

International vicuna fiber trade and its benefit sharing

Comercio internacional y distribución de beneficios de la fibra de vicuña



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Resumen

Objetivo: con este artículo de investigación se espera mostrar la influencia del comercio internacional de fibra de vicuña para la sostenibilidad social y económica, en el marco de los beneficios compartidos y bienestar para las comunidades campesinas andinas. **Metodología:** la investigación utilizó indicadores sociales y económicos para determinar la sostenibilidad social y económica de las comunidades andinas. Asimismo, los beneficios económicos de los acuerdos comerciales y Free on board - FOB valores del comercio internacional de fibra de vicuña para el período 1995 – 2011. **Hallazgo:** se encontró que aproximadamente US \$ 13 millones generados a partir del valor FOB en ese período no tiene bienestar social en las regiones afectadas. Del mismo modo, el comercio internacional de fibra de vicuña tuvo una influencia de bajo nivel (0.0792) en su bienestar económico al igual que los US \$ 21 millones generados a partir del valor FOB. **Conclusión:** el comercio internacional de fibra de vicuña no tuvo influencia en el bienestar social o económico de las comunidades campesinas. El aumento de los recursos humanos en estas a niveles competitivos en educación, conocimiento tecnológico, acceso a sistemas de salud y nutrición serán un avance en el marco del desarrollo sostenible de la cultura y los valores morales andinos. **Palabras clave:** Fibra de vicuña; Economía agraria; Desarrollo rural; Desarrollo sostenible.

Abstract

Objective: this research article is expected to show the influence of international trade in vicuna fibre for social and economic sustainability, within the framework of shared benefits and welfare for the Andean peasant communities. **Methodology:** the research used social and economic indicators to determine the social and economic sustainability of Andean communities. In addition, the economic benefits of the trade agreements and Free on board - FOB values of the international trade of vicuna fibre for the period 1995 – 2011. **Finding:** it was found that approximately US\$ 13 million generated from the FOB value in that period has no social welfare in the affected regions. Similarly, the international trade in vicuna fibre had a low level influence (0.0792) on its economic welfare as did the US\$ 21 million generated from the FOB value. **Conclusion:** international trade in vicuna fibre had no influence on the social or economic welfare of peasant communities. The increase in human resources at these competitive levels in education, technological knowledge, access to health systems and nutrition will be a step forward in the sustainable development of Andean culture and moral values. **Keywords:** Vicuna fiber; Agricultural economics; Rural Development; Sustainable Development.

Introduction

The vicuna (*Vicugna vicugna* Molina, 1782) fiber is historically recognized for its high value fineness. De la Vega (2009) in his work the "Royal Commentaries of the Incas" states the following:

The wool of the guanacos, because its wool is enough, was distributed to ordinary people. Instead, vicuna wool, because it is so esteemed by its fineness, was all for the Inca, of which he commanded to share with those of his royal blood, which others could not wear on that wool under pain of life (p. 315).

"They also gave of it by privilege and particular favor to the Curacas, who otherwise could not dress of it" (De la Vega, 2009, p. 315). The benefits generated from vicuna fiber were limited to the high hierarchical social levels in the Incanate. Similarly, the period of Viceroyalty gave high value to vicuna fiber. It was used as one of the goods for export, "not only silver and gold from Peruvian ports, but also cotton ... vicuña wool ..." (Chocano et al., 2010, p.14). In the same way, the Republican period of Peru through Simon Bolívar protected vicuna populations and banned the vicuna poaching (PEURV, 1980).

International trade in vicuna fiber (*Vicugna vicugna*), under the Convention on International Trade in Endangered Species of Wild Fauna and Flora - CITES signed by the country in 1975, was reopened in 1995, when Vicuna populations were transferred from Appendix I to II at the Ninth meeting of

the Conference of the Parties held at Fort Lauderdale (United States of America), 07-18 November 1994. This vicuna fiber trade has two important features to consider, comes from the shearing of live animals and the management should be carried out by the peasant populations of the Peruvian Andes.

Vicuna populations are threatened by poaching for trade their fine fiber in the international market, its biggest negative driver (Rosales et al., 2016). Peru is by far the most important fiber exporter in the region with nearly 10 times more fiber exported than that from Argentina or Chile (McAllister et al., 2009). In addition, other research commented that "vicuna fibre is exported as dirty fibre, pre-dehaired, dehaired or washed fiber or as products (threads, cloths and garments) and eighty per cent of hair reported by weight was exported by Peru with the remainder from Bolivia" (Sinovas et al., 2017, p. 30). Hence, this vicuna trade should benefit local peasant communities and vicuna populations' conservation.

In this regard, this article proposes to know if the international vicuna fiber trade from live sheared animals influences on socioeconomic welfare of the peasant communities? Therefore, this article intends to determine the influence of the international vicuna fiber trade on the social and economic welfare of the affected regions. Consequently, this report presents vicuna fiber chain trade and determining its contribution to

socioeconomic well-being for local peasant communities.

1. Material and methods

The study area included departments or regions of Ayacucho, Puno, Huancavelica, Junín, Cusco, Arequipa, Apurímac, Lima, Ica, Tacna and Pasco, which are part of the home range area of *V. vicugna* populations, considered in this report like the affected regions (Appendix 1). Departments where populations had zero and negative growth rate (TC = 2000/1997) or populations less than 1.000 vicunas have not been considered in this study. Hence, following these indicators regions of Ancash, Moquegua, Cajamarca, Huánuco and La Libertad were not included. The period of the study was 1995 to 2011.

The primary information collected was through field visits to the department of Ayacucho to know the characteristics of the activity of the vicuna chaccu. Likewise, vicuna fiber gathering centers in Nazca and Lima, and the vicuna fiber industry located in Arequipa. Field data were collected from representatives of Andean communities, forestry and wildlife experts and authorities by surveys. Information on regulations, management documents, and agreements signed for the vicuna trade were reviewed from General Direction of Forest and Fauna Wild. Finally, data from FOB values registered by the CITES Peruvian authority and FOB values from National Superintendence of

Customs and Tax Administration - SUNAT (Peruvian acronym).

Secondary information of the publications on international trade in vicuna fiber (Hoces, 2000, Rosales et al, 2016) and the publications of statistics on social and economic variables (INEI, 2011, INEI, 2012) were reviewed.

The aforementioned data were analyzed and processed to determine the influence of the international vicuna fiber trade on socioeconomic wellbeing of the regions concerned. “The social and economic variables considered, as well as the ranges and levels of sustainability, are based on Rosales methodology” (2014, p. 94).

Social sustainability (SS) was determined according to the variables: the population in poverty (PP), the illiteracy rate (IR) and the infant mortality rate (IMR). Using the INEI data for the affected regions, based on the average data for the period 2000-2010 of the total of the affected regions. The product was determined with the average data obtained from each of the variables.

$$SS = PP \times IR \times IMR$$

The influence of international vicuna fiber trade on social sustainability was determined by the following ranks and levels (Rosales, 2014).

Range	Levels
< 0.9 - 0.7	High
> 0.7 - 0.6	Medium
>0.6	Low

Economic sustainability (ϵ 'S) was determined on the basis of the Gini

coefficient (GC) and the economically inactive population (EIP). Based on data from the INEI statistics for the year 2011, the average data of the affected regions. The product of these variables determines the economic sustainability.

$$\epsilon^{\circ}S = GC \times EIP$$

The influence of international trade on economic sustainability was determined by the adjusted ranges and levels proposed by Rosales (2014).

Range	Levels
> 0.20 - 0.28	High
< 0.28 - 0.3	Medium
< 0.3	Low

The economic benefits from vicuna fiber trade were reviewed on the base trade agreements with Andean Communities and CITES exports permits (Free on board - FOB values) of period 1995 – 2011.

2. Results

2.1 Social and economic aspects related to vicuna fiber international trade

2.1.1 Social and economic characteristics of peasant communities in study area

We registered that peasant community's developed management of vicuna populations during study period, in order to obtain benefits from the vicuna fiber trade from shearing of live animals. The communities through their communal organization systems carried out the management in freedom and in modules of sustainable use, fences where vicunas are in semi captivity breeding approximately 1000 ha. The capture and shearing were carried out in a coordinated

manner with the authorities through a schedule to capture and shearing. The supervision of the different activities related to use of vicuna fiber was carried out by the authorities from capture to export. The authorities corresponded to the General Directorate of Forest and Fauna Wild, now is National Forest and Wildlife Service; the National Council of South American Camelids - CONACS which worked until 2007; and, the Regional Governments through their natural resource office.

The negotiation of vicuna fiber by communities was done through agreements where economic benefits were established per kilogram of fiber or others linked to percentages of retribution as finished products and vicuna conservation activities. The vicuna fiber trade during the first years, over the period 1995-2008, was done through a single sales channel by the National Breeders' Society of Vicuna (Sociedad Nacional de Criadores de Vicuña - SNV del Perú) and a single purchase channel by the International Vicuna Consortium (IVC). This Consortium bought all fiber collected. Subsequently after 2008, the sale of different communal groups to different companies began. The most advantageous contractual conditions found for the communities were established in the agreement between the SNV (as Spanish acronym) and the IVC, since included benefits percentages for finished products and vicuna conservation activities. However, the

mechanisms of transparency and accountability of the SNV management did not respond to the community's needs.

The Andean rural peasant communities benefited were from the Ayacucho, Puno, Lima, Junín, Apurímac, Huancavelica, Arequipa, Cusco, Pasco, Huánuco, Ica, Tacna and Moquegua regions. They were organized into 740 communal committees. They manage vicuna populations in semi captivity breeding and in wild system.

The benefits and their negotiation were related to the social conditions of the communities. The percentage of poverty in the regions affected on average, over the years 2001-2010, was 51.37%. The highest levels of poverty on average for the aforementioned period were higher for Huancavelica (83.35%), Apurímac (71.07%), Puno (70.15% %) and Ayacucho (69.14%) (Figure 1).

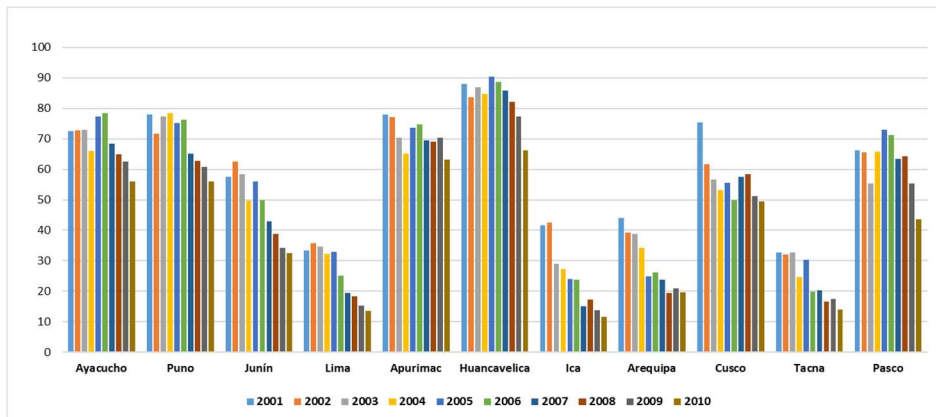


Figure 1. Percentage of the population by Regions in poverty 2001 – 2010.
 Source: INEI (2011).

The average illiteracy rate for the regions affected from 2007 to 2010 was 10.45%. The regions with the highest values of

illiteracy rates were Apurímac (18.28%), Huancavelica (17.96%), Ayacucho (15.5%) and Puno (12.56%) (Figure 2).

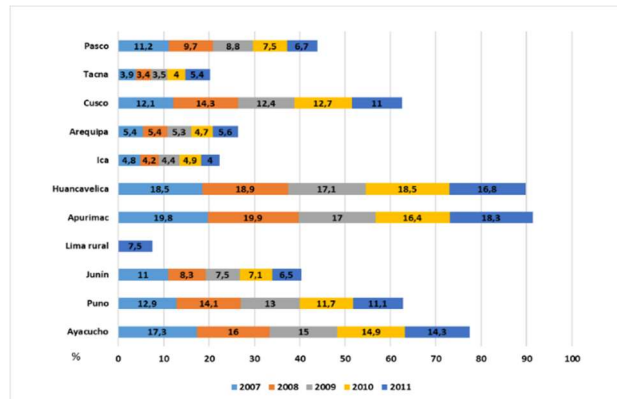


Figure 2. Illiteracy rate (percentage of total population aged 15 and over) by Regions 2007 - 2011.
Source: INEI. Retrieved from <https://www.inei.gob.pe/estadisticas/indice-tematico/sociales/>

The infant mortality rate averaged 21.45 (for every one thousand live births less than one-year-old), the highest values had to Puno (40), Cusco (35) and Huancavelica (27), with increasing tendency to the affected regions with values $y = 2.6364$ and $R^2 = -1561$.

The Gini coefficient of inequality on average was 0.36 and the regions with the highest inequality were Huancavelica (0.42), Cusco (0.41) and Pasco (0.38) Figure 3. The Gini coefficient is a measure of the inequality. It measures the

inequality in income, is a number between 0 and 1, where 0 corresponds to perfect equality (all have the same income) and where the value 1 corresponds to the perfect inequality (one person has all the income and the other none). Data for these variables are presented in 2011.

The economically inactive population in the regions affected was 22.18%, with the highest percentages being the regions of rural Lima (29.2%), Arequipa (28.5%) and Tacna (26.8%).

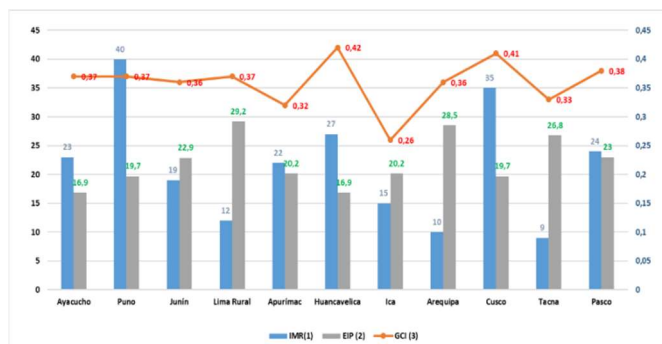


Figure 3. Infant mortality rate - IMR (For every thousand live births below one year), economically inactive population (EIP) and the GINI coefficient of inequality (GCI) the affected regions in 2011.

Source: (1) INEI. Retrieved from <https://www.inei.gob.pe/estadisticas/indice-tematico/sociales/>
 (2) INEI. Retrieved from <https://www.inei.gob.pe/estadisticas/indice-tematico/ocupacion-y-vivienda/> (3) INEI (2012).

2.1.2 The social organization of Andean communities for trade of vicuna fiber

The communities are organized to manage the vicuna populations that habit on their communal lands. The management includes the breeding in semicautivity or the handling in freedom. They, as part of the management, organize chaccu, catch, shearing, control and surveillance against poaching. After the shearing, the fiber is taken to the gathering centers where it is generally cleaned by women of communities who select the fiber and given the primary treatment.

The representatives of the communities negotiate the value per kilogram of vicuna fiber with the representatives of the industrial or export companies, through agreements. On average for the study period, dirty fiber (fiber without cleaning) was valued at US \$385 / kg, clean fiber US \$450 / kg and fiber at 95% purity at US \$ 650 / kg. In the nineties one kilogram of fiber was valued at US \$900.

The National Society of Breeders of Vicuna of Peru - SNV was the representative of the communities. They managed vicuna fiber trade between 1994 and 2008. Later, the communities organized themselves with other legal business representations to realize the trade of its fiber.

In the period 1994 - 2002, the commercialization took place through an agreement between the National Society of Breeders of Vicuna - SNV and the

International Vicuna Consortium -IVC. This agreement established sale profits of the fiber as added value as clean fiber, for monitoring vicuna populations by the SNV, for technical assistance and for the conservation and management of vicuna populations. In addition, a percentage was agreed on the net commercialization price of finished products. This agreement had additions between the period 1994 - 2002 and generated US \$10 711 811 to local communities. Subsequently, the communities entered into fiber sales contracts with LEAF INC, Southern Products, Johnston of Elgin and Mitchell Cia.S.A.

We reviewed the vicuna fiber agreements in the present study, it was found that the trade agreements signed between peasant communities and the companies LEAF INC, Southern Products, Johnston of Elgin and Mitchell Cia.SA, did not established clauses on the percentage of profit sharing final products, as well as it was established in the agreement signed with IVC.

2.2 Social aspects related with vicuna fiber trade

Andean communities carry out the capture and shearing according to an annual program approves by the authority. All the amounts of fiber collected in vicuna chaccus were not exported on the period 1994 to 2011, see figure 4. The years in which the largest amounts of vicuna fiber have exported were 1996 (127%), 1998 (81%), 2004 (83%), 2005 (80%) and 2010 (86%). On

the other hand, 31, 2017 Kg did not export in the period (Figure 4).

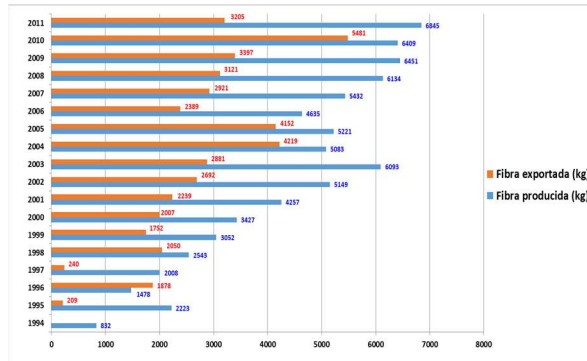


Figure 4. Annual comparison between the quantities fiber collected and fiber exported 1994 - 2011.

Source: CONACS (2007) and DGFFS (2011).

The present research reports the economic benefits of exports based on FOB value that were declared in Peru's CITES export permits. The value of fiber per kilogram was decreasing in relation to

the decade of the nineties. For the period 1994-2000 the average value of one kilogram of vicuna fiber was US \$ 700, for 2001-2006 US \$ 380 and for 2007-2011 US \$ 500 (Figure 5).

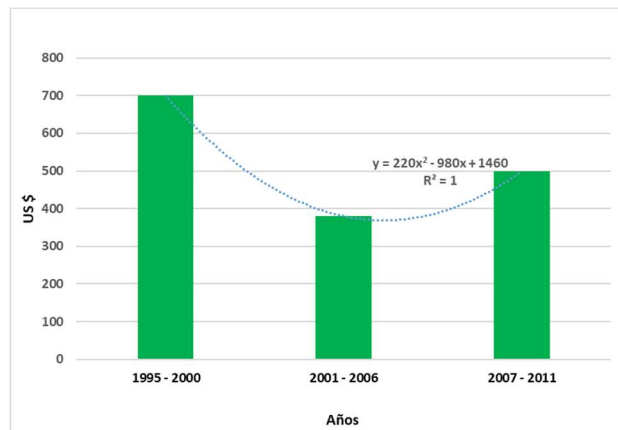


Figure 5. Vicuna fiber FOB value by periods.

Source: DGFFS (2011).

The total FOB value obtained for the period 1995 - 2011 has been US \$ 21 222 281. It was US \$ 5 695 200 for the period 1995-2000; US \$ 6 206 224 for 2001-2006; and, US \$ 9 338 982 for 2007 - 2011. The results of production and trade show that the FOB value has been increased

since increased quantities exported. It had not corresponded to the increase or maintenance FOB value per kilogram of vicuna fiber. On the other hand, it did not have significant value on aggregate value of fiber treatment by Andean communities.

The period 1995 - 2000 it was exported 8 136 kg of vicuna fiber and it was obtained about five million seven hundred thousand American dollars. Between 2001 and 2006 more than doubled, 18,572 kg fiber, of the previous period was exported and six million two hundred thousand American dollars was obtained,

five hundred thousand dollars more. In the period 2007 - 2011 the value of the fiber was recovered, but not enough, generated nine million three hundred thousand American dollars approximately derivate to export 18 125 kg fiber (Figure 6).

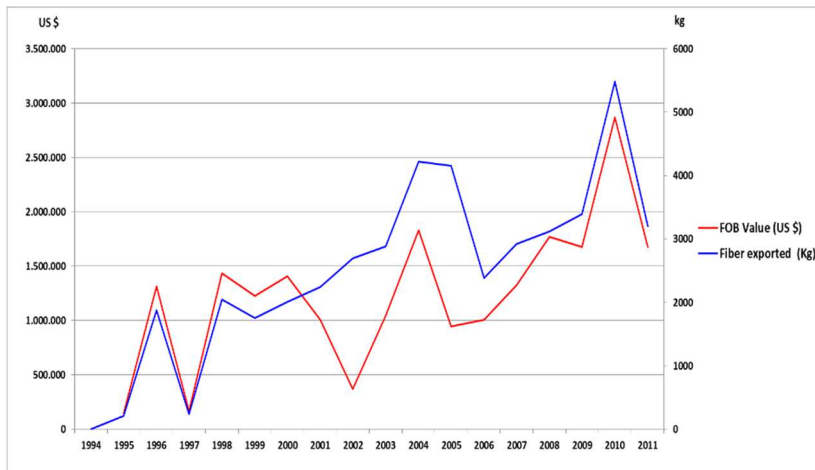


Figure 6. Comparison between fibers exported and FOB value 1994 - 2011.

Source: CONACS (2007) and DGFFS (2013).

The revision of FOB values presented in the SUNAT export statistics for the years 1999-2008, which presented the complete data. It showed that there were significant differences between the FOB values of the fiber exports registered in the CITES export permits and the FOB values registered in the SUNAT, for seven tariff headings. They were: one for fiber (5105392000) and six for vicuna products (5111112000, 5111192000, 5111902000, 5112112000, 5112192000 and 5112202000).

The 78.29% of the FOB values of the exports registered by SUNAT corresponded to the vicuna fiber or hair, 21.71% to vicuna fabrics and 00.1% to

vicuna fabric mixed with synthetic or artificial filaments. The tariff headings are found in Section XI "Textile Materials and their Manufactures" and Chapter 51 "Wool and Fine or Ordinary Hair Products; Yarn and Knitting of Crin". If we compare the FOB values of the vicuna fiber registered in the CITES export permits with the SUNAT FOB values of Chapter 51, they represented only on average 1.56% of the value of the fiber Chapter 51 (1999 - 2008) with ranges were from 0.38% to 2.88%. Fiber and vicuna fabrics exported were not significant at the level of total exports of wool and fine hair or yarn and other fiber fabrics at the national level (Table 1).

Table 1. FOB values of fiber vicuna and vicuna fabrics exported with other textile materials 1999-2008.

FOB US \$ and Percentages	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
FOB CITES vicuna fiber (US \$)	1.226.400	1.404.900	1.007.550	371.318	1.046.390	1.828.985	943.688	1.008.293	1.327.461	1.772.408
FOB SUNAT fiber y fabrics vicuna (US \$)	78.440	102.660	23.640	45.059	76.213	65.552	865.120	521.623	711.238	818.522
CAP 51 - Sección X FOB lana y pelo fino u ordinario; hilados y tejidos de crín (US \$)	63.299.782	65.148.429	82.195.268	97.028.479	95.531.597	63.518.978	65.148.429	82.444.556	97.028.479	95.531.597
% FOB fibra vicuna del FOB CAP 51 – Sección X	1,94	2,16	1,23	0,38	1,1	2,88	1,45	1,22	1,37	1,86

Source: CONACS (2007), DGFFS (2013) and SUNAT. Retrieved from <http://www.aduanet.gob.pe/cl-ad-itestadispartida/resumenPPaisS01Alias> and <http://www.sunat.gob.pe/>

2.3 Vicuna fiber marketing chain

The peasant Andean communities manage the vicuna populations. They carry out the chaccu under a chronogram to do the capture and shearing hair of vicunas. The authorities participate in the chaccu to register the capture of animals and the sheared of vicunas, as well as, the weight of the fleeces per individual. Furthermore, vicuna management plans of the sustainable use committees were approved since 2009. The sheared fiber is registered in "Unique Register of Wild South American Camelids" (Registro Único de Camélidos Sudamericanos Silvestres del Perú – RUCSSP), its transport to the centers of primary

collection and transformation, by a transport official document. In the centers of primary collection and transformation, the communities do the cleaning of the fiber and its registration in the respective RUCSSP (Spanish acronyms).

Vicuna fiber with primary processing is sold to industrialists. It can be processed into clothing products or exported for secondary processing outside the country. Vicuna fiber is label in bags with CITES security stamps, issued by the Peruvian CITES Authority before to export (Figure 7).

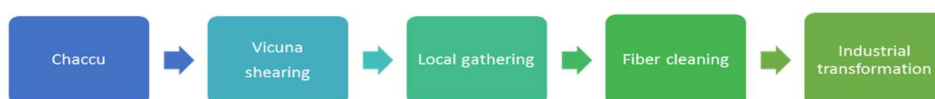


Figure 7. Transformation process of vicuna fiber 1995 - 2011.

Source: Field surveys.

The vicuna fiber exporting companies sign specific agreements with the peasant communities for the transformation of vicuna fiber into final products. Furthermore, they sign agreements with the Peruvian authority for the uses of the Vicuna - Peru trademark in case of industrial products and Vicuna - Peru

handicrafts, for the case of vicuna products in handicrafts.

It is important to emphasize that the authority controls, monitors and supervises all stages until the final industrialization or export, registering in the RUCSSP the fiber, threads, fabrics, cloths and garments. When the secondary industrialization is carried out in Peru, the

final products are recorded. The fiber collected for export is controlled and monitored with CITES security labels. The authority grants the shearing, stocking, primary processing and vicuna fiber acquisition certificates, the latter to authorize the final industrialization. On the other hand, it is important to consider the characteristic of this marketing chain, the representatives of the communities negotiate directly with the industry the payment per kilogram of vicuna fiber and the authority does the supervision step by step on the field.

2.3.1 International vicuna fiber trade and its influence on the social and economic well-being of the affected regions.

The 47 thousand kilograms of fiber exported (Rosales, 2016, p. 6) have generated social benefits for Andean communities at 81% distribution area regions in period 1995 - 2011. This generated FOB value of twenty-one million American dollars. However, it only accounts 1.56% of Peruvian total fibers exports. This different kind of fibers included wool, yarn, fabrics and fiber different kind from vicuna fiber. Hence, it was not significant at the level of total fiber exports in that period.

2.3.2 Influence of the international vicuna fiber trade in the social welfare of the affected regions.

We worked with social variables corresponding to period 2001 – 2010. These data were used to calculate influence on social welfare. In this period

29 857 kg of vicuna fiber were exported corresponding US \$ 12 850 866 FOB value. This FOB value must have generated social benefits for the communities that have participated on its management during that period. In this regard, social sustainability was determined for the period indicated.

In this sense, the social sustainability (SS) according to the social variables studied, taking the averages of the period 2001 - 2010 for the affected regions, give us results of a population with 51% in poverty in the affected Regions, 10.45% illiteracy rate and 0.21 infant mortality rate. The expected positive values of social welfare would be those that approach one, the values of human populations that are not in poverty, is not illiterate and does not present infant mortality, giving the following results: $SS = 0.49 \times 0.90 \times 0.79 = 0.34839$.

It has a low level of social sustainability 0.34839, approximately one-quarter of the population, especially rural, do not have social welfare in the affected regions. Consequently, the international trade of vicuna fiber did not have influence on the social or economic welfare of the affected regions. Likewise, the approximately US \$ 13 million generated from FOB value in that period, did not have influence on the social welfare of the affected regions.

2.3.3 Influence of the international vicuna fiber trade in the economy of the affected regions.

Vicuna fiber exportation generated US \$ 21 222 281 in period 1995 - 2011, which had to create economic effects of the affected regions. In this regard, we determined economic sustainability with data of the last year of the study period.

Economic sustainability ($\varepsilon'S$), according to the variables Gini coefficient was 0.36 and the economically inactive population was 0.22, both average for the affected regions, giving the following results: $\varepsilon'S = 0.36 \times 0.22 = 0.0792$.

International vicuna fiber trade had low-level influence (0.0792) on the economic well-being of the affected regions. The US \$ 21 million generated from FOB value has had a low influence on the economic well-being of the affected regions.

Consequently, the international trade of vicuna fiber did not have influence on the social or economic welfare of the affected regions since the benefits sharing did not develop social and economic sustainability.

3. Discussion

The fair and equitable sharing of benefits is a condition for achieving the sustainable use of components of biological diversity and their products. The Convention on Biological Diversity develops among its objectives the fair and equitable sharing of benefits arising from the use of genetic resources. It focuses on genetic resources in its Articles 1 and 15, through mutually agreed terms (CBD, 1993). It is important to emphasize that

sharing benefits derive from biological resources, including their natural derivatives, and of the ecosystem services does not develop explicitly on this Convention.

On the other hand, the legislation related to the management of the vicuna, Legislative Decree 653, Law No. 26496 and its regulations: Supreme Decree Nos. 048-91-AG and 007-96-AG, respectively, the latter modified by Supreme Decree No. 008-2014-AG, include as benefits to peasant communities the delivery of vicuna herds that are distributed on their lands for the usufruct of the vicuna fiber of live sheared animals. In this regard, Hoces (2000, p. 224) referred that

The Government issued Law No. 26496 that determines the Regime of Property, Commercialization and Sanctions for the Hunting of Species Vicuña, Guanaco and its Hybrids. This law gives property vicuna populations to the peasant communities, assuring the greater and fair benefits in their favor and establishes severe penalties for poaching, which guarantee the preservation of the vicuna specie in favor of its sustainable use.

However, Liechtenstein et al. (2002, p. 67) concluded in their study that

management of the vicuña could have a very important social impact and be a way to promote the development of the Andean communities, but this rich opportunity is not being taken advantage. The lack of significant direct and indirect benefits to the communities translates into a limited social impact of the project. The lack of equity in the distribution of benefits translates into a decrease interest participation of community members into vicuna conservation.

The present study found that international vicuna fiber trade from vicuna live sheared animals, has had a low influence on social sustainability (0.34839) and a low influence on economic sustainability (0.0792). The social conditions at the affected regions did not give facilities to sharing benefits to peasant Andean communities. Unfavorable conditions were their poverty levels, illiteracy rate and infant mortality. These data can be better visualized considering that the conditions were more unfavorable in the affected regions with the highest number of vicunas: "Ayacucho (30%), Puno (19%) and Huancavelica (11%), on the base of the last vicuna population's census" (DGFFS, 2014, p. 2). Which has a relation with their illiteracy levels of 16%, 13% and 18% and infant mortality rate of 23, 40 and 27 (per thousand live births under one year). In addition, Appendix 2 shows the positive correlation of 0.4428 between the percentages of chronic malnutrition and the number of vicuna individuals. Therefore, there is correlation between the affected regions that have larger populations of vicunas and the highest percentages of chronic malnutrition (Ayacucho 35%, Puno 21% and Huancavelica 54% as a percentage of total children under 5 years of age). Likewise, other driver was the growing population, the affected regions had a total growth of 261% in 2007 related with population in 1940 (Appendix 3).

These conditions were reflected on lack communal capacity to control and ensure the effectiveness of their representatives, the National Breeders' Society of Vicuna - SNV. There were many complaints and impeachments due a non-transparent management from SNV. Hence, this effect caused delays and not transference economic benefits to Andean peasant communities, according to surveys results from communal representatives of committees of Cusco, Apurímac and Ayacucho. "Poor management of funds and lack of participation in decision-making within communities undermine project sustainability" (Liechtenstein et al., 2002, p. 67).

The communal committees of the affected regions were approximately 740. They received US \$ 11 million from International Vicuna Consortium - IVC during period 1994 - 2002. Therefore, each committee per year received US \$ 1 858. Furthermore, they received US \$ 21 million from FOB value on period 1995 – 2011, corresponding US \$ 28 378 to income each committee per year. These economic figures had a low economic sustainability with a consequent low social sustainability. "Moreover, taking account that there were 150 000 rural families involved" (Tuppia, 2008, p. 8), economic influence per family was US \$ 140 per year. Hoces (2000, p. 227-228) said that "projected the generation of 16 tons vicuna fiber collection and an income approximately US \$ 8 000 000 per year". However, based on FOB values,

the income per year was US \$ 1 312 500 for the study period.

It is indisputable, then, to consider social and economic sustainability under conditions of disadvantageous social variables, with levels of poverty, education and health that are worrying. This case must still take into account that the good to be produced is private with restrictions (only vicuna fiber from live shear) and wild, it is not a product of the human labor force. The shearing of vicuna fiber is carried out in wild populations that depend on the conservation of ecosystems in their functions and processes. The profitability and productivity depends on its function of the randomness of the nature. Under these conditions, the uncertainty of fiber productivity is not competitive in the globalized market, either by volume or by fineness, affecting the profitability in prices per kilogram of fiber and benefits for investors, the peasant communities whom collecting vicuna fiber.

Vicuna populations are more important for ecosystems functions than their direct economic value as fiber. This fiber trade should be integrated with the production of domestic camelids, alpaca and llama. Rosales et al. (2016 p. 10) reported that the FOB value of exports of alpaca fiber for the period 2005-2011 was US \$ 229 371 876.41 and for that same period the FOB value of the vicuna fiber was US \$ 11 272 838. The FOB value of the vicuna fiber corresponding to 4.91% of the FOB value of the alpaca fiber. On the other hand,

exports of fiber and vicuna fabrics were not significant at the level of total exports of wool and fine hairs or yarns and fabrics of other fibers at national level, representing 1.56% their FOB value [0.38% - 2, 88%] in the period 1999-2008. In this regard, Quispe et al. (2009) referred that

difficulties in the commercialization of fiber vicuña as well as guanaco are linked to the lack of an offer in a predictable amount and with the large fluctuations in the price obtained. Both are usual difficulties for producers of special fibers. With small amounts of fiber available and volatile demand, related to fashions and trends, is difficult to plan a sustainable production that guarantees an income to the producer or the community. Of all ways there is a potential that can be tapped sporadically (p. 11).

The international commercialization of vicuna fiber may have a significant social influence, if the social conditions of rural populations will improve, eradicating poverty, increasing investments in education in human economic assets, ensuring access to health and quality food for Andean peasant communities. Lichtenstein (2010) regarded that “the distribution of costs and benefits between and within different stakeholder groups should be revised and made more equitable. Local communities “pay the cost” of vicuña conservation by allowing vicuñas to graze on communal or private land” (p. 116).

Wild biological resources should not be considered as a way out of poverty for rural populations, because they do not fit

as a private good to competitiveness and market forces, given their high uncertainty and stochasticity to generate service supply versus a competitive global market with technological requirements. The excuse to contribute to the gross domestic product and reduce poverty of rural populations, it encourages trade in wildlife species where social and economic sustainability is not significant. Pressure on wildlife affect their ecological sustainability. It is unjustifiable to seek to achieve profitability at the cost of sacrificing ecological sustainability and social sustainability, considering intergenerational and intergenerational equity.

Circumstantial economic growth does not imply economic development of the affected areas in the long term, because although the vicuna fiber is extracted from this area, the expected well-being does not reach the inhabitants of the affected areas as they expected.

Finally, we consider that vicuna management must maintain in wild habitats integrated with the ecosystem approach management. Based on agricultural production, livestock of alpacas and llamas and, nature tourism. The potential vicuna fibre demand should relate with its healthy population and habitat conservation. It is necessary to emphasize the vicuna is a wild animal not a domestic animal, so the market should consider the demand on the base of its conservation. On the other hand, the development of rural populations

depends on the productivity of land, technology and market access. Hence, the economic assets that are the degraded ecosystems of Puna due to desertification processes, soil erosion and general deterioration, must be recovered. Furthermore, it is urgent develop human resources of Andean peasant communities at competitive levels in education, technology knowledge, access to health and nutrition systems, within the framework of sustainable development of Andean culture and moral values.

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Appendix 1

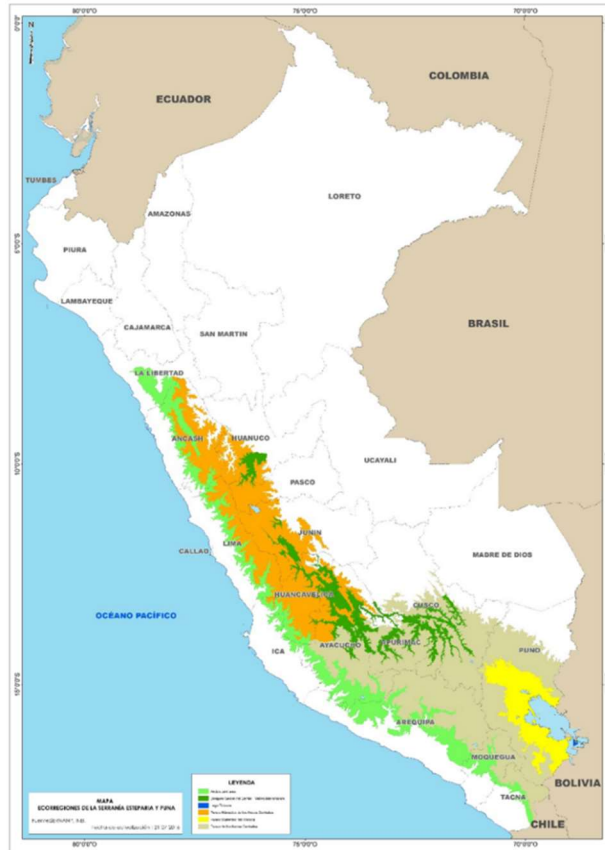
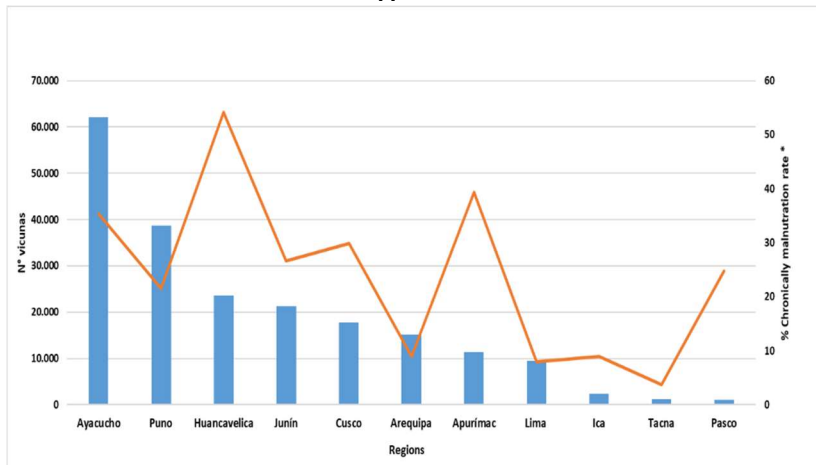


Figure 8. Study area international vicuna fiber trade and its benefit sharing.
Source: Mg. SC. J. Iris Villafani.

Appendix 2



* Percentage of total children under 5 years of age

Figure 9. Number of vicunas and chronic malnutrition rate of children under 5 years (2010/2011), by department.

Source: INEI - Encuesta Nacional de Hogares (ENAHO) <https://www.inei.gov.pe/estadisticas/indice-tematico/sociales/> and DGFFS (2014).

Appendix 3

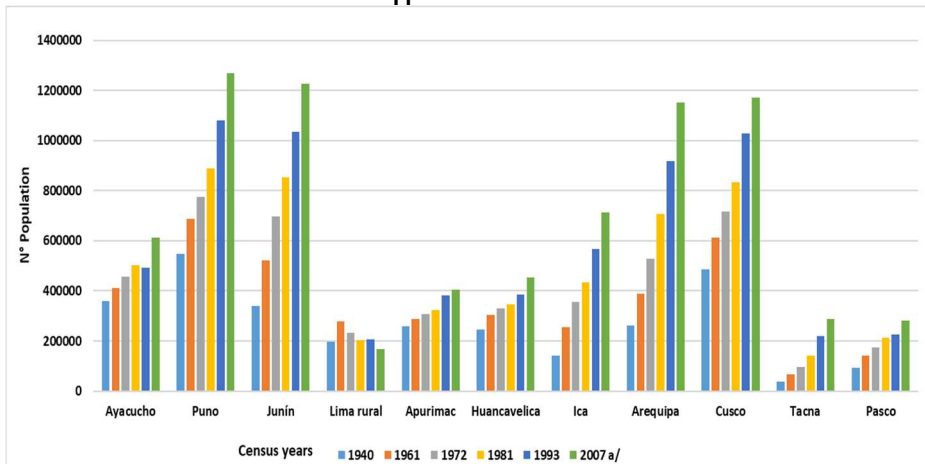


Figure 10. Human population census of the affected regions 1940, 1961, 1972, 1981, 1993 and 2007.

Source: INEI <https://www.inei.gov.pe/estadisticas/indice-tematico/poblacion-y-vivienda/>