International Trade in Vicuna Fiber and Its Influence on the Conservation Status of Populations of Peru

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Abstract

International trade of vicuna fiber (Vicugna vicugna) and its products were made by the countries of Argentina, Bolivia, Chile, Peru and the United Kingdom. Peru was the main exporter of fiber, recorded significant volumes from the inclusion of their populations in Appendix II of CITES in the decade of the nineties. It exported 82% of the total quantities, 47,319 kg of fiber corresponding to 241,423 sheared vicunas for the period 1975-2011.

Ecological sustainability of vicuna populations for the study period was 0.6261, showing that international trade fiber of vicuña populations have had positive influences on its conservation condition with a middle value. However, these values must take into account the negative drivers vicuña populations, such as poaching, main driver. For that, it is need to prioritize the management of vicuna populations in its habitats than manage in captivity, seeking to diversify economic options to offer at the market, based on goods and services generated by Andean ecosystems, integrating vicuña population conservation, its habitats with landscape approach.

Keywords: Trade, Fibre, Vicuna, Conservation, CITES.

1. Introduction

The vicuna (Vicugna vicugna) populations are two geographical subspecies at South America. Vicugna vicugna vicugna (Molina, 1782) light-colored, the white color reaches half of the ribs and the anterior region of the hind limbs and have no tuft on the body; and, Vicugna vicugna mensalis (Thomas, 1917) has a vicuña color and pectoral tuft.

The international trade of vicuna is only allowed its fiber, derived from the shearing of live animals and their finished products. It is regulated by the International Convention on Endangered Species of Wild Fauna and Flora - CITES. Vicuna populations are found in Appendix II and I; are listed in Appendix II populations of Argentina (the populations of the Provinces of Jujuy and Catamarca and the semi-captive populations of the Provinces of Jujuy, Salta, Catamarca, La Rioja and San Juan); Chile (population of the First Region); of Ecuador (entire population); of Peru (the whole population); and the Plurinational State of Bolivia (the whole population); all other populations are included in Appendix I of CITES (CITES, 2016). Vicuna populations of Ecuador were introduced from Peru, Chile and Bolivia (Lichtenstein et al., 2002).

Globally, Argentina, Bolivia, Chile and Peru have traded vicuna fiber and finished products. On the other hand, Belgium, Italy, UK, Switzerland and France have produced finished garments. Peru has been the largest exporter of fiber, recorded significant volumes since vicuna populations were included in Appendix II of CITES. The experience of Peru and Chile supported the vicuna management experiences in South America.

Vicuna populations are threatened by poaching for trade their fine fiber in the international market, its biggest negative driver. Others drivers are: lack of manage and handling of high Andean grasslands; irrigation infrastructure which deriving water of high Andean wetlands for agricultural use, affecting the health of vicunas for dependency on high Andean wetlands (Rosales, 2014); and, handling semi captive in some regions or departments, it can exceed 40% of its total population, according to analysis of data from the last population assessment of vicunas on 2012 by the Ministry of Agriculture and Irrigation (MINAGRI, 2014). The shear of live vicuna populations has occurred since the period of the Inca Empire through Chaku. In the Viceroyalty of Spain, the indigenous people paid taxes with vicuña wool; therefore, it was regulated and in the Republic Period, it was maintained. The high commercial value and uncontrolled extraction forced the establishment of protective measures and regulation that has prohibited hunting vicunas until today (Annexes 1 and 2).

This study presents the analysis of international trade in vicuna fiber considering the global and Peruvian context; management of vicuna populations and their habitats. The questions are: vicuña populations of Peru have ecological
sustainability to maintain international trade? And how has it influenced on conservation status of vicuna populations? Research studied the period 1975 - 2011 at the area geographic range habitat of *V. vicugna mensalis*, hereinafter *V. vicugna* or "vicuna".

2. Objectives

Diagnose whether populations of vicuna (*Vicugna vicugna*) have ecological sustainability to keep international fiber trade. Know the influence of fiber international trade of *V. vicugna* on its conservation status.

3. Methodology and sub headings

The study area corresponded of the departments: Ayacucho, Puno, Huancavelica, Junín, Cusco, Arequipa, Apurímac, Lima, Ica, Moquegua, Tacna, Pasco, La Libertad, Ancash and Huánuco that are part of the habitat of *V. vicugna* populations (Annex 3) for the study period 1975 - 2011. Cajamarca is not considered be part of the natural range of this species.

The study was carried on the period 2009 - 2013. The study had three steps. Recompilation of background vicuña information: biology, population ecology, management and trade vicuna fiber. Realized evaluation on the field: surveys to representatives of communities and the experts; visits to chaku activities in Ayacucho and fiber centers in Nazca and Lima, as well as the industry of vicuna fiber in Arequipa. Systemization and analysis the information.

The data referred to were integrated to determine the ecological sustainability indicator to establish the influence of international trade of fiber on the conservation status of populations of *V. vicugna*, through the following modified model (Rosales, 2014):

\[ ES = P \times H \times \text{Habit} \]

**ES**: Ecological sustainability.

**P**: current population sheared in relation to the original sheared population according to their average growth rate.

**H**: Harvesting (natural death, management and poaching).

**Habit**: Current Habitat in relation to the original (regions or departments with records of declining populations).

Sustainable levels listed below in ranges, which has been determined by mathematical calculations of optimal scenarios for high, medium and low. One close values represent higher probability of ecological sustainability. The ranges and levels of indicators of ecological sustainability are detailed below:

<table>
<thead>
<tr>
<th>Ranges</th>
<th>Levels</th>
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<tbody>
<tr>
<td>0.9750 - 0.875</td>
<td>Alta</td>
</tr>
<tr>
<td>Less than 0.875 - 0.360</td>
<td>Media</td>
</tr>
<tr>
<td>Less than 0.36</td>
<td>Baja</td>
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</table>

4. Result/Findings:

National Vicuna Populations

The analysis of vicuña populations showed an increase of 66,559 in 1994 to 118,678 vicunas in 2000. However, growth rates have declined from 0.55 (1997/1994) and 0.15 (2000/1997). It is important say that evaluations of vicuna population carried on the field were the years 1994, 1997 and 2000, the other data were elaborated on the base of the populations estimates (Fig. 1).

The analysis of growth rates showed increase in Tacna, Pasco and Ancash and decrease in Lima, Junín, Huancavelica, Ayacucho, Apurímac and Puno, with significant amounts (Fig. 2).

More than 80% of the population was in six of sixteen departments or regions, Lima, Junín, Ayacucho, Apurímac, Huancavelica and Puno. The regions of Ayacucho and Puno have presented the largest populations of vicuna, with the exception of Lima in 1994. The increment of individuals in populations by region or department had no correlation with increases in population growth rates a national scale. Growth rates by region are on average 0.21 [-0.78 to 0.811] for 1997/1994 and 0.02 [-0.84 to 0.69] for 2000/1997 that are not considering data Cajamarca and Pasco. The Cajamarca populations were introduced. They are result of stocking programs in the provinces of Cajamarca and Contumaza managed by community organizations. Table 1.

The structure of the population in the assessments made for 1994, 1997 and 2000 showed that the percentage of offspring on average was 17% and females 56% of the population. Values of hatchlings 17.47% in 1994; 16.64% in 1997; and 18.28% in 2000, corresponding to 56.82%, 55.71% and 55.18% of females, in those years, respectively.

Management of Vicuna Populations.

The vicuna populations have managing under two mechanisms: modules sustainable use, and the wild management. The objective is gotten the fiber from live animals sheared. Holders management are rural communities and natural or legal persons on whose land is naturally distributed vicuna. The management of populations of vicuna includes actions of repopulation, this mainly to manage them in semi-captivity in sustainable use modules. These holders must have their management plan that need to be approved by the Forest and Fauna Authority. Most approved management plans are in the departments of Ayacucho (34%) and Huancavelica (57%). Regional Governments are the agencies that assist and build capacities of local communities on the management of vicuna populations. Before 2009, was done by the National Council of South American Camelids (CONACS).

Analysis of the records of repopulation period 1979 - 2010 showed Ayacucho, especially Pampa Galeras, these populations corresponded to the Central Andes of Peru, 5,861 vicunas transferred to Junín (1,012), Huancavelica...
(2.222) Arequipa (152), Ancash (208), Ecuador (200), Cajamarca (435), Pasco (122), La Libertad (550) and Apurímac (960). The repopulation was occurred in genetically distinct populations (4,119 vicunas): 1,134 vicunas were transferred of the Central Andes to Central Andes Orientals, 985 of Central Andes to the North Andes - Central and 2,000 of the Southern Andes to the North Andes - Central. In total it has made the repopulation of 9,980 vicunas, data systemized and analyzed on the base of the reports of the National Council of South American Cameldids - CONACS and Forestry and Wildlife, taking account of genetics studies on vicuna population in Peru (Wheeler et al., 2001).

The Andean communities have organized to manage and control the illegal poaching since 1996. The major proportion of them are in the regions of Puno, Ayacucho, and Lima y Apurímac.

The capture and shearing of vicunas is given during the "chaku" during the months of May to November each year, which makes by specialized personnel, separating the females in gestation, young and give sanitary treatment. Analysis of vicuna capture showed it increased annually during the period 1994 to 2003, decreased from 2004 to 2006 and then again increased during the period 2007 to 2010. The number of vicunas sheared have had the same curve. However, the fiber sheared has not had the same behavior since 2008. The proportion of vicunas captured and vicunas sheared has had an averaged 2.3, at ranges 1.7 to 2.6. The percentage of sheared vicuna of the captured was 47% during the period 1994-2005 and 39% from 2006 to 2010. However, the number of vicuna sheared increased since 2008 until 2010, due vicuna growth population. Fig. 3

Fig. 1. Vicuna Population period 1965 - 2011

Table 1. Rates of population growth (RPG) of vicunas by region

<table>
<thead>
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<tr>
<td>Ayacucho (AY)</td>
<td>0.88</td>
<td>0.21</td>
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<tr>
<td>Puno (PU)</td>
<td>0.66</td>
<td>0.27</td>
</tr>
<tr>
<td>Lima (LI)</td>
<td>0.38</td>
<td>0.04</td>
</tr>
<tr>
<td>Junin (JU)</td>
<td>0.48</td>
<td>0.09</td>
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The capture, shearing and gathering vicuna fiber were carried out by Andean communities with national or regional authorities as supervisors. The fiber, yarns, fabrics and garments of vicuna were recorded in the "Register of Wild South American Camelandids of Peru".

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<table>
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<tbody>
<tr>
<td>Apurímac (AP)</td>
<td>0.09</td>
<td>-0.13</td>
</tr>
<tr>
<td>Huancavelica (HUANC)</td>
<td>2.55</td>
<td>0.30</td>
</tr>
<tr>
<td>Cusco (CU)</td>
<td>0.52</td>
<td>0.49</td>
</tr>
<tr>
<td>Arequipa (AR)</td>
<td>0.39</td>
<td>0.27</td>
</tr>
<tr>
<td>Ica (IC)</td>
<td>0.00</td>
<td>-0.18</td>
</tr>
<tr>
<td>Tacna (TA)</td>
<td>0.48</td>
<td>0.69</td>
</tr>
<tr>
<td>Ancash (AN)</td>
<td>-0.10</td>
<td>0.15</td>
</tr>
<tr>
<td>Pasco (PA)</td>
<td>-0.78</td>
<td>5.24</td>
</tr>
<tr>
<td>Moquegua (MO)</td>
<td>-0.77</td>
<td>0.00</td>
</tr>
<tr>
<td>Cajamarca (CA)</td>
<td>0.00</td>
<td>2.26</td>
</tr>
<tr>
<td>Huánuco (HUA)</td>
<td>-0.63</td>
<td>-0.84</td>
</tr>
<tr>
<td>La Libertad (LL)</td>
<td>0.88</td>
<td>0.88</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>0.88</td>
<td>0.88</td>
</tr>
</tbody>
</table>


**Fig. 2.** Population growth rates of vicuna by regions 1997/1994 and 2010/1997

![Population growth rates of vicuna by regions 1997/1994 and 2010/1997](source)


**Fig. 3.** Number of vicunas captured, vicunas sheared and production of fiber in kilograms 1994-2010.

![Number of vicunas captured, vicunas sheared and production of fiber in kilograms 1994-2010](source)

Source: CONACS (2007), MINAG (2008) and MINAG (2011) a,b

The ratio of the number of vicunas sheared and fiber production period 2001 to 2010 has had an average of 5.4 vicunas for obtaining a kilogram of fiber for this period. While, the average for the period 1994 - 2000 was 4.77 vicunas per kilogram of fiber. The correlation of the vicunas captured and vicunas sheared vicuna was 0.9920, and of the vicunas sheared and fiber production was 0.9959 (Fig. 4).

The vicuna fiber has come from wildlife management 50% and the other 50% from modules of sustainable use. The last two years 2009 and 2010 came 55% from wildlife management origin and 45% of sustainable use modules (fences). However, the early years of this decade fiber production in greater proportion came from the fences management, between 2002 and 2004 85% of vicuna fiber proceeded from the fences management and 15% from wildlife management. The figures 3, 4 and 5 showed that vicuna populations have been increasing at national level but fiber production by sheared vicuna has decreased. On average, during the years 1994 - 2000 the production of fiber having a sheared vicuna was 211 gr, for 2001-2006 was 189 gr and the 2007 - 2010 was 176 gr. It is also important to note that the number of captured and sheared vicuna has increased; however, the amount of fiber obtained by vicuna has decreased by 17% compared to the early years of shearing.
The estimate of vicuña populations nationwide with capture data and annual percentages indicated that approximately 40% of the population is captured during the Chaku. In the year 2010, 97,376 vicunas were captured. Thus, vicuña population per that year was estimated at 243,440 individuals. On the other hand, growth of the population between the years 1997 - 2000 was 5%. With these data we can infer that from 2000 to 2010 the population has grown by 50% compared to year 2000. On the basis of the population in the year 2000 was 118,678 vicunas could be inferred that the population in 2010 would be between 243,440 to 178,017 individuals, with an average of 210,728.5 individuals.

International Trade Vicuna

International trade in vicuña fiber sheared from live individuals, is regulated by CITES. All of these populations were found in Appendix I in the period 1975-1987, trade was banned. Peru and Chile were the first countries that submitted proposals to CITES to transfer vicuña populations to Appendix II. These conservation and management efforts were supported by the "Convention on Conservation and Management of the Vicuña", this has been the place where Argentina, Bolivia, Chile and Peru have built capacities and catalyst to strengthen the management of vicuña populations in the region.

The International Trade of Vicuña from Peru

Exports in specimens of vicuña from Peru have been of plates, leather products, fiber, skins, live animals, cloths, garments and bones (Fig. 6). The largest quantities exported were of fiber, cloth and garments. The vicuña garments were exported in greater proportion to Japan, USA, Germany and UK. Exports of vicuña hair fibres have had continuous growth from 1995 to 2001. The main countries of destination of the fiber have been Italy, France and Japan. The years of higher fiber export volume were 1996, 2004 and 2009 (Fig. 7).

![Fig. 6. Peru's total exports of fiber, cloth, garments, parts and derivatives of](image)

Source: WCMC (2013)

![Fig. 7. Total exports of vicuña fiber in kilograms 1975-2011.](image)

Source: WCMC (2013)
Records of vicuna fiber exports for the period of study from WCMC and CITES Authority in Peru are not correspond each other. The calculation of exports of vicuna fiber exported 1975 - 2011 by WCMC (2013) was 47,319 kg and 41,198 kg by the CITES Peru’s Management Authority. The great differences were in 1996, 2005 and 2009, it recorded 6.121 kg vicuna fiber of difference between of WCMC and CITES Peru data (Fig. 8).

Vicuna Poaching

Poaching of vicuña has been linked to fiber demand in the international illegal market exit borders with Bolivia and its transfer to Chile, with the final destination to Europe, according to the surveys conducted.

Andean communities, organized through committees of monitoring and control, have confronted with poachers in disadvantage. Poachers were equipped with armaments with high-technology. They use weapons for hunting with telescopic sight vicunas and transport with wheel drive vehicles for a quick leak and get out from Andean geography difficult.

The departments that have suffered the highest incidences of poaching during the period 1994 - 2011 have been Lima, Huancavelica, Ayacucho and Apurimac. Major poaching incidents in Ayacucho have been taking place in the buffer zone of the National Reserve of Pampa Galeras in the province of Lucanas, for that reason in 2010 rural communities and private associations formed a consortium to strengthen control actions and monitoring of vicuna populations.

Analysis of data from poaching during the period 1994 - 2011 has had a greater impact 1994 - 1997; 2002 - 2007; and 2009 - 2010. The trend until 2010 has been increased (Fig. 9). This illicit activity occurs in the months of May to November, with the participation of people of Andean origin who know the area who work for international organized gangs. The number of dead vicunas, according to the reports found, by this illegal activity for the mentioned period was 13.053 vicunas, corresponding to 2.558,39 kg vicuna fiber on average. This fiber is valued in the range of US $ 787.969 - US $ 2.302.506 dollars. Also, must consider the loss of each vicuna, with worth a minimum of US $ 7.911 dollars. In this regard, the economic total value of 13.053 dead vicunas by poaching was US $ 103.262.283 dollars.

Trafficing routes vicuna fiber are Huancavelica - Ayacucho - Arequipa - Puno and Bolivia; Lima - Ayacucho - Puno - Bolivia; Lima - Pasco - Junín - Huancavelica - Ayacucho - Cusco - Arequipa - Puno and Bolivia; and Arequipa - Cusco - Puno Bolivia. The fiber goes to Bolivia, then leaves to other countries.

The Influence of International Fiber Vicuna Trade in Their Conservation Status.

The ecological sustainability of the stocks of vicuña was determined depending on the potential population based on the current population sheared in relation to the original sheared population.

Current population sheared in relation to the original sheared population according to their average growth rate (P).

The original sheared vicuna population was 7,145 in 1996, from an estimated population of 90,323 vicunas; in 2000 were 16,956 vicunas of a population of 118,678 vicunas evaluated; and in 2010 of 37,410 vicunas shorn of an estimated total population of 210,729 vicunas. They presented a positive rate of 1.30 by the increase in population growth rate.
Harvesting (natural death, management and poaching) (H).

The harvest was determined according to indicators of natural death (5%), management (1%) and poaching (8%), leaving for potential harvest index 0.86.

Current Habitat in relation to the original (regions or departments with records of declining populations) (Habt).

The current habitat in relation to the original, was fixed based on the reduction of stocks, it shows a reduction of 44% (decrease of population in seven regions of the sixteen), leaving for potential rate of 0.56 current habitat. The determination of loss indicator habitat conditions for viable populations of vicuña, is related, among others, by poaching, the non-management of pasture, competition with domestic livestock, the loss of wetlands, the cold spell, which generally they constitute cumulative effects, data derived from surveys.

Ecological sustainability (ES)

Resulting ecological sustainability (ES) of 0.6261, showing that international trade of vicuña fiber had positively influences in their ecological vicuña population conditions with an average value, to maintain this international trade in vicuña fiber.


Fig. 9. Dead vicunas per year due to poaching for the period 1994-2011

5. Discussion

The influence of international trade in vicuña wool in its state of conservation is Threatened" by national legislation, Decree Supreme N° 004-2014-MINAGRI. However, vicuña populations were in "Vulnerable" category in 1977 (Ministry Resolutions N° 01710-77-AG/DGFFS and 01082-82-AG/DGFFS) and then passed to "Near Threatened" in 2004 (Decrees Supremes N° 034-2004-AG and 004-2014-MINAGRI). The evolution of vicuña status conservation has been favorable. It has related with the access of the vicuña fiber and garments to the market. Furthermore, benefit sharing within Andean communities, strategic actors to improve governance and fight against vicuña poaching.

This study found an indicator of ecological sustainability medium 0, 6261, giving positive influence of international trade in vicuña fiber, derived from live animals sheared. This economic activity uses vicuña fiber without killing animals of population, giving priority to increase vicuña populations to gain higher economic benefits. However, the results of last population assessment of vicuña made in 2012, by MINAGRI, have maintain the same trend reported in this investigation, the populations recorded decrease of the percentage of offspring 13% with respect of the total population. With regard to the years 1994, 1997 and 2000 the percentage of them were 17.47%, 16.64 and 18.28%, respectively.

On the other hand, the demand of international trade in vicuña wool was influenced to increase the shearing and seek population increase of 66,559 vicuña in 1994 to 208,899 vicunas in 2012. In this regard, the objective has been increase populations through increasing in the number of modules of semi-captivity fence. In 2004, 17% of the population have been in semi-captivity and by 2012 30% of the population have been in fence modules. Other negative effect has been poaching with high-tech equipment, lack of patrol and an inefficient control drove to decrease vicuña population in the regions of Lima, Huancavelica, Ayacucho and Apurimac. The illegal vicuña killing has maintained since many years ago, for example this crime caused the death of 45,000 vicunas in the period 1989 -1993 (Lichtenstein et al., 2002).

Furthermore, one has to say that repopulation activities depend on responsible stewardship, and control...
commitments taking into account genetic groups of vicuña’s population. It has not been positive in Ancash and Apurímac. Populations of vicuña at La Libertad region have had a high influence on the repopulation.

The influence of international trade on the conservation status of populations of vicuña has been directly related to increasing their populations by market demand, rather than managing the grasslands and recovery of degraded habitats, especially in the sustainable use modules with poor and very poor grasslands. 70% of vicuña population live in regular grasslands conditions and 12% in poor condition (MINAGRI, 2014). There is still lack of policies to prioritize the recovery of degraded grasslands, as part of the management of populations of vicuña.

To face climate change, vicuña management should take account the percentage variations in rainfall by 2030 (MINAM, 2015). The projection of the variation would be between -10 to -30 precipitation at the home range of vicuña populations. Then, considering that drought is a negative factor, hydrology projects such as Chavimochic (La Libertad), Chinecas (Ancash), Pichis Palcazu (Junín), Tambo Ccaracocha (Ica - Huancavelica), Rio Cachi (Ayacucho), Majes Sihuas (Arequipa), Pasto Grande (Moquegua) and Tacna must conserve grasslands and Andean wetlands especially. Irrigation projects are laudable for food security and economic growth; but, it is required sincerer efficiency of water use for agriculture. Irrigation projects should consider the wetlands as sources of water for human and vicuña populations. It is required to improve the efficiency of water use in irrigation technology for agriculture uses. It is not understand how agriculture activity use 87.7% of surface water (MINAM, 2014).

The stewardship of populations in semi captivity has contributed to the increase in vicuña populations, but this management has carried to concentrate 80% of the population in 38% of its home range; reduction the percentage of breeding structure the population; and, decrease fiber production in 17%. Therefore, it is important to handle them as wild species. This management of vicuña population should integrate with eco-tourism, services provided by rural communities organized; enhanced with policies that ensure the safety of tourists and infrastructure in all areas required for rural areas of the country; and, rethink the institutional management of vicuña populations in Peru.

In this regard, integrated wild vicuña management in their natural habitats, keeping the breeding of domestic camelids such as alpaca. It is necessary to invest in improving alpaca wool quality, which since 2008 has exceeded four thousand tons of production, generates more than 25 million dollars annually in FOB value. The FOB value of exports of alpaca fiber for the period 2005 - 2011 was US $ 229,371,85719 and vicuña fiber was US $ 11,272,838 corresponding to 4.91% of the FOB value of alpaca fiber.

So the question arises whether the ecological sustainability of vicuña populations to maintain international trade in its fiber that generates benefits to rural communities, requires increasing the number of modules of sustainable use?, or offers of goods and services Andean ecosystems, are more vital to ensure the access to market?, as alpaca fiber production with high quality, eco-tourism in all its forms, native crops, water, among others integrated with vicuña management in wild. Vicuña populations in wild are vital for generating those ecosystem goods and services. There is need to prioritize the management of populations in wild, seeking to diversify economic options of the ecosystems services offers, looking for the integration of conservation of the vicuña populations with the conservation of their habitats and its landscape.

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References


19. SUNAT. Datos de las exportaciones de las Partida Nro 510219100 (pelo fino alpaca o de llama) y la Partida Nro 510591000 (pelo fino cardado o peinado de alpaca o de llama) para el periodo 2005 – 2011[acts exports of heading No. 510219100 (fine alpaca or llama hair) and Item No. 510591000 (fine hair carded or combed alpaca or llama) for the period 2005 to 2011]. [online] Available at http://www.conopa.org/publicaciones/div_genetica_manejo_poblaciones_vicuna.php [Accessed 05 December, 2012].


Appendix


"The Inca did not allow hunting to prevent the Indians became lazy and they did not give the necessary to their homes. No one could break the law of the Inca, as its laws were not made that nobody to be laugh of them". (Inca Garcilazo de la Vega)


Annex 2. Laws of protection of vicuña populations from the Inca Empire, Viceroyalty and Republic of Peru

Source: graphic http://www.genial.ly/Editor/index/557e861b7ee14b1454545c9f#
Annex 3. Study area of international trade in vicuña fiber