Mart.) J.B.Gillett (**imburana**) (1.43).

It was observed that *A. pyrifolium* achieved the highest UV_g and UV_c and *S. brasiliensis* had the greatest UV_p. The high value of UV_c for *A. pyrifolium* was due its use, especially in construction and technology categories. *S. brasiliensis* had the highest UV_p due its low availability in the local vegetation (almost zero).

Families with the highest UV_g were Apocynaceae (6.91), Rhamnaceae (4.23), and Anacardiaceae (3.87). Families with the highest UV_c were Apocynaceae (4.99), Rhamnaceae (2.40), and Anacardiaceae (2.20). Families with the highest UV_p were Apocynaceae (1.92), Rhamnaceae (1.83), and Anacardiaceae (1.67).

Regarding the UV of the categories, it was observed that the construction category had the highest UV_g (0.37), followed by fuel (0.26) and technology (0.25). The UV current values were obtained for construction (0.22), medical (0.20), and food (0.19). For UV potential, fuel (0.59), construction (0.14), and technology (0.11) stood out. The Pearson coefficient showed that there were significant correlations between UV_g and UV_c (r=0.9; p<0.0001), UV_g and UV_p (r=0.93; p<0.0001), and UV_c and UV_p (r=0.84; p<0.0001), showing that the cast of the most valued in each UV was very similar.

Hypothesis of ecological apparency

We recorded many correlations between the use values and phytosociological parameters. Spearman correlation showed positive correlations in A1 between UV_g and basal area, and DoRt, UV_c and basal area, DoRt, and IV (Table 1). In A2, correlations were found between UV_g and basal area and DoRt, UV_c and basal area, DRt, and DoRt (Table 1).

When analyzing by category, positive correlations in the A1 were found only in the construction category. These were between UV_g and all five parameters and between UVc and both Drt and FRt (Table 2).

In A2, all pairwise correlations in the construction, fuel, and medicinal categories were significant except medicinal UV_p and Drt (Table 2). Use values for individual taxa within each category are listed in Tables 3 through 13.

Table 1. Relationship between use values (UV-general, current, potential) and the phytosociological parameters of the species that were recorded in a degraded forest area (A1) and a preserved forest area (A2) using the Spearman correlation coefficient within the community of Capivara in the city of Solânea, Paraíba, Brazil. 1 = *p*<0.05, 2 = *p*<0.01.

	A1			A2		
	UV_g	UV_c	UV_p	UV_g	UV_c	UV_p
Basal Area	0.41[1]	0.51[1]	-	0.41[1]	0.44[1]	-
Density	-	-	-	-	0.40[1]	-
Dominance	0.41[1]	0.51[2]	-	0.41[1]	0.45[1]	-
Frequency	-	-	-	-	-	-
Importance Value	-	0.42[1]	-	-	-	-

Table 2. Relationship between use values (UV) with the phytosociological parameters of the species analyzed by use categories recorded in a degraded forest area (A1) and a preserved forest area (A2) using the Spearman correlation coefficient within the community of Capivara in the city of Solânea, Paraíba, Brazil. 1 = *p*<0.05, 2 = *p*<0.01

	A1			A2								
	Construction			Construction			Fuel			Medicinal		
	UV_g	UV_c	UV_p	UV_g	UV_c	UV_p	UV_g	UV_c	UV_p	UV_g	UV_c	UV_p
Basal Area	0.42^{1}	-	-	0.84^{2}	0.83^{2}	0.79^{2}	0.73^{2}	0.83^{2}	0.69^{2}	0.80^{2}	0.81^{2}	0.70^{2}
Density	0.45^{1};	0.44^{1}	-	0.70^{2}	0.72^{2}	0.57^{2}	0.62^{2}	0.75^{2}	0.56^{2}	0.57^{1}	0.58^{1}	-
Dominance	0.41^{1}	-	-	0.85^{2}	0.83^{2}	0.79^{2}	0.74^{2}	0.84^{2}	0.69^{2}	0.81^{2}	0.82^{2}	0.70^{2}
Frequency	0.42^{1}	0.43^{1}	-	0.66^{2}	0.68^{2}	0.53^{1}	0.61^{2}	0.75^{2}	0.53^{1}	0.56^{1}	0.55^{1}	0.60^{1}
Importance Value	0.46^{1}	-	-	0.77^{2}	0.77^{2}	0.65^{2}	0.65^{2}	0.76^{1}	0.65^{2}	0.65^{2}	0.66^{2}	0.58^{1}

Table 3. Species identified in the fuel category with their respective use values (UV-general, current, potential) within the community of Capivara in the city of Solânea, Paraíba, Brazil.

Names		Use Values		
Scientific	**Vernacular**	UV_g	UV_c	UV_p
Amburana cearensis (Allemão) A.C.Sm.	**cumarú**	0.13	0.03	0.11
Anadenanthera colubrina (Vell.) Brenan	**angico**	0.69	0.32	0.37
Aspidosperma pyrifolium Mart.	**pereiro**	0.75	0.46	0.29
Bauhinia cheilantha (Bong.) Steud.	**mororó**	0.36	0.19	0.17
Capparis jacobinae Moric. ex Eichler	**icó**	0.01	0.01	-
Chorisia glaziovii (Kuntze) E.Santos	**barriguda**	0.01	-	0.01
Commiphora leptophloeos (Mart.) J.B.Gillet	**imburana**	0.23	0.08	0.15
Cordia trichotoma (Vell.) Arráb. ex Steud.	**frei jorge**	0.02	0.01	0.01
Coutarea hexandra (Jack.) K.Schum.	**quina quina**	0.02	0.01	0.01
Croton blanchetianus Baill.	**marmeleiro**	1.04	0.81	0.22
Cynophalla flexuosa (L.) J.Prese	**feijão brabo**	0.14	0.04	0.1
Erythrina velutina Willd.	**mulungú**	0.04	0.02	0.02
Eugenia uvalha Cambess.	**ubaia**	0.01	0.01	-
Handroanthus impetiginosus (Mart. ex DC.) Mattos	**pau d'arco roxo**	0.13	0.04	0.09
Hymenoca courbaril L.	**jatobá**	0.02	-	0.02
Jatropha mollissima (Pohl) Baill.	**pinhão brabo**	0.01	0.01	-
Libidibia ferrea (Mart. ex Tul.) L.P.Queiroz	**jucá**	0.26	0.12	0.14
Luetzeburgia sp.	**pau pedra**	0.03	0.01	0.02
Manihot cf. *dichotoma* Ule	**maniçoba**	0.02	-	0.02
Maytenus rigida Mart.	**bom nome**	0.48	0.20	0.29
Mimosa tenuiflora (Willd.) Poir.	**jurema preta**	0.19	0.08	0.11
Myracrodruon urundeuva Allemão	**aroeira**	1.11	0.52	0.59
Piptadenia stipulaceae (Benth.) Ducke	**amorosa branca**	0.63	0.44	0.20
Pithecellobiun diversifolium Benth.	**espinheiro**	0.01	-	0.01
Poincianella pyramidalis Tul.	**catingueira**	1.39	0.87	0.53
Pterogyne nitens Tul.	**madeira nova**	0.08	-	0.08

Names		Use Values		
Scientific	Vernacular	UV_g	UV_c	UV_p
Schinopsis brasiliensis Engl.	**baraúna**	1.46	0.70	0.76
Senna martiana (Benth.) H.S.Irwin & Barneby	**canafístula**	0.07	0.04	0.03
Sideroxylon obtusifolium (Roem. & Schult.) T.D.Penn.	**quixabeira**	0.13	0.04	0.09
Spondias tuberosa Arruda	**umbuzeiro**	0.23	0.08	0.15
Tabebuia aurea (Silva Manso) Benth. & Hook.f. ex S.Moore	**craibeira**	0.07	0.03	0.04
Tabebuia serratifolia (Vahl) G.Nichols.	**pau d'arco amarelo**	0.04	-	0.04
Thiloa glaucocarpa (Mart.) Eichler	**joão mole**	0.05	0.02	0.04
Ximenia americana L.	**ameixa**	0.08	0.02	0.06
Ziziphus joazeiro Mart.	**juazeiro**	0.74	0.36	0.38

Table 4. Species identified in the technology category with their respective use values (UV-general, current, potential) within the community of Capivara in the city of Solânea, Paraíba, Brazil.

Names		Use Values		
Scientific	Vernacular	UV_g	UV_c	UV_p
Amburana cearensis (Allemão) A.C.Sm.	**cumarú**	0.45	0.27	0.18
Anadenanthera colubrina (Vell.) Brenan	**angico**	0.14	0.01	0.13
Aspidosperma pyrifolium Mart.	**pereiro**	2.83	2.22	0.61
Bauhinia cheilantha (Bong.) Steud.	**mororó**	0.12	0.09	0.03
Bowdichia virgilioides Kunth	**sucupira**	0.03	0.01	0.02
Chorisia glaziovii (Kuntze) E.Santos	**barriguda**	0.05	0.01	0.04
Commiphora leptophloeos (Mart.) J.B.Gillet	**imburana**	0.66	0.19	0.47
Cordia trichotoma (Vell.) Arráb. ex Steud.	**frei jorge**	0.12	0.08	0.04
Croton blanchetianus Baill.	**marmeleiro**	0.27	0.19	0.08
Cynophalla flexuosa (L.) J.Prese	**feijão brabo**	0.56	0.41	0.15
Enterolobium timbouva Mart.	**tambor**	0.11	0.05	0.05
Erythrina velutina Willd.	**mulungú**	0.06	0.04	0.03
Handroanthus impetiginosus (Mart. ex DC.) Mattos	**pau d'arco roxo**	0.65	0.36	0.29
Hymenoca courbaril L.	**jatobá**	0.01	0.01	-
Libidibia férrea (Mart. ex Tul.) L.P.Queiroz	**jucá**	0.33	0.24	0.09
Luetzeburgia sp.	**pau pedra**	0.13	0.12	0.01
Manihot cf. *dichotoma* Ule	**maniçoba**	0.01	0.01	-
Maytenus rigida Mart.	**bom nome**	0.34	0.21	0.13
Myracrodruon urundeuva Allemão	**aroeira**	0.49	0.09	0.40
Piptadenia stipulaceae (Benth.) Ducke	**amorosa branca**	0.22	0.21	0.02
Poincianella pyramidalis Tul.	**catingueira**	0.08	0.06	0.02
Pseudobombax marginatum (A.St.-Hil., Juss. & Cambress.) A.Robyns	**imbiratã**	0.03	0.01	0.02
Pterogyne nitens Tul.	**madeira nova**	0.25	0.09	0.16
Sapium lanceolatum (Müll.Arg.) Huber	**burra leiteira**	0.01	-	0.01
Schinopsis brasiliensis Engl.	**baraúna**	0.65	0.12	0.54
Senna martiana (Benth.) H.S.Irwin & Barneby	**canafístula**	0.16	0.11	0.05

Names		Use Values		
Scientific	**Vernacular**	**UV_g**	**UV_c**	**UV_p**
Sideroxylon obtusifolium (Roem. & Schult.) T.D.Penn.	**quixabeira**	0.02	0.01	0.01
Spondias tuberosa Arruda	**umbuzeiro**	0.02	-	0.02
Tabebuia aurea (Silva Manso) Benth. & Hook.f. ex S.Moore	**craibeira**	0.29	0.11	0.18
Tabebuia serratifolia (Vahl) G.Nichols.	**pau d'arco amarelo**	0.12	0.08	0.04
Tabebuia sp.	**pau d'arco branco**	0.02	0.02	-
Thiloa glaucocarpa (Mart.) Eichler	**joão mole**	0.07	0.04	0.04
Ximenia americana L.	**ameixa**	0.01	0.01	-
Ziziphus joazeiro Mart.	**juazeiro**	0.08	0.02	0.06

Table 5. Species identified in the construction category with their respective use values (UV-general, current, potential) within the community of Capivara in the city of Solânea, Paraíba, Brazil.

Names		Use Values		
Scientific	**Vernacular**	**UV_g**	**UV_c**	**UV_p**
Amburana cearensis (Allemão) A.C.Sm.	**cumarú**	0.08	-	0.08
Anadenanthera colubrina (Vell.) Brenan	**angico**	0.26	0.11	0.15
Aspidosperma pyrifolium Mart.	**pereiro**	3.1	2.2	0.9
Bauhinia cheilantha (Bong.) Steud.	**mororó**	0.42	0.30	0.12
Capparis jacobinae Moric. ex Eichler	**icó**	0.01	0.01	-
Cedrela odorata L.	**cedro**	0.03	-	0.03
Chorisia glaziovii (Kuntze) E.Santos	**barriguda**	0.01	-	0.01
Cnidoscolus quercifolius Pohl	**favela**	0.01	-	0.01
Commiphora leptophloeos (Mart.) J.B.Gillett	**imburana**	1.08	0.46	0.63
Cordia trichotoma (Vell.) Arráb. ex Steud.	**frei jorge**	0.03	0.02	0.01
Croton blanchetianus Baill.	**marmeleiro**	1.55	1.32	0.23
Cynophalla flexuosa (L.) J.Prese	**feijão brabo**	0.09	0.02	0.07
Enterolobium timbouva Mart.	**tambor**	0.12	0.04	0.07
Erythrina velutina Willd.	**mulungú**	0.01	-	0.01
Handroanthus impetiginosus (Mart. ex DC.) Mattos	**pau d'arco roxo**	0.22	0.05	0.17
Hymenoca courbaril L.	**jatobá**	0.02	0.01	0.01
Jatropha mollissima (Pohl) Baill.	**pinhão brabo**	0.1	0.09	0.01
Libidibia ferrea (Mart. ex Tul.) L.P.Queiroz	**jucá**	0.12	0.04	0.07
Luetzeburgia sp.	**pau pedra**	0.01	-	0.01
Manihot cf. *dichotoma* Ule	**maniçoba**	0.01	0.01	-
Maytenus rígida Mart.	**bom nome**	0.04	0.01	0.03
Mimosa tenuiflora (Willd.) Poir.	**jurema preta**	0.12	0.05	0.06
Myracrodruon urundeuva Allemão	**aroeira**	1.35	0.73	0.62
Piptadenia stipulaceae (Benth.) Ducke	**amorosa branca**	0.37	0.26	0.11
Poincianella pyramidalis Tul.	**catingueira**	0.85	0.54	0.30
Pterogyne nitens Tul.	**madeira nova**	0.07	0.04	0.03
Sapium lanceolatum (Müll.Arg.) Huber	**burra leiteira**	0.03	0.01	0.02
Schinopsis brasiliensis Engl.	**baraúna**	1.49	0.74	0.75

Names		Use Values		
Scientific	Vernacular	UV_g	UV_c	UV_p
Senna martiana (Benth.) H.S.Irwin & Barneby	**canafístula**	0.12	0.06	0.05
Sideroxylon obtusifolium (Roem. & Schult.) T.D.Penn.	**quixabeira**	0.01	-	0.01
Spondias tuberosa Arruda	**umbuzeiro**	0.01	0.01	-
Tabebuia aurea (Silva Manso) Benth. & Hook.f. ex S.Moore	**craibeira**	0.13	0.03	0.10
Tabebuia serratifolia (Vahl) G.Nichols.	**pau d'arco amarelo**	0.03	-	0.03
Tabebuia sp.	**pau d'arco branco**	0.02	0.01	0.01
Thiloa glaucocarpa (Mart.) Eichler	**joão mole**	0.04	0.02	0.02
Ximenia americana L.	**ameixa**	0.01	0.01	-
Ziziphus joazeiro Mart.	**juazeiro**	0.01	0.04	0.06

Table 6. Species identified in the medicinal category with their respective use values (UV-general, current, potential) within the community of Capivara in the city of Solânea, Paraíba, Brazil.

Names		Use Values		
Scientific	Vernacular	UV_g	UV_c	UV_p
Amburana cearensis (Allemão) A.C.Sm.	**cumarú**	1.07	1.02	0.05
Anadenanthera colubrina (Vell.) Brenan	**angico**	0.39	0.36	0.04
Bauhinia cheilantha (Bong.) Steud.	**mororó**	0.06	0.06	-
Chorisia glaziovii (Kuntze) E.Santos	**barriguda**	0.06	0.04	0.02
Cnidoscolus quercifolius Pohl	**favela**	0.04	0.02	0.02
Commiphora leptophloeos (Mart.) J.B.Gillet	**imburana**	0.27	0.19	0.08
Coutarea hexandra (Jack.) K.Schum.	**quina quina**	0.01	0.01	-
Croton blanchetianus Baill.	**marmeleiro**	0.57	0.43	0.14
Croton rhamnifolius Kunth.	**velame**	0.02	0.02	-
Cynophalla flexuosa (L.) J.Prese	**feijão brabo**	0.04	0.03	0.02
Erythrina velutina Willd.	**mulungú**	0.07	0.03	0.04
Handroanthus impetiginosus (Mart. ex. DC.) Mattos	**pau d'arco roxo**	0.09	0.07	0.02
Hymenoca courbaril L.	**jatobá**	0.08	0.06	0.02
Jatropha mollissima (Pohl) Baill.	**pinhão brabo**	0.12	0.05	0.06
Jatropha ribifolia (Pohl) Baill.	**pinhão manso**	0.03	0.03	-
Libidibia ferrea (Mart. ex Tul.) L.P.Queiroz	**jucá**	0.13	0.13	0.01
Maytenus rigida Mart.	**bom nome**	0.45	0.34	0.11
Mimosa tenuiflora (Willd.) Poir.	**jurema preta**	0.02	0.02	-
Myracrodruon urundeuva Allemão	**aroeira**	1.27	1.12	0.15
Poincianella pyramidalis Tul.	**catingueira**	0.67	0.58	0.09
Schinopsis brasiliensis Engl.	**baraúna**	0.2	0.15	0.04
Sideroxylon obtusifolium (Roem. & Schult.) T.D.Penn.	**quixabeira**	0.64	0.58	0.06
Spondias tuberosa Arruda	**umbuzeiro**	0.03	0.03	-
Thiloa glaucocarpa (Mart.) Eichler	**joão mole**	0.01	-	0.01
Ximenia americana L.	**ameixa**	0.34	0.25	0.09
Ziziphus joazeiro Mart.	**juazeiro**	0.24	0.17	0.07

Table 7. Species identified in the fodder category with their respective use values (UV-general, current, potential) within the community of Capivara in the city of Solânea, Paraíba, Brazil.

Names		**Use Values**		
Scientific	**Vernacular**	**UV_g**	**UV_c**	**UV_p**
Amburana cearensis (Allemão) A.C.Sm.	**cumarú**	0.02	0.02	-
Anadenanthera colubrina (Vell.) Brenan	**angico**	0.02	0.02	-
Aspidosperma pyrifolium Mart.	**pereiro**	0.07	0.05	0.02
Bauhinia cheilantha (Bong.) Steud.	**mororó**	0.04	0.03	0.02
Capparis jacobinae Moric. ex Eichler	**icó**	0.04	0.03	0.01
Commiphora leptophloeos (Mart.) J.B.Gillett	**imburana**	0.09	0.05	0.04
Croton blanchetianus Baill.	**marmeleiro**	0.23	0.17	0.06
Croton rhamnifolius Kunth.	**velame**	0.02	0.02	-
Cynophalla flexuosa (L.) J.Prese	**feijão brabo**	0.04	0.04	-
Eugenia uvalha Cambess.	**ubaia**	0.07	0.03	0.04
Libidibia ferrea (Mart. ex Tul.) L.P.Queiroz	**jucá**	0.03	0.02	0.01
Manihot cf. *dichotoma* Ule	**maniçoba**	0.11	0.06	0.04
Maytenus rigida Mart.	**bom nome**	0.02	-	0.02
Myracrodruon urundeuva Allemão	**aroeira**	0.12	0.07	0.04
Piptadenia stipulacea (Benth.) Ducke	**amorosa branca**	0.09	0.07	0.02
Poincianella pyramidalis Tul.	**catingueira**	0.13	0.11	0.03
Schinopsis brasiliensis Engl.	**baraúna**	0.03	0.01	0.02
Senna martiana (Benth.) H.S.Irwin & Barneby	**canafístula**	0.01	0.01	-
Sideroxylon obtusifolium (Roem. & Schult.) T.D.Penn.	**quixabeira**	0.04	0.02	0.03
Spondias tuberosa Arruda	**umbuzeiro**	0.81	0.61	0.21
Ximenia americana L.	**ameixa**	0.02	0.02	-
Ziziphus joazeiro Mart.	**juazeiro**	0.93	0.66	0.27

Table 8. Species identified in the "other uses" category with their respective use values (UV-general, current, potential) within the community of Capivara in the city of Solânea, Paraíba, Brazil.

Names		**Use Values**		
Scientific	**Vernacular**	**UV_g**	**UV_c**	**UV_p**
Amburana cearensis (Allemão) A.C.Sm.	**cumarú**	0.03	0.03	-
Anadenanthera colubrina (Vell.) Brenan	**angico**	0.01	0.01	-
Aspidosperma pyrifolium Mart.	**pereiro**	0.08	0.05	0.03
Chorisia glaziovii (Kuntze) E.Santos	**barriguda**	0.02	-	0.02
Commiphora leptophloeos (Mart.) J.B.Gillett	**imburana**	0.09	0.04	0.04
Croton blanchetianus Baill.	**marmeleiro**	0.01	0.01	-
Cynophalla flexuosa (L.) J.Prese	**feijão brabo**	0.01	0.01	-
Enterolobium timbouva Mart.	**tambor**	0.02	0.01	0.01
Handroanthus impetiginosus (Mart. ex DC.) Mattos	**pau d'arco roxo**	0.01	0.01	-
Libidibia ferrea (Mart. ex Tul.) L.P.Queiroz	**jucá**	0.01	0.01	-
Manihot cf. *dichotoma* Ule	**maniçoba**	0.04	0.04	-
Maytenus rígida Mart.	**bom nome**	0.01	-	0.01
Myracrodruon urundeuva Allemão	**aroeira**	0.07	0.04	0.03

Names		Use Values		
Scientific	**Vernacular**	**UV_g**	**UV_c**	**UV_p**
Piptadenia stipulacea (Benth.) Ducke	**amorosa branca**	0.01	-	0.01
Poincianella pyramidalis Tul.	**catingueira**	0.06	0.05	0.01
Schinopsis brasiliensis Engl.	**baraúna**	0.20	0.11	0.09
Senna martiana (Benth.) H.S.Irwin & Barneby	**canafístula**	0.04	0.04	-
Sideroxylon obtusifolium (Roem. & Schult.) T.D.Penn.	**quixabeira**	0.02	0.01	0.01
Spondias sp.	**umbucajá**	0.01	0.01	-
Spondias tuberosa Arruda	**umbuzeiro**	0.47	0.37	0.11
Ziziphus joazeiro Mart.	**juazeiro**	1.82	0.95	0.88

Table 9. Species identified in the veterinary category with their respective use values (UV-general, current, potential) within the community of Capivara in the city of Solânea, Paraíba, Brazil.

Names		Use Values		
Scientific	**Vernacular**	**UV_g**	**UV_c**	**UV_p**
Amburana cearensis (Allemão) A.C.Sm.	**cumarú**	0.02	0.02	-
Anadenanthera colubrina (Vell.) Brenan	**angico**	0.04	0.02	0.02
Aspidosperma pyrifolium Mart.	**pereiro**	0.05	0.02	0.04
Bauhinia cheilantha (Bong.) Steud.	**mororó**	0.01	0.01	-
Commiphora leptophloeos (Mart.) J.B.Gillett	**imburana**	0.01	-	0.01
Coutarea hexandra (Jack.) K.Schum.	**quina quina**	0.01	-	0.01
Croton blanchetianus Baill.	**marmeleiro**	0.03	0.03	-
Croton rhamnifolius Kunth.	**velame**	0.01	0.01	-
Cynophalla flexuosa (L.) J.Prese	**feijão brabo**	0.38	0.32	0.06
Jatropha mollissima (Pohl) Baill.	**pinhão brabo**	0.03	0.01	0.02
Myracrodruon urundeuva Allemão	**aroeira**	0.12	0.11	0.01
Poincianella pyramidalis Tul.	**catingueira**	0.01	-	0.01
Sideroxylon obtusifolium (Roem. & Schult.) T.D.Penn.	**quixabeira**	0.01	0.01	-
Thiloa glaucocarpa (Mart.) Eichler	**joão mole**	0.07	0.04	0.03
Ziziphus joazeiro Mart.	**juazeiro**	0.02	0.01	0.01

Table 10. Species identified in the ornamental category with their respective use values (UV-general, current, potential) within the community of Capivara in the city of Solânea, Paraíba, Brazil.

Names		Use Values		
Scientific	**Vernacular**	**UV_g**	**UV_c**	**UV_p**
Aspidosperma pyrifolium Mart.	**pereiro**	0.02	0.01	0.01
Handroanthus impetiginosus (Mart. ex DC.) Mattos	**pau d'arco roxo**	0.01	-	0.01
Poincianella pyramidalis Tul.	**catingueira**	0.01	0.01	-
Schinopsis brasiliensis Engl.	**baraúna**	0.02	-	0.02
Senna martiana (Benth.) H.S.Irwin & Barneby	**canafístula**	0.11	0.08	0.03
Sideroxylon obtusifolium (Roem. & Schult.) T.D.Penn.	**quixabeira**	0.01	-	0.01
Spondias tuberosa Arruda	**umbuzeiro**	0.03	0.02	0.01
Tabebuia serratifolia (Vahl) G.Nichols.	**pau d'arco amarelo**	0.01	-	0.01
Ziziphus joazeiro Mart.	**juazeiro**	0.03	0.01	0.02

Table 11. Species identified in the poison/abortive category with their respective use values (UV-general, current, potential) within the community of Capivara in the city of Solânea, Paraíba, Brazil.

Names		Use Values		
Scientific	Vernacular	UV_g	UV_c	UV_p
Anadenanthera colubrina (Vell.) Brenan	**angico**	0.08	0.06	0.02
Aspidosperma pyrifolium Mart.	**pereiro**	0.01	-	0.01
Bauhinia cheilantha (Bong.) Steud.	**mororó**	0.01	0.01	-
Manihot cf. *dichotoma* Ule	**maniçoba**	0.64	0.50	0.14

Table 12. Species identified in the magical/religious category with their respective use values (UV-general, current, potential) within the community of Capivara in the city of Solânea, Paraíba, Brazil.

Names		Use Values		
Scientific	Vernacular	UV_g	UV_c	UV_p
Anadenanthera colubrina (Vell.) Brenan	**angico**	0.12	0.06	0.05
Bauhinia cheilantha (Bong.) Steud.	**mororó**	0.01	-	0.01
Jatropha ribifolia (Pohl) Baill.	**pinhão manso**	0.02	0.01	0.01
Poincianella pyramidalis Tul.	**catingueira**	0.06	0.04	0.03
Senna martiana (Benth.) H.S.Irwin & Barneby	**canafístula**	0.02	0.01	0.01

Table 13. Species identified in the feed category with their respective use values (UV-general, current, potential) within the community of Capivara in the city of Solânea, Paraíba, Brazil.

Names		Use Values		
Scientific	Vernacular	UV_g	UV_c	UV_p
Capparis jacobinae Moric. ex Eichler	**icó**	0.04	0.03	0.01
Eugenia uvalha Cambess.	**ubaia**	0.14	0.12	0.03
Hymenoca courbaril L.	**jatobá**	0.01	0.01	-
Manihot cf. *dichotoma* Ule	**maniçoba**	0.01	-	0.01
Sideroxylon obtusifolium (Roem. & Schult.) T.D.Penn.	**quixabeira**	0.07	0.06	0.01
Spondias sp.	**umbucajá**	0.01	0.01	-
Spondias tuberosa Arruda	**umbuzeiro**	1.43	1.24	0.19
Ximenia americana L.	**ameixa**	0.01	0.01	-
Ziziphus joazeiro Mart.	**juazeiro**	0.28	0.20	0.08

Discussion

Relative importance versus availability

The ecological apparency hypothesis has been tested in several regions of tropical forests, emphasizing rainforests (Cunha & Albuquerque 2006, Galeano 2000, Jiménez-Escobar & Rangel-Ch 2012, La Torre-Cuadros & Islebe 2003, Lawrence *et al*. 2005, Mutchnick & McCarth 1997, Phillips & Gentry 1993a, 1993b, Thomas *et al*. 2009) over dry forests (Albuquerque *et al*. 2005, Ferraz *et al*. 2006, Lozano *et al*. 2014, Lucena *et al*. 2007, 2012a, 2012b, 2014, Ribeiro *et al*. 2014). The results presented in studies in humid forests indicate that people of these regions preferentially use plant resources that are more available. This varies from dry forests, as demonstrated in this study, where null and negative correlations between use and availability were exhibited. Based on these contrary responses, it is necessary to test the ecological apparency hypothesis in other dry forest areas in order to understand what dynamics are involved in the use of plant resources to verify if this negative trend is repeated, and determine if there is some specific pattern in this region, as exists in the humid forest.

However, different from the other studies carried out in the Caatinga area, cited above, in the community of Capivara we recorded many positive correlations, confirming strong ecological apparency, both in correlations of the species with ecological parameters and also between the species and categories of use. Other studies carried out in that ecosystem also recorded some positive correlations between the two variables, such as Lucena *et al*. (2007) who found in Caruaru (Pernambuco state) a correlation only between UV_g and frequency. In Soledade (Paraíba state), Lucena *et al*. (2012a) found positive correlations between all UVs and basal area and dominance. In Brazil (Paraíba state), Lucena *et al*. (2012b) found positive correlations between UV_g or UV_c and all phytosociological parameters, between UV_p and basal area, UV_p and dominance, UV_p and frequency, and UV_p and IV. Recently, Ribeiro *et al*. (2014) found in degraded areas in Lagoa (Paraíba state) positive correlations between UV_c and both basal area and dominance and in conserved areas, correlations between UV_g or UV_c and basal area, density, dominance, frequency, and IV.

The studies of Lucena *et al*. (2007) showed positive correlations but only in the area away from the population, unlike the present study, which showed correlations for areas close to and far away from the community, similar to the results of Ribeiro *et al*. (2014). According to Lucena *et al*. (2007), the use and extraction of plant resources can be altered by the influence of the structure of the vegetation of the areas sampled. Based on this, it was observed that despite the conserved area being further away, people sought out these areas due to the occurrence of abundant plant resources, which were theoretically more preserved because they offer non-timber products.

In the study of Lucena *et al*. (2007), positive correlations were recorded in the fuel, construction, and technology categories, but only between UV_g and basal area, and for the medicinal category only between UV_g and frequency. Lucena *et al*. (2012a) found a correlation only in construction between UV_c and density, UV_c and dominance, UV_c and frequency, and UV_c and IV. Lucena *et al*. (2012b) found correlations only in the fuel category between UV_g or UV_c and all phytosociological parameters. In the study of Ribeiro *et al*. (2014), in degraded areas, correlations were found only in the fodder category between UV_p and density and UV_p and frequency; in conserved areas, correlations were found only in the fuel category between UV_c and basal area and UV_c and dominance.

In the study of Lucena *et al*. (2007), the correlations that were found prevailed in the area close to the community, except in the medical category, which showed a correlation in both the area close to the community and the area away from the community. In Lucena *et al*. (2012b), correlations were found only in the area away from the community. In this study, there were correlations in both the area close to the community and the area away from the community, but mainly in the latter, which showed correlations in the fuel, construction, and medicine categories. Such correlations have also been found in other studies carried out in several regions of the world, for example, Mutchnick and McCarthy (1997) in Guatemala, Galeano (2000) in Colombia, Tacher *et al*. (2002) in Mexico, and Thomas *et al*. (2009) in Bolivia. Lawrence *et al*. (2005) stated that

> "the abundance of a species is only a crude reflection of its overall apparency, and measures of ecological dominance (such as basal area) might better indicate the impacts of plant apparency on human values." Lawrence *et al*. 2005:46

Lucena *et al*. (2012a) suggested that future studies try to understand the community dynamics and quantify the extraction of plant resources because when timber species are used, they are usually extracted completely.

The medical category in the present study showed positive correlations consistent with the study of Lucena *et al*. (2007), which showed that in the case of medicinal species, the frequency (abundance) was more interesting than the basal area (dominance). Based on the results in the community of Capivara, it can be suggested community members usually search for woody species in areas that have suffered less anthropogenic pressure since these species are scarce in areas nearer to the community.

In a study done in humid forest, Gueze *et al*. (2014) recorded a positive correlation between categories and Importance Value Indexs that were related to the fact that the species used within a particular category have more difficult characteristics to be replaced than the other categories. Other studies carried out in dry forests have not shown positive correlations for the medical category (Albuquerque *et al*. 2005, Ferraz *et al*. 2006, Lozano *et al*. 2014, Lucena *et al*. 2007, 2012a, 2012b, 2014, Ribeiro *et al.* 2014). Even in the study in Chapada do Araripe by Lozano *et al*. (2014), which tested apparency exclusively in medicinal species, no positive results were obtained for apparency. In the humid forest, Lawrence *et al*. (2005) also found correlations for this category.

The relationship between use and availability, generally tested in dry forests, has shown different results. The studies by Albuquerque *et al*. (2005) in Alagoinha (Pernambuco state), Ferraz *et al*. (2006) in Floresta (Pernambuco state), and Lucena *et al*. (2014) in São Mamede (Paraíba state) were all conducted in dry areas of the Caatinga and found opposite results to those expected by apparency, showing that the species most valued by the population were those with a low local availability. In contrast, this study and others (Lucena *et al*. 2007, 2012a, 2012b, Ribeiro *et al.* 2014) have found positive correlations that corroborate the assumptions of apparency.

Analysis of the UV

The limitations of the UV have been documented in the literature (La Torre-Cuadros & Islebe 2003, Lucena *et al*.

2012a, Stagegaard *et al*. 2002). However, UV is an objective index for analysis of useful species importance in traditional populations. Previously, Lucena *et al*. (2012a) tested the UV using different data collection and analysis methods, distinguishing between citations of current use and those of potential uses, as discussed in this paper.

The species that have shown the highest UV_g values were *A. pyrifolium*, *M. urundeuva*, and *Z. joazeiro*. The highest UV_c values were shown by *A. pyrifolium*, *C. blanchetianus*, and *M. urundeuva*. The highest UV_p values were shown by *S. brasiliensis*, *A. pyrifolium*, and *M. urundeuva*. The use of these species was also recorded in other areas of Caatinga (Albuquerque *et al*. 2002a, 2002b, 2006, Albuquerque & Oliveira 2007, Ferraz *et al*. 2006, Lucena *et al*. 2007, 2012a, 2014). Based on these results, we conclude that variations in the cast of the most important species were minimal, as also seen by Lucena *et al*. (2012a), with just the species rank being modified most of the time. This indicates that in general, in rural communities from Brazil's semi-arid region, the same species tend to have the same importance.

However, regarding the test of the ecological apparency hypothesis, the distinction between the citations indicated that the correlations between UV_c and phytosociological parameters were stronger than those between UV_p or UV_g and phytosociological parameters. This indicates that in the test of apparency, this UV is the most appropriate.

Conclusion

People from the community of Capivara showed abundant knowledge about the use of woody species, knowing the utility of most of them. The species found met the needs of the residents; thus the search for external resources was rare. It was observed that in the vegetation, there was a focus on extraction of the woody species.

Current use value (UV_c) presented the strongest relationship between the availability of a resource and its use by community residents. This may have been because this index takes into consideration only the effective (current) uses of plants. Also, we observed different responses for the different UVs, showing the need for distinction between effective use and knowledge.

Based on this study and others held in Caatinga, ecological apparency explains the local importance of useful plants in the categories related to logging and timber. There is a need to conduct studies that (1) evaluate the impact on the plants to understand how the process of extraction and collection of plant resources is performed in this community and in native and secondary vegetation areas, and (2) assess the quantity of resource extracted and whether the vegetation can withstand this exploration.

Literature Cited

Albuquerque, U.P. 2009. How ethnobotany can aid biodiversity conservation: Reflections on investigations in the semi-arid region of NE Brazil. *Biodiversity and Conservation* 18(1):127–150.

Albuquerque, U.P. & L.H.C. Andrade. 2002a. Conhecimento botânico tradicional e conservação em uma área de caatinga no Estado de Pernambuco, Nordeste do Brasil. *Acta Botanica Brasilica* 16(3):273–285.

Albuquerque, U.P. & L.H.C. Andrade. 2002b. Uso dos recursos vegetais da caatinga: O caso do agreste do Estado de Pernambuco (Nordeste do Brasil). *Interciencia* 27(7):336–345.

Albuquerque, U.P., L.H.C. Andrade & A.C.O. Silva. 2005. Use of plant resources in a seasonal dry forest (Northeastern Brazil). *Acta Botanica Brasílica* 19(1):27–38.

Albuquerque, U.P. & R.F.P. Lucena. 2005. Can apparency affect the use of plants by local people in tropical forests? *Interciencia* 30:506–511.

Albuquerque, U.P. & R.F. Oliveira. 2007. Is the use-impact on native caatinga species in Brazil reduced by high species richness of medicinal plants? *Journal of Ethnopharmacology* 113(1):156–170.

Araújo, E.L. & E.M.N. Ferraz. 2010. Amostragem da vegetação nos estudos etnobotânicos. Pp. 223–253 em *Métodos e Técnicas na Pesquisa Etnobiológica e Etnoecológica*. Editado por U.P. Albuquerque, R.F.P. Lucena & L.V.F.C. Cunha. Núcleo Publicações em Ecologia e Etnobotânica Aplicada (NUPEEA), Recife, Pernambuco, Brasil.

Ayantude, A.A., P. Hiernaux, M. Briejer, H. Udo & T. Tabo. 2009. Uses of local plant species by agropastoralists in south-western Niger. *Ethnobotany Research & Applications* 7:53–66.

Begossi, A., N. Hanazaki & J.Y. Tamashiro. 2002. Medicinal plants in the Atlantic forest (Brazil): Knowledge, use, and conservation. *Human Ecology* 30:281–299.

Cunha, L.V.F. & U.P. Albuquerque. 2006. Quantitative ethnobotany in an Atlantic forest fragment of northeastern Brazil - Implications to conservation. *Environmental Monitoring and Assessment* 114:1–25.

Dhar, U., R.S. Rawal & J. Upreti. 2000. Setting priorities for conservation of medicinal plants – A case study in the Indian Himalaya. *Biological Conservation* 95(1):57–65.

Feeny, P. 1976. Plant apparency and chemical defense. Pp. 1–40 in *Biological Interactions between Plants and Insects: Recent advances in phytochemistry.* Edited by J.W. Wallace & R.L. Nansel. Plenum Press, New York, New York, U.S.A.

Ferraz, J.S.F., U.P. Albuquerque & I.M.J. Meunier. 2006. Valor do uso e estrutura da vegetação lenhosa às margens do Riacho do Navio, Floresta, PE, Brasil. *Acta Botânica Brasílica* 20(1):25–134.

Florentino, A.T.N., E.L. Araújo & U.P. Albuquerque. 2007. Contribuição de quintais agroflorestais na conservação de plantas da Caatinga, município de Caruaru, PE, Brasil. *Acta Botânica Brasílica* 21(1):37–47.

Galeano, G. 2000. Forest use at the Pacific coast of Chocó, Colômbia: A quantitative approach. *Economic Botany* 54:358–376.

Gavin, M.C. & G.J. Anderson. 2005. Testing a rapid quantitative ethnobiological technique: First steps towards developing a critical conservation tool. *Economic Botany* 59(2):112–121.

Guèze, M., A. Catarina, J. Paneque-Gálvez, M.J. Macía, M. Orta-Martínez, J. Pino & V. Reyes-García. 2014. Are ecologically important tree species the most useful? A case study from indigenous people in the Bolivian Amazon. *Economic Botany* 68(1):1–15.

IBGE (Instituto Brasileiro de Geografia e Estatística). 2010. *Censo Demográfico 2010*. Disponível em www.ibge.gov.br/cidades. Acesso em: 07 de agosto de 2011.

Jiménez-Escobar, N.D. & J.O. Rangel-Ch. 2012. La abundancia, la dominancia y sus relaciones con el uso de la vegetación arbórea en la Bahía de Cispatá, Caribe Colombiano. *Caldasia* 34(2):347–366.

Kristensen, M. & H. Balslev. 2003. Perceptions, use and availability of woody plants among the Gourounsi in Burkina Faso. *Biodiversity Conservation* 12:1715–1739.

La Torre-Cuadros, M.A. & G.A. Islebe. 2003. Traditional ecological knowledge and use of vegetation in southeastern México: A case study from Solferino, Quintana Roo. *Biodiversity and Conservation* 12:2455–2476.

Lawrence, A., O.L. Phillips, A. Reategui, M. Lopez, S. Rose, D. Wood & A.J. Farfan. 2005. Local values for harvested forest plants in Madre de Dios, Peru: Towards a more contextualised interpretation of quantitative ethnobotanical data. *Biodiversity and Conservation* 14(1):45–79.

Lozano, A., E.L. Araújo, M.F.T. Medeiros & U.P. Albuquerque. 2014. The apparency hypothesis applied to a local pharmacopoeia in the Brazilian northeast. *Journal of Ethnobiology and Ethnomedicine* 10:2.

Lucena, R.F.P., U.P. Albuquerque & E.L. Araújo. 2007. Does the use-value of woody plants of the Caatinga (Northeastern Brazil) explain their local availability? *Economic Botany* 61(4):347–361.

Lucena, R.F.P., D.C. Farias, T.K.N. Carvalho, C.M. Lucena, C.F.A. Vasconcelos Neto, & U.P. Albuquerque. 2011. Uso e conhecimento da aroeira (*Myracrodruon urundeuva*) por comunidades tradicionais no Semiárido brasileiro. *Sitientibus* 11(2):255–264.

Lucena, R.F.P., A.P. Leite, K.M. Pedrosa, C.M. Lucena, C.F.A. Vasconcelos Neto & J.P.O. Ribeiro. 2012b. O uso de espécies vegetais no Vale do Piancó pode ser explicado por sua disponibilidade local? *BioFar - Revista de Biologia e Farmácia* 8(Especial):55–71.

Lucena, R.F.P., P.M. Medeiros, E.L. Araújo, A.G.C. Alves & U.P. Albuquerque. 2012a. The ecological apparency hypothesis and the importance of useful plants in rural communities from Northeastern Brazil: An assessment based on use value. *Journal of Environmental Management* 96:106–115.

Lucena, R.F.P., V.T. Nascimento, E.L. Araújo & U.P. Albuquerque. 2008. Local uses of native plants in area of Caatinga vegetation (Pernambuco, NE Brazil). *Ethnobotany Research & Applications* 6:3–13.

Lucena, R.F.P., T.C. Soares, C.F.A. Vasconcelos Neto, T.K.N. Carvalho, C.M. Lucena & R.R.N. Alves. 2012c. Uso de recursos vegetais da Caatinga em uma comunidade rural no Curimataú Paraibano (Nordeste do Brasil). *Polibotánica* 34:237–258.

Lucena, R.F.P., R.F. Sousa, N.M. Guerra, J.E.S. Ribeiro, A.P. Leite, D.B.O. Abreu, T.K.N. Carvalho, D.M.B.M. Trovão, C.A.B. Alves, R.R.N. Alves, P.F. Borges, L.A. Andrade, J.S. Souto, S.P. Sousa, Jr. & E.N. Nunes. 2014. The ecological apparency hypothesis and dry tropical forests: An assessment ethnobotany. *Etnoecológica* 10(9):1-17.

Lykke, A.M., M.K. Kristensen & S. Ganaba. 2004. Valuation of local use and dynamics of 56 woody species in the Sahel. *Biodiversity Conservation* 13:1961–2004.

Marín-Corba, C., D. Cárdenas-López & S. Suárez-Suárez. 2005. Utilidad del valor de uso en etnobotánica. Estudio en el Departamento de Putumayo (Colombia). *Caldasia* 27(1):89–101.

Monteiro, J.M., R.F.P. Lucena, N.L. Alencar, V.T. Nascimento, T.A.S. Aráujo & U.P. Albuquerque. 2008. When intention matters: Comparing three ethnobotanical data collection strategies. Pp. 113–124 in *Current Topics in Ethnobotany*. Edited by U.P. Albuquerque & M.A. Ramos. Research Signpost, Kerela, India.

Mutchnick, P.A. & B.C. McCarthy. 1997. An ethnobotanical analysis of the tree species common to the subtropical moist forests of the Petén, Guatemala. *Economic Botany* 51:158–183.

Nascimento, V.T., L.G. Sousa, A.G.C. Alves, E.L. Araújo & U.P. Albuquerque. 2009. Rural fences in agricultural landscapes and their conservation role in an area of caatinga (dryland vegetation) in Northeast Brazil. *Environment, Development and Sustainability* 11:1005–1029.

Nascimento, V.T., M.A.S. Vasconcelos, M.I.S. Maciel & U.P. Albuquerque. 2012. Famine foods of Brazil's seasonal dry forests: Ethnobotanical and nutritional aspects. *Economic Botany* 66(1):22–34.

Paré, S., P. Savadogo, M. Tigabu, J.M.Q. Ouadba & P.C. Oden. 2010. Consumptive values and local perception of dry forest decline in Burkina Faso, West Africa. *Environment, Development and Sustainability* 12:277–295.

Phillips, O. & A.H. Gentry. 1993a. The useful plants of Tambopata, Peru: I. Statistical hypothesis tests with a new quantitative technique. *Economic Botany* 47:15–32.

Phillips, O. & A.H. Gentry. 1993b. The useful plants of Tambopata, Peru: II. Additional hypothesis testing in quantitative ethnobotany. *Economic Botany* 47:33–43.

Ramos, M.A. & U.P. Albuquerque. 2012. The domestic use of firewood in rural communities of the Caatinga: How seasonality interferes with patterns of firewood collection. *Biomass & Bioenergy* 39:147–158.

Ramos, M.A., P.M. Medeiros, A.L.S. Almeida, A.L.P. Feliciano, & U.P. Albuquerque. 2008a. Use and knowledge of fuelwood in an area of caatinga vegetation in NE. Brazil. *Biomass & Bioenergy* 32:510–517.

Ramos, M.A., P.M. Medeiros, A.L.S. Almeida, A.L.P. Feliciano, & U.P. Albuquerque. 2008b. Can wood quality justify local preferences for firewood in an area of caatinga (dryland) vegetation. *Biomass & Bioenergy* 32:503–509.

Reyes-Garcia, V., V. Vadez, S. Tanner, T. McDade, T. Huanca & W.R. Leonard. 2007. Evaluating indices of traditional ecological knowledge: A methodological contribution. *Journal of Ethnobiology and Ethnomedicine* 2:1–9.

Rhoades, D.F. & E.R.G. Cates. 1976. Toward a general theory of plant antiherbivore chemistry. Pp. 169–213 in *Biological Interactions Between Plants and Insects: Recent advances in phytochemistry*. Edited by J.W. Wallace & R.L. Nansel. Plenum Press, New York, New York, U.S.A.

Ribeiro, J.P.O. 2013. *A Hipótese da Aparência Ecológica pode Explicar a Utilização de Plantas Uteis em uma Comunidade Rural do Sertão da Paraíba?* (Monografia em Licenciatura em Ciências Agrárias). Centro de Ciências Humanas Sociais em Agrárias, Universidade Federal da Paraíba, João Pessoa, Paraíba, Brazil.

Ribeiro, J.P.O., T.K.N. Carvalho, J.E.S. Ribeiro, R.F. Sousa, J.R.F. Lima, C.A.B. Alves, J.G. Jardim & R.F.P. Lucena. 2014. Can ecological apparency explain the use of plant species in the semi-arid depression of Northeastern Brazil? *Acta Botanica Brasilica* 28(3):476–483.

Rossato, S.C., H.F. Leitão-Filho & A. Begossi. 1999. Ethnobotany of Caiçaras of the Atlantic Forest Coast (Brazil). *Economic Botany* 53:387–395.

Sá e Silva, I.M.M., L.C. Marangon, N. Hanazaki & U.P. Albuquerque. 2009. Use and knowledge of fuelwood in three rural caatinga (dryland) communities in NE Brazil. *Environment, Development and Sustainability* 11:833–852.

Sokal, R.R. & F.G. Rholf. 1995. *Biometry*. Freeman and Company, New York, New York, U.S.A.

Stagegaard, J., M. Sorensen & E.L.P. Kvist. 2002. Estimations of the importance of plant resources extracted by inhabitants of the Peruvian Amazon flood plains. *Perspectives in Plant Ecology. Evolution and Systematics* 5:103–122.

Tacher, S.I.L., R.A. Rivera, M.M.M. Romero & A.D. Fernández. 2002. Caracterización del uso tradicional de la flora espontánea en la comunidad Lacandona da Lacanhá, Chiapas, México. *Interciência* 27:512–520.

Thomas, E., I. Vandebroek & P. Van Damme. 2009. Valuation of forest and plant species in indigenous territory and national park Isiboro-Sécure, Bolivia. *Economic Botany* 63(3):229–241.

Trujillo-C, W. & M. Correa-Múnera. 2010. Plantas usadas por una comunidad indígena coreguaje en la Amazonía Colombiana. *Caldasia* 32(1):1–20.

Tunholi, V.P., M.A. Ramos & A. Scariot. 2013. Availability and use of woody plants in a agrarian reform settlement in the cerrado of the state of Goiás, Brazil. *Acta Botanica Brasilica* 27(3):604–612.

Appendix 1. Woody species with diameter at ground level ≥ 3 cm used in the rural community of Capivara, Solânea city (Paraiba, northeastern Brazil). Results of the phytosociological parameters and the use values (UV-general, current, potential) of use of each species in a degraded forest area (A1) and a preserved forest area (A2).

Family/Species Voucher numbers	UV_g	UV_c	UV_p	Basal Area		Density		Dominance		Frequency		Importance Value	
				A1	A2	A1	A2	A1	A2	A1	A2	A1	A2
Anacardiaceae	**3.87**	**2.19**	**1.68**	**0.67**	**1.07**	**3.89**	**3.85**	**4.23**	**6.50**	**15.72**	**12.79**	**23.84**	**23.15**
Myracrodruon urundeuva Allemão 17.632	4.56	2.67	1.89	0.61	0.70	3.61	2.63	3.89	4.26	7.49	5.47	14.99	12.36
Schinopsis brasiliensis Engl. 17.255	4.08	1.80	2.28	0.03	0.37	0.16	1.15	0.17	2.22	0.86	3.52	1.19	6.89
Spondias tuberosa Arruda 17.556	2.99	2.12	0.87	0.03	0.00	0.12	0.07	0.17	0.02	0.64	0.39	0.93	0.48
Apocynaceae	**6.91**	**4.99**	**1.92**	**0.48**	**5.03**	**2.84**	**22.14**	**3.08**	**30.51**	**8.73**	**15.82**	**14.65**	**68.47**
Aspidosperma pyrifolium Mart. 17.566	6.91	4.99	1.92	0.48	5.03	2.84	22.14	3.08	30.51	4.28	9.18	10.20	61.83
Bignoniaceae	**1.11**	**0.53**	**0.58**	**0.01**	**-**	**0.04**	**-**	**0.06**	**-**	**0.44**	**-**	**0.54**	**-**
Handroanthus impetiginosus (Mart. ex DC.) Mattos	1.11	0.53	0.58	0.01	-	0.04	-	0.06	-	0.21	-	0.32	-
Burseraceae	**2.44**	**1.01**	**1.43**	**0.09**	**0.30**	**0.28**	**0.44**	**0.56**	**1.83**	**2.18**	**2.69**	**3.03**	**4.97**
Commiphora leptophloeos (Mart.) J.B.Gillett 17.642	2.44	1.01	1.43	0.09	0.30	0.28	0.44	0.56	1.83	1.07	1.56	1.91	3.84
Capparaceae	**1.26**	**0.88**	**0.38**	**0.12**	**0.10**	**0.85**	**0.52**	**0.74**	**0.59**	**4.80**	**3.70**	**6.40**	**4.82**
Cynophalla flexuosa (L.) J.Prese 17.583	1.26	0.88	0.38	0.12	0.10	0.85	0.52	0.74	0.59	2.36	2.15	3.95	3.26
Combretaceae	**0.24**	**0.12**	**0.12**	**0.17**	**0.05**	**0.89**	**0.74**	**1.08**	**0.27**	**6.11**	**4.38**	**8.08**	**5.39**
Thiloa glaucocarpa (Mart.) Eichler	0.24	0.12	0.12	0.17	0.05	0.89	0.74	1.08	0.27	3.00	2.54	4.97	3.55
Euphorbiaceae	**0.96**	**0.74**	**0.22**	**6.49**	**3.11**	**42.58**	**31.24**	**41.53**	**18.89**	**20.96**	**6.23**	**105.09**	**66.97**
Sapium lanceolatum (Müll.Arg.) Huber	0.04	0.01	0.03	0.04	0.30	0.24	1.70	0.26	1.80	1.28	5.27	1.79	8.78
Manihot cf. *dichotoma* Ule 17.254	0.81	0.61	0.20	0.88	0.03	2.43	0.37	5.61	0.17	6.42	1.37	14.47	1.91
Croton blanchetianus Baill. 17.249	3.70	2.93	0.77	5.18	2.66	29.78	26.06	33.14	16.16	9.42	9.77	72.35	51.99
Jatropha mollissima (Pohl) Baill. 17.578	0.25	0.16	0.09	0.37	0.12	9.60	3.07	2.39	0.75	9.42	7.03	21.41	10.83
Jatropha ribifolia (Pohl) Baill.	0.04	0.03	0.01	0.02	0.00	0.53	0.04	0.13	0.01	1.07	0.20	1.73	0.24

Family/Species Voucher numbers	UV_g	UV_c	UV_p	Basal Area		Density		Dominance		Frequency		Importance Value	
				A1	A2	A1	A2	A1	A2	A1	A2	A1	A2
Fabaceae	**1.21**	**0.79**	**0.42**	**6.23**	**5.28**	**41.72**	**30.29**	**39.84**	**32.00**	**21.83**	**16.84**	**111.64**	**87.41**
Piptadenia stipulacea (Benth.) Ducke 17.877	1.32	0.97	0.35	2.49	1.42	19.12	12.77	15.90	8.62	10.49	9.57	45.52	6.69
Anadenanthera colubrina (Vell.) Brenan 17.630	1.74	0.96	0.78	-	-	0.04	-	0.01	-	0.21	-	0.27	-
Poincianella pyramidalis Tul. 17.234	3.28	2.24	1.04	1.50	3.33	11.87	9.48	9.57	20.19	9.42	9.38	30.86	34.04
Amburana cearensis (Allemão) A.C.Sm. 17.638	1.80	1.38	0.42	0.21	-	0.77	-	1.36	-	2.78	-	4.91	-
Libidibia ferrea (Mart. ex Tul.) L.P.Queiroz 17.639	0.86	0.53	0.33	0.05	0.05	0.12	0.37	0.31	0.28	0.64	1.56	1.07	2.21
Mimosa tenuiflora (Willd.) Poir. 17.626	0.32	0.15	0.17	-	-	0.04	-	0.02	-	0.21	-	0.27	-
Pterogyne nitens Tul.	0.40	0.13	0.27	0.01	0.00	0.08	0.04	0.06	-	0.43	0.20	0.14	0.24
Bauhinia cheilantha (Bong.) Steud. 17.648	1.03	0.69	0.34	1.95	0.48	9.60	7.63	12.49	2.91	8.35	3.32	30.45	13.86
Luetzeburgia sp.	0.16	0.12	0.04	0.02	-	0.08	-	0.12	-	0.43	-	0.63	-
Malvaceae	**0.07**	**0.03**	**0.04**	**0.16**	**0.62**	**1.18**	**1.71**	**1.03**	**3.75**	**7.42**	**9.43**	**9.62**	**14.88**
Chorisia glaziovii (Kuntze) E.Santos	0.11	0.06	0.05	-	0.02	-	0.04	-	0.10	-	0.20	-	0.33
Pseudobombax marginatum (A.St.-Hil., Juss. & Cambess.) A. Robyns 17.562	0.03	0.01	0.02	0.16	0.60	1.18	1.67	1.03	3.65	3.64	5.47	5.84	10.78
Olacaceae	**0.47**	**0.31**	**0.16**	**0.06**	**-**	**0.16**	**-**	**0.40**	**-**	**0.87**		**1.43**	**-**
Ximenia americana L. 17.557	0.47	0.31	0.16	0.06	-	0.16	-	0.40	-	0.43	-	0.99	-
Rhamnaceae	**4.23**	**2.40**	**1.83**	**0.22**	**0.12**	**0.24**	**0.78**	**1.42**	**0.71**	**1.31**	**3.37**	**2.97**	**4.86**
Ziziphus joazeiro Mart. 17.575	4.23	2.40	1.83	0.22	0.12	0.24	0.78	1.42	0.71	0.64	1.95	2.30	3.45