



# What to conserve? Different contexts/different pretexts: three study cases in Argentina

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## Research

### Abstract

**Background:** The starting point of this work is Alcorn's definition of ethnobotany. For this reason, the author goes on to say that the ethnobotanical study object is a sort of text –sensu Ricoeur (1971 cited Alcorn 1995)- whose meaning is partially derived from the natural, social- and cultural context. Following this perspective of conservation, the goal of this contribution is to analyze the significance of three tree taxa populations in three areas of Argentina.

**Methods:** Ethnobotanical and historical ethnobotany methodology have been used.

**Results:** The Quebrada peach (*Prunus persica*), early introduced to Jujuy province, assimilated into local crops, and considered as part of local identity. Various citrus (*Citrus* spp.), also introduced early on by the Jesuits, and highly valued by the locals in Misiones, but rejected in the management of protected areas due to their wild-type and exotic nature-. The tala (*Celtis tala*), native to the Río de la Plata coastal area, where it lends its name to a particular forest formation, which is often overexploited, and is the focus for the establishment of protected areas.

**Conclusions:** The perusal of these texts (tala, peaches, and citrus) demonstrates that they are considered as a part of local identity or heritage no matter a long or short story and native or exotic origin. We also to contribute to the design of conservation strategies from a biocultural perspective.

**Keywords:** Identitary species, Immaterial heritage, Introduction of plants, Landscape construction, Local practices, Perceptions, Qualitative ethnobotany.

### Background

The starting point of this work is Alcorn's (1995: 24) definition of ethnobotany as "the study of plant human interrelationships embedded in dynamic ecosystems of natural and social components. Put another way, it is the study of contextualized plant use". Both the use of plants and other human-plant interrelationships are shaped by history, by their physical and social environments, and by the qualities inherent to the plants themselves. For this

reason, the author goes on to say that the ethnobotanical study object is a sort of text - sensu Ricoeur (1971 cited Alcorn 1995)- whose meaning is partially derived from the natural, social and cultural *context*.

The idea that human activity is antagonistic to the environment (which should be preserved through diverse mechanisms, generally imply intangibility), has become established in diverse contexts, and particularly in those responsible for decision-making, therefore giving rise to the conservation paradigm (Evans 1993). This model of intangibility also translates into contempt for exotic species. However, this conception ignores the role of local people in biocultural conservation, since many of the landscapes that are intended to be preserved are the result of traditional human activities and/or practices (eg, slash and burn, tolerance, protection, agriculture) generating changes in the environment (Hilgert *et al.* 2014, Hurrell *et al.* 2019, Stampella 2018). More recently, conservation through use has been proposed, which states that taking advantage of available resources tends to value and conserve them rather than their elimination (Evans 1993). Thus, the conservation of biological diversity cannot be separated from cultural memory and local botanical knowledge (Nazarea 2006). In fact, for local people, diversity is the sum of biological and cultural diversity, for them there is no such division, both components co-evolve inseparably (Diegues 2000, Maffi 2001). From the recognition of local people as effective administrators of biodiversity and landscape modeling, Biosphere Reserves emerge that contemplate human occupation and sustainable development, however, in their management, the native / exotic dichotomy remains, and efforts are focused on the conservation of native species (Doumecq *et al.* 2020).

This dichotomy was also important in ethnobotanical studies. Whereas the early ethnobotanists dismissed the exotic species that were mentioned by social actors because they did not consider the knowledge about them as genuine, in recent times the view of these plants has been revised and has allowed the proposal of a radical change of perspective (Ladio 2005, Lambaré 2015, Martínez & Manzano-García 2016, Medeiros *et al.* 2017, Stampella 2015, Villalba & Lambaré 2019). Nevertheless, those in charge of environmental management decisions often maintain a negative view of introduced species, both wild and cultivated.

Also, the valuation that local people have for introduced species has often been disregarded. However, the decision whether to incorporate exotic elements can only be understood in the context of the practices, lore, and beliefs of each group, which are in continuous transformation, and with the social actors taking active part in the decisions to conserve, incorporate, reject, or abandon customs and objects within their social and historical dynamics (Lambaré & Pochettino 2012).

In this sense, the objective of this contribution is to analyze the meaning of three tree taxa for local people in three areas of Argentina. We discuss similarities and differences to assess the importance of context in shaping that meaning. It is worth noting that those taxa are under some degree of environmental protection and that locals play an active role in their conservation. The tree species are: 1- "**Quebrada peach**" [*Prunus persica* (L.) Batsch] from Humahuaca Ravine (Quebrada de Humahuaca, Jujuy province), introduced during the colonial period; 2- **citrus** trees [*Citrus* spp.], also introduced early on by Jesuits (Misiones province) and 3- **tala** [*Celtis tala* Gillies ex Planch.], a small tree native to the coast of the Río de la Plata river, where it gives its name to the **talares** (hence **talar** forests) low forest formations typical of this coastal sector (Buenos Aires province).

## Material and Methods

### *Study area*

For this research, we selected three areas of Argentina with cultural, historical and phytogeographical differences, which share the fact that they are under some level of environmental protection: 1) Juella, a community located in the north of Tilcara department, in Humahuaca Ravine "Quebrada de Humahuaca", Jujuy province (UNESCO World Heritage Site since 2003); 2) Cerro Mártires, a locality northeast from Concepción de La Sierra department, in the south of Misiones province (Ruins of "Santa María la Mayor" and its forest); and 3) the area of influence of the "Parque Costero del Sur" (hence PCS) Biosphere Reserve, which includes the coastal sector of the departments Magdalena and Punta Indio, in north-eastern Buenos Aires province (Fig. 1).

The community in Juella includes peasant farmers descended from native populations and European settlers, dedicated to agriculture since prehispanic times (Lambaré 2015). Some of the interviewees combine farming with jobs in the municipal government. Their major products include both pome and stone-fruits, **maize**, **potatoes** (*Solanum tuberosum* L. subsp. *andigenum* (Juz. & Bukasov.) Hawkes), **fava beans** (*Vicia faba* L.), as well as goat cheese and goat and cow meat. In phytogeographical terms, this place is part of the valleys of the Prepuna Province, in the Chacoan Domain (Cabrera 1971) and within Humahuaca Ravine, which is a World Cultural Heritage site.

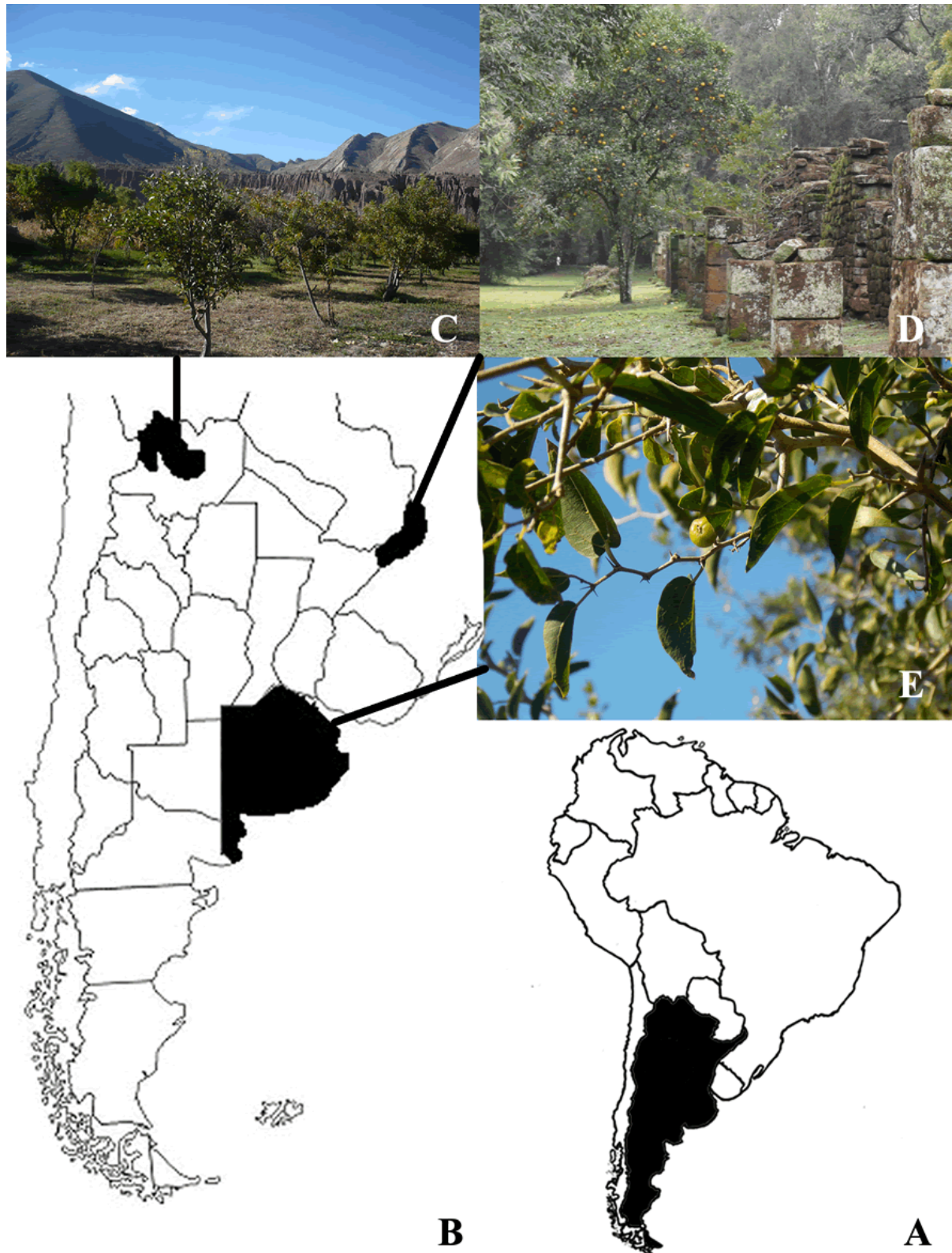


Figure 1. Study area and studied species. A. Location of Argentina in South America (in black). B. The three provinces involved in the study (in black). C. **Peach** trees (*P. persica*) in a **rastrojo** (crop field). D. Specimen of **apepú** (*Citrus* × *aurantium*) in Jesuitical ruins of Misiones. E. Detail of a branch of *Celtis tala* with fruits.

The second locality, Cerro Mártires, is a small place located along Provincial Route N° 30 that connects Paraje La Corita with Arroyo del Medio, in the vicinity of a 18<sup>th</sup> century Jesuit reduction for the Guarani (“Santos Mártires del Japón”); and 12 km away from the Jesuit ruins of Santa María la Mayor (UNESCO Heritage Site). This zone is near the Parque Costero del Río Uruguay Route (Provincial Decree N° 1373). The locals –descended from M’bya and

from 20th century European settlers- rely on slash-and-burn agriculture and cattle farming, which they complement with hunting, fishing, and gathering of various plants. The production units are known as “chacra” (small farm) and the production is used both for subsistence and eventually for sale or exchange of surplus. The main crops are **sugarcane** (*Saccharum officinarum* L.), **manioc** (*Manihot esculenta* Crantz), **beans** (*Phaseolus* spp.) and **maize** (*Zea mays* L.) (Stampella 2016, 2018). From a phytogeographic perspective, this site is within the Urunday District, a transitional zone between the Mixed Forests and the Fields districts, all of which belong to the Paranensean Province (Cabrera 1971, Martínez-Crovetto 1963).

Lastly, the PCS Biosphere Reserve is part of the Eastern Pampean District, Pampean Province (Cabrera & Willink 1980), and its inhabitants, highly diverse in terms of provenance, are distributed in urban, periurban and rural nuclei. The main economic activities in this region are seashell mining, extensive cattle farming (Arturi *et al.* 2009) and tourism in one locality, Punta del Indio. The main use of plants, both past and present, is extraction for firewood, both in local homes and for commercial purposes.

### ***Ethnobotanical methods***

To achieve this contribution, we put into dialogue our doctoral thesis, performed in the above-mentioned areas. Consequently, different strategies have been employed. Both historical and actualistic ethnobotanical methodology have been used. Historical ethnobotany is the diachronic analysis of documentary sources for understanding past interrelationships between people and plants (Hernández Bermejo & Lora González 1996, Medeiros 2010, Touwaide 2010), in this case the introduction of exotic fruit trees. Documentary sources, conceived in a wide sense (including written literature, unpublished documents and chronicles, iconography, maps, photographs, cadastral references) have been identified, recorded, analyzed and criticized (Medeiros 2010). We have also considered archaeobotanical literature to establish *Celtis tala* antiquity of use (Pérez Meroni *et al.* 2010).

The first stage in actualistic study was obtaining the prior informed consent from all interviewees; in this procedure they were told about the characteristics of the research, the dissemination and expected return of the results (Laird & Noejovich 2002). Field work was done between 2010 and 2019, using a qualitative ethnobotanical methodology involving diverse ethnographic techniques, such as open and semi-structured interviews, participant observation, walks and participant workshops (Cotton 1998), to characterize local beliefs, knowledge and practices regarding the tree species studied. We worked with 64 local inhabitants from the three areas of Argentina (Jujuy, Misiones and Buenos Aires). In Juella, Jujuy province, the work involved 30 producers (19 women and 11 men) between 43 and 77 years. The inhabitants of these high arid valleys are farmers dedicated to crop and cattle farming for self-consumption and local commerce. The study in Cerro Mártires (Misiones) involved a total of 11 interviewed, 6 males and 5 females, between 18 and 80 years, nine of which were visited repeatedly. Their occupations spanned crop farmers (“chacrero”), cattle farmers, employees (forestry, cattle), and some that also took casual jobs. In the PCS area, we worked with 23 interviewed (6 women and 17 men), between 45 and 75 years. These individuals had diverse occupations, ranging from farming, commerce, hired workers, municipal employees and officials, and retirees (pensioners).

The plant material for reference was collected in the company of the corresponding interviewed at diverse sites that they identified. This plant material was later prepared, taxonomically determined and deposited in the collections of the Laboratorio de Etnobotánica y Botánica Aplicada (FCNyM, UNLP) and INCOA (UNJu-CONICET). The cultural, spatial and temporal contextualization allows the use of terms such as “ethnotaxa” -singular “ethnotaxon”-, “ethnospecies” and “ethnovariety” to define the locally recognized variability or discontinuities between species, and cultivated and wild varieties (Harlan 1992, Rivera-Núñez *et al.* 1997).

The field work was complemented by means of eight interviews to people involved in the management of protected areas (this included Tourism officers of the municipalities of Humahuaca Ravine, forest rangers, members of the management committee in the case of PCS, guides and staff employed in the Jesuitic ruins), as well as governmental documents and publications, in order to contrast their opinions and appraisals with those of the local population.

In agreement with Taylor *et al.* (2016) we consider that qualitative data analysis is an intuitive and inductive process. Consequently, we performed our own analysis and codification of the data, to gain a deeper understanding of what we have recorded in the field and to continually refine our interpretations. For that reason, data analysis was an ongoing process and went hand to hand with data collection. As we were working with local narratives, the main steps were: identifying themes, reviewing and comparing data, collecting additional data, elaborating the final concept.

## Results and Discussion

Table 1 shows a comparative ethnobotanical characterization of the studied species in the contexts considered for this work.

Table 1. Comparison of different features of **peaches**, **citrus** and **tala** in the considered contexts

Ethnotaxon	Peaches	Citrus fruits	Tala
<b>Origin</b>	China	Southeast Asia	America, from North America to central-south South America
<b>History</b>	Early introduction. Second half of 16 <sup>th</sup> century	Early introduction to America, introduced locally by Jesuits at the start of the XVII century	Native. Associated with indigenous groups since the late Holocene, Intensive use of <b>talar</b> forests in colonial times
<b>Current use</b>	Food (fruit), medicinal (juice of desiccated peaches), Fuel (firewood), fertilizer (epicarp removed from the fruits), as graft foot (branches)	Food: fruit, juice. Bait for hunting and fishing. Seasoning. Preserves and jams. Alcoholic drinks. Cattle fodder. Medicinal (multiple ailments). Ornamental. As container for "tereré" (cold herbal infusion)	Fuel (firewood and coal), tool handles, food (fruit, jams, liquors), dyeing and medicinal. Shade and shelter for livestock.
<b>Local practices</b>	Cultivation: Fertilizer, pruning and selection of seeds.	Gathering and in situ consumption. Tolerance to wild plants when Domestic Unit (DU) moves further the forest. Fostering by bringing saplings from natural forested areas. Protection and cultivation (sensu stricto) in diverse microenvironments of the DU (gardens, fruit tree copse, vegetable plot, fields, slash-and-burn, capuera forest, forest)	Eradication. Pruning of leaves and branches. Gathering, in situ consumption. Tolerance, fostering, conservation.
<b>Public policies</b>	Ethnovarieties are preserved and commercialized (fruit and processed products) at local scale. No public policy for their protection, but this crop is perceived as being typical/characteristic for the area.	Commercial varieties cultivated as mono- and polyculture. In protected areas citrus plants are removed due to their being exotic species.	Protected species

### **History of the "Quebrada peaches" ("duraznos de la Quebrada")**

According to available bibliographical records, the origin of this species was in the mountain areas of Tibet and northern China. Its presence in the Mediterranean region goes back to the beginnings of the Christian Era (1<sup>st</sup> century); however, its taxonomy, evolutionary history, and centers of origin and dispersal, are still being debated (Burger *et al.* 2011, Burkart 1972, Delucchi 2011, Depypere *et al.* 2007). Pip and stone fruits of the rose family (Rosaceae) first entered the Argentine Northwest during the second foundational (second half of 16<sup>th</sup> century)

journey into what is currently part of the province Santiago del Estero, and subsequently expanded their range during the second half of the century with the founding of cities in Tucumán, Salta and Jujuy (Sica 2010). These expeditions were driven by diverse motives; on the one hand, the need to find new lands to cultivate using native labor (recreating Spanish-style farming environments, a task that was not possible in the highlands due to the high population density) and on the other, to establish a connection between the Central Andes and the Northwest, particularly with the “Gobernación del Tucumán” (Sica & Ulloa 2010). Even though these crops were not part of the daily diet of native peoples according to archaeological records, between the second half of the 16<sup>th</sup> century and the beginning of the 17<sup>th</sup> century these species were already being handled and incorporated (Báez 1947, 1949, Capparelli *et al.* 2005), possibly having been stolen from or discarded by frustrated expedition teams (Sica *et al.* 2010). By the end of the 17<sup>th</sup> century, the colonial system was firmly established in the region of Tucumán. In that context, the territory of the current province of Jujuy (extreme northwestern Argentina) was considered during the colonial period as a transit/border zone, used by both the native population and the Spaniards as a route to reach Bolivia (Potosí) and Perú (Lorandi 1988). European products were incorporated early on, beginning with episodes of coexistence/cohabitation in Spanish settlements –which were later abandoned- and with the contact resulting from the travel of Europeans between the southern high lands and the Gobernación de Tucumán further to the north (Sica 2006). Vázquez de Espinosa describes Humahuaca Ravine in the mid-17th century: “...*Omaguaca es pueblo de indios, el valle es fértil, y abunda el trigo y maíz, papas, con otras raíces y frutas de españa y la tierra esta toda poblado de pueblos pequeños de indios...*” [“...Omaguaca is a settlement of indians, the valley is fertile, with abundant **wheat** and **maize, potatoes**, with other fruit and root vegetables from Spain, and the land is entirely populated with small Indian villages...”] (Sica 2006, Chap. 6: 6). The same author (2006, Chap. 6: 5) transcribes a narration by Sotelo de Narváez regarding the Calchaqui Valleys in 1580, before the definitive foundation of Jujuy, as follow: “...*hay muchas crías de yegua, vacas, mulas, ovejas y cabras y puercos en abundancia; de todo lo cual tienen los indios y los crían como españoles... Cogese en esta tierra trigo y maíz, cebada y mucha cantidad de frisoles y dasé todo lo de Castilla, por la experiencia que se tiene de haber estado en esta tierra poblado un pueblo de españoles...*” [“... there is much breeding of mares, cows, mules, sheep and goats and abundance of pigs; all of these the Indians have and raise them in the Spanish style... in this land the crops yield wheat and maize, barley and many beans, and everything grown in Castilla, because in the past a settlement of Spaniards existed in this land...”]

The joint presence of **peach** trees and Andean crops, which are arranged following specific patterns of distribution and with crop cycles adjusted to fit them, highlights the long tradition behind these practices. With respect to environmental requirements, **peach** trees are characteristic of temperate zones, they require cold rainy winters coupled with arid springs, hot dry summers, and temperate-cold autumns; these trees need an accumulation of winter cold for successful budding. Likewise, they are sensitive to strong winds (Scorza & Sherman 1996). Similar environmental conditions in the zone allow assuming that in the case of the **Quebrada peaches**, in spite of having a different rain regime (with summer rains), the conditions were favorable and their cultivation became adjusted to the local temporality, i.e. they gave rise to a crop that is managed with a cycle similar to those of species of Andean provenance, such as **maize**.

The most important perceived role of the fruit for the local population is as food: “*I have known it is important to my life. In my memories they are the favorites because they not only fed me, when I was a teenager, they helped me with my studies, because dad would take them to Ledesma (department of Ledesma, Jujuy) and sell them*” (M.F., 73 year old, female, Juella).

The fruits are eaten fresh, desiccated or as part of diverse preparations (jelly, marmalade, or jam). As a medicinal option, the juice of desiccated **peaches (pelones)** boiled with sugar (“compota”) is used to treat kidney-related ailments. Likewise, during the pruning season for **peach** trees (June-July), secondary shoots (“chupones”) and lateral non-blossoming branches are removed and used for firewood or grafted onto a different graft foot. After the harvest, the women peel the ripe peaches to make **pelones**, and the epicarp removed from the fruits is deposited on crop soils as fertilizer (Lambaré 2014).

The ethnovarieties included in the ethnotaxon **Quebrada Peach** or **Juella Peach** are primarily classified into common **peaches** and “**prisco**” **peaches**, which differ in the adherence between the “stone” (fruit endocarp) and the “flesh” (fruit mesocarp). Within these two groups we were able to identify nine ethnovarieties defined by particular attributes or features –of the fruit and/or other plant parts- recognized by the farmers in the community. These attributes are defined by use, some agronomical characteristics, and personal assessment.

**Peaches** play an important role in the food heritage of the area, and both the fresh fruits and the manufactured fruit products are offered as typical products. They are sold in commercial shops for tourists but are also the focus of theme fairs that involve the local population (Lambaré *et al.* 2015). All these activities are promoted by management officers in the diverse localities of the area, who recognize "*gastronomic tourism as an economic alternative to promote local products in the different communities in the area*" (C.M., 46 year old, male, Humahuaca) according to the reports from members of the Tourism Secretary Offices of those municipalities. Therefore, peaches become a differential product that boosts local economies. Thus, even though there are neither specific policies for the protection of **peaches** as a local crop, nor plans for their eradication as foreign species, in actual fact the cultivation of this species is implicitly promoted through encouragement of its consumption.

#### ***History of apepú and other citrus fruits in south Misiones***

**Citrus** trees are native to the warm regions of Southeast Asia, temperate areas of China, Australia and south-western Pacific islands (Gmitter & Hu 1990). Since the 11th century, Arabian travelers took **citrus** from India to the coasts of the Mediterranean Sea. The Spanish and Portuguese people brought them to America during the conquest and these plants became established in the area that currently corresponds to Misiones province due to the actions of Jesuits in the early 17th century (Hilgert *et al.* 2014, Ramón-Laca 2003, Stampella *et al.* 2013a). Currently, five **citrus** taxa occur spontaneously in Argentina (Hurrell *et al.* 2010, Seo & Xifreda 2008, Stampella *et al.* 2013a, 2014).

This early entrance was not a uniform process, but rather signaled the starting point of the arrival of diverse varieties, which entered Argentina as pulses with different paths and provenances. Those first varieties brought to the Spanish colonies in Asunción and surroundings were joined by others introduced by the Jesuits during the 150 years of permanence of their missions. Although there are no details regarding **citrus** trees in the written works of Jesuits that lived near the studied location, it is possible to transpolate the diversity portrayed in the "Treatise on Citrus" by the Italian Jesuit Ferrari (1646), which dealt with grafted as well as "common" and "wild" plants. Similarly, the inventories written by Brabo (1872) for the expulsion of Jesuits in 1768 provide a brief account of the standing plants that remained in their orchards. The beginning of **citrus** cultivation in the Argentine Northeast (NEA) and the search for novel graft supports with greater resistance to diseases and the novel climatic and soil conditions led to the entrance of local varieties imported from Africa, India, and Australia (Banfi 1954, Palacios 1978).

This introduction of varieties with disparate levels of dependence on humans may be seen today in "criollo" (i.e., creole or local people) farming communities of south Misiones. At the abovementioned sites we recorded 30 ethnovarieties structured into nine ethnospecies, which in turn correspond to three groups of ethnovarieties according to their usage for grafts: common (cultivated from seeds, corresponding to the homonymous varieties of Ferrari), grafted (on diverse supports), and those used as graft foot (common varieties that were introduced relatively late and used as graft supports by the **citrus** production industry). In turn, this diversity comprises seven microenvironments or areas characterized by the presence of **citrus** trees: gardens (ornamental and medicinal plants), vegetable plots (cultivation of vegetables, spices and medicinal plants), fruit groves (plot with perennial fruit trees), fields, fire-fallow (slash-and-burn agriculture for **maize, manioc, sugar cane, sweet potato**), "capueras" (succession on abandoned farmlands) and forest (primary and secondary humid forest). The first three types are peridomiliary areas with controlled management conditions, with predominance of grafted varieties as well as common varieties grown from seed or taken from the forest. The fire-fallow areas include both common and grafted varieties, which are tolerated when this productive microenvironment advances onto the forest. The "capueras" comprise the remains of abandoned productive microenvironments as well as common and grafted varieties newly grown due to the scarce plant cover. The forest hosts diverse "spontaneous" **citrus** varieties such as **sweet orange** and **apepú** (both *Citrus × aurantium* L.), **tangerine** (*C. reticulata* Blanco) and **lemon** (*C. × taitensis* Risso), and occasionally **sweet lime** (*C. × limettioides* Tanaka) and **grapefruit** (*C. × aurantium*); these man-made forests are true reservoirs of an agro-diversity that is constantly under selection by the farming communities.

The close relationship between the local communities and **citrus** trees is also realized in the diversity of uses given to these plants. At local level, their alimentary uses include consumption as fruit (endocarp or pulp), elaboration of refreshing beverages (such as "tereré", widely consumed in the area); the whole fruits or their peel are used to make jams and preserves, and both the endocarp and epicarp as flavoring for cakes and alcoholic beverages. In addition, the juice obtained from sour-endocarp varieties is used as food seasoning. Their medicinal use is widely spread, with common varieties of most ethnospecies being used for the treatment and prevention of diverse diseases. Other less frequent uses include the use of hollowed-out fruits as containers for medicinal "mate" and "tereré", as

ornamental trees and to provide shaded areas for cattle, and as bait for hunting small mammals and capturing fruit-eating fishes.

This perspective that corresponds to the local actors (in this case, "criollo" farmers) is complemented by other perceptions often related to larger-scale land holdings, such as those of cattle breeders and producers of yerba mate, other crops, and forestry (logging), which generally support agroecosystems that are less diverse and more dependent on external input, and where productive microenvironments are abundant in detriment of native forest.

The management practices (*sensu* Casas 2001) used by local communities for **citrus** plants are characterized by tolerance, favoring and protection (Stampella 2018): "*when we clean a "rozado" (slash and burn) to plant or to build the house, we leave the seedlings that we find and even add forest soil and other fertilizers. We also take care of the animals that are going around the house or by the "rozado"* (S.F., 70 years old, female, Cerro Mártires). When the above-mentioned microenvironments advance over the "monte" (native forest), those species considered useful –including **citrus**– are tolerated and remain as part of the domestic environment. These same plants are subsequently favored (by dispersion of propagules or elimination of competitors) and often protected (by pruning and/or protection against pests). A similar process occurs in the area of the Jesuit ruins categorized as UNESCO heritage (San Ignacio Miní, Santa Ana, Loreto and Santa María la Mayor) where the staff in charge of the maintenance of open spaces tolerates and protects **citrus** trees –as well as other useful plants– while performing maintenance in the estate parks. In contrast, the situation in protected areas is the complete opposite. The testimonies of park rangers indicate that these fruit trees are removed because they are exotic species: "*We remove all the plants and seedlings that we find because they are exotic plants. We only leave one or two plants to have fruits to eat and prepare tereré (cool drink made with yerba mate and fruit juices)*" (G.S. 45 years old, male, San Ignacio). Furthermore, some authors (Pedersen 1995) categorize exotic species as invasive; and other works consider them as invasive without any support for this characterization (Stampella 2015). An extreme example of this situation is the work by Rodolfo *et al.* (2008), who mention **apepú** as an invasive species in a tourist path within Iguazu National Park (Paraná, Brazil) after finding a density of *one apepú* individual per linear kilometer.

Phytosanitary policies also represent a threat to the local diversity of **citrus**. In late 2009, a phytosanitary emergency was declared in the province due to the presence of HLB (Huanglongbing), a disease capable of devastating most **citrus** varieties (SENASA 2012). Due to the confirmation of several positive cases, the last few years have seen the removal of more than 1500 plant individuals in several departments in the north of Misiones province, as well as 21500 specimens in Paraguay (SENAVE 2013, TD 2014).

#### **History of tala and the talarés (tala forests) in PCS and surroundings**

The most important forest community of Buenos Aires province, the **talar**, grows in the northeast of this province, along the coastal region from San Nicolás de los Arroyos in the north to Mar Chiquita in the south (Cabrera 1944, Parodi 1940, Torres Robles & Arturi 2009). The **talar** woods are developed from the soils formed over the shell ridges existing in the area, with a parallel and sub-parallel arrangement to the coast, whose conformation was linked to the changes in sea level that occurred during the Holocene (Cavallotto 2009). This community is dominated by the **tala**, along with **coronillo** (*Scutia buxifolia* Reisseck), **sombra de toro** (*Jodina rhombifolia* (Hook. & Arn.) Reisseck.), and **molle** (*Schinus longifolia* (Lindl.) Speg.), among others. The characteristics of **talar** forests are conditioned by diverse variables such as substrate, climate, landscape structure and the type and intensity of anthropic management (Torres Robles & Arturi 2009).

The anthropic use of **talar** forests has been studied from diverse disciplinary perspectives. Archaeological research has identified the occupation of these formations by late Holocene hunter-gatherer groups. The **talar** forest is considered to have been a key element in the choice of settlement sites because it provided refuge, protection and a multiplicity of resources (Aldazábal *et al.* 2004, González & Frère 2009, Paleo *et al.* 2002). Archaeobotanical studies have allowed recognizing the use of *C. tala* in archaeological remains such as pottery fragments, mortars and pestles (Pérez Meroni *et al.* 2010) and coal (González & Frère 2009). These human groups possibly did not cause major alterations to the **talar** forests or other plant communities (Delucchi & Correa 1992).

Historical references point to the intensive use of the wood of this species since the beginnings of the Hispanic occupation of Buenos Aires in the 16th century (Athor 2006, Torres Robles & Tur 2006), mainly as firewood and as material for building fences and houses. There were Town Hall ordinances aimed at protecting it from overexploitation. Numerous chroniclers, travelers and naturalists of the 18<sup>th</sup> and 19<sup>th</sup> centuries such as Cardiel, Falkner, Azara, Carrió de la Vandra, Armaignac and Morris, mention the presence and use of **talar** forests in the



coast of the Río de la Plata (Athor 2006, Azara 1943, Cardiel 1930, Carrió de la Vandra 1997, Delucchi & Charra 2012, Falkner 2003). Vervoort (1967) mentions that in the 19th century, the **tala** and **coronillo** forests were exploited for firewood, timber, and coal. Since the late 19th century, their exploitation became even more intense due to their use as train fuel (González & Frère 2009). Likewise, **tala** was also used for dyes, as medicine, food, and as raw material for diverse utensils (González & Frère 2009, Hurrell 2004).

We will focus on the **talar** formations that grow on shell levees, due to the existence of the “Parque Costero del Sur” Biosphere Reserve (PCS), located in the coastal area of the departments Magdalena and Punta Indio. Palynological studies attest to the presence of this species in the area since approximately 2000 years BP (Paleo *et al.* 2002).

The establishment of PCS as a protected area is grounded on its rich biodiversity that includes **talar** forests, which are a conspicuous element of the local coastal environment, combined with grasslands, wetlands, and beaches. The identification of the valuable natural and cultural heritage of the area by the CEPA (Centro de Estudios y Proyección del Ambiente) foundation led to a proposal of protection for this area. Thus, in 1984 the PCS was declared as a Natural and Cultural World Biosphere Reserve by UNESCO (CEPA 1989). Furthermore, the PCS was declared as Refugio de Vida Silvestre (Wildlife Refuge) by the provincial government in 1997. It is worth noting that its protection was driven and decided “from the outside” without involving the local population, and that it existed on paper only for a long time. At local level, the Ordinance N° 294/98 of Punta Indio bans the use of certain native plant species typical of **talar** forests such as **tala**, **coronillo**, **sombra de toro**, **espinillo** (*Vachellia caven* (Molina) Seigler & Ebinger) and **ombú** (*Phytolacca dioica* L.). This regulation is often questioned by the local inhabitants who demand the right to use some of these native species, e.g., **tala** and **coronillo**, that are highly valued as firewood (Doumecq 2019, Doumecq *et al.* 2020).

The diverse economic activities that take place in the area and the indiscriminate logging that has persisted through time, have led to shrinkage of the **talar** forests, which are at present strongly altered (Torres Robles & Arturi 2009). However, their persistence is probably explained by the benefits they provide for cattle, such as shade and shelter (Arturi *et al.* 2006). The locals express their concern about environmental issues and identify habitat exploitation as a local problem that is often attributed to the lack of control on the part of government officers (Stratta Fernández *et al.* 2017). On the other hand, the locals are also interested in the development of the area as a touristic area, which necessitates the development of the service sector to respond to that demand, while maintaining these activities compatible with the nature of a protected area.

Ethnobotanical studies have corroborated the appropriation of native flora, especially the **tala**, within the PCS. This is evidenced by the sustained consumption of the fruit as food and the novel use of the leaves to elaborate a typical beverage, a liquor that is sold to tourists in the craft stalls of Punta del Indio (Ghani-Echenique *et al.* 2018): “*We sell tala liquor, as a souvenir, when people come they always want to take a souvenir of the place they visited*” (A.Z. 30 years old, female, Punta del Indio). With respect to its use as firewood, most local producers agree on the negative effects of overexploitation on **talar** forests, and consequently avoid cutting trees. However, the use of **tala** wood at domestic level persists in their practices and discourses without a negative connotation, whereas abusing this resource for wood is seen as strongly negative for the environment.

All this indicates that the **tala** is part of the identity of the people that inhabit the PCS, given that they identify, value, and use this species in their daily life. However, some local activities are non-sustainable or harmful for the environment and thus for the preservation of **talar** forests. These activities are currently controlled by regulations but, as stated by Arturi *et al.* (2006), it is necessary to integrate a management plan into the productive structure of the area, to guarantee the permanence and sustainable use of **talar** forests. In this sense, the park management committee promotes activities tending to the conservation of **talar** forests in general and **tala** trees in particular.

### ***Landscape construction according to its context***

The previous examples show that the native/exotic dichotomy is not operational, because it is not significant for the perspective of local inhabitants. Consequently, a conservation model guided by biocultural paradigm, as mentioned in the introduction, seems to be the most operative (Diegues 2000, Maffi 2001, Nazarea 2006). However, the paradigm of natural conservation, strongly present in the discourse and actions of managers, is the background for this dichotomy, in which native elements are an object for conservation while the exotic ones, considered as disruptive, must be eliminated (Rodolfo *et al.* 2008). Both **peaches** and **citrus** are identity plants –and thus, part of the biocultural heritage– for the local people, with a well-documented local history, manifold uses, and widely

spread in diverse microenvironments of domestic units (Hilgert *et al.* 2014, Stampella *et al.* 2013b); in the case of **peaches**, they are even promoted by local authorities as a symbol of the local alimentary heritage. Despite this, in the National Parks Iguazú and El Palmar, both **citrus** and **peaches** are considered exotic invasive plants (Management Plan for El Palmar National Park 2015, Stampella 2015).

The other side of the coin is the case of the **tala**, a native tree that has been overexploited by diverse sectors throughout history, while being a sustainable resource for local family-scale producers (Doumecq 2019). However, this alternative local usage generates conflict in the areas established as Multiple Use Reserve and even in entire departments (such as in Punta Indio) where the use of wood from this species is banned.

It is possible to reconsider these three examples from the perspective of a construction of the landscape, that is to say, an intervened environment built by past and present practices with diverse local meanings, in which native and introduced species are equally used by local inhabitants in their daily life, to construct this same environment (Paleo *et al.* 2016). Thus, we wonder if the paradigm of natural conservation could be re-focused with a biocultural approach.

For the case of **citrus** and **peaches**, fruit trees that have been introduced since the first contact between the Old and New Worlds, and are currently associated to Jesuit ruins and family-level producers, we pose the following questions: are these fruit trees not a cultural and historical heritage? In this case, would conservation in a strict biological-ecological sense, not threaten this heritage? Are these plants really invasive? Are the relationships that have existed between these **citrus**, and the local fauna for more than five centuries, taken into account before undertaking eradication procedures?

Similarly, though in an opposed direction, for the case of the **talar** forests: Is it only the natural heritage that which is being preserved? Are the diachronic relationships between **talar** forests and the different human populations taken into account? Considering the diverse uses of **talar** forests by local inhabitants, would it be possible to differentiate between sustainable and non-sustainable management practices?

These examples allow us to reflect on the importance of time in the construction and permanence of environmental lore. The concept of “traditional” has been defined in diverse works, generally as long-established knowledge that is transmitted from one generation to the next (Berkes 1993). Here, we also link the concept of “local” with the intervention on the environment—in this case, cultivated lands, and the **peaches** and **citrus** ethnovarieties—, in cases where, despite the relatively short time elapsed, this interaction has given rise to a corpus of currently valid knowledge that is used and renewed by each generation, allowing for sustainability of the cultivation and the practices related to these fruits as food choices, but also as elements with a high symbolic value that deserve an outstanding place in the discussion.

## Conclusions

This contribution analyses three examples of tree species and their significance for both the local people and external agents, in different areas that receive protection because of their biological and cultural attributes, with national and international recognition. The perusal of these species as texts demonstrates that according to the local context- they are considered as a part of local identity or heritage no matter a long or short story and native or exotic origin. This characteristic in the three studied cases is further demonstrated by the existence of local labels to designate the plants and their fruit (**Quebrada peaches**, **apepú** –the Guaraní name for **bitter orange**-), and even naming the forest communities generated by these plants and where diverse human populations have had settlements, such as the **talares** (**talar** forests). Likewise, in the three cases these plants are assigned uses that respond to local demands situated in time and space, in addition to those recognized globally.

In contrast, in another *context* and depending on the activity of external agents, the valuation of these plants is different. In areas that are natural reserves, where conservation assumes the preservation of “pristine” pre-existent environments, native species are given greater importance. In this case, while in Buenos Aires the **tala** and **talar** forests were the motive behind the creation of the protected area, in Misiones the **apepú** together with other citrus that result from local management are seen as a threat to native flora that should be exterminated. In the case of productive areas such as Humahuaca Ravine (UNESCO World Heritage Site since 2003) where this heritage is associated to tourist activity (Montenegro 2010), it is the added value which predominates: the particular features (flavor, size, specific uses) of the **peaches** are significant, and these crops do not compete with commercial varieties as in the case of the **citrus** trees in Misiones.

Studies that approach these issues from ethnobotanical and applied botanical standpoints offer alternative views to characterize the new modes of relationship of peoples and individuals (Ladio *et al.* 2013, Pochettino 2007), including management strategies for spaces and species, as well as the elaboration of particular products and their inclusion in trade circuits different from conventional ones, and which respond to the demands for a local product with distinctive features. It is our hope that the knowledge generated from such scientific research may translate into benefits for current society as a whole and especially for the local communities involved.

**List of abbreviations:** BP: Before Present; CEPA: Centro de Estudios y Proyección del Ambiente; CONICET: Consejo Nacional de Investigaciones Científicas y Técnicas; FCNyM: Facultad de Ciencias Naturales y Museo, Universidad Nacional de La Plata; Fig.: Figure; FONCyT: Fondo Nacional para la Ciencia y la Tecnología; INECHOA: Instituto de Ecorregiones Andinas; LEBA: Laboratorio de Etnobotánica y Botánica Aplicada; NEA: Argentine Northeast; PCS: Parque Costero del Sur; UNESCO: United Nations Educational, Scientific and Cultural Organization; UNJu: Universidad Nacional de Jujuy, Argentina; UNLP: Universidad Nacional de La Plata, Argentina

**Ethics approval and consent to participate:** We have previously informed consent, as detailed in the manuscript. An agreement of will was established between the interviewees and the researchers, where the framework in which the work is carried out, the objectives and importance of the research and the commitment to deliver a copy of the work carried out to the families interviewed and not to use the information provided for commercial purposes. On the other hand, the interviewee explicitly agrees to participate in conducting the interview and chooses as to the possibility of spreading his name, photos, recordings and/or knowledge.

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