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Relationships between Land-Use Types and Plant Species Used by Traditional Ethno-Medical System

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Authors' contributions

This work was carried out in collaboration between all authors.

Original Research Article

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ABSTRACT

Aims: The agricultural frontier advances progressively on forested regions in Central Argentina, changing the landscape structure by extremely reducing the extension of native forests. In rural communities that are related to the forests, it is possible that severe changes in the landscapes can have an impact on the knowledge and uses of medicinal plants. The aim of this paper was to evidence some general patterns between the ethnobotanical information recorded in the Chaco region and some characteristics of the landscape. Specifically, we hypothesized that the knowledge on medicinal plants and their type (native or exotic) are related to different types of land use (i.e. different proportions of native forests).
Place and Duration of Study: The study was performed 15 rural localities within the Chaco phytogeographic regionin Córdoba, Argentina, conducted between 2004 and 2012.
Methodology: A total of 279 interviews were conducted. Plant species were identified according to their status (native or exotic), and a standardized proportion of exotic

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species was calculated for each site. The different types of land use and their proportions were estimated in 15 rural localities using satellite images. A Principal Component Analysis and a bivariate Spearman correlation were performed to analyze the associations among land-use types, the proportion of native forests and the knowledge of medicinal plants.
Results: In general, people had known many native and exotic medicinal plants. Nevertheless, in those localities where landscapes have experienced higher deforestation rates, exotic medicinal plants are more available than native ones (cultivated in gardens and orchards). The tradition of maintaining exotic species in gardens may contribute to maintain the ethno-medical systems in regions of severe forest fragmentation.
Conclusion: The disappearance of the forest showed a positive association with losses in the knowledge and use of native medicinal plants.

Keywords: Ethnobotany; medicinal plants; deforestation; satellite images.

1. INTRODUCTION

The process of forest fragmentation due to human activity is an important driver for biodiversity loss and changes in the landscape structure [1]. The different patterns of land use, particularly intensive agriculture and urbanization, have been labeled as human activities that influence landscape configuration and dynamics of animal, plant and human populations [2]. In the particular case of Argentina, the agricultural frontier advances progressively on forested regions, with an extreme reduction of original forests [3]. Human activities have led to the total loss or structural simplification of large forests in the Chaco region during the last twenty years. Deforestation rates are the highest recorded in South America [4]. Moreover, these changes have also affected the functional component of the biodiversity [5]. This process has been accelerated by the increase in the soybean crop, which has been associated with reductions in agricultural diversity and overall diversity [6]. Furthermore, one century ago 60% of the Argentinean population was rural. Currently, rural population has decreased to less than 10% [7], influencing the interaction between people and the environment. In this regard, several authors have pointed out the relationship between urbanization and the decline of the native flora [8,9,10,11].

In Córdoba, which presents an annual deforestation rate of 2.9%, 122,798 ha of native forests have been removed during the period between 1998 and 2002, while 16,108 ha are severely fragmented [12]. The main causes of natural forest vegetation loss in Córdoba, in recent decades, have been the expansion of the agricultural frontier, fires, and the impact caused by the development of the railway network in the first half of the twentieth century [13]. This process has significant adverse environmental effects on services and environmental goods [14,15,16,5]. However, relatively conserved forests and industrial monospecific crops are two extremes of the spectrum of land use. Between these ends there are the traditional ways (not industrialized or highly technological) of ecosystem managements [17,18].

The use of medicinal plants is widely spread, and they are effectively used in the rural populations of Córdoba, Argentina [19,20,21]. Previous studies in this region found that rural residents have deep knowledge about medicinal plants, forming an ethno-medical system which is orally transmitted through generations [21]. Nevertheless, the distribution of this

knowledge is not homogeneous within the population, varying according to socio-cultural characteristics such as age, gender, years of schooling, etc. [19,22,23]. It is likely that those changes produced by the advance of the agricultural frontier will directly impact on traditional knowledge and use of vegetation [24]. In general, deforestation of large forests is usually a decision of condominiums and industrial companies and not one of rural people, who usually do not have their formal ownership [25]. Forest loss can affect traditional rural activities such as collection of medicinal and food plants, hunting, etc. Then, it is interesting to know how traditional knowledge on plants is affected in this context of biodiversity loss and forest fragmentation. Thus, the aim of this paper is to evidence some general patterns between the ethnobotanical information recorded in the Chaco region and some characteristics of the landscape. The prediction is that ethno-medical knowledge on medicinal plants and their type (native or exotic) are related to different types of land use (i.e. different proportions of native forests). Specifically, a higher knowledge on native medicinal plants is expected in rural communities located within regions of higher proportions of well-conserved Chaco forests. Finally, traditional knowledge on medicinal species was compared by using different areas of native forests, and by discussing some mechanisms that allow the persistence of ethnobotanical knowledge.

2. MATERIALS AND METHODS

2.1 Study Sites

The study was performed in 15 rural localities within the Chaco phytogeographic region (Cabrera 1976): Chancaní (Dpto. Pocho), San Vicente (Dpto. San Alberto), Totora Huasi, Guasapampa and La Playa (Dpto. Minas), San Clemente, Los Aromos and La Paisanita (Dpto. Santa María), Cerro Colorado, Rayo Cortado, Chañar Viejo and Villa Candelaria Norte (Dpto. Río Seco), Miramar and Marull (Dpto. San Justo), and Villa Trinidad (Santa Fe Province) (Fig. 1). The first five communities belong to the Chaco Árido (Dry Chaco), characterized by species with adaptations to drought, scarce annual rainfalls (300 to 500 mm) mainly concentrated in the summer, and with water deficit throughout the year [17]. The original vegetation surrounding the studied communities comprises xerophilous forests dominated by *Aspidosperma quebracho-blanco* Schltdl. (“quebracho blanco”), *Prosopis* spp. (“algarrobos”), *Cercidium praecox* (Ruiz & Pav. Ex Hook) Harms (“brea”), *Ziziphus mistol* Griseb.(“mistol”) and Stetsonia coryne (Salm-Dyck) Britton & Rose (“cardón”), and schrubs as *Larrea divaricata* (jarilla), *Mimozyganthus carinatus* (lata), *Sennaa phila* (pichana) and *Maytenus vitis-idaea* (carne gorda) [26,27]. Forest configuration and biodiversity in the Chaco Árido were mainly modified by cattle ranch, wood exploitation and human fires [27,13].

Cerro Colorado, Rayo Cortado and Chañar Viejo are located in the northern Chaco, where hills are lower but vegetation is still distributed by altitudinal strips. The presence of palms and subtropical elements as “mato” (*Myrcianthes cisplatensis*) is remarkable. Relictual sites with large trees, lianas and epiphytes are scarce [27]. Finally, Miramar, Marull, and Villa Candelaria are located near Mar Chiquita, associated to Chaco forests dominated by *Aspidosperma quebracho-blanco* (quebracho blanco), *Ziziphus mistol* (mistol) and *Prosopis* spp. (algarrobos). Saline soils are covered by halophytes as *Allenrolfea* spp., *Acacia aroma* (tusca), *Geoffroea decorticans* (chañar), *Grawbowskia duplicata* (matorro), *Maytenus vitis-idade* (carne gorda) and *Prosopis strombulifera* (mastuerzo). The East region is characterized by the presence of *Trithrinax campestris* (palma caranday), *Prosopis algarrobilla* (ñandubay), *Cereus validus* (ucle) and several shrub species of Acacia. At the

area where Primero and Segundo rivers flow into Mar Chiquita lagoon, there are small forests of *Celtis spinosa* (tala), *Salix humboldiana* (sauce) and *Sapium haemato spermun* (lecherón) [28].

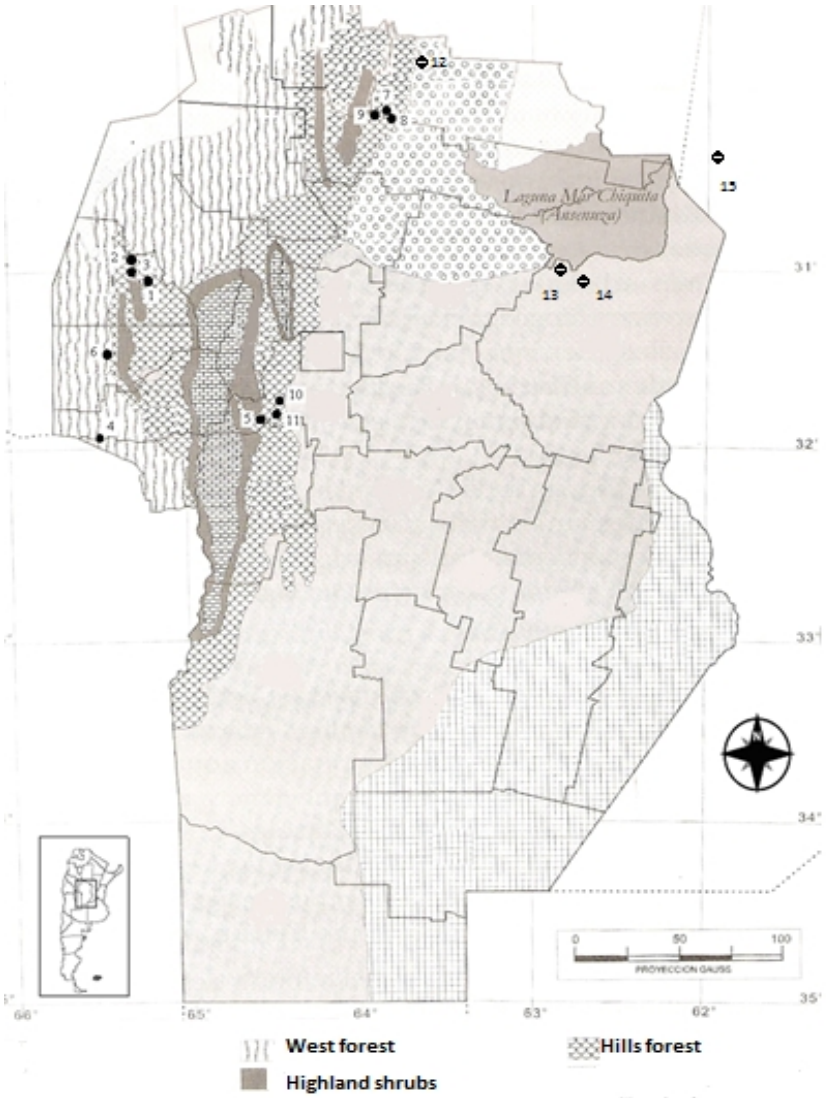

Fig. 1. Rural communities studied in Córdoba within the Chaco region (adaptation by authors from Barboza et al. 2008; original of Luti et al. 1979).

References: 1) Guasapampa; 2) Totora Huasi; 3) La Playa; 4) San Vicente; 5) San Clemente; 6) Chancaní; 7) Cerro Colorado; 8) Rayo Cortado; 9) Chañar Viejo; 10) Los Aromos; 11) La Paisanita; 12) Villa Candelaria; 13) Miramar; 14) Marull; 15) Villa Trinidad.

In the Río Dulce wetlands, the most important human intervention is the extensive livestock (bovine, ovine and equine). Cattle are permanently located in flooded areas or require periodic movements to different areas according to periodic fluvial influence. Tall grass communities of *Spartina argentinensis* (“espartillares”) are burned annually in order to

improve the nutritional quality and palatability of grasses. Chaco vegetation surrounding the lagoon has been heavily deforested. The south and east coasts are almost entirely used for agriculture, so that only small forest fragments are observed. On the west coast, there is a recent and severe process of deforestation associated with the expansion of the agricultural frontier, benefitted by rainfall increases. Human activities such as logging, arson, and overgrazing have changed the landscape dramatically in all the studied areas in the past 15 years.

Summarizing, these environments are characterized by xeric secondary forests, steep slopes, poor socioeconomic and technological development [29]. Rural people, commonly referred as “Criollos”, carry out extensive livestock and dry-land crops [30]. Criollo settlers’ productive activities are linked to the domestic sphere. These farmers have limited capital and small production units of a few hectares, use family labor, and occupy a subordinate position in comparison with other stakeholders such as owners of large extensions of land, public officials, etc. [30]. Several authors have suggested cultural continuity throughout the semi-arid Chaco [31,32,33,34], as forest management decisions to obtain fodder, medicinal or veterinary plants [21,35,36].

"Traditional" rural populations are defined as those who possess a model for the use of natural resources mainly developed for subsistence, with family labor applying low-impact technologies derived from traditional knowledge, with land use regulated by internal rules rather than written rules, and commonly lacking legal registration of individual land ownership [37]. Considering this set of characteristics, rural residents of the Chaco region can be included within the "traditional" class [35]. However, nowadays traditional forms of labor are being replaced by public employment and small family businesses, as part of a widespread socio-economic phenomenon [38].

2.2 Methods

In order to obtain information about plant species with medicinal properties which were known and used by the residents, almost the total population of small localities at the mountain regions (between 80 and 100%) was interviewed. In the larger localities (southern Mar Chiquita), around 10% of the population has been interviewed, until the saturation of the new information was achieved (i.e. when new data are not provided by new interviewees). The interviews, conducted between 2004 and 2012, were semi-structured [39,40,41]. Key informants were designed to make the interviewees, characterize harvest sites, and provide their knowledge and use of plant resources. In addition, field visits to the areas with key informants were conducted to identify the species used.

The species listed by the settlers were placed into a field-herbarium and later identified (e.g., scientific names, status: native/exotic) according to the Flora of the Southern Cone in the online version (available at www.darwin.edu.ar). After species identification, the origin (exotic or native) for each one was determined. Then, the standardized proportion of exotic medicinal plants (p ') was calculated as the product of the inverse sine (arcsine) proportion of exotic species of the total species. Thus, this index ranges from 0 to 90. Higher values indicate higher relative citation of exotic plants. The standardized proportion of exotic medicinal plants between populations was used because this algorithm minimizes the errors associated with the differences in the number of inhabitants [42].

Land uses were characterized from the scenes 229/82, 229/81, 230/81 and 230/82 Landsat 5 TM image of May, June, August and November 2004. The identification of different land

uses was performed using supervised classification [43]. The images were classified using a discriminating function method (Fisher classifier) [44]. Five classes of land uses were considered for the classification of all the scenes: conserved forest in comparative good condition, degraded forest, intensive farming, urban or bare soil, and water. Four dates per scene were used. Finally, the accuracy of the estimate was evaluated by the random generation of sites for field verification on land uses. Classes were compared with the classification obtained by the actual land cover through an error matrix [45]. According to personal observations and walks with key informants, the plant-search area for the inhabitants was defined at 3,000 m in diameter centered at each sampling site. Then, the area of each land coverage type was calculated. It is possible that a particular species can be eventually obtained from longer distances, but most species are usually collected within this area. Fig. 2 shows the images corresponding to each location.

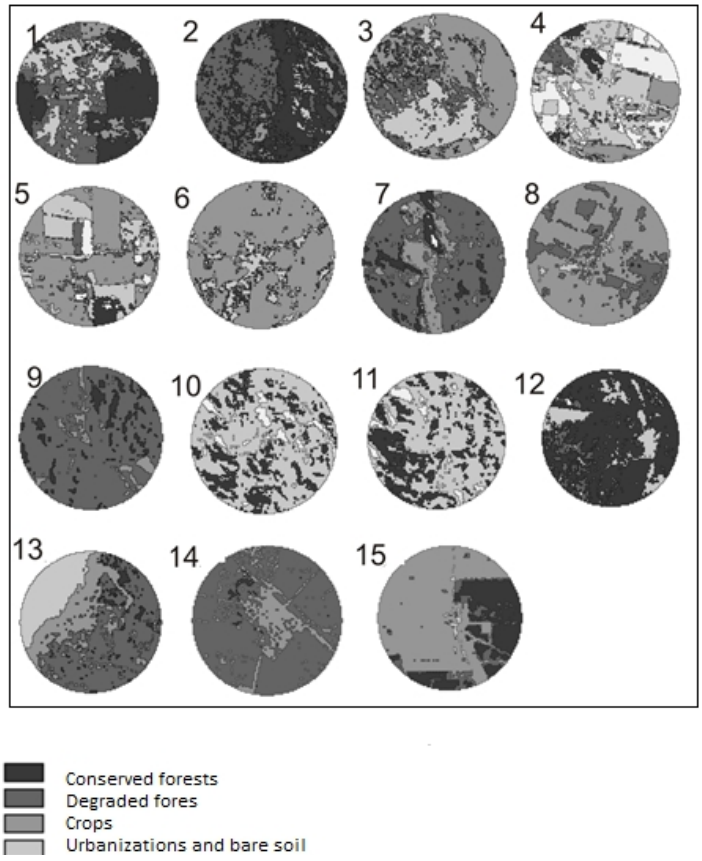

Fig. 2. Landsat 5 TM satellite images used to characterize land use types after a supervised classification

References: 1) Guasapampa; 2) Totora Huasi; 3) La Playa; 4) San Vicente; 5) San Clemente; 6) Chancaní; 7) Cerro Colorado; 8) Rayo Cortado; 9) Chañar Viejo; 10) Los Aromos; 11) La Paisanita; 12) Villa Candelaria; 13) Miramar; 14) Marull; 15) Villa Trinidad.

In order to explore the possible associations between the proportions of species used by land use, a Principal Component Analysis (PCA) was performed [46]. In order to look for relationships among land uses and p´, a bivariate Spearman correlation was run.

3. RESULTS

A total of 175 medicinal species (65 botanical families) was registered for the 15 localities, with a minimum of 25 species collected at Villa Candelaria and a maximum of 89 at La Playa. The complete list of the taxa (botanical family, scientific name, popular name, origin and use) is presented as Appendix I. Medicinal plants are obtained by direct collection or by exchange between relatives and neighbors. The collection areas are concentrated near sites of daily activities (home, workplace, road trips, orchards and gardens, etc.). The species are both native and exotic. The native species are generally obtained in the forest, while 87% of the exotic are obtained in the gardens of the houses (56.5%, such as "rude" (*Ruta chalepensis*), "mint" (Mentha spp.), "Rosemary" *(Rosmarinus officinalis),* "basil" *(Ocimum basilicum),* "matico" (*Artemisia douglasiana))* or disturbed land (30.4%, such as "yerba del sapo" *(Marrubium vulgare)* and "malva" *(Malva parviflora).*

From the number of exotic respect to the total number of plant used, the proportion of exotic plant species used (hereafter p ') at each location was obtained. This ratio showed values from p '= 18.7 to 40.4, reflecting the lowest and the highest number of exotic species mentioned at different localities, respectively. With that proportion and the land use characterization, a PCA was performed, and the first two axes of the analysis accounted 68.2% of the variation (Fig. 3, Tables 1 and 2).

Table 1. Components matrix

	1	2
Conserved forest	-0.615	-0.655
Degraded forest	-0.633	0.721
Crops	0.877	-0.211
Urbanization and bare soil	0.768	0.251
p´*	0.101	0.456

**p ´= proportion of exotic plant species used*

Component 1 (summarizing the 42.9% of the variation) was positively associated with intensive cultivated areas, urban and bare soil, and negatively associated with forested areas. Some associations between land-use types and the knowledge of the plants used at different rural communities can be highlighted; for example, the left size of the Fig. 3 grouped six localities where the native forest has disappeared or is disappearing, and the land is almost entirely dedicated to productive proposals. Although the satellite images of San Clemente showed large forested areas, mostly of the forest cover corresponds to Pinus and Cupressus, two exotic species. For this reason, this land use was considered as crop land.

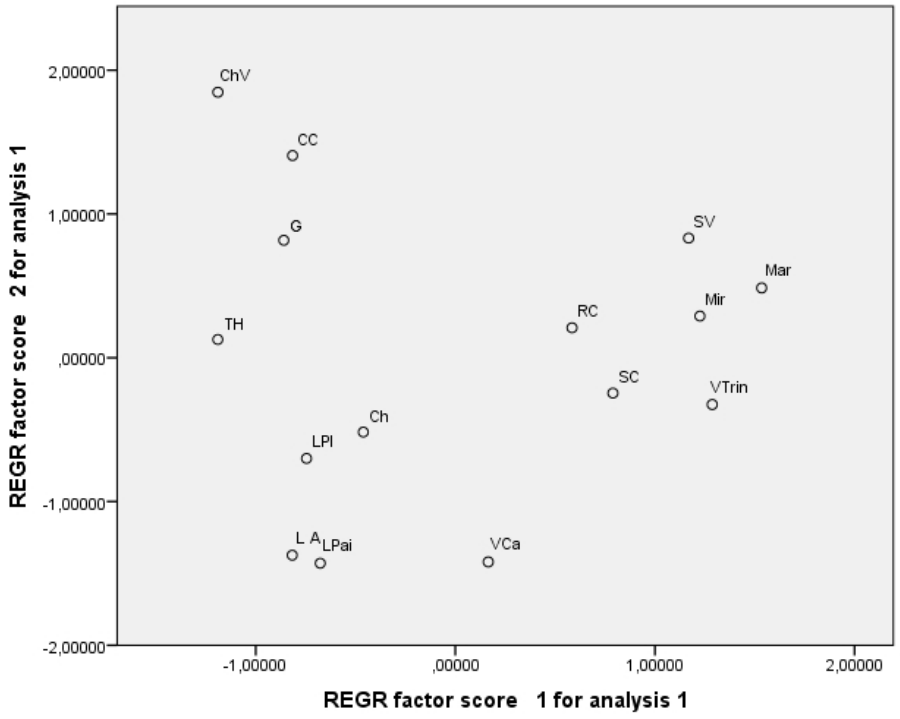

Fig. 3. Principal Component Analysis showing the distribution of the studied communities according to land use types and the standardized proportion of exotic medicinal plants (p '= proportion of exotic medicinal species of the total species used by the people).

References: ChV: Chañar Viejo, CC: Cerro Colorado, G: Guasapampa, TH: Totora Huasi, LPl: La Playa, Ch: Chancaní, LA: Los Aromos, LPai: La Paisanita, VCa: Villa Candelaria, RC: Rayo Cortado, SV: San Vicente, Mir: Miramar, Mar: Marull, SC: San Clemente, VTrin: Villa Trinidad

Table 2. Data utilized by perform PCA and correlation

Community	Forest	Deg. forest	Crops	Urban	P´
San Vicente	0.120	0.109	0.480	0.291	40.40
San Clemente	0.152	0.000	0.836	0.011	39.80
Marull	0.000	0.012	0.788	0.199	39,79
Chancaní	0.547	0.113	0.293	0.048	38.60
Chañar Viejo	0.091	0.838	0.070	0.001	37.40
Cerro Colorado	0.104	0.684	0.185	0.021	36.20
Los Aromos	0.698	0.000	0.226	0.000	34.40
Rayo Cortado	0.002	0.232	0.737	0.029	33.20
La Paisanita	0.648	0.000	0.293	0.000	32.50
Totora Huasi	0.445	0.483	0.028	0.044	31.30
Miramar	0.000	0.040	0.480	0.270	30.66
La Playa	0.472	0.240	0.288	0.000	30.60
Guasapampa	0.128	0.643	0.229	0.000	30.00
Villa Trinidad	0.000	0.032	0.815	0.150	28.03
Villa Candelaria	0.230	0.099	0.650	0.015	18.66

The component 2 (summarizing the 25.3% of the variation) was positively associated with the proportion of degraded forest and p ', and negatively associated with forests in good condition. The combination of these axes determines that at the upper right quadrant, four sites with comparatively conserved forest can be found, while in the lower left quadrant those sites associated with degraded forests (Fig. 3). The correlation between p 'and the different types of land use showed a marginal association between urbanization and the proportion of exotic plants used (R= 0.49 – α= 0.92). The other correlations were not significant (results are not shown). Among localities at the mountains with less presence of surrounding forests, people proportionally increased the use of exotic plants (i.e., estimated by p ') compared to those located near remaining forests. Moreover, the value of p ' is actually hiding an absolute value of plants cited much lower in these populations than in those with forest (about 20 to over 60 species cited, respectively).

Another point to highlight was the variability in the knowledge between regions. At localities in the mountainous area, almost all informants mentioned uses of medicinal plants, whereas at deforested areas around Mar Chiquita a significant number of people reported neither knowing nor using medicinal plants. Thus, the information for the latter localities was provided by few informants from families that effectively know and use medicinal plants. This is the case of Villa Candelaria, where only one, very isolated family mentioned the use of a large number of medicinal plants, while the rest of the population mentioned the use of few species (none to five).

4. DISCUSSION AND CONCLUSION

This study showed a positive association among the uses of medicinal plant species in different rural localities located within a gradient of increased proportion of remaining native forest in the landscape. According to the information obtained through surveys, it is possible to suggest some causes to explain the pattern for the increased use of exotic plants with a parallel decreased use of the native plants according forested areas decreased. On the one hand, useful native plants have disappeared or become inaccessible as a result of deforestation. On the other hand, exotic medicinal species have historically been grown by rural people in gardens near the main house of each family, as it was previously reported. Medicinal gardens usually are conformed by more exotic than native species because same exotic species showed a great cultural importance, probably because the hispanic origin of most families within the population. In addition, the experiences of domestication of natives are scarce or very recent. Thus, in those localities where landscapes experienced higher deforestation rates, the most available medicinal plants for people are the exotic ones, cultivated in gardens and orchards. It is important to note that (a) the tradition of maintaining exotic species in gardens may contribute to maintain the ethno-medic systems in regions of severe forest fragmentation, and (b) popular knowledge on native and exotic medicinal plants is maintained in the Chaco region.

The invasion of exotic plant species has been identified as a main concern and it was related to deforestation [13]. This situation is very common in the Chaco region of Córdoba where many exotic woody species became invaders [47,48]. It is possible that the appearance or increased populations of adventitious ruderal species such as "yerba del sapo" (*Marrubium vulgare*) and "malva" (*Malva parviflora*) could be related to deforestation, since many of the exotic species originally cultivated around homes are now growing in the wild or associated with secondary sites, being able to compete with native species [48].

The differential knowledge of wild plants as a resource, and its relation to the loss of native forests was reflected in studies conducted in Córdoba [49]. For example, elderly people who had grown up in comparatively well preserved forest environments, have mentioned many uses for trees as providers of food, firewood, timber for fencing and shelter. However, younger people who had grown up in an environment already deforested, showed a limited perception of those benefits [21,22]. Knowledge erosion and the loss of native plant uses are important aspects for biodiversity loss [50], and it can be correlated with deforestation [51].

In Center and NW Córdoba, biodiversity loss and the disappearance of traditional farmers (non-industrialized) were associated with the expansion of industrial agriculture [52], as well as changes in traditional farming practices. It is important to highlight the role of 'traditional' communities in the conservation of the landscapes, since people use natural resources according to their culture [53]. According to the latest perspectives for environmental conservation, it is impossible to conceive and interpret the environment separately from human societies because people are located within landscapes that need to be preserved well enough to guarantee their survival [54]. In the case of localities from Córdoba, small rural producers seem to select survival actions that minimize biodiversity loss [21,22]. It is probably that the ancestral knowledge about available wild resources has been part of traditional management systems, alternative to intensive agriculture, that seem to be less harmful to the environment. For example, extensive breeding of goats and cultivation of family farms (the traditional main economic activity of the populations studied) can be sustainable activities in the long term compared to deforestation and intensive crops [55]. Even in situations of great deterioration due to overgrazing, forests can be recovered if some actions (i.e., a decrease in the number of animals per hectare) are applied. These examples of management decisions are impracticable after forest clearing and soybean monoculture [55].

Cultural loss due to the advance of industrial agriculture has resulted in eroded ethnomedical knowledge that is the product of thousands of years of interactions between people and the environment [54]. Similar effects have been reported for the Mapuches from argentinean Patagonia [56]. These traditional communities are abandoning their practices of collecting wild food due to the increasing difficulty in accessing the forest (now privately owned), and also due to drought and deterioration of their lands by overgrazing [56]. Similarly, mbya and settlers from northern Argentina claimed that deterioration of forest resources is in part a consequence of the gradual deforestation, resulting in the loss of the fundamental conditions for survival strategies in rural areas [57]. The advance of the agricultural frontier not only impacts on the natural environment but also on the culture of the people, eroding traditional knowledge, including traditional forms of more sustainable management practices than industrial monoculture. These trends are ubiquitous in the Chaco region, aggravating both the environmental situation of the region and the socio-economic situation of the people.

The countries that are leveraging the growing global demand for commodities and are following a path of rapid economic development will have considerable difficulties in reducing the rate of forest conversion in monoculture, due to high prices of food and fuel that will favor continued clearing to increase both livestock and crop production. In view of this uncertain future for forests and associated cultural groups, it is a challenge for governments to carry out land use planning processes that include the people who historically inhabit those landscapes. Thus, sustainable forest management poses a real challenge, not only scientific and technical, but also as part of a general context [55] that includes economic, social, political and ethical changes.

CONSENT

Not applicable.

ETHICAL APPROVAL

Not applicable.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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APPENDIX I

Medicinal plants used in the studied communities, including family, scientific name, vernacular name, properties and origin (E: exotic – N:native).

Family	Scientific name	Vernacular name	Properties	Origin
Adoxaceae	*Sambucus nigra* L.	Sauco	Painthooth Respiratory disorders	E
Amarillidacaea	*Allium sativum* L.	Ajo	To cold, to viper poison	E
Amaranthaceae	*Alternanthera pungens* Kunth	Yerba del pollo	Digestive disorders, diuretic, diarrhea	N
Anacardiaceae	*Lithraea molleoides* [Vell.] Engl.	Molle	Tooth pain, sedative, digestive	N
	Schinus fasciculate (Griseb) I.M. Johnst. *Schinopsis marginata* Engl.	Moradillo	Buccal infection Heart diseases	N
	Schinus areira L.	Orco quebracho	Digestive	N
		Aguaribay	Digestive disorders, abortive, head ache, anti-inflammatory	N
Apiaceae	*Foeniculum vulgare Mill.*	Hinojo	----------	E
	Petroselium crispum (Mill.) A.W. Hill	Perejil	Abortive	E
Apocynaceae	*Aspidosperma quebracho-blanco* Schltdl.	Quebracho blanco	Disinfectant, digestive disorders, contraceptive	N
	Morrenia odorata [Hook. &Arn.] Lindl.	Tasi	To induce the production of milk, skin disorders	N
	Vallesia glabra [Cav.] Link	Ancoche	To remove skin boils	N
Aristolochiaceae	*Aristolochia argentina* Griseb.	Charrúa	To haemorrhoids, diuretic, diarrhea	N

Asteraceae	*Achyrocline satureoides* [Lam.] DC..	Vira vira	Digestive, respiratory disorders	N
	Achyrocline tomentosa Rusby	Marcela	Digestive	N
	Ambrosia tenuifolia Spreng.	Altamisa	Digestive	N
	Artemisia absinthium L.	Ajenjo	Digestive	E
	Artemisia alba Turra	Alcanfor	Tooth pain	E
	Artemisia douglasiana Besser	Matico – Hepatalgina	Digestive, hepatic disease	E
		Carqueja	Hepatic disease	
	Baccharis articulata [Lam.] Pers.	Carqueja	Digestive	N
	Baccharis crispa Spreng.	Chilca amarga	Digestive	N
	Baccharissalicifolia [Ruiz &Pav.] Pers.		To the “aire”	N
		Manzanilla silvestre	Digestive	
	Bidens subalternans DC.	Pulmonaria		N
		Palo azul	To cold	
	*Conyza*sp.		Diuretic	N
	Cyclolepis genistoides D. Don	Fique o Balda		N
			Back aches	
	Flaveria bidentis [L.] Kuntze	Chilca		N
			Back aches	
	Flourenciaoo lepis S.F. Blacke	Topasaire		N
			To the “aire”	
	Gaillardia megapotamica [Spreng.] Baker	Zarzaparrilla		N
	Jungia polita Griseb.	Lechuga	Diuretic, circulation, to fall the blood pressure	N
	Lactuca sativa L.	Manzanilla	Sedative	E
	Matricaria recutita L.	Lucera	Digestive, to inflammations	E
	Pluchea sagittalis [Lam.] Cabrera	Yerba del venado	Digestive	N

			Digestive, anti-inflammatory	
	Porophyllum obscurum [Spreng.] DC.	Mata pulgas	External anti-parasitic	N
	Schkhria pinnata [Lam.] Kuntze ex Thell.	Suico	Diarrhea, digestive for children	N
	Tagetes minuta L.	Mimosa	Heart diseases, digestive	N
	Tanacetum parthenium (L.)Sch.Bip.	Diente de león	Digestive	N
	Taraxacum officinale G. Weber ex F.H. Wigg.	Chilca dulce	Digestive	E
	Tessaria dodoneifolia [Hook. Et Arn.]Cabrera	Guillermito	Digestive	N
	Thymophylla pentachaeta [DC.] Small	Contrayerba	Back aches, to cold	N
	Trixis divaricata [Kunth] Spreng.	Mirasol	Ophthalmic use	N
	Verbesina encelioides [Cav.] Benth.& Hook. f.ex A. Gray	Abrojo	Diuretic	N
	Xanthium cavanillesii Schouw	Cepacaballo	Back ache, to “slim” the blood	N
	Xanthium spinosum L.			N
Bignonaceae	*Dolinchandra cynanchoides* Cham.		--------	N
Boraginaceae	*Borago officinalis* L.	Borraja	Cough suppressant	E
	Heliotropium amplexicaule Vahl	Yerba meona	Diuretic	N
	Heliotropium curassavicum L	Cola de gama	To urie acid	N
	*Namaundulatum*Kunth	Matagusano	Digestive	N
Brassicaceae	*Brassica* sp	Mostaza	Protective	E
	Coronopus didymus (L.) Sm. *Lepidium bonariense* L.	Quimpe Bolsa de pastor	Respiratory disorders Disorders diarrhea	N N

Bromeliaceae	*Tillandsia duratii* Vis.	Flor del aire	Heart diseases	N
Buddlejaceae	*Buddleja cordobensis* Griseb.	Pulmonaria - Sanalotodo	Respiratory disorders	N
Cactaceae	*Opuntiaficus-indica* L. [Mill.]	Tuna	To hemorrhoids	N
Capparaceae	*Capparisatamisquea* Kuntze	Atamisqui	To cold, disinfectant, to the "pasmo"	N
Cecropiaceae	*Cecropia pachystachya* Trécul	Ambay	Cough suppressant	E
Celtidaceae	*Celtis ehrenbergiana* [Klotzsch] Liebm.	Tala	Digestive for baby and children	N
Chenopodiaceae	*Atriplex undulata* [Moq.] D. Dietr.	Cachiyuyo	Bone pains	N
	Chenopodium album L.	Yerba de la perdiz	Sedative	N
	Dysphania ambrosioides (L).	Paico	Digestive disorders	N
Commelinaceae	*Commelina erecta* L.	Santa Lucía	Ophthalmic use	N
Cucurbitaceae	*Cayaponia citrullifolia* [Griseb.] Cogn.ex Griseb.	Sandía de la víbora	To blood circulation	N
	Cucurbita maxima Duchesne	Zapallo	To the "aire" and intestinal paeasite	N
Ephedraceae	*Ephedra triandra* Tul.emend .J.H.Hunz.	Tramontana	To knocks, back aches	N
Equisetaceae	*Equisetum giganteum* L.	Cola de caballo	Diuretic	N
Euphorbiaceae	*Acalypha communis* Müll. Arg.	Albaquilla	Digestive	N
	Euphorbia serpens Kunth	Yerba meona	Diuretic	N
	Euphorbia sp.	Leche de golondrina	To cold	N
	Croton lachnostachyus Baill.	Bálsamo Marquito	To cold	N
	Croton parviflorus Mull. Arg	Castor	….	N
	Ricinos communis L.		Laxative	E
Fabaceae	*Acacia aroma* Gillies ex Hook. &Arn.	Tusca	External disinfectant	N
	Acacia atramentaria Benth	Espinillo negro	Diuretic, to tooth pain	N
	Acacia caven [Molina] Molina	Espinillo	External disinfectant	N

	Acacia praecox Griseb.	Garabato	To tooth pain	N
	Bauhinia forficata Link	Pezuña de vaca	Diabetes	N
	Caesalpinea gillesii [Wall.ex Hook.] D.Dietr.	Lagaña deperro	Disinfectant	N
	Cercidium praecox [Ruiz &Pav. ExHook.] Harms	Brea	-	N
	Erihtrina crista-galli L.	Ceibo	To inflammations	N
	Geoffraea decorticans [Gillies ex Hook. &Arn.] Burkart	Chañar	Respiratory disorders	N
	Mymozyganthus carinatus [Griseb.] Burkart	Lata	To stomach acidity.	N
	Prosopis alba Griseb.	Algarrobo blanco	To disorders diarrhea	N
	Prosopis chilensis [Molina] Stuntz emend. Burkart	Algarrobo blanco	To stomach acidity	N
	Prosopis ruscifolia Griseb.	Vinal	Diabetes	N
	Prosopis torquata [Cav. ex Lag.] DC.	Tintitaco	Digestive	N
	Senna corymbosa [Lam.] H.S. Irwin & Barneby	Sen o Cafeto	Purgative	N
Gentianaceae	*Gentianella multicaulis* [Gillies ex Griseb.] Fabris	Nencia	No reference	N
Hydnoraceae	*Prosopanche americana* [R.Br.] Baill.	Guaicurú - Flor de tierra	To cold.	N
Hypericaceae	*Hypericum connatum* Lam.	Cabotoril	Heart disease	N
Lamiaceae	*Hedeoma multiflora* Benth.	Tomillo	Digestive, disinfectant, alcoholism	N

	Lavandula officinalis L.	Lavanda	Less the “aire”	E
	Lepechinia floribunda (Benth.) Epling	Salvia blanca	To cold	N
	Marrubium vulgare L.	Yerba del sapo	Hepatic disease	E
	Melissa officinalis L.	Toronjil	Heart disease	E
	Mentha spicata L.	Yerba buena	Digestive	E
	Mentha sp.	Veramota	Digestive	E
	Mentha sp.	Menta	Digestive	E
	Minthostachys mollis [Kunth] Griseb	Peperina	Digestive	E
	Ocimum selloi Benth.	Albahaca	Digestive	E
	Origanum vulgare L.	Orégano	Digestive	E
	Salvia officinalis L.	Salvia	Digestive	E
	Rosmarinus officinalis L.	Romero	Digestive	E
Lomariopsidaceae	*Elaphoglossum gayanum* [Feé] T. Moore	Calaguala	Femeninecicle	N
Lauraceae	*Laurus nobilis* L.	Laurel	Digestive, to cold	E
Loranthaceae	*Ligaria cuneifolia* [Ruiz etPav.] Tiegh.	Liga	To fall blood pressure	N
Lycopodiaceae	*Huperzia saururus* [Lam.] Trevis.	Cola de quirquincho	Contraceptive, aphrodisiac	N
Lythraceae	*Heimia salicifolia* [Kunth] Link	Quiebrarado	Digestive, back aches	N
Malvaceae	*Malva parviflora*	Malva	To inflammations, digestive Hepatic protector	E

	Malvastrum coromandelianum (L.) Garcke	Yerba del potro		N
	Sphaeralcea bonariensis (Cav.) Griseb.		Constipation	
	Sphaeralcea cord obensis Krapov.	Malvavisco		N
		Malva	To inflammations, to heal up, to hemorrhoids	N
Meliaceae	*Melia azedarach* L.	Paraíso		E
Monimiaceae	*Peumus boldus* Molina	Boldo	Digestive	E
Moraceae	*Ficus carica* L.	Higuera	Diabetes	E
Myristicaceae	*Myristica fragans* Houtt.	Nuez moscada	Protective	E
Myrtaceae	*Eucaliptus sp*	Eucaliptus	Tocold, antitusive.	E
Oleaceae	*Ximena americana* L.	Albarillo		N
Papaveraceae	*Argemone subfusiformis* G.B. Ownbey	Cardo santo	Diuretic, digestive, to cold.	N
Parmeliaceae	*Usneaamblyoclada* [Müll. Arg.] Zahlbr	Barba de piedra	Sorethroat	N
Passifloraceae	*Pasiflora caerulea* L.	Pasionaria	Sedative	N
Phytolacaceae	*Phytolacca dioica* L.	Ombú		N
Piperaceae	*Piper sp.* L.	Pimienta	“magic”	E
Plantaginaceae	*Plantago mayor L.*	Llantén	Digestive, disinfectiant	E
	Plantago tomentosa Lam.	Llantén	Idem	N
Poaceae	*Oryza sativa* L.	Arroz	Diarrhea	E
	Triticum sp. – Paspalum sp.	Gramilla	Back aches, contraceptive Diuretic	E
	Zea mays L.	Choclo		N
Polygonaceae	*Rumex* sp	Romasa	Depurative	E
	Ruprechtia apetala Wedd.	Juda o manzano del campo	Diuretic	N
	Polygonum sp.	Sanguinaria	Blood circulation	E
Pteridaceae	*Argyrochosma nivea* [Poir.] Windham	Culandrillo	Contraceptive	N

Punicaceae	*Punica granatum* L.	Granada	Diarrhea	E
Ranunculaceae	*Clematis montavidensis* Spreng.	Loconte	-	N
Rhamnaceae	*Condalia mycrophylla* Cav.	Piquillín	To haemorrhage	N
	Ziziphus mistol Griseb.	Mistol	Respiratory disorders	N
Rosaceae	*Cydonia oblonga* L.	Membrillo	Diarrhea	E
	Eriobotrya japonica [Thunb.]Lindl	Níspero	Cough suppressant	E
	Prunus persica [L.] Batsch.	Durazno	Digestive, hepatic	E
Rutaceae	*Citrus limon* [L.] Burm.f.	Limón	Digestive	E
	Citrus sinensis [L.] Osbeck	Naranja	Sedative	E
	Ruta chalepensis L.	Ruda	Digestive disorders, home protector, blood circulation, sedative	E
Salicaceae	*Salix humboldtiana* Willd.	Sauce	Analgesic, to fall hair	N
Santalaceae	*Jodinia rhombifolia* [Hook. &Arn.] Reissek	Peje - Quebracho flojo	Digestive disorders, respiratory disorders, diarrhea, abortive.	N
Sapindaceae	*Allophyllus edulis* (A.St-Hil.)Radlk.ex Warm.	Cocu	Hepatic disorders	N
	Cardiospermum halicacabum L.	Globito -Pedorra	Blood circulation	N
Sapotaceae	*Sideroxylon obtusifolium (Roem.et Schult.) T.D.Penn*	Guaraniná	-	N
Schizaeaceae	*Anemia tomentosa* [Savign.y]Sw.	Doradilla	Antitusive, cough suppressant	N
Solanaceae	*Cestrum parqui* L'Hér.	Duraznillo negro	Skin inflammations	N

	Lycium ciliatum Schltdl.	Piquillín víbora	Digestive and stomach inflammations.	N
	Lycium elongatum Miers	Gualeguay	Digestive	N
	Nicotiana glauca Graham	Palán palán	Skin diseases, injuries	N
	Nicotiana tabacum L.	Tabaco	To the “aire”	E
	Nicotiana longiflora Cav.	Flor de sapo	_	N
	Nierembergia linariefolia Graham	Chuscho	Abortive	N
	Solanum argentinium Bitter &Lillo	Duraznillo	Skin burns	
	Solanum sisymbriifolium Lam.	Espina corona	Digestive, diuretic	N
	Solanum tuberosum L.	Papa	Skin burn	N
Tiliaceae	*Tilia sp*	Tilo	Sedative	E
Urticaceae	*Urtica urens* L.	Ortiga	Blood circulation, back aches, cough suppressant, hair loss	E
Valerianaceae	*Valeriana sp*	Valeriana	Sedative	E
Verbenaceae	*Aloysia citriodora* Palau	Cedrón	Cardiotonic, digestive	N
	Aloysia gratissima [Gillies et Hook.] Tronc.	Palo amarillo	Digestive	N
	Aloysia polystachya [Griseb.] Moldenke	Te de burro	Digestive	N
	Glandularia dissecta (Willd. ex Spreng.) Schnack & Covas	Verbena	Sedative	N
	Lippia integrifolia [Griseb.] Hieron.	Incayuyo	Digestive, diuretic	N
	Lippia turbinata Griseb.	Poleo	Digestive	N

Xanthorrhoeaceae	*Aloe sp.*	Aloe	To skin diseases	E
Zygophyllaceae	*Larrea divaricata* Cav.	Jarilla	To back aches, febrifuge	N
	Porliera microphylla [Baill.] Descole, O´Donell et Lourteig	Cucharero	Digestive	N
		[F] Azafrán del monte		
		[F] Buscapina	Digestive	
		[F] Piedra de sapo		
		[F] Sertal	Digestive	

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