Use of Wood Resources in Central Argentina: A multivariate approach for the study of phytogeography and culture

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Research

Abstract

Changes in land use and forest loss determine not only the loss of biodiversity, but the associated traditional ecological knowledge. Thus, knowing the several uses of forest resources by rural communities might help in guiding conservation efforts. We applied a multivariate approach to evaluate knowledge on uses of wood species—based on environmental factors and participants' (N = 114) socioeconomic characteristics—in six rural communities of Córdoba Province, Argentina, located in three different phytogeographical areas. Older men with unstable jobs and low education represent the embodiment of those who know about wood resources. Although the multivariate analysis suggests that socioeconomic factors are important when determining the known uses of wood resources within each area, environmental factors such as the availability of species considerably contribute to the characterization of the different communities. Quantitative analysis, including the socioeconomic characterization of human populations, might provide a valuable tool when planning policies for management and conservation of fuelwood resources.

Introduction

Traditional ecological knowledge is the group of knowledge, practices, and beliefs maintained through generations by cultural transmission, which contributes to a better integration and adaptation of individuals to the environment. The use of wild plants is part of this knowledge in different human populations (Berkes 1999), and for those populations located in areas with marked seasons, those resources available along the entire year such as crust and woods become especially important (Albuquerque & Andrade 2002, Albuquerque *et al*. 2005).

The use that human populations make of the environment depends on both the possibilities that it provides and the perception that individuals have of it. This perception is influenced by, among others, socioeconomic factors (Arango Caro 2004, Arias Toledo 2006), the gain or loss of traditional knowledge (Benz *et al*. 2000), and other characteristics from specific societies and cultures (Alexiades 1996). However, and despite its relevance, how traditional knowledge on the use of species is distributed according to informants' socioeconomic characteristics has not been well studied. Thus, e.g., in a review of previous works published from 1981–2004, Pfeiffer and Butz (2005) found that less than 5% of the papers examined gender variation in the ethnobiological knowledge and practices.

The availability of vegetal resources is determined to a great extent by the diversity of plants in a particular environment (Prance 1995). In rural communities, one of the biggest demands is the use of plant resources as fuel-

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wood, and this demand might vary due to the quality of wood, its availability, accessibility, social and economic factors, etc. (Ogunkunle & Oladele 2004, Samant *et al.* 2000, Tabuti *et al.* 2003). Consequently, and given the excessive use pressure on forests, identifying the major users of forest resources can help in guiding conservation efforts (de Medeiros *et al.* 2012).

The Córdoba Province in Argentina has a varied geography with different ecosystems. However, the forest exploitation together with the advance of agricultural frontiers, determine not only the loss of biodiversity, but also the associated traditional knowledge on natural resources by the populations that are directly affected by these problems (Arias Toledo *et al.* 2010). These processes rapidly promote the discredit and disuse of several vegetal resources (Caballero 1986); thus, addressing these issues is relevant since this region is characterized not only by the availability of timber and fuelwood resources of valuable quality such as **algarrobos** (*Prosopis* sp.)**, quebracho blanco** (*Aspidosperma quebracho-blanco* Schltdl.), and **espinillo** (*Acacia caven* var. *caven* (Molina) Molina), but also by other important medicinal and edible resources.

Studies on the use of forest resources and conservation have been previously conducted in semi-arid regions (de Medeiros *et al.* 2011, 2012, Ramos *et al.* 2012, 2014). Due to the persistent decline experienced by these regions—including the native forest areas of Córdoba (Zak *et al.* 2004)—it is relevant to study the knowledge and uses of wood resources, considered as critical in low-income rural populations (Binford 1980), and their associated factors. Thus, the present study is focused on assessing the availability, knowledge, and uses of wood resources by rural communities located in different phytogeographical areas in Córdoba Province, Argentina, in relation to informants' socioeconomic characteristics.

Materials and Methods

Study areas

The studied communities are located within the **chaco** phytogeographical region (Cabrera 1976), formed by different phytogeographical areas with a great floristic diversity. The studied communities are grouped in three different areas within this region (Figure 1):

Chaco serrano (hilly chaco)

The area of **chaco serrano** extends throughout the following systems: Sierras chicas, Sierras grandes**,** and Sierras de Pocho-Guasapampa, at altitudes ranging from 400 to 1300 m (Cabrera 1976). There is a marked rain seasonality, mostly in spring and summer, with a yearly average around 800 mm (Torres & Galetto 2011). In this

location we studied the rural communities of Villa Los Aromos (VLA) and La Paisanita (LP). They are both characterized by forest and scrubs distributed in the lowest part of the hills.

Chaco árido (arid chaco)

The driest part of the **chaco,** known as **chaco árido,** is located to the west of Córdoba. The diverse and unpredictable climate, together with a great daily temperature variation, is very common in this area. The arboreal stratum is limited, and the shrub is continuous (known as xerophile low forest or scrub), with annual average rainfall around 500 mm (Cabido *et al.* 1991). In this area we studied the rural locations of San Vicente and San Martín. Most of the **chaco árido** has suffered from timber extraction and overgrazing while the remaining is almost exclusively a secondary forest formed by dense shrubs and a few trees (Cabido & Zak 1999). Thus, the main production systems are extensive livestock and forest exploitation limited to the production of fuelwood and charcoal (Karlin *et al.* 1992).

Chaco seco (dry chaco)

To the north of the **chaco** region the hills are lower, but the vegetation is distributed in altitudinal levels with forest between 700 and 1200 m, shrubbery between 900 and 1500 m, and grassland from 1500 m on. The weather gets warmer and drier when moving from east to west, while temperatures become lower, and there is more water availability when going up the hills due to increased local rainfall and a lower evapotranspiration rate (Cabido & Zak 1999). Within this area we considered the communities of Rayo Cortado and Chañar Viejo, where human activities including logging, intentional fires, and overgrazing have dramatically modified the area's physiognomy.

Working methods

Sampling and variables

In order to estimate the knowledge and uses of wood resources by the informants, we performed one interview per household. Interviews were semi-structured (Bernard 1994) or semi-standardized (Padua & Ahman 1994) and included ethnographical methods used in ethnobotany (Capparelli & Raffino 1997). These were combined with analytical techniques for social sciences (Padua & Ahman 1994). Interviews covered (i) basic demographic characteristics (sex, age, and marital status); (ii) data on the number and type of wood resources known and used by the informants; (iii) economic characteristics (type of job, make ends meet, etc.); (iv) geographic characteristics (distance to the site where wood is collected, distance covered for daily activities, etc.); and (v) educational access (maximum educational level achieved). Interviews
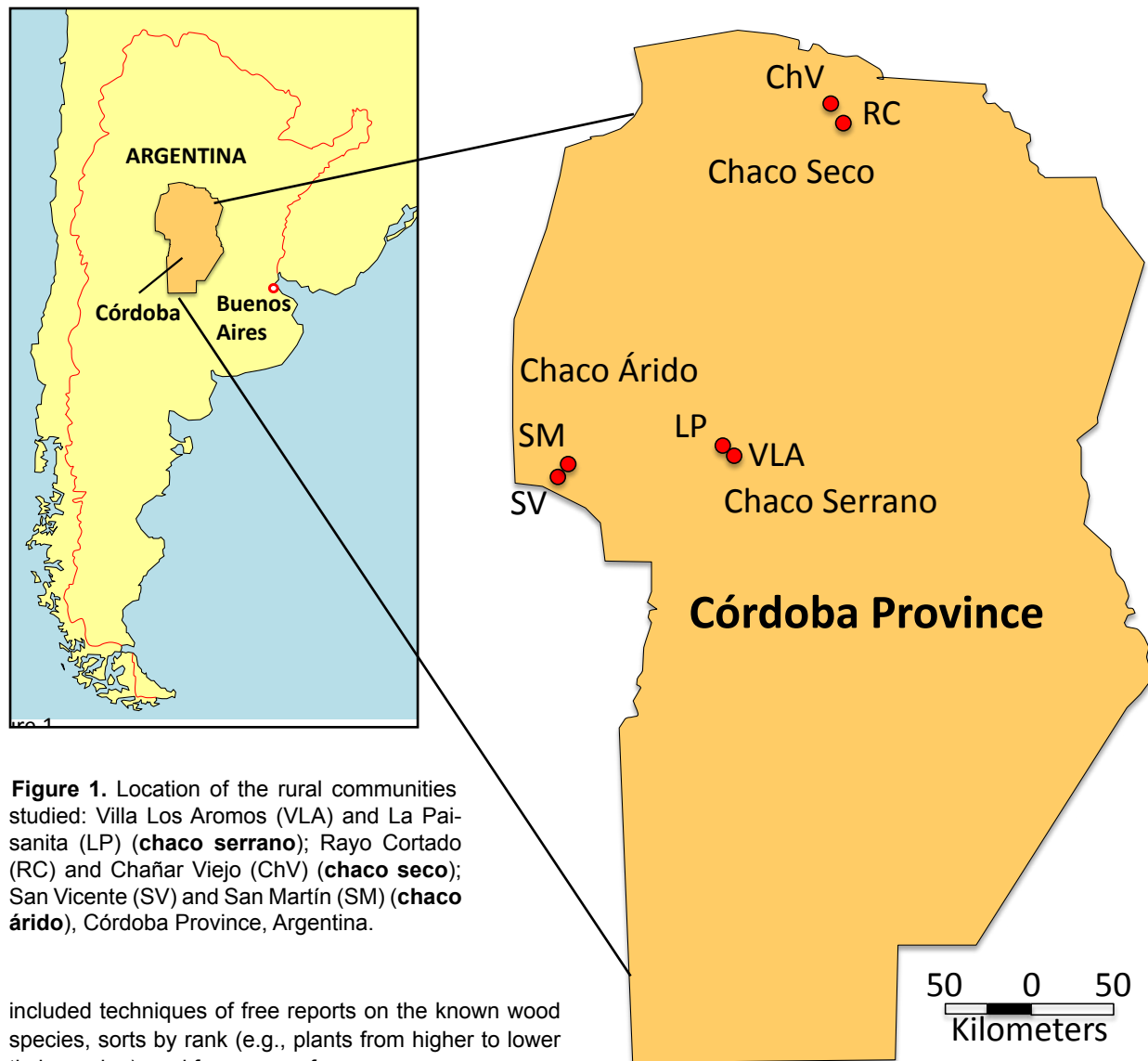
Figure 1. Location of the rural communities studied: Villa Los Aromos (VLA) and La Paisanita (LP) (**chaco serrano**); Rayo Cortado (RC) and Chañar Viejo (ChV) (**chaco seco**); San Vicente (SV) and San Martín (SM) (**chaco árido**), Córdoba Province, Argentina.

included techniques of free reports on the known wood species, sorts by rank (e.g., plants from higher to lower timber value), and frequency of use.

Additionally, timber counts were carried out in order to assess species availability in every community. We selected specific areas based on our observations, recollection areas, and joint walks with the informants. In every community, we considered a total of five 100-m transects (and areas of 25 m² when possible). Although it is likely that some species can eventually be located in isolated areas, these timber counts largely include most of the reported wood specimens.

Statistical analysis

First, we performed a principal component analysis (PCA) to observe spatial associations among variables, including self-reports of known species, specimens sur-

veyed in timber counts, and sociocultural variables within each community.

Then, we calculated the frequency of the distribution of known wood resources for each community and for the total area. We evaluated the association between such knowledge with socioeconomic factors and indicators of geographic access (sex, age, origin, educational level, type of job, way of access to the resources, and the use of alternative resources) by means of non-parametric ANOVA (including Kruskal-Wallis and Dunn's post-hoc tests). Informants' origin was defined as "native" when, even coming from urban areas, informants had lived in the communities for at least 15 years; and otherwise as "immigrants."

Plant collection

Both the species mentioned as used by the informants and those surveyed in timber counts were collected, identified, and made into herbarium voucher specimens. Specimens collected and identified with informants were deposited at the CORD herbarium (Botany Museum, Universidad Nacional de Córdoba, Argentina) with voucher specimens under the signature of Bárbara Arias Toledo (see Supplementary Material for identification numbers). The scientific names were assigned and corroborated first using Flora Argentina (2014) and then The Plant List (2015).

Results

Interviews covered a total of 114 individuals (81 women and 33 men) aged 14–84 years. A list of 47 known and used wood species, including 35 native and 12 exotic taxa (with their respective scientific and vernacular names and the main uses reported by the interviewed participants), is reported in Appendix 1.

Figure 2 shows the relationship pattern among the known and used resources, the different phytogeographical areas (as an environmental variable), and socioeconomic factors. The first two components (PC1 and PC2) explain almost 84% of the variability. Graphically, the six communities are grouped according to the three areas of the **chaco** considered. PC1 has a positive correlation with some species mentioned in the **chaco serrano,** such as the native **espinillo** and **moradillo,** or the exotic ones such as **eucalipto** and **acacia negra.** Similarly, there is a positive correlation for more species available in this area, such as **paraíso** (exotic), **espinillo, moradillo, molle,** and other native species.

On the other hand, PC1 has a negative correlation with those species reported in the area of the **chaco árido** such as **algarrobo, brea, jarilla, atamisqui,** and **retamo** (all native species), and with those actually available in timber counts such as **duraznillo, peje, tuna, retamo, brea, algarrobo,** and others. This negative correlation with PC1 is also observed with other socioeconomic variables such as the knowledge of species by men, by adult individuals, and by those who buy wood, which are grouped in the area of **chaco árido.** The correlation among these variables isolates the communities of **chaco serrano** from those of **chaco árido.** PC2 has a positive correlation with a great number of variables, characterizing the communities in the **chaco seco** and isolating them from the other ones. Some examples are the species reported by the informants in those communities (RC and ChV), such as the native ones **tintitaco, garabato, itín, quebracho blanco,** and **mistol**. Other variables are represented by their presence in timber counts, such as **tala, algarrobo, cardón, tusca, siempre verde, quebracho blanco, mistol,** and others.

The known wood resources sorted by the informants' socioeconomic characteristics are shown in Table 1. There are non-significant differences in the median number of known species among the communities. Compared to women or younger informants, men and older participants reported higher knowledge of wood resources. Those informants with none or unstable jobs, and those

Table 1. Knowledge distribution of wood resources by informants' socioeconomic characteristics. *N:* number of informants; Median: median number of species cited within each group. The remaining variables refer to participants. Non-parametric ANOVAs (Kruskal-Wallis) were performed; [a]indicates differences between categories, estimated by Dunn's post-hoc test; [b]indicates the use of alternative resources, mainly liquid gas bottles.

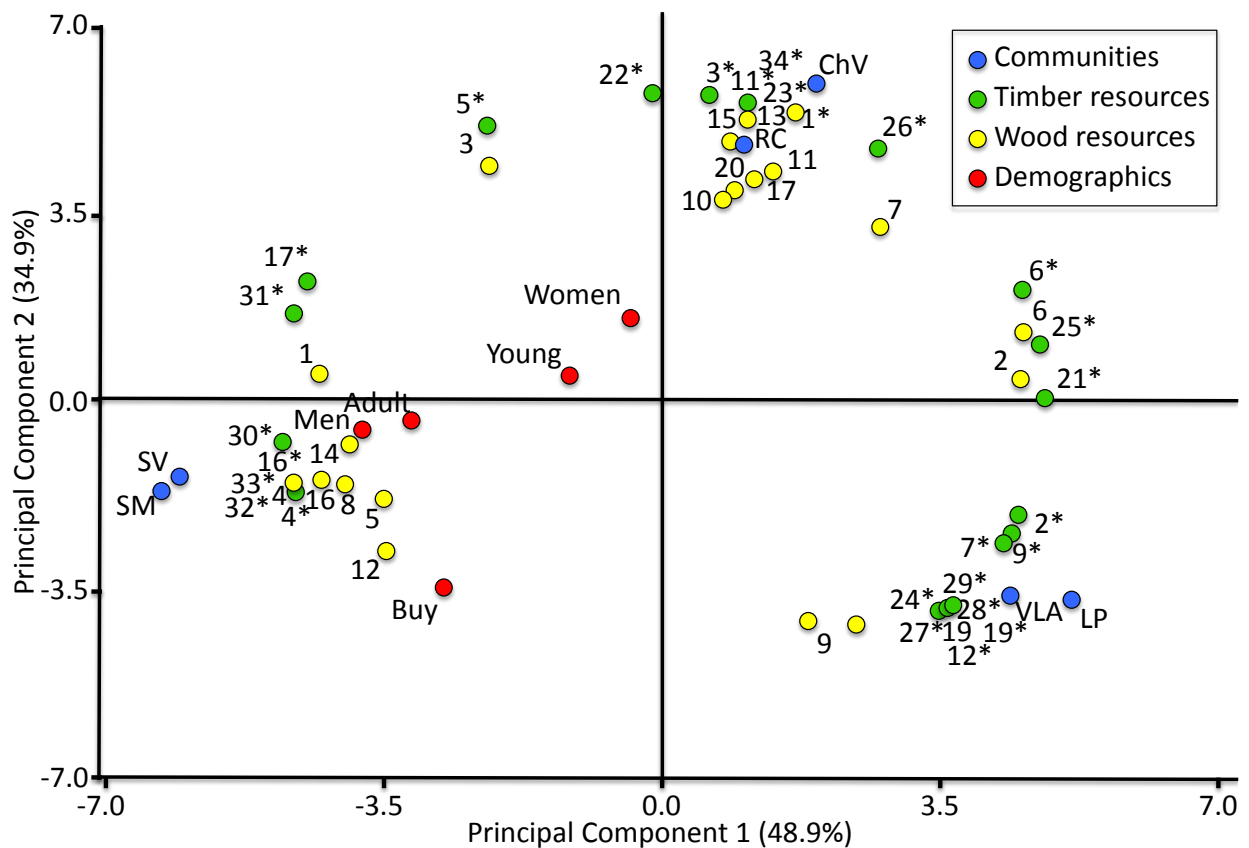| Variables		N	Median	p
Communities				
	Villa Los Aromos	22	5.0± 4.1	0.245
	La Paisanita	12	7.0± 1.7	
	Rayo Cortado	25	5.0± 2.9	
	Chañar Viejo	14	6.0± 2.8	
	San Vicente	28	4.5± 2.4	
	San Martín	13	5.5± 2.7	
Sex				
	Men	33	7.0± 2.7	<0.001
	Women	81	5.0± 2.8	
Age (years)				
	15–45 years	69	5.0± 2.8	<0.05
	46 and more	45	7.0± 3.1	
Origin				
	Native	83	5.0± 2.8	0.800
	Immigrant	31	5.0± 3.4	
Job				
	Stable	35	4.0± 3.3	<0.05
	Unstable/no job	79	6.0± 2.8	
Educational level				
	Primary	76	6.0[a]± 2.8	<0.05
	High school	31	4.0[a]± 2.8	
	High/University	7	5.0± 4.5	
Access to resources				
	Collect	77	7.0± 2.7	<0.001
	Buy/Given	24	4.0± 2.1	
Alternative resource[b]				
	Yes	97	5.0± 2.8	0.071
	No	17	4.0± 3.4	

Figure 2

Figure 2. Principal component analysis including: self-reports of known wood resources (yellow dots), counted timber resources (green dots), and sociodemographic characteristics (red dots). Communities (blue dots): Villa Los Aromos (VLA), La Paisanita (LP), Rayo Cortado (RC), Chañar Viejo (ChV), San Martín (SM), and San Vicente (SV). Wood resources: *Prosopis alba* var. *alba* Griseb. **algarrobo** (1), *Acacia caven* var. *caven* (Molina) Molina **espinillo** (2), *Aspidosperma quebracho-blanco* Schltdl. **quebracho blanco** (3), *Parkinsonia praecox* (Ruiz & Pav.) Hawkins **brea** (4), *Acacia aroma* Hook. & Arn. **tusca** (5), *Schinus fasciculata* (Griseb.) I.M.Johnst. **moradillo** (6), *Condalia microphylla* Cav. **piquillín** (7), *Larrea divaricata* Cav. **jarilla** (8), *Melia azedarach* L. **paraíso** (9), *Prosopis torquata* (Lag.) DC. **tintitaco** (10), *Ziziphus mistol* Griseb. **mistol** (11), *Populus alba* L. **álamo** (12), *Acacia praecox* Griseb. **garabato** (13), *Atamisquea emarginata* Miers ex Hook. & Arn. **atamisqui** (14), *Prosopis kuntzei* Kuntze **itín** (15), *Bulnesia retamo* (Gillies ex Hook. & Arn.) Griseb. **retamo** (16), *Jodina rhombifolia* (Hook. & Arn.) Reissek **peje** (17), *Salix humboldtiana* var. *humboldtiana* Willd. **sauce** (18), *Cecropia pachystachya* Trécul **cafeto** (19), *Porlieria microphylla* (Baill.) Descole, O'Donell & Lourteig **pan de cata** (20), *Bouganvillea stipitata* Griseb. **tala falso** (21), *Celtis iguanaea* (Jacq.) Sarg. **tala** (22), *Stetsonia coryne* (Salm-Dyck) Britton & Rose **cardón moro** (23), *Zanthoxylum coco* Gillies ex Hook. f. & Arn. **coco** (24), *Lithraea molleoides* (Vell.) Engl. **molle** (25), *Ligustrum lucidum* W.T.Aiton **siempre verde** (26), *Gleditsia triacanthos* L. **acacia negra** (27), *Geoffroea decorticans* (Hook. & Arn.) Burkart **chañar** (28), *Platanus acerifolia* (Aiton) Willd. **plátano** (29), *Opuntia ficus-indica* (L.) Mill.var. *ficus indica* **tuna** (30), *Cestrum parqui* (Lam.) L'Hér. **duraznillo** (31), *Prosopis nigra* Hieron. **algarrobo negro** (32), *Prosopis* sp. **algarrobo dulce** (33), and *Schinus areira* L. **aguaribay** (34).

with low educational background (primary school; 66% of participants) also reported greater use of species than those with stable jobs and those with high-school education. Moreover, informants who collect wood have greater knowledge than those who buy it or receive it (as favors by a community's authorities or as payments).

Discussion

Our study showed the importance of considering socio-economic factors, in addition to the availability and diversity of resources, when studying the knowledge and use of wood resources in rural communities.

Gender is an important aspect when evaluating these results, due to its relationship with other socioeconomic factors such as occupation, educational attainment, social status, access to resources, etc. (di Leonardo 1991, Sarin 1998). We found that men reported greater knowledge of wood resources than women. This finding is in line with previous studies reporting that compared to women, men have a deeper knowledge than women about uses of timber resources, mainly trees (Hanazaki *et al*. 2000), while women seem to have a wider knowledge of non-forest species, mostly medicinal herbs (Arias Toledo 2006, Arias Toledo *et al*. 2007, Phillips & Gentry 1993). In our study, men are generally in charge of providing fuelwood for their homes. Performing these activities in the forest allows them direct contact with the resources and contributes to maintenance of these facts. In this sense, most authors agree that gender differences in the use of plants are linked to the cultural role of every group in the communities (Cotton 1996, Kainer & Duryea 1992).

Age is also an important factor in the knowledge of wood resources (Arango Caro 2004, Figueiredo *et al*. 1993, Hanazaki *et al*. 2000, Rossato *et al*. 1999), with greater knowledge among older individuals. Similar results were described by Phillips and Gentry (1993) among participants of southeast Peru, in which the knowledge of plants used for construction is higher among individuals around 30–50 years old. We observed differences regarding gender and age in the **chaco árido,** in which the difference between men and women in relation to daily activities is marked. Men work in the fields along the year, and women work in the fields mainly during potato harvest season, taking care of household labor during the rest of the year. The main economic activities are potato plantations, together with work in brick and charcoal ovens where men are engaged in their daily activities. These give them a more direct contact with fuelwood resources, contributing to their higher knowledge of fuelwood.

Surprisingly, access to fuelwood resources and the job situation of informants are not related (non-significant correlation). This might be due to the high number of informants (83% of the total) who use some kind of alternative resource to wood, mainly liquid gas bottles. The use of liquid gas in these communities is a common complement to the use of fuelwood, somehow independent of the household income. Moreover, we found no differences either in the use of these alternative resources among the communities or in the informants' origin.

The absence of a stable job is associated with a low level of education in our study. We found that educational attainment is an important factor associated with knowledge of wood resources, being higher among those individuals with primary studies, followed by those with the highest education. Similar results for other types of vegetal species (edible and medicinal) were previously reported in the same study areas (Arias Toledo 2006), suggesting that informants with university studies are mainly immigrants from urban areas who have decided to live in rural environments and have a specific interest in nature. This is clearer in the area of **chaco serrano** due to its location, relatively close to urban areas. Overall, we highlight that older men with unstable jobs and lower education embody the profile of the knower of wood resources. Previous studies showed that the characterization of the major users of forest may be valuable when promoting conservation efforts (de Medeiros *et al*. 2012), and our findings support this notion, especially for older men with unstable jobs and low educational backgrounds.

In addition to bivariate analysis, multivariate analysis of environmental factors and informants' socioeconomic characteristics allowed us to characterize the studied communities and the areas where they are located. The associations show the differentiation of the communities in the **chaco árido** from the other ones. This might be due (in addition to regional differences in floristic composition and land uses) to a higher preference of the interviewees (mainly older adults) for some particular species that are common in the **chaco árido** such as **brea, retamo, atamisqui, tala,** and **jarilla,** all widely used in this area for charcoal and brick ovens. Moreover, knowledge per capita is the lowest in this area, which might suggest that this knowledge is focused on some specific resources, as described above.

The **chaco serrano** is mainly characterized based on self-reported species (also available in abundance) such as **espinillo, moradillo, paraíso,** and **acacia negra.** Some of these are widely-used invasive exotics typical from these communities, whose appearance is a consequence of sustained logging in the area. The effect of these variables separates the **chaco serrano** from the **chaco árido.** Furthermore, these areas are also grouped according to the described socioeconomic variables which are not shared by the communities in the **chaco seco** where middle-education informants and those who buy wood are knowledgable young men.

The described pattern of relationships in multivariate analysis groups those informants who buy wood near the communities of the driest part of the **chaco,** where the availability of wood resources is lower. Wood is a limited resource in most of these areas and at the same time, a widely used resource in rural communities. The scarcity of wood resources and the increasing needs of rural populations lead to non-selective use and favoring quantity instead of quality. Thus, the use of fuelwood seems to be relatively independent from the quality and the intrinsic properties of the species. Surprisingly, educational attainment and employment situation are not relevant in multivariate analysis. Although social and cultural factors are relevant when defining the composition of known wood species, environmental factors also play an important (and perhaps more relevant) role. Conversely, other mul-

tivariate studies in these areas considering the uses and knowledge of edible and medicinal plants showed that socioeconomic factors were more important in the composition of known species (Arias Toledo *et al*. 2009). Such differences might suggest that the use of different vegetal resources might be defined by specific selection criteria that are non-extrapolated, or by the availability of species in the different **chaco** regions.

The current situation of all the studied areas (**bosque chaqueño**) greatly differs from what was described in the beginning of the 20th century about the abundance, diversity, and use of resources (Río & Achával 1905). It is clear that the native populations had to adapt to the changes suffered by the environment since then. Within this context—and despite considering the steady reduction of species abundance and the consequent loss of the associated traditional knowledge—it is interesting to know how this adaptation would have arisen through understanding the changes that have occurred in the ecological perception of individuals (Rocha 2004). The use of quantitative analysis of socioeconomic effects on different communities is necessary to achieve this goal. This allows for the comparison of human populations from different environments and for acting accordingly. This method could be a first step when devising management and conservation policies of natural resources with human populations (Hanazaki *et al*. 2000), especially when the main conservation efforts are focused on fuelwood resources (de Medeiros *et al*. 2011).

In conclusion, our results show the importance of considering socioeconomic factors in addition to species availability when studying the composition of wood species known in rural communities and their potential use as management and conservation tools directed to each particular area. This study provides an approach to the interpretation of the complexity related to the construction of the traditional ecological knowledge in rural communities.

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Appendix 1. Self-reports and availability of wood resources in the six studied communities (Villa Los Aromos, La Paisanita, Rayo Cortado, Chañar Viejo, San Martín, and San Vicente) in three distinct parts of the chaco phytogeographical area (**chaco serrano**, **chaco seco**, and **chaco árido**) in Córdoba province, Argentina. Wood resources are represented in the communities where they were registered at least on one occasion. † = exotic species; vouchers specimens are deposited in the CORD herbarium at the Botany Museum, Universidad Nacional de Córdoba, Argentina.

Plant names	Communities in phytogeographical areas of chaco						Main uses	Voucher specimen
	serrano		seco		árido			
Scientific	Villa Los Aromos	La Paisanita	Rayo Cortado	Chañar Viejo	San Martín	San Vicente		
Vernacular								
Acacia aroma Hook. & Arn.								001
tusca	x	x	x		x	x		
Acacia caven var. *caven* (Molina) Molina							Fences; fuelwood; fruit as fire ignition	002
espinillo	x	x	x	x	x	x		
Acacia praecox Griseb.							Fuelwood	003
garabato			x	x				
Aspidosperma quebracho-blanco Schltdl.							Fuelwood	004
quebracho blanco	x	x	x	x	x	x		
Atamisquea emarginata Miers ex Hook. & Arn.							Unpleasant odor so not used as fuelwood	007
atamisqui			x		x	x		
Bougainvillea stipitata Griseb.								005
talafalso		x						
Bulnesia retamo (Gillies ex Hook. & Arn.) Griseb.							Stakes; fences, long-lasting wood	006
retamo					x	x		
Casuarina cunninghamiana Miq.								008
casuarina†	x							
Cecropia pachystachya Trécul								009
cafeto†	x	x						
Ceiba sp.								010
palo borracho		x						
Celtis iguanaea (Jacq.) Sarg.							Fuelwood	011
tala	x	x	x	x	x	x		
Cestrum parqui (Lam.) L'Hér.								013
duraznillo		x	x	x	x	x		
Condalia microphylla Cav.								014
piquillín	x	x	x	x				
Cupressus sp.								015
ciprés†	x							
Eucaliptus sp.							Fuelwood -unappreciated by its low quality but abundant. Bark used for fire ignition	016
eucalipto†	x	x	x					
Flourensia campestris Griseb.								018
chilca		x						

Plant names	Communities in phytogeographical areas of chaco						Main uses	Voucher specimen
	serrano		seco		árido			
Scientific	Villa Los Aromos	La Paisanita	Rayo Cortado	Chañar Viejo	San Martín	San Vicente		
Vernacular								
Geoffraea decorticans (Gillies ex Hook. & Arn.) Burkart							Brak used as fire ignition	019
chañar	x	x	x	x	x	x		
Gleditsia triacanthos L.							Fences; fruit used as fire ignition	020
acacia negra[†]	x	x						
Heterothalamus alienus (Spreng.) Kuntze								021
romerillo		x						
Jodina rhombifolia (Hook. & Arn.) Reissek								022
peje	x		x	x				
Larrea divaricata Cav.							Wood used for bread-ovens and for boiling water	023
jarilla	x				x	x		
Ligustrum lucidum W.T.Aiton								024
siempre verde[†]	x			x				
Lithraea molleoides (Vell.) Engl.							Fuelwood, although fires, unpleasant odor	025
molle	x	x	x	x	x	x		
Melia azedarach L.								026
paraíso[†]	x	x	x	x	x	x		
Morus alba L.								027
mora[†]		x			x	x		
Olea europaea L.								028
olivo[†]					x	x		
Opuntia ficus-indica (L.) Mill. var. *ficus indica*							Construction of corral doors	048
tuna					x	x		
Parkinsonia acuelata L.								029
uña de gato	x							
Parkinsonia praecox (Ruiz & Pav.) Hawkins							Wood for charcoal and brick-ovens	012
brea			x		x	x		
Pinus sp.								030
pino[†]	x		x	x				
Platanus acerifolia (Aiton) Willd.								031
plátano[†]	x							
Populus alba L.							"Fake wood," "without heart;" not useful for making coal, so low rated	032
álamo[†]	x				x	x		
Porlieria microphylla (Baill.) Descole, O'Donell & Lourteig								033
pan de cata				x				
Prosopis alba var. *alba* Griseb.							Fuelwood, construction, stakes, fences, crafts	034
algarrobo	x	x	x	x	x	x		

Plant names	Communities in phytogeographical areas of chaco						Main uses	Voucher specimen
	serrano		seco		árido			
Scientific	Villa Los Aromos	La Paisanita	Rayo Cortado	Chañar Viejo	San Martín	San Vicente		
Vernacular								
Prosopis kuntzei Harms.							Fuelwood, although produces lots of sparks	035
itín			x	x				
Prosopis nigra var. *nigra* Hieron.								036
algarrobo negro	x			x				
Prosopis torquata (Lag.) DC.							Fuelwood	037
tintitaco	x			x				
Prunus sp.								038
ciruelo		x						
Ruprechtia apetala Wedd.								039
manzano del campo		x		x				
Salix humboldtiana var. *humboldtiana* Willd.								040
sauce	x	x						
Schinopsis balansae Engl.							Excellent wood, not very used because of its low availability	041
quebracho colorado	x		x					
Schinus areira L.								042
aguaribay	x	x	x					
Schinus fasciculata var. *fasciculata* (Griseb.) I.M.Johnst.							"Fake wood," not useful for making coal, burns with an unpleasant odor so low rated	043
moradillo	x	x	x	x				
Senna aphylla (Cav.) H.S.Irwin & Barneby							Fire ignition; used as brooms	044
pichanilla					x			
Stetsonia coryne (Salm-Dyck) Britton & Rose.							Construction of corral doors	045
cardón moro			x					
Ulmu ssp.								046
olmo	x			x				
Zanthoxylum coco Gillies ex Hook. f. & Arn.							"Soft wood," not very appreciated	017
coco		x						
Ziziphus mistol Griseb.								047
mistol	x		x	x				