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### **Fiber, Seeds and Woods Used by Seven Ethnias in Argentina's North West: Ecological and Social Implications**

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**Abstract**

*The increasing price of soya, is causing the clearing of native forests in Salta Province, mainly to produce soya for international markets, with total clearing in Salta Province approximated at two million ha. The native people of Salta make a living using both wood and non-wood forest resources, selling handicrafts to the tourists, thus the deforestation of the region has substantial negative socioeconomic impacts on the seven ethnias living in the North and East of Salta Province: Chané, Chiriguano, Chulupí, Chorote, Tapiete, Toba and Wichi. To further elucidate the relationship between commercially relevant species for local ethnias, we identify the species we identify the species used by the natives to make handicrafts and to analyze the relationship between the availability of them, the clearing of the forest and social indicators. To reach those objectives we bought handicrafts in three ecosystems used by the natives: Semiarid Chaco, Transition Forest and Tucuman-Bolivian Moist Forest. We identified 45 species found in their artisan handicrafts, but identified *Leucaena leucocephala*, *Ricinus communis* and *Sapindus saponaria* as present in most of the samples we bought. The prevalence of those exotic species, show a shift in collection patterns, because the native species are more difficult to obtain. The main problem of the natives is lack of access to their traditional sources of food and supplies. The forest clearings are causing the eviction of native settlers increasing child malnutrition and mortality rates, while social policies are focused in small subsidies in cash to cover basic needs, affecting negatively the sustainable development goals.*

**Keywords:** Argentina, Forest Clearings, Handicrafts, Seeds, Woods

## 1 Introduction

The first years of the twenty-first century will be remembered for a global land rush of nearly unprecedented scale. The rapid economic growth generates increasing pressure on biodiversity and ecosystems services, particularly when the growth is heavily dependent on an increasing, unsustainable use of natural resources (Grau & Aide, 2008; Manzanal & Villareal, 2010; Piquer-Rodriguez *et al.*, 2015). Global trends in prices of relevant export products (e.g. commodities and manufactured goods) as well as, trade policies -including foreign debt service, foreign direct investments and monetary policies (interest rates)- are incentives to buy land to plant industrial crops, and help explain the high deforestation rate in ecosystems like the South American Chaco, producing not only high export revenues but also the devastation of the ecosystems as well as an increase in poverty and social conflicts (Aizen *et al.*, 2009; WWF, 2014). When the price of food increased in 2008, pushing the number of hungry people in the world to over one billion, it spiked the interest of investors as well, and within a year foreign land deals in the developing world rose by a staggering 200 percent (Ward *et al.* 2011).

A combination of factors, namely (i) the devaluation of the Argentinean peso of up to 400 % -between December 2001 and March 2002- (ii) the increasing price of soya beans in the international market, (iii) low land price and the possibility of paying most of the production costs in local currency, allow chip production of soya which was primarily driven by markets in China (Giancola *et al.*, 2009; Rossi *et al.* 2015).

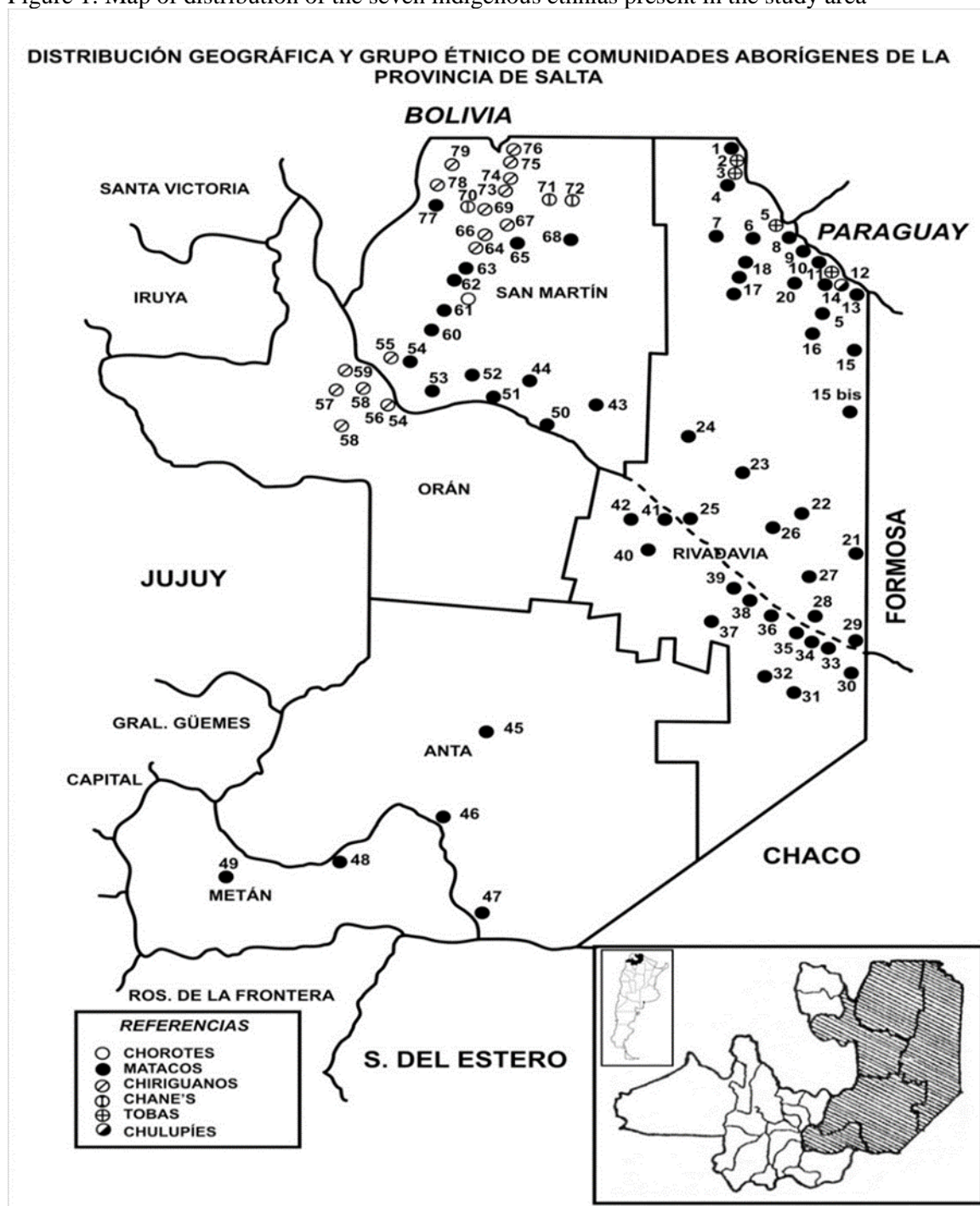
### Environmental and Social Impact of Forest Clearings

Argentina is one of the main world's grain and meat exporters, with approximately 40 million inhabitants but the potential to produce food for 400 million. This is a big economic opportunity in a planet that will increase its inhabitants from current 7.000 million to 9.000 million in the next 50 years (WWF, 2014). According to its Strategic Agro-industrial and Agro-feeding Plan, the Argentinean Government wants to increase the production of soya by 50% 2020, to target of 70 million tons. Of soya per year. The push for increased soya production has accelerated the clearing of lands and increased social struggles, largely due to evictions of local inhabitants by the farmers from the lands they have been using for years, causing the concentration of power and land in agribusiness (Kroger & Lalander, 2016).

The total historic clearing in Salta is about two million ha. but most of that surface of native forest 1185326 ha. was removed during the period 2001 – 2014 (Global Forest Watch, 2016; Redaf, 2012). The indigenous people of Salta make a living through using wood and non-wood forest resources. More specifically, the artisan handicrafts that they sell are the main source of consistent income for the seven ethnias living in the North and East of Salta Province: Chané, Chiriguano, Chulupí, Chorote, Tapiete, Toba and Wichi, (Leake, 2010). The locations of the seven ethnias of Salta are shown in Figure 1.

In 2012 Martinez reported the use of the forest by the Toba to make handicrafts in Chaco Province, following that research line, we decided to identify the species of trees and shrubs used by the native settlers to make handicrafts in Salta Province as well as to analyze the relationship between the availability of those resources, the clearing of the forest and the environmental impacts caused by other economic activities.

Figure 1: Map of distribution of the seven indigenous ethnias present in the study area



Source: Government of Salta Province, 1984

## 2 Methods

### Study area

The dry Chaco of Northern Argentina is an extensive plain with dry forest where the vegetation is dominated by *Aspidosperma quebracho-blanco*, *Schinopsis quebracho-colorado*, *Chorisia speciosa*, *Caesalpinea paraguariensis* and *Prosopis spp.* It is relatively homogeneous in terms of environment and historical land use (Cabrera, 1976). Annual rainfall is minimal in the East of the study area (500mm). Along the western border rainfall reaches 700–900mm, providing the opportunity for rainfed agriculture in what is called the Transition Forest between the Semiarid Chaco and Tucuman-Bolivian Moist Forest, species from both the Semiarid Chaco and Tucuman-Bolivian Moist Forest are present in the Transition Forest (Minetti, 1999). Overgrazing in open fields, irrational logging, the production of charcoal and fire wood, are the main ecologic problems of Chaco ecosystem ecosystems (Bucher & Huszar, 1999). But the Semiarid Chaco is still the biggest continuous area of Neotropical dry forest and the largest subtropical habitat for many large vertebrates, including jaguars and three species of peccaries (Altrichter & Boaglio, 2004; Barbaran, 2011; Eva *et al.*, 2004; Grau *et al.*, 2008). Extensive grazing continues to be the most common land-use practice, but global markets are promoting deforestation in areas where increasing rainfall is sufficient for rainfed agriculture: it is the case of the Transition Forest (Grau *et al.*, 2005).

The Tucuman-Bolivian Moist Forest forms a mesic habitat placed between two drier habitats: the Chaco and the Puna (Olson *et al.* 2000). This is an evergreen forest, with trees no higher than 15 m (Stattersfield *et al.* 1998). Between 1200 – 2500 m the dominant species are Andean Alder *Alnus acuminata* and Mountain Pine *Podocarpus parlatorei* or Queñoa *P. australis*; at lower elevations these species form a mosaic with other trees, especially Lauraceae and Myrtaceae (Ojeda and Mares 1989). More than 50% of the original forest vanished In Argentina, due to agriculture, logging, infrastructure development and tourism (Vervoost 1979; WWF/IUCN 1997). The high diversity of wildlife include herbivores such as white-lipped and collared Peccary *Tayassuidae* and the tapir *Tapirus terrestris*, as well as carnivorous like the jaguar *Panthera onca*, puma *Puma concolor*, margay *Felis wiedii* and jaguarundi *Herpailurus yagouaroundi* (SAREM, 1996).

On the other hand, the uncertainty about the land ownership, promoted the competence for the use and property of the natural resources between mestizos (gauchos) and the indigenous people mainly in the Semiarid Chaco, where extensive grazing, logging, fishing and trapping are the main economic activities. That situation gave place to a good example of the Tragedy of the Commons (Hardin, 1968)<sup>1</sup>. In the Transition Forest and in the Tucuman-Bolivian Moist Forest, where is possible to plant soya, a third component of the conflict is the agribusiness, avid for new lands to clear. For the indigenous people, the main consequence of the bad use of the ecosystems is the need to complement their original economic activities with wages, in order to have access to goods and western technologies, being incorporated to the market economy, living now in a chronic syncretism (Gonzalez Arzac *et al.*, 1981; Naharro & Alvarez, 2011).

The Indigenous are the first link of the trade chain of different forest products: wood, furs, skins, pets and fish. Outsiders concerned about indigenous knowledge and rights, tend to romanticize the relationship between the Indigenous and the environment, without considering that the natural resources use, is influenced by the technologies of access to them, the infrastructure of communications and the demand of the western society, even when the indigenous economy has not the objective of capital accumulation (Barbaran, 2001). Considering the main component of handicrafts are dry fruits, fibers and seeds, to identify all the species used to make them, the fieldwork

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<sup>1</sup> Just to give ownership of the lands claimed will not solve the poverty problem nor the irrational use of the natural resources if at the same time there are not investments in a minimum infrastructure to manage them (mainly wire fences) as well as technical assistance and basic and applied research (Rihoy, 1992; Barbarán, 2002).



was carried out between May 22 and 27 (2013), two months after the end of the rainy season. The collecting points of handicrafts, are representative and easy access places of three different ecosystems used by indigenous people: Semiarid Chaco (Santa Victoria Este 22° 16' S 07.8° 62' 38' W), Transition Forest Mision Chaqueña (23°15'32"S 63°44'13"W) and (Embarcación 23 ° 13' S 64 ° 7' W) and Tucuman-Bolivian Moist Forest (Tartagal 22 ° 32' S 63 ° 49' W) (Cabrera, 1976). The location of those collecting points is available in the Figure 2.

#### The Tucuman Bolivian Moist Forest

In each of those places, we bought and photographed, samples of bags, bracelets, decorative objects made with wood and hanging items, until we couldn't be able to identify new species. Despite we made our best effort to collect all the seeds of species used, optimizing the collection date (just after the rainy season) and covering the main trade points in the study area, is not possible to state that we have a complete list, because is always possible to find new species. The information about the species involved, was collected using methods of ethnobotany (Martin 1995), through open-ended and semi-structured interviews. The material obtained in the field, was identified taxonomically in the Biodiversity and Experimental Biology Laboratory (University of Buenos Aires, Argentina) and kept there.

Eighteen Wichi artisans were interviewed, 10 men and 8 women, between 24 and 88 years of age. Data were recorded in notebooks and when possible, the interviews were registered with a camcorder. The evidence to discuss the environmental and social impact of the main economic activities in the study area, is based in published statistics related to forest clearings, overgrazing, illegal logging, environmental policies in the national and provincial levels, as well as socioeconomic information related to emigration, malnutrition and child mortality rate of indigenous people (Barbaran *et al.* 2015; Barbarán & Arias 2001, Redaf, 2012, Republica Argentina, 2007)

Figure 2: Study area and collecting points of handicrafts: Tartagal, Embarcacion and Santa Victoria Este. The territory used by the Wichi, the most important in Salta Province (52000 persons) is in light green.



Source: Modified from Suarez & Montani, 2010.



### 3 Results

Table 1: List of species used by indigenous artisans to make handicrafts in the study area.

Family	Scientific Name	Part used & common name	Ecosystem of Native Species	Place of Collection	Conservation Status of Native Species
1. Anacardiaceae	1. Schinopsis balansae Engl.	Wood. Wood of old dry trees “madera campana” used to dye fibers in dark orange colour. Quebracho Colorado	Tree. Semiarid Chaco	Santa Victoria Este	Native, common
2. Apocynaceae	2. Aspidosperma quebracho blanco Schltdl.	Wood. Wood of old dry trees “madera campana” used to dye fibers in dark red colour. Quebracho Blanco	Tree. Semiarid Chaco	Santa Victoria Este	Native, common
	3. Thevetia peruviana (Pers.) K. Schum.	Fruit.	Shrub	Tartagal	Exotic, cultivated
3. Arecaceae	4. Euterpe edulis Mart.	Seed. Palmera	Palm	Tartagal	Exotic
4. Bignoniaceae	5. Tabebuia nodosa (Griseb.) Griseb.	Wood. Palo Cruz	Tree. Semiarid Chaco	Santa Victoria Este	Native, common
5. Bombacaceae	6. Ceiba chodatii (Hassl.) Ravenna	Wood. Palo Borracho	Tree. Transition Forest, Tucumán-	Tartagal	Native, common

			Bolivian Moist Forest		
6. Boraginaceae	7. Cordia trichotoma (Vell.) Arráb. ex Steud.	Wood. Peteribi	Tree. Transition Forest, Tucumán-Bolivian Moist Forest	Embarcación	Native
7. Brassicaceae	8. Raphanus sativus L.	Fruit. Abato	Herb	Tartagal	Exotic, wild
8. Bromeliaceae	9. Bromelia hieronymi Mez	Fiber. Chaguar	Herb. Semiarid Chaco	Santa Victoria Este	Native, common
	10. Bromelia urbaniana (Mez) L. B. Sm.	Fiber. Chaguar corto	Herb. Semiarid Chaco	Santa Victoria Este	Native, common
9. Cannaceae	11. Canna sp.	Seed. Achira	Herb. Tucumán-Bolivian Moist Forest	Tartagal	Native, common
10. Combretaceae	12. Terminalia catappa L.	Fruit. Almendro Indio	Tree	Tartagal	Exotic
11. Euphorbiaceae	13. Jathropa curcas L.	Fruit. Piñon. Piñon del Diablo	Shrub	Tartagal	Exotic, cultivated
	14. Ricinus communis L.	Seed. Tartago	Shrub	Embarcación	Exotic, wild and cultivated
	15. Hura crepitans L.	Fruit. Jabillo	Tree	Tartagal	Exotic
12. Fabaceae	16. Acacia aroma Gillies ex Hook. & Arn.	Seed.	Shrub. Semiarid Chaco	Santa Victoria Este	Native, common
	17. Acacia caven Molina (Molina) var. caven	Fruit. Churqui	Shrub. Semiarid Chaco	Tartagal	Native, common
	18. Acacia sp.	Seed. Arrocillo	Shrub. Semiarid Chaco	Tartagal	Native, common
	19. Anadenanthera colubrina (Bell.) Brenan cebil (Griseb.) Altschul	Seed. Cebil	Tree. Transition Forest	Tartagal	Native, common

	20. <i>Amburana cearensis</i> (Allemão) A.C. Sm.	Wood. Roble	Tree. Tucumán-Bolivian Moist Forest	Embarcación	Native. Endangered (IUCN)
	21. <i>Bahuinia variegata</i> L.	Seed.	Tree	Embarcación	Exotic, wild
	22. <i>Caesalpinia paraguariensis</i> (D.Parodi) Burkart	Fruit. Wood of old dry trees “ <i>madera campana</i> ” used to dye fibers in black colour. Guayacón	Tree. Semiarid Chaco	Embarcación	Native, Vulnerable (IUCN)
	23. <i>Delonix regia</i> (Bojer) Raf.	Seed. Chivato	Tree	Tartagal	Exotic, cultivated
	24. <i>Gleditsia amorphoides</i> (Griseb.) Taub	Fruit. Espina de Corona	Tree. Tucumán-Bolivian Moist Forest	Tartagal	Native, common
	25. <i>Leucaena leucocephala</i> (Lam.) de Wit ssp. <i>glabrata</i> (Rose) Zarate	Seed. Cebilillo, Eucaena	Tree	Tartagal	Exotic, cultivated
	26. <i>Mucuna sloanei</i> Fawc. & Rendle	Seed. Ojo de Buey	Vine	Tartagal	Exotic
	27. <i>Mimozyanthus carinatus</i> (Griseb.) Burkart	Wood. Iscayante	Tree. Semiarid Chaco	Tartagal	Native, common
	28. <i>Prosopis alba</i> Griseb.	Wood, bark and resin to dye fibers in brown color. Algarrobo blanco	Tree. Semiarid Chaco	Santa Victoria Este	Native, Lower risk/Near threatened (IUCN)
	29. <i>Prosopis nigra</i> (Griseb.) Hieron.	Wood, bark and resin to	Tree. Semiarid Chaco	Santa Victoria Este	Native, Data Deficient (IUCN)

		dye fibers in yellow. Algarrob o Negro			
	30. <i>Pterogyne nitens</i> Tul.	Wood. Tipa colorada	Tree. Tucumán-Bolivian Moist Forest	Embarcación	Native, Lower Risk/Near Threatened (IUCN)
	31. <i>Sesbania</i> sp.	Seed. Poroto del monte	Shrub. Semiarid Chaco	Santa Victoria Este	Native, common
13. Meliaceae	32. <i>Cedrela balansae</i> C. DC.	Wood. Cedro	Tree. Tucumán-Bolivian Moist Forest	Embarcación	Native, Endemic.
	33. <i>Melia azedarach</i> L.	Fruit. Paraiso	Tree	Tartagal	Exotic, cultivated
14. Myrtaceae	34. <i>Eucaliptus</i> sp.	Seed. Eucalipto	Tree	Embarcación	Exotic, cultivated
15. Moraceae	35. <i>Maclura tinctoria</i> (L.) Steud	Wood. Mora amarilla	Tree. Transición Forest, Tucumán-Bolivian Moist Forest	Embarcación	Native, common
16. Olacaceae	36. <i>Ximenia americana</i> L.	Root to dye fiber in red colour. Pata	Shrub. Semiarid Chaco	Santa Victoria Este	Native, common
17. Poaceae	37. <i>Coix lacrimajobi</i> L.	Seed. Lagrima de la Virgen	Herb	Tartagal	Exotic
18. Polygonaceae	38. <i>Rupechtia</i> sp.	Wood. Duraznillo	Shrub. Semiarid Chaco	Santa Victoria Este	Native, common
19. Rhamnaceae	39. <i>Ziziphus mistol</i> Griseb	Wood. Wood of old dry trees “madera campana” used	Tree. Semiarid Chaco	Embarcación	Native, Data Deficient (IUCN)

		to dye fibers in purple colour. Mistol			
20. Rubiaceae	40. Calycophyllum multiflorum Griseb	Wood. Palo Blanco	Tree. Semiarid Chaco, Transitio n Forest	Embarcaci ón	Native, common
21. Sapindaceae	41. Sapindus saponaria L.	Seed. Coco, Jaboncillo, Palo jabón	Tree. Tucuma n- Bolivian Moist Forest	Tartagal	Native, common
22. Sapotaceae	42. Chrysophyllum gonocarpum (Mart. & Eichler) Engl.	Seed. Aguay	Tree. Tucuma n- Bolivian Moist Forest	Tartagal	Native, common
23. Tiliaceae	43. Heliocarpus popayanensis Kunth	Wood. Afata	Tree. Tucuma n- Bolivian Moist Forest	Embarcaci ón	Native, common
24. Ulmaceae	44. Phyllostylon rhamnoides (J. Poiss.) Taub.	Wood. Palo Amarillo	Tree. Transitio n Forest, Tucuma n- Bolivian Moist Forest	Embarcaci ón	Native, common
25. Zygophyllaceae	45. Bulnesia sarmientoi Lorentz ex Griseb.	Wood. Palo Santo	Tree. Semiarid Chaco	Embarcaci ón	Native, Lower risk/Conservat ion Dependent (IUCN). CITES Appendix II (2010), EU Listing B (2014)

Source: From the authors.

#### 4 Discussion

We identified 45 species, belonging to 25 families, but only 3 exotic species: *Leucaena leucocephala*, *Ricinus communis* and *Sapindus saponaria* are present in about 90 % of the handicrafts collected, because they are abundant and easily available, mainly in Embarcacion and Tartagal. Santa Victoria Este is far away those cities, so the handicrafts there, are made mainly with native species of the Semiarid Chaco. The use of 14 exotic species (30% of the total), is an evidence of a shift in the trapper & collecting cultures. The Toba and Wichi used to be nomads, but their permanent settlement around Tartagal and Embarcacion, is an adaptation to the degradation of the ecosystems originally used by them because they can't cover their basic needs trapping and collecting only, now they need access to infrastructure, markets and social services (Barbaran, 2001; Torres et al, 1999). Considering the 23 species of native trees identified, *Cedrela balansae* is endemic of the Tucuman-Bolivian Moist Forest, *Amburana cearensis* is categorized endangered, while *Pterogyne nitens* is considered near threatened by The Red List of the IUCN (2016) (Zapater et al., 2004). Those three species suffer illegal logging, as well as *Prosopis alba* the most used by indigenous carpenters, to make chairs and tables.

*Schinopsis balansae*, have one of the hardest woods of the world, is affected mainly by overgrazing, as well as *Caesalpinia paraguariensis*, vulnerable for the IUCN, this species is the only tree that produce fruits with high protein value the year around, so very important for the cattle and wildlife of the Semiarid Chaco (Aronson & Toledo, 1992). *Bulnesia sarmientoi* is by far the most frequent species found in wood handicrafts. It is included in CITES Appendix II (regulated trade), EU listed B and considered conservation dependent by the IUCN. It is important also as a refuge provider to species used for bush meat by local people: *Catagonus wagnery*, *Mazama americana*, *Pecari tajacu* and *Tayassu pecari*, between others (Barbaran, 2011; Barbaran & Saravia Toledo, 2000). The wood of old dry trees “*madera campana*” of *Aspidosperma quebracho blanco*, is used to dye fibers in dark red colour. This species is an addition to the list of 26 plants mainly used by the Wichi to dye fibers of *Bromelia*, published by Suarez & Arenas (2012). Siwok Foundation, the main exporter of handicrafts made with Palo Santo under fair trade basis, proposed to Salta's Government that only indigenous artisans should have the right to use that species considering its importance as source of income and to preserve the culture of vulnerable people of the Semiarid Chaco.

The seeds necessary to make handicrafts are still available, because most of them, used to make necklaces and hanging items come from exotic species, while the woods for lumber are used in low scale. During field work, we found an important interchange and trade of fiber and seeds of different species between local and foreign artisans to keep the market active: that is why a species like *Hura crepitans* with origin in Amazonia, was found in this research: the frontiers with Bolivia and Paraguay are close and well connected with roads. Despite the native women have to travel to longer distances to obtain the two species of *Bromelia* due to the intensive use of the fiber of that species to weave bags, the supplies necessary to make handicrafts are still available because most of the seeds used to make necklaces and hanging items come from exotic species, while the woods to make small pieces of handicraft are used in low scale, mainly recycling discards of sawmills (Suarez & Montani, 2010). It is not the case of furniture: in Mision Chaqueña and Embarcacion collected photographic evidences of the illegal logging of *Amburana cearensis*, *Prosopis alba* and *Schinopsis quebracho Colorado*.

#### *Social Implications of Forest Clearings and Concentration of Land Ownership*

The main problem of the all the ethnias, is to have access to their traditional sources of food and supplies in the forests. The intensive transformation of the original landscape in agriculture land, is causing the eviction of the native settlers despite they are claiming its ownership. Even though the Argentinian Government recognizes in its Constitution that right to natives, the management of land claims has been inadequate: the social policies are poor and focused in small subsidies in cash to cover basic needs (Barbaran, 2002).



Considering the public concern about the size of the surface cleared to plant soya, after the strong pressure of the media and NGOs like Greenpeace, in 2007 the law 26331 was approved, establishing payments for environmental services and support of indigenous communities and small farmers for the sustainable use of the forest (Republica Argentina, 2007). Despite that, the payments offered to land owners are by far below the profit given by agriculture, while indigenous communities in many cases are not organized enough to obtain the funds, so the clearing of the forest continued.

In 2011 the federal government invested only 17,6 % of the money established to enforce the law and even less in subsequent years, so the priority is clear: to collect taxes for grains exports (US\$ 4000-5000 millions/year ) to be used at the discretion of the federal executive power (FARN, 2013). The contradictions between the political speech and the effective implementation of the law, encouraged Indian communities to present legal demands in the courts, claiming lands, respect for their culture and human rights. The corruption of the political power to favor agribusiness dispossessing indigenous people in Argentina, was studied in deep by Caceres (2014).

The migratory balances between humane population censuses of 1980, 1990, 2001 and 2010 in areas of production of soya were all negative. Despite agriculture build infrastructure, improved public services and attracted humane population to areas formerly degraded by overgrazing, it was not enough to change the trend to emigrate (Barbaran & Arias, 2001). A multiple correlation between the variables surface cleared, malnutrition and mortality rates in children, in the main areas of soya production between 2002 and 2012, resulted in  $r = 0,81$  in Anta (24 41' S 64 15' W) and  $r = 0,69$  in Oran Department (32 09' S 64 19' W). (Barbaran et al., 2015; Brusco *et al.*; 2004).

In Argentina, a soya production of 46 million of ton. and a gross income of US\$ 25 billion involving more than 20 million ha. were estimated for 2014 (Bolsa de Cereales de Buenos Aires, 2013). Despite that, less than 10% of tax collection for soya exports is invested in the production areas, in consequence the provincial government can't define its own development agenda, prevailing poverty and inequality.

In Argentina the native forest is disappearing because the investors make a profit of 30 % (about US\$ 200/ha.) for harvesting soya beans vs. the US\$ 10 offered by the law on native forest as a payment to preserve the forest. Bucher and Huszar (1999) tested a business model for the Semiarid Chaco in Salta Province, producing beef, charcoal, timber and wildlife. The main disadvantage of this model is that are necessary high investments in infrastructure (mainly in wire fences) and the managed system will have a positive net value after 13 years considering a discount rate of 8 %. Important long term investments like this, need subsidies of the government to be economically viable.

On the other hand, Grau et al. (2008) believe that where land use has been driven by government-sponsored colonization programs, the expansion of extensive grazing has led to low food production, and widespread environmental degradation. In contrast, in the region dominated by market-driven soybean expansion, the rural population decreased, but food production is between 300% and 800% greater, and low-density extensive cattle production has declined over extensive remaining forested areas, resulting in a land-use trend that appears to better balance food production and nature. Given the current global trends of increasing demand for soybean, technological advance, and increasing precipitation in the region, deforestation is likely to continue in areas of the Chaco that are suitable for modern agriculture (Grau et al., 2005; Paruelo & Oesterheld, 2005).

Salta Province generate about US\$ 200 million/year in taxes for exporting grains, but the provincial government has not decision about that money, because it is in the hands of the federal executive power. Development and infrastructure are mainly directed to dense population centers with high concentration of voters, but Salta Province has only 3 % of the total population of the country, so it is always out of the federal government priorities. Approximately 52000 persons were registered as native in the study area in 2010 representing only 4,3 % of the total population of Salta Province. The indigenous living there are poor: above 70 % have unsatisfied basic needs (INDEC, 2015). The obvious conclusion is that agriculture is eliminating the forest without considering the value of nature, while the federal government doesn't reinvest the taxes collected in the areas they are generating that richness, causing inequity.

## 5 Conclusions

The availability of independent data and research related to the accumulative environmental impact of the use of high quantities of pesticides, unemployment rates and humane emigrations related to the expansion of agriculture and forest clearing, are important to balance the economic grow, the use of natural resources and social issues.

More investment in research about sustainable use is also necessary, in order to create alternatives for the traditional use of the land.

Opposite visions between conservation and development should be balanced, considering that indigenous people have the right to participate in the decisions related to their future as humane beings and the preservation of their culture.

The national budget allocation policy in Argentina must be changed, recognizing the importance of regional economies and giving more economic power and political independence to provincial governments, to allow them to establish their own development agenda.

On the other hand, to give ownership of land to indigenous communities without the eradication of overgrazing and illegal logging, doesn't guarantee forest management, but the continuity of poverty and degradation of the ecosystems. To solve this problem of inequity and misery, is necessary to define a more inclusive economy, to implement sustainable use development projects involving indigenous communities and to consider the real value of forest services and biodiversity

Is necessary to implement a long term plan for the use of the ecosystem beyond economic and political changes, taking in account the scientific research focused in sustainable development, infrastructure and the creation of incentives to generate inclusion, employment and to diversify the productive offer as well as to train humane resources with skills enough to implement it.

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