



**VOLUME IV**

# LATIN AMERICA

**Opportunities for rangelands restoration  
through livestock value chains.**

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# EXECUTIVE SUMMARY

Sustainable livestock value chains in Latin America's rangelands offer significant restoration and economic opportunities. However, success depends on aligning standards, ensuring equitable community participation, and fostering private-public investment models to maximize environmental and social returns across the region's diverse rangeland landscapes.

Sustainable Investments for Large-Scale Rangelands Restoration (STELARR) provides an in-depth overview of key livestock value chains for camelids (vicuna, guanacos, alpacas, and llamas) beef, sheep and goats amongst other, and highlights the challenges and opportunities for achieving sustainable production and explores their potential to reverse rangeland degradation, reduce poverty, and create inclusive livelihoods, particularly for women and youth.

The private sector is beginning to adopt regenerative practices through product certifications (e.g., Responsible Alpaca Standard) aimed at supporting biodiversity and sustainable soil management. Currently, the benefits of such certifications favor large exporting firms over local communities, presenting an opportunity for community-based models and investment partnerships.

For brand owners and exporters, investment in local production through initiatives such as traceability and certification offers the potential for high-impact restoration and value creation. Notable examples include investments by brands such as LVMH's Loro Piana in vicuña preservation, which showcase the role of private investment in high-value chains. A coordinated Rangeland Standard, as suggested by STELARR partners, would provide consistency across varied household production systems, allowing brands to make reliable sustainability claims.

The GANSO standard system for high-value beef further illustrates how certification linked to financing and stakeholder engagement can drive rangeland preservation and increased productivity. Through shareholder models and seed capital, GANSO supports sustainable grazing systems that yield economic and environmental benefits.

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# CONTENTS

<b>EXECUTIVE SUMMARY</b>	<b>3</b>
<b>THE LATIN AMERICAN REGION</b>	<b>6</b>
<b>THE ANDEAN AND PATAGONIAN RANGELANDS: CAMELIDS</b>	<b>8</b>
<i>Vicuña (Vicugna vicugna)</i>	11
<i>Overview</i>	11
<i>Guanacos (Lama guanicoe)</i>	29
<i>Overview</i>	29
<i>Alpacas (Vicugna pacos)</i>	31
<i>Overview</i>	31
<i>Llamas (Lama glama)</i>	37
<i>Overview</i>	37
<b>THE LLANOS AND THE PAMPAS RANGELANDS: HIGH-VALUE BEEF</b>	<b>39</b>
Rangelands restoration with ongoing cattle farming initiatives:	
<i>Ganadería Sostenible (GANSO) in Colombia</i>	40
<i>a. GANSO certification</i>	41
<i>b. Farm investment model</i>	41
<i>c. Deforestation monitoring</i>	41
Small ruminants	42
<i>Sheep</i>	42
<i>Goats</i>	44
<b>FINAL REMARKS</b>	<b>46</b>
<b>REFERENCES</b>	<b>48</b>

## TABLES

Table 1. <i>South American Rangelands conservation programmes.</i>	7
Table 2A. <i>Camelid population and area in South America.</i>	8
Table 2B. <i>Camelid population and area in South America.</i>	8
Table 3. <i>Camelid meat products.</i>	8
Table 4. <i>Camelid fibre products.</i>	9
Table 5. <i>Normative issues on camelid production.</i>	9
Table 6. <i>Morphological differences between the two Vicuña subspecies.</i>	11
Table 7. <i>Ongoing rangelands regeneration strategies in the vicuña value chain.</i>	13
Table 8. <i>Reserves and protected natural areas with presence of vicuñas in Latin America</i>	15
Table 9. <i>Main vicuña fibre exporter companies (2014–2018) in Perú</i>	15
Table 10. <i>Vicuña fibre textile companies/brands</i>	24
Table 11. <i>Other vicuña stakeholders contacts</i>	26
Table 12. <i>Peruvian companies exporting alpaca fibre to the Italian market, according to FOB export value and volume in 2018.</i>	33
Table 13. <i>Main exporter of alpaca fibre companies (2014–2018) in Perú</i>	34
Table 14. <i>Stakeholder list of the llama's value chain in Bolivia.</i>	38
Table 15. <i>Sustainable beef production labels in Latin America and their characteristics.</i>	40
Table 16. <i>Chemical composition of goat, sheep, cow, and human milk.</i>	45



## FIGURES

Figure 1. <i>Main rangelands areas in South America.</i>	6
Figure 2. <i>Vicuña value chain map.</i>	13
Figure 3. <i>Stakeholder mapping for guanaco management in Argentina.</i>	30
Figure 4. <i>Segmented structure of the alpaca fibre chain within the framework of the Peruvian Technical Standards for fibre standardization, 2002–2013.</i>	34
Figure 5. <i>Evolution of the GANSO certificate, 2019–2023.</i>	41
Figure 6. <i>Sheep meat and wool value chain mapping in Argentina.</i>	43

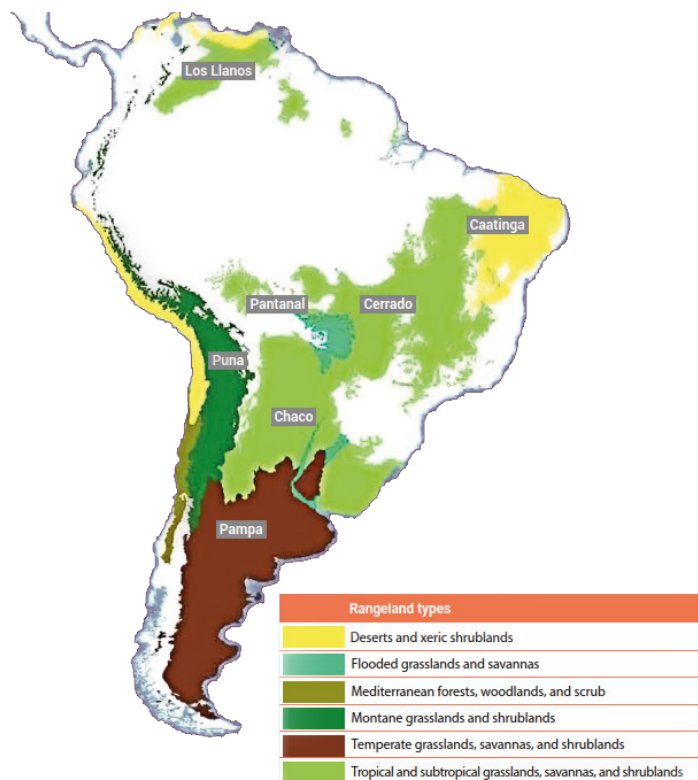
# THE LATIN AMERICAN REGION

Figure 1 presents the main rangeland areas in Latin America. According to the United Nations Convention to Combat Desertification (UNCCD 2024), rangelands cover about 33% (605 million hectares) of the total area of South America. They are distributed across various regions with a multiplicity of biophysical and socioeconomic conditions that shape the vegetation and wildlife in these landscapes. The enormous variety of these rangelands (grasslands, savannas, tropical, temperate, montane, desert and flooded shrublands) support multiple livestock systems that include the breeding of wild vicuñas and guanacos, the grazing of llamas and alpacas in high-altitude grasslands, the grazing of sheep and goats in dry lands and cattle production throughout the continent.

The rangelands in Latin America include:

- Llanos: Venezuela and Colombia
- Gran Chaco: Argentina, Paraguay, Bolivia and Brazil
- Caatinga: Northeastern Brazil
- Cerrado: Brazil (mainly), Bolivia and Paraguay
- Pampa: Argentina, Uruguay and Brazil
- Patagonia: Southern Argentina and Chile
- Andean Highlands: Peru, Bolivia, Argentina and Chile

Figure 1. Main rangelands areas in South America.



Source: Based on UNCCD (2024).

Table 1 provides a summary of regional initiatives implemented to address rangeland degradation in Latin America and to improve the livelihoods of pastoral communities.

Table 1. South American Rangelands conservation programmes.

Programme or Initiative	Conservation Work	Actors Involved	Countries/Region	Webpages
The Red Pastoamericas - the FAO Pastoralist Knowledge Hub	Leading the Southern America Regional Support Group of the IYRP	FAO	South America	<a href="https://www.fao.org/pastoralist-knowledge-hub/es/">https://www.fao.org/pastoralist-knowledge-hub/es/</a>
Restoring a Free-Flowing PantaNow	Freshwater tropical wetlands with savannah vegetation while targeting the health of other hydrologically connected landscapes.	WWF, GEF, IKI, EU, USAID	Bolivia, Brazil, and Paraguay	<a href="https://www.wwf.org.ec/?389513/PantaNow-initiative-launched-to-protect-the-worlds-largest-freshwater-wetland">https://www.wwf.org.ec/?389513/PantaNow-initiative-launched-to-protect-the-worlds-largest-freshwater-wetland</a>
Alianza del Pastizal	Rangelands sustainable management & livestock production	BirdLife International	Argentina, Brazil, Paraguay & Uruguay	<a href="https://alianzadelpastizal.birdlife.org/es/">https://alianzadelpastizal.birdlife.org/es/</a>
Grass Cultivation in Deschampado Understory Patches	Use of native resources to improve forage supply while protecting the Chaco Forest and its ecosystem services.	Creole communities, National University of Salta	The Chaco Rangelands	N/A
The National Observatory of Land Degradation and Desertification	Provide information and tools for analysing desertification and drought in Latin America.	EUROCLIMA programme, Europe Aid, CIIFEN	Latin America.	<a href="http://scado.ciifen.org/scado/php/index.php?id=3000">http://scado.ciifen.org/scado/php/index.php?id=3000</a>
The Puna Pastoralist Landscape in the Central Andes	Develop a framework to gain critical insights into the Punta pastoral systems and to collaboratively plan for a sustainable future.	VICAM, local stakeholders in Santa Catalina (Cooperative of Santa Catalina Livestock Producers, Community Council, CONICET, National Universities of Jujuy and Lujan	Puna rangelands	N/A
Cerrado Alive Initiative	Building local capacity through small gro-extractive activities, SLM and improved governance led by local or traditional communities.	WWF, Araticum Network, The Cerrado Knowledge Platform	The Cerrado Rangelands, Brazil	<a href="https://www.wwf.org.br/?74943/Cerrado-Alive">https://www.wwf.org.br/?74943/Cerrado-Alive</a>

**Note:** IYRP: International Year of Rangelands and Pastoralists Initiative; FAO: Food and Agriculture Organization of the United Nations; WWF: World Wide Fund for Nature; GEF: Global Environment Fund; IKI: Die Internationale Klimaschutzinitiative; EU: European Union; USAID: US Agency for International Development; CIIFEN: Centro Internacional para la Investigación del Fenómeno del El Niño; CONICET: Consejo Nacional de Investigaciones Científicas y Técnicas.

Source: Based on UNCCD 2024.

# THE ANDEAN AND PATAGONIAN RANGELANDS: CAMELIDS

Included here are alpacas, llamas, vicuñas and guanacos. These animals inhabit the high Andean region above 3,000 metres above sea level and are found in Peru, Bolivia, Argentina, Ecuador and Chile (Quispe et al. 2009).

Table 2 summarizes information on the population, distribution and production of camelids in the referenced countries. Tables 3 and 4 summarize information on the camelid products.

Table 2A. Camelid population and area in South America.

Camelid	Perú				Bolivia			Argentina		
	Herd size	Area (ha)	APU**	Producers	Herd size	Area (ha)	Producers	Herd size	Area (ha)	Producers
Llama	1,069,412 (1)	N/A	N/A	297,414 (8)	2,800,000 (5)	N/A	37,000 – 50,000 (8)	200,000 (5)	N/A	2,803 (8)
Alpaca	4,533,927 (1)	N/A	82,459 (6)	789,775 (8)	373,640 (4)	N/A	13,603 (8)	5,000 (4)	N/A	N/A
Vicuña	218,000 (2)	6,661,498(2)	412 * (6)	250 (8)	163,333 (2)	5,357,800 (2)	N/A	72,678 (2)	12,300 (2)	22 (8)
Guanaco	3,810 (3)	N/A	N/A	N/A	1,000 (3)	N/A	N/A	2,200,000 (3)	N/A	15 (8)

Table 2B. Camelid population and area in South America.

Camelid	Chile			Ecuador		
	Herd size	Area (ha)	Producers	Herd size	Area (ha)	Producers
Llama	80,000 (5)	N/A	1,388 (8)	10,356 (7)	N/A	N/A
Alpaca	28,551 (4)	N/A	916 (8)	3,793 (4)	N/A	N/A
Vicuña	10,015 (2)	575,250 (2)	N/A	7,185 (2)	58,560 (2)	N/A
Guanaco	160,000 (3)	N/A	N/A	N/A	N/A	N/A

\* Driving Holders with Valid Authorization (only for Perú). Of 412 driving holders in total, 275 (66,7%) represent communities, 72 (17,5%) associations, 41 (10%) natural people, 11 (2,7%) committees, 9 (2,2%) companies, 3 (0,7%) cooperatives and 1 (0,2%) university.

\*\*APU: Agricultural Production Units

Sources: (1) Ministerio de Desarrollo Agrario y Riego-MIDAGRI, 2023. Information for 2022. (2) Convenio vicuña (2018). (3) Dalvit & Zabalo (2021). (4) AVSF (2013). (5) Vilá & Arzamendia (2022a). (6) MIDAGRI (2020). (7) Subsecretaría de Ganadería, (2010). (8) Quispe et al., (2009).

Table 3. Camelid meat products.

Camelid	Perú	Bolivia	Argentina	Chile
Llama	3,971 ton (1)	13,501 ton (2)	N/A	N/A
Alpaca	12,754 ton (1)	2,403 ton (2)	N/A	N/A
Vicuña	N/A	N/A	N/A	N/A
Guanaco	N/A	N/A	N/A	N/A

Sources: (1) Ministerio de Desarrollo Agrario y Riego-MIDAGRI, 2023. Information for 2022. (2) Unidad de Producción Agropecuaria, (2008).

Table 4. Camelid fibre products.

Camelid	Indicator	Perú	Bolivia	Argentina	Chile	Ecuador
Llama	Sheared animals	347,564(1)	N/A	N/A	N/A	N/A
	Fibre (t)	696(1)	526 ton (3)	70 ton (5)	N/A	N/A
	Yield (kg/llama)	2,002(1)	1.2 ton (4)	N/A	N/A	N/A
	Price (Sol/Pound)	2,92(1)	N/A	N/A	N/A	N/A
Alpaca	Sheared animals	2,139,190 (1)	N/A	N/A	N/A	N/A
	Fibre (t)	4,422(1)	434 ton (3)	N/A	N/A	N/A
	Yield (kg/alpaca)	2,067(1)	2,2 (4)	N/A	N/A	N/A
	Price (Sol/Pound)	6,67(1)	N/A	N/A	N/A	N/A
Vicuña	Sheared animals	N/A	N/A	N/A	N/A	N/A
	Fibre (kg)	12,318.66 (2)	N/A	377 Kg (5)	N/A	N/A
	Chaccus	720 (2)	N/A	N/A	N/A	N/A
Guanaco	N/A	N/A	N/A	1,500 Kg (5)	N/A	N/A

Sources: (1)Ministerio de Desarrollo Agrario y Riego-MIDAGRI, 2023. Information for 2022. (2)SERFOR, 2024. Information for 2024. (3)Unidad de Producción Agropecuaria, (2008), (4) Ministerio de Desarrollo Productivo y Economía Plural, (2014). (5) Quispe et al. (2009).

Table 5. Normative issues on camelid production.

Chile	Perú	Bolivia	Argentina
Resolution No. 4784 of 2016. Provides the requirements for traceability in domestic South American camelids.	Law No. 28,041 of 2004. Promotes the value chain, encouraging breeding, production, marketing and consumption of domestic South American camelids (alpaca and llama) through repopulation and genetic work.	Law No. 2.5127 of 2013. Constitutes Camelids South Americans (llamas, alpacas, vicuñas and guanacos) as Heritage of Bolivia.	National Law No. 2.2421 of 1981 deals with the protection and conservation of wildlife.
Resolution 3371 of 1995. These are functional standards for genealogical registration of domestic South American camelids, llamas and alpacas.	Law No. 28,350. Genetic improvement and protection of South American camelid breeds (alpaca and llama).	The Comprehensive Strengthening Program of the Camelid Value Chain in the Bolivian Altiplano (Pro-Camélidos) covers aspects such as productive and environmental conditions, environmental services and the process of reaching the final consumer.	Resolution of the Government Secretariat of Environment and Sustainable Development (SAyDS) No. 243-2019 deals with the National Plan for the Sustainable Management of the Guanaco 2019. Management technique for capture and breeding in captivity.
Decree 2/2016. Technical Standards of Law 20089 creates the National Certification System for Organic Agricultural Products.	Sectoral Intervention Action Program for Strengthening Chains Associated with South American Camelids 2023–2027 seeks to improve technical management, livestock food systems, provide added value, create commercial chains and strengthen public and private actors.		Program for the Improvement of Wool Quality (PROLANA). Advise the producer on quality and marketing issues.

Source: based on González Ulibarry 2023.

Table 5 summarizes the national governance mechanisms of camelid production in Chile, Peru, Bolivia and Argentina. These regulations seek to strengthen the sector, which is considered structurally weak. For example, in Peru, the FAO (2005) identified that the lack of technological development with traditional management of alpacas and llamas led to the decline of natural pastures due to overgrazing and low-quality fibre. Where there was communal ownership of the land and private management of the animals, there was a tendency towards overgrazing. López Canelas (2021) and Poma (2023) highlighted that camelids adapted to the fragile conditions of the Andean area and, therefore, would not have a considerable impact on their environment, as is the case of Chacaltaya (Bolivia). However, Quispe et al. (2009) highlighted that some llama production systems usually integrate Creole sheep to diversify risk in the system, which ends up generating overgrazing scenarios. The sector has opportunities to develop sustainable value chains. Genetic research is essential for this purpose. In this regard, Tupayachy Quispe et al. (2022) warn that vicuña is a quality fibre with significant potential demand. However, it is an animal with high mortality rates and producer's risk aversion leads to low production levels compared to other camelids that may be less profitable but safer. Genetic research and best management practices would allow these opportunities to be taken advantage of.

On the other hand, traceability creates confidence in consumers. Furthermore, in the case of alpaca and llama fibre, some experiences show improvements in income for producers in Peru. However, it is not the common denominator (Wurzinger & Foglia 2020). In the Chilean case, there is progress in the regulations for the traceability of camelids and it is based on elements such as the registration of livestock establishments, the declaration of the existence of the animals, the official animal identification and the registration of the movement of the animals. However, this process would not include marketing (SAG, n.d.). Quality standards and certifications are another central point. MIDAGRI (2020) suggests that the requirements for environmental sustainability and animal welfare have an increasingly prominent role and the sector's development needs to comply with them while starting sustainable certification processes. For example, the Responsible Alpaca Standard (RAS) is a voluntary international framework on animal welfare throughout the entire fibre chain. The certification covers aspects such as proper land management and the chain of custody of the fibre until it arrives at the final distributor (Textile Exchange 2021).

In the sheep sector, Argentina has some competitive advantages for wool production resulting from economies of scale in its primary production due to installed capacity. However, the environmental impact and disintegration in its value chain are problems to address. The value chain adds 66.7% in the manufacturing stage but only 7% in agricultural activity (Santos Sotomayor et al. 2019). Production with higher sustainability standards can improve the outlook through certifications such as regenerative wool from the Ovis21 network with the Regenerative Wool Standard (RWS) standard (Ovis21 n.d.).

# Vicuña (*Vicugna vicugna*)

## Overview

The vicuña is a wild South American camelid that lives 3,500–4,000 metres above sea level in the arid and semi-arid steppes of the Puna or Altiplano regions of Argentina, Peru, Chile and Bolivia (Vilá & Arzamendia 2022). Vicuña fibre is one of the finest and most expensive in the fashion industry and is highly valued in luxury fashion markets in European countries like Italy (importer and re-exporter) and the UK, in Japan and growing demand from China and the United States (International Trade Centre-ITC 2018; Vilá & Arzamendia 2022). Argentina is also a key player in the re-exportation of the fibre, with an estimated 62% of its exports originating from Peru, Bolivia and Chile (ITC 2018). The price of a kilogram of vicuña fibre ranges between USD 400–500 (Vilá & Arzamendia 2022). Due to its economic value and poaching, the vicuña has been at risk of extinction for several decades, prompting the implementation of various protection laws and the involvement of local communities, which have successfully increased the population. However, some vicuña subspecies remain under threat (Table 6) (Karandikar et al. 2023; Risco-Castillo et al. 2014; SERFOR 2022; Vilá, Arzamendia & Rojo 2020).

**Table 6.** Morphological differences between the two vicuña subspecies.

Description	Subspecies	
	<i>Vicugna vicugna mensalis</i>	<i>Vicugna vicugna vicugna</i>
Distribution	Peru, west of Bolivia and northwest of Chile	Argentina, west of Bolivia and northwest of Chile
Fur	Cinnamon colour (commercial vicuña), white only on the ventral side and inner legs, with a pectoral tuft	Beige (commercial light fawn), white on the ventral side extending up the flanks, without a pectoral tuft
Body length	98–112 cm	150 cm
Percentage of total population	73%	27%

Source: *Convenio vicuña (2018)*.

The production models for vicuña primarily include i) wild management (free grazing), implemented in Peru, Bolivia and Argentina; ii) captive breeding used in Argentina under the regulations of the National Institute of Agricultural Technology (INTA); and iii) semi-captive breeding promoted in Peru and Chile (Quispe et al. 2009). In Peru, the main producer and exporter of vicuña fibre, it is estimated that around 70% of vicuñas are in the wild, compared to 30% in semi-captivity (MIDGARD 2012). Their diet is based on native grasses or Poaceae, including Calamagrostis and Festuca, low and creeping herbs. Their grazing is considered low impact compared to other domesticated animals (SERFOR 2022; Muñoz et al. 2015). The management and preservation of vicuña constitute a socioeconomic alternative with great potential for sustainable development as it is well-adapted to extreme climatic conditions, provides important provisioning and regulating ecosystem services, and coexists with vulnerable communities.

At least seven phases can be distinguished in the vicuña value chain (Figure 2). The first phase involves species management and conservation. Internationally, the species and their commercialization are regulated by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the Convention on Biological Diversity, along with the Convention for the Conservation and Management of the Vicuña signed by Bolivia, Chile, Ecuador, Argentina and Peru (MIDAGRI 2012), Wildlife Trade Regulation (EC No. 338/97) for exports to European countries and the regulations of the Fish and Wildlife Service (FWS) for exports to the United States (ITC 2018). Under these agreements and specific legislation of each country, it is established that

the only products that can be exported are shorn vicuña fibre and fabrics and manufactured products made from this fibre, including luxury crafts and woven items (ITC 2018). The species is also found in natural areas protected by these countries (Table 8).

Primary production is carried out by peasant communities and associations, which also perform control functions (monitoring births, health and welfare, predator control), improvement of pastures for animal feeding, vicuña capture (an ancestral practice known as *chaccu*), animal health assessment, identification and shearing. Property rights of the vicuña belong to the national, regional and provincial governments or are *res nullius*, as in Chile, where they belong to no one (ITC 2018). Thus, the communities act as custodians and can benefit from the commercialization of the fibre. In Peru, peasant communities have the right to use (*usufruct*) the vicuña thanks to Law 26,496 of 1995. In Argentina, the INTA farm distributes groups of 10–20 vicuñas to producers responsible for their management, protection and ownership of the fibre (Quispe et al. 2009).

According to the description of communal marketing by ITC (2018), in Peru it is conducted through the National Vicuña Society (SNV), in Bolivia through the Community Association for the Commercialization of Vicuña Fibre of Bolivia (ACOFIV) and in Chile through a cooperative called *Cooperandino*. Production in Argentina follows two models, one communal and the other entrepreneurial. The latter model has raised concerns among local communities since European fibre traders have acquired land where vicuñas live to maintain a constant supply. Notably, *Loro Piana* plays a role in exporting fibre to Italy, forming an oligopsony market.<sup>1</sup>

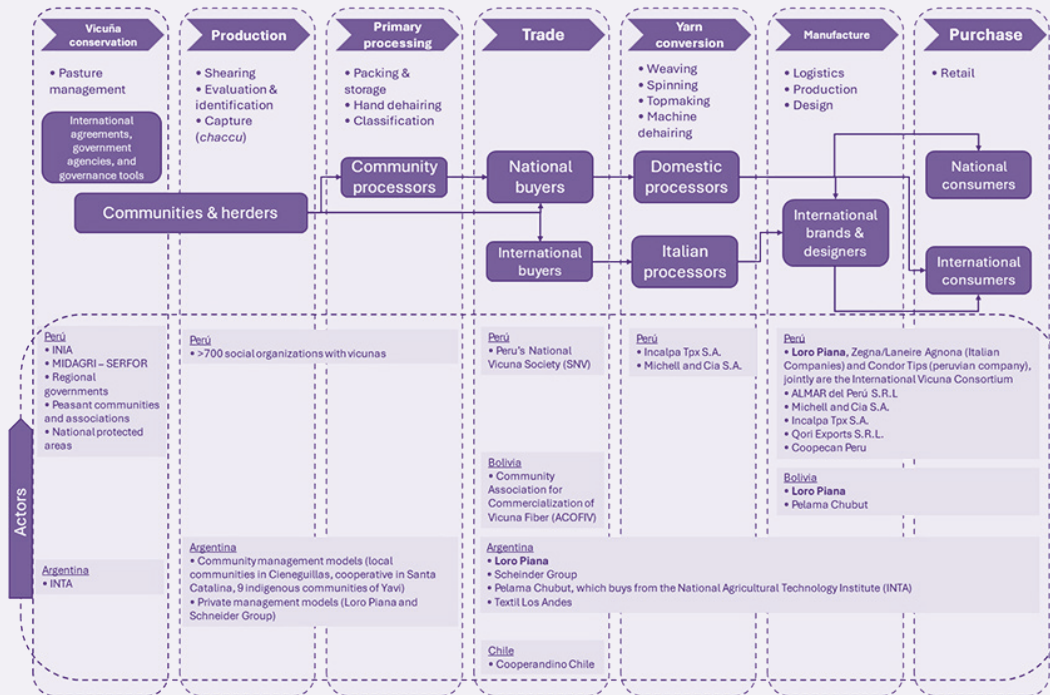
The fibre is marketed in three processing categories which determine the price: i) dirty fibre, ii) pre-dehaired fibre and iii) dehaired fibre. The majority of marketed fibre is pre-dehaired and unprocessed fibre. Communities generally perform manual dehairing, as this not only preserves the product's quality but also creates jobs in the community, where women play an important role (ITC 2018). Fine down fibres are highly valued as their market value is associated with their characteristics and with exotic environments and cultures (Quispe et al. 2009).

The main limitations facing vicuña include i) poaching, which poses dangers to the species and competes in price with legal fibre in a 1:5 ratio, ii) the development of captive management and production systems, which impact animal welfare and fibre quality, iii) crossbreeding between vicuñas and alpacas as a substitute, iv) habitat degradation, v) pasture deterioration due to overgrazing, which, with the increase in the vicuña population, competes with other Andean mountain animals, vi) the instability of predictable fibre volume in the market, and vii) the fair distribution of value along the chain, especially its redistribution to peasant communities who need models to increase the added value of fibre production (ITC 2018; Benites et al. 2019; Risco-Castillo et al. 2014; Quispe et al. 2009).

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1 A state of the market in which only a small number of buyers exists for a product.

Figure 2. Vicuña value chain map.



Sources: Based on ITC (2018), SERFOR (2024), Lichtenstein et al., (2002), Hoces (2008).

Table 7. Ongoing rangelands regeneration strategies in the vicuña value chain.

### The Andean Initiative: Elevating a collaborative agenda on agrobiodiversity, climate action and healthy diets

#### General description

The initiative focuses on the Andes mountains, which, like many ecosystems worldwide, face the challenges of climate change, biodiversity loss and inefficiencies in the food system. The Andes is the longest mountain range in the world, covering about 33% of Argentina, Bolivia, Chile, Colombia, Ecuador, Peru and Venezuela. They are of vital importance to the economy and livelihoods of the populations in these regions. Approximately 86 million people live in the Andes and 40 million depend on the ecosystem services the mountains provide. Moreover, it is a fragile and exposed ecosystem that has received little attention despite its great potential in terms of climate science and environmental impact.

The initiative combines four intervention components: 1) agrobiodiversity, 2) climate action, 3) nutrition and food systems and 4) a social approach to overcome inequality with an emphasis on indigenous peoples, gender and youth. Work in rangelands with vicuñas has been concentrated in Peru through two projects (described below). Their funding depends on donations from the Peruvian Government to the CGIAR and more specifically to the International Potato Center - CIP, which annually contributes between USD 200,000 – 400,000. Thus, these efforts correspond to small-scale initiatives.

**First Project (2021–2022): Identification of changes in the management of high Andean lands in the face of climate change and the multicausality of effects on integrated mangle management in peasant communities owning vicuña herds**

*Objectives:*

- Diagnosis of land use territoriality and climate change emphasizes i) changes in land use in high-altitude areas, and ii) determination of carbon stocks in natural grassland areas.
- Identification of the genus and species of mites parasitizing vicuña populations and identified foci of propagation and infection.
- Pilot proposal for managing and treating mangle in vicuña populations, including options for different types of drugs available on the market and their treatment efficacy.
- Key publications and databases in the public domain and widely disseminated.

*Results:*

- Measurements of organic carbon in grasslands inhabited by vicuñas and classification of these according to projections of organic carbon reserves.
- National Guide for the Identification of Grass Species Palatable to Vicuñas: <https://bit.ly/3yZHWQZ>
- Technical Document for The Management of Scabies in Vicuñas: <https://bit.ly/3Rrm7zM>

**Second Project (2023-2025): Restoration of high Andean ecosystems in watershed headwaters for water security and multi-use ecosystem services**

This ongoing project focuses on the restoration of degraded grasslands, which are crucial for restoring the water cycle and have been heavily affected by Andean glacier melting. The Puna region, where the project is concentrated, is covered 65% by Bofedal ecosystems (5,481 km<sup>2</sup>), Pajonal de Puna Seca (48,871 km<sup>2</sup>) and Pajonal de Puna Húmeda (119,819 km<sup>2</sup>), offering multiple opportunities for environmental recovery of the water cycle.

According to project information, there are currently 651 management declarations for sustainable use of wild South American camelids, increasing annually, covering 13% of the Puna ecosystems surrounding the Peruvian Andes.

*Objectives:*

- Sustainable management for water resource conservation in the peasant community of Picotani

*Expected results:*

Methodology for the restoration of degraded native high Andean grasslands

Report on conservation and sustainable management of water resources, including landscape, soils and ancestral knowledge for the Picotani community

**Actors**

Centro Internacional de la Papa (CIP), SERFOR

**Contacts**

- Stef De Haan / [s.dehaan@cgiar.org](mailto:s.dehaan@cgiar.org)
- Henry Juárez / [h.juarez@cgiar.org](mailto:h.juarez@cgiar.org)
- Javier Ochoa / [javier.ochoa@cgiar.org](mailto:javier.ochoa@cgiar.org)

**Links**

<https://cipotato.org/es/iniciativandina/>

Table 8. Reserves and protected natural areas with presence of vicuñas in Latin America

Country	Protected area	Area (ha)
Perú	Reserva Nacional Pampa Galeras - Bárbara D' Achille	6,500
	Reserva Paisajística Nor Yauyos - Cochabamba	221,268
	Reserva Paisajística Subcuenca del Cotahuasi	490,450
	Parque Nacional Huascarán	340,000
	Santuario Histórico de Chacamarca	2,500
	Reserva Nacional Salinas y Aguada Blanca	366,936
Bolivia	Parque Nacional Sajama	N/A
	Area Protegida Apolobamba	N/A
	Reserva Biológica Cordillera de Sama	N/A
	Reserva Nacional de Fauna Andina Eduardo Abaroa	N/A
Chile	Parque Nacional Lauca	137,883
	Monumento Natural Salar de Surire	11,298
	Reserva Nacional Las Vicuñas	209,131
	Parque Nacional Volcán Isluga	174,774
	Reserva Nacional Los Flamencos	73,987
	Parque Nacional Lluillailaco	268,671
Ecuador	Parque Nacional Nevado de Tres Cruces	58,082
	Reserva de Fauna Chimborazo	58,560
Argentina	Monumento Natural Laguna Los Pozuelos	N/A
	Reserva Provincial Las Chinchillas (Jujuy)	N/A
	Reserva de la Biosfera y Parque Nacional San Guillermo – San Juan	N/A
	Reserva Provincial de Fauna Los Andes - Salta	N/A
	Parque Provincial Laguna de Leandro - Jujuy	N/A

Source: *Convenio vicuña* (2018).

Table 9. Main vicuña fibre exporter companies (2014–2018) in Perú

### Almar del Perú S.R.L

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Share (%) in total volume: 41.6%

HS Codes: HS 51 – Wool, fine or coarse animal hair, horsehair yarn and woven fabric

Shipment Destination: Italy

Transport method: Air

*Contact information:*

Calle Juvenal Denegri 265, Urb. Santa Catalina, La Victoria Lima; Lima, Perú

Tel. +51-1-2262955, +51-1-2240202

Email: [almarcorp@hotmail.com](mailto:almarcorp@hotmail.com)

*Executive staff:*

- Alexander Granados (Accountant)
  - Ericka Karim Acharte Quispe (General manager)
- 

### Michell & Cía S.A.

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Share (%) in total volume: 5.9%

Information available for Alpaca fibre. Nonpublic information about company activities around Vicuña is available.

HS Codes: 3131 - Preparation and Spinning of Textile Fibres and Yarn Manufacturing; 31321 - Broadcloth Manufacturing

The company is part of the Michell Group, which is the largest alpaca textile group in Perú.

The company is dedicated to raising alpacas and retailing the highest quality alpaca products. Its focus is to offer unique products and experiences related to the alpaca and its fibre. The Michell Group is in charge of the entire process, from breeding to the final sale of the products.

*Contact information:*

Juan De La Torre 101 San Lazaro, Arequipa; Arequipa, Perú

Tel: +51-54-202525

Email: [michell@michell.com.pe](mailto:michell@michell.com.pe)

Webpage: <http://www.michell.com.pe>

**Executive staff:**

- Michael Willian Michell Stafford (Chairman)
- Frank Anthony Michell Lopez de Romana
- Guiliana Mariella Testino Silva
- Luis Martin Chirinos Chirinos (administration manager)
- Yubel German Cueva (finance manager)
- Gonzalo Ramiro Zuniga Alvarez (operation manager)
- Derek Francis Michell Lopez de Romana (Production manager)
- Juan Ciro Pepper Pastor (sales manager)

**Certifications:****Licences:****Sustainability reports:**

Based on norms established by Global Reporting Initiative (GRI): *Sustainable report 2021*

**RAS Certification:** Responsible Alpaca Standard

- **Breeding programmes:** advising and supporting breeders from the following associations free of charge: APROCANICH, LLANGA LLANGA, QUENMARI, as well as the CAPILLAPATA, MALLKINI and OQUEMARCA farms.
- **SAN Certified Fibre:** The animal welfare of the alpacas has been audited using criteria for nutrition, living conditions and animal management. Best practices in land and biodiversity management and protection have also been ensured. All SAN Certified Fibre has been purchased directly from the producers, ensuring traceability from the origin. This has represented an average increase of 17% in the profits of the 55 direct beneficiaries of this certification.

**SOL ALPACA brand:** 100% organic Alpaca Garment Line. During 2021 the company launched the 100% organic alpaca garment Sol Alpaca brand. Previously, they only had certification for yarn. This certification for garments is expected to promote responsible and sustainable textile consumption.

**Circular Economy:** Through the brand SOL ALPACA, the company launched Infinity Scarf, a scarf with a circular design and concept made with production waste and 100% reused material. This makes the Infinity Scarf an environmentally friendly product that consumes less water and emits less greenhouse gases.

*Main suppliers:*

- **Communities in high Andean zones** (Cusco, Puno, Huancavelica, Arequipa), with whom Michell has collaborated in development programmes such shearing techniques, have improved the quality of the work and the final product.
- **Intermediaries**, with whom we work sporadically according to demand and season.
- **Own Producers:** The Michell Ranch has its own alpaca production, breeding and development farm. The farm is certified for producing organic alpaca and Responsible Alpaca Standard (RAS) fibres.

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**Comunidad Campesina Lucanas (association)**

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Share (%) in total volume: 14.6%

Location: Reserva Nacional Pampa Galeras Barbara D'Achille, Lucanas Province, Ayacucho department.

Area: 6,500 ha

*Contacts*

- Santiago Paredes Guerrero – Staff expert of the Reserva Nacional Pampa Galeras Barbara D'Achille
- Aldo Espinoza Rojas – President of Comunidad Campesina de Lucanas

Webpage: <https://www.facebook.com/profile.php?id=61560900166220>

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**Comité Multicomunal de Manejo de la Vicuña de Picotani – Puno (association)**

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Share (%) in total volume: 11.1%

*Contacts*

- Antonio Mullisaca Mara (president) / Felipe Catunta Mullisaca

*Interest documents*

Calmet et al. (2015). Competitividad de la cadena productiva y comercialización con Valor Agregado de la Fibra de Vicuña. <https://dialnet.unirioja.es/descarga/articulo/5319730.pdf>

### Asociación de Comunidades Productoras y Exportadoras de Fibra de Vicuña de Arequipa (association made up of 26 regional communities)

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Share (%) in total volume: 9.4%

#### Contacts

■ Alejandrina Mercado

**Address:** Mza. N° Lote. 2 Asoc. Villa Continental (3 Cuadras de Jardín Villa Continental), Cayman, Arequipa, Perú

**Phone:** Not available

**Webpage:** Not available

**HS Codes (CIU):** 91993 - Miscellaneous wools: yarns and fabrics / Wool and fine or coarse hair, carded or combed (including "bulk worsted wool")

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### Qori Exports S.R.L.

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Share (%) in total volume: 1.9%

The company is dedicated to the marketing, export and import of textile products. Export and import products related to manufacturing clothing made with high-quality yarns, including alpaca, cashmere and cotton, among others.

#### Contacts

**Address:** Perú, Department de Arequipa, Yanahuara, 54, Ca. Las Beatas Mza. L Lt. 5

**Tel:** +51 (54) 25-45-75 / +51 (54) 25-46-02 / +51 957 856 768

**Email:** [boutiqueqori@gmail.com](mailto:boutiqueqori@gmail.com)

**Web page:** <https://www.facebook.com/QoriBoutiqueAlpaca/>

**Executive staff:** Leonor Becerra Guerra (manager)

**Export destinations:** Switzerland, United States, Canada, Italy

**Licences:** Use of the Brand VICUÑA PERÚ – ARTESANÍA (link: <http://www.conveniovicuna.org/marca/>)

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### Asociación de Comunidades Campesinas Criadores de Vicuñas de la Región Cusco - Acribar

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Share (%) in total volume: 2.8%

**General description:** Sustainable breeding and management of vicuñas in the Cusco region, Peru. The association produces vicuña fibre and promotes practices that ensure species conservation and the well-being of the farming communities involved.

#### *Contacts*

**Web page:** <https://www.facebook.com/profile.php?id=100008365867072>

**Community Development:** They improve the communities' economic and social conditions by selling products derived from the vicuña.

**Training:** They offer training to breeders on management practices and fibre quality.

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### Comunidad Campesina Huaytará

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Share (%) in total volume: 3%

#### *Contacts*

**Address:** Cal. Municipalidad Nro. S/n (a Media Cdra Plaza de Armas), Huaytara, Huaytara, Huancavelica, Perú

**Web page:** [https://www.facebook.com/p/Comunidad-Campesina-de-Huaytara-100092296282314/?\\_rdr](https://www.facebook.com/p/Comunidad-Campesina-de-Huaytara-100092296282314/?_rdr)

**Tel:** +51 995 314 474

**Email:** [dehuaytara.comunidadcampesina@gmail.com](mailto:dehuaytara.comunidadcampesina@gmail.com)

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### Asociación de Uso Sostenible de los Camélidos Sudamericanos Silvestres Chayñapampa - San Pedro (association)

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Share (%) in total volume: 1.9%

#### *Contacts*

**Address:** Ave. Jose Maria Arguedas nro. 729, Ayacucho, Lucanas Province, San Pedro District, Perú

**Executive staff:** President: Fredy Jose

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### Cooperativa de Producción y Servicios Especiales de los Productores de Camélidos Ltda

Share (%) in total volume: 1.8%

**General description:** Fibre comes from alpacas that are not mistreated or harm the environment. Activities improve the quality of life of South American camelid breeders in the high Andean regions of Peru. This is achieved by commercializing products derived from alpacas and vicuñas and strengthening the communities' organizational and technical capacity.

#### Contacts

**Address:** Ave. de la Poesía #270, Urb. Torres de San Borja San Borja

**Email:** [coopecan@coopecan.pe](mailto:coopecan@coopecan.pe)

**Phone:** +51 (01) 224191

**Webpage:** <https://coopecan.pe/>

**Facebook:** <https://www.facebook.com/Coopecan>

**Twitter:** @coopecanperu

**Certifications:**  INTERWOOLLABS  
International Association of Wool Textile Laboratories



#### Sustainability reports:

Management of natural resources and improvement of the alpaca herd lead to adequate animal well-being, environmental conservation and increased productivity rates in alpaca breeding.

**Subprograms:** Genetic improvement, management of natural resources (soil and water), good sanitary practices, good shearing practices, good herd management practices.

### Loro Piana Perú S.A.C

Share (%) in total volume: 1.3%

#### Contacts

**Facebook:** <https://www.facebook.com/LoroPiana/>

**Instagram:** <https://www.instagram.com/loropiana/>

**Tel:** 855 481 91 00

**Webpage:** <https://fr.loropiana.com/en/our-world/vicuna>

### Comunidad Campesina Ondores

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Share (%) in total volume: 1.1%

*Contacts*

Address: Ave. Junin Nro. S/n (Cerca Plaza Principal), Ondores, Junin, Perú

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### LL Exportación e Importación S.A.C.

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Share (%) in total volume: 1.7%

*Contacts*

Address: Ave. Parque Río Surco No. 708 Int. 1, San Borja Sur (Frente al Pentagonito), San Borja, Lima, Perú

Tel: 2256024 / +51 1 2256024

*Executive staff:*

- LLERENA ARRIOLA CARLOS ORLANDO
- 

### Comunidad Campesina San Juan de Ondores

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Share (%) in total volume: 0.4%

Not available online

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### Gli Abiti S.A.C.

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Share (%) in total volume: 0.3%

*Contacts*

Address: Ave. Dos de Mayo No. 1240 (a 1 Cdra de Wong de San Isidro), San Isidro, Lima, Perú

Tel: 4221636

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### Comunidad Campesina de Iscahuacao

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Share (%) in total volume: 0.4%

#### Contacts

**Address:** Carret. Panamericana Sur Km. 166 Comun.Camp. Iscahuaca (Plaza de Armas-Sr. Luciano Chipana), Cotaruse, Aymaraes, Apurimac, Perú

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### Consortio Alpaquero Perú Export

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Share (%) in total volume: 0.7%

**General description:** provide classification, washing, styling and marketing services to the national and international alpaca and vicuña fibre market.

#### Contacts

- **President:** Marcelino Ramos Ochochoque
- Juan Portada Tito
- Gabriel A Fernández Puma
- Sixto Raúl Flores Delgado

**Tel:** +51 951 892 177

**Contact in Italy:** Andrea Cortesi +39 349 261 1929

**Address:** Calpex (oficina), Jr. Ramón Castilla Nro. 302 Esquina con Azangaro (Colegio Abagodos - Tercer Piano) – Juliaca (Puno) Perú

**Email:** [contacto@alpacaconsorcioperu.com](mailto:contacto@alpacaconsorcioperu.com)

**Financed by:** AID 011.488 (Agenzia Italiana per la Cooperazione e lo Sviluppo, Tejiendo la Solidariedad)

#### Certification:

Within the Weaving Solidarity Project framework, the company plans to begin the procedures for defining protocols and their application aimed at achieving the Responsible Alpaca Standard Certification.

#### Sustainability efforts:

CALPEX is dedicated to collecting and marketing alpaca fibre and seeks to improve fibre classification capabilities among alpaca farming families to increase their income. Promotes the reception of fibre by qualities instead of “by sweeping” to preserve its quality. In addition, it has trained 12 master classifiers, improved fibre management and advanced mechanical shearing.

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Table 10. Vicuña fibre textile companies/brands

**Loro Piana – LVMH French conglomerate**

**Webpage:** <https://www.lvmh.com/en>

**Entry point (environmental 2023 report):**

The company has established the following goals for environmental impacts related to animal management, land use management and rangeland conservation. The main objective regarding rangeland restoration is related to the 2030 objective of 5 million hectares of fauna and flora habitat to be regenerated or rehabilitated.

**Berluti**

**Webpage:** <https://www.berluti.com/en-int/homepage/>

**Entry points:**

No information was available regarding sustainability reports or commercial activity. However, within the brand’s objectives and reports in its biodiversity pillars are:

**Biodiversity:**

- Choosing responsible materials by using supply chains that contribute to the regeneration of biodiversity (preservation of resources and the climate, respect for animal welfare, fight against deforestation, elimination of hazardous chemicals and reduction of air and water pollution.
- 95% of bovine and ovine leather is Silver or Gold certified by the Leather Working Group
- 98% of crocodile leather is certified by the National Sanitation Foundation or the International Crocodilian Farmers Association
- 42% of wool and cashmere is certified or recycled and has Responsible Wood Standard certification
- 89% viscose is derived from sustainability-managed forest
- 90% cotton carries the following labels: Global Organic Textile Standard, Organic Content Standard, Better Cotton Initiative, Global Recycled Standard

## Zegna

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Web page: <https://www.zegnagroup.com/en/>

### Entry points:

Company *sustainability reports* aligned with the Science Based Targets initiative (SBTi) and Global Reporting Initiative Standards. The materiality matrix recognizes the impact of the extraction of raw materials on the environment, although emphasis is placed on animal welfare rather than soil management. For the latter, the focus is more on preventing deforestation rather than regenerative or soil restoration approaches.

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## Brioni

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Web page: <https://www.brioni.com/en/us/sustainability>

### Entry points:

*Sustainable manifesto*. "A deep respect for nature lends itself to inspired creation, beginning with carefully selected materials. We craft primarily with fibres and fabrics from the natural world, using the finest cashmere, silk, wool, linen and cotton sourced from long-standing suppliers. To compliment the exquisite materials in our collections, we are including new regenerative textiles originating from agricultural methods that restore and renew biodiversity while creating benefits for local communities. Although we are exploring new climate and nature-smart possibilities, our commitment to craft with the highest quality materials automatically means that we are safeguarding historical supply chains and sourcing partners as a priority."

This means they can be open to commercial alliances with production based on regenerative or restorative approaches (rangelands fits).

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## Zilli

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Web page: <https://en.zilli.com/gender-equality-at-maison-zilli/>

### Entry points

No online information is available about sustainability reports.

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### Savile Row

Acquiring their own vicuña fibre since 2003 from Bolivia, Perú, Argentina and Chile.

Web page: <https://savilerowco.com/about-us>

*Entry points:*

No online information is available about sustainability reports.

### Holland & Sherry

Acquiring their own vicuña fibre since 2003 from Bolivia, Perú, Argentina and Chile.

Web page: <https://www.hollandandsherry.com/>

*Entry points:*

Their *sustainability reports* focus more on their work around wool in *Chilean Patagonia and Argentina*. Even so, it has RWS certifications, accreditations from the Sustainable Fibre Alliance, GOTS Organic Fibres, Better Cotton Initiative, OEKO Tex Estándar 100, Recycled Fibre, REACH (Registration, Evaluation, Authorisation & Restriction of Chemical), Azo Dyes and pH Neutral. The company has its own team working on sustainability issues that can be an entry point for further discussions: Nathalie Opitz Sustainability Analyst and Alexandra Taylor Trainee Sustainability Officer

Table 11. Other vicuña stakeholders contacts

### Sociedad Nacional de la Vicuña – Perú

*Convenio para la Conservación y Manejo de la Vicuña* (<http://www.conveniovicuna.org/>)

Ministerio de Ambiente y Desarrollo Sustentable, secretaria Política Ambiental en Recursos Naturales, Dirección Nacional de Biodiversidad Argentina

■ Daniel Ramadori [edramadori@ambiente.gob.ar](mailto:edramadori@ambiente.gob.ar)

Ministerio de Ambiente – Ecuador

Ministerio de Ambiente y Agua, Dirección General de Biodiversidad y Areas Protegidas Bolivia

■ [marcelo.pino@ambiente.gob.ec](mailto:marcelo.pino@ambiente.gob.ec)

MIDAGRI, Servicio Nacional Forestal y de Fauna Silvestre (SNFFS), Dirección de Gestión Sostenible del Patrimonio de Fauna Silvestre – Perú

■ [teresaaralenyperes@gmail.com](mailto:teresaaralenyperes@gmail.com)

■ [jorgelaura3@gmail.com](mailto:jorgelaura3@gmail.com)

Corporación Nacional Forestal Chile

- [acalderon@serfor.gob.pe](mailto:acalderon@serfor.gob.pe)
- [cmichaud@serfor.gob.pe](mailto:cmichaud@serfor.gob.pe)
- [hector.penaranda@conaf.cl](mailto:hector.penaranda@conaf.cl)
- [carlos.nassar@conaf.cl](mailto:carlos.nassar@conaf.cl)

#### *Autoridades Administrativas y Científicas CITIES*

Ministerio de Relaciones Exteriores, Comercio Internacional y Culto, Dirección de Asuntos Ambientales (DIGMA) Argentina

- [vqs@mrecic.gov.ar](mailto:vqs@mrecic.gov.ar)
- [digma@mrecic.gov.ar](mailto:digma@mrecic.gov.ar)

Ministerio de Relaciones Exteriores y Movilidad Humana (MREMH) Ecuador

- [Johanna.montoya@ambiente.gov.ec](mailto:Johanna.montoya@ambiente.gov.ec)
- [Paul.aulestia@ambiente.gov.ec](mailto:Paul.aulestia@ambiente.gov.ec)

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### **Asociación Comunitaria para la Comercialización de la Fibra de Vicuña de Bolivia** ([renepaca6@gmail.com](mailto:renepaca6@gmail.com) - <https://bit.ly/45uVcju>)

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#### *Grupo Especialista en Camélidos Sudamericanos (GECS)*

Member organizations of GECS ([gecs@camelid.org](mailto:gecs@camelid.org) - <https://bit.ly/3z8Etzi>):

- Centro de Investigación en Biodiversidad y Cambio Global (CIBC-UAM) España
- Gerencia Regional de Agricultura, Gobierno Regional de Arequipa Perú
- Grupo Vicuñas, Camélidos y Ambiente (VICAM) CONICET, Universidad Nacional de Jujuy Argentina
- Wetlands International and Fundación Humedales Argentina
- Facultad de Ciencias Agrarias y Forestales Pontificia Universidad Católica de Chile Chile
- Grupo de Investigaciones en Ecofisiología de Fauna Silvestre GIEFAS-INIBIOMA CONICET Universidad Nacional del Comahue – Argentina
- Universidad Nacional Mayor de San Marcos; CONOPA Instituto de Investigación y Desarrollo de Camélidos Sudamericano Perú
- Natural Resource Ecology & Management, Iowa State University, United States
- Wildlife Conservation Society Argentina
- Facultad de Ciencias Forestales y de la Conservación de la Naturaleza Universidad de Chile Chile
- Corporación Nacional Forestal (CONAF), Ministerio de Agricultura Chile
- Ministerio de Desarrollo Rural y Tierras Bolivia
- Instituto Nacional de Antropología y Pensamiento Latinoamericano (INAPL) CONICET Argentina

- Instituto de Patobiología CICVyA, INTA Castelar Argentina
- Centro Nacional Patagónico (CENPAT) CONICET Argentina
- Servicio Nacional de Areas Protegidas-Ministerio de Medio Ambiente y Agua Bolivia
- Instituto de Ecología Regional (IER) CONICET-TUCUMAN Argentina
- Instituto Argentino de Investigaciones en las Zonas Aridas (IADIZA)-CONICET Argentina
- Asociación para la Investigación y Conservación de la Naturaleza CONATURA Smithsonian Institution United States
- Centro Austral de Investigaciones Científicas CONICET WCS Argentina
- Servicio Agrícola y Ganadero (SAG) Ministerio de Agricultura Chile
- SERFOR Perú
- Universidad de la Serena Chile
- CONICET/GEMAVAR Argentina
- Universidad Santo Tomás Chile

*Asociación Latinoamericana en especialistas en pequeños rumiantes y camélidos sudamericanos (ALEPRyCS) ([andrademontemayor@gmail.com](mailto:andrademontemayor@gmail.com) - <https://bit.ly/3Vgghm8>)*

- Héctor Andrade-Montemayor, President ALEPRyCS and Director for Central America and the Caribbean of the International Goat Association (IGA)

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### Other stakeholders

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- Fundación para la innovación Agraria (FIA) - Observatorio para la Innovación silvoagropecuaria y la cadena agroalimentaria Chile (<https://bit.ly/3KLwqv2>)
  - Textil de los Andes S.A. Argentina (llamas, guanacos & vicuñas) (<https://bit.ly/3VH1Qci>)
  - Ministerio de Comercio Exterior y Turismo MINCETUR Perú (<https://www.gob.pe/mincetur>)
  - Asociación de Exportadores ADEX (<https://www.adexperu.org.pe/>)
  - Consejo Nacional de Camélidos Sudamericanos (CONAGS)
  - PACOMARCA Sustainable Alpaca Network (<https://pacamarca.com/es/>)
  - VICAM Argentina (<https://www.vicam.org.ar/>)
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## Guanacos (*Lama guanicoe*)

### Overview

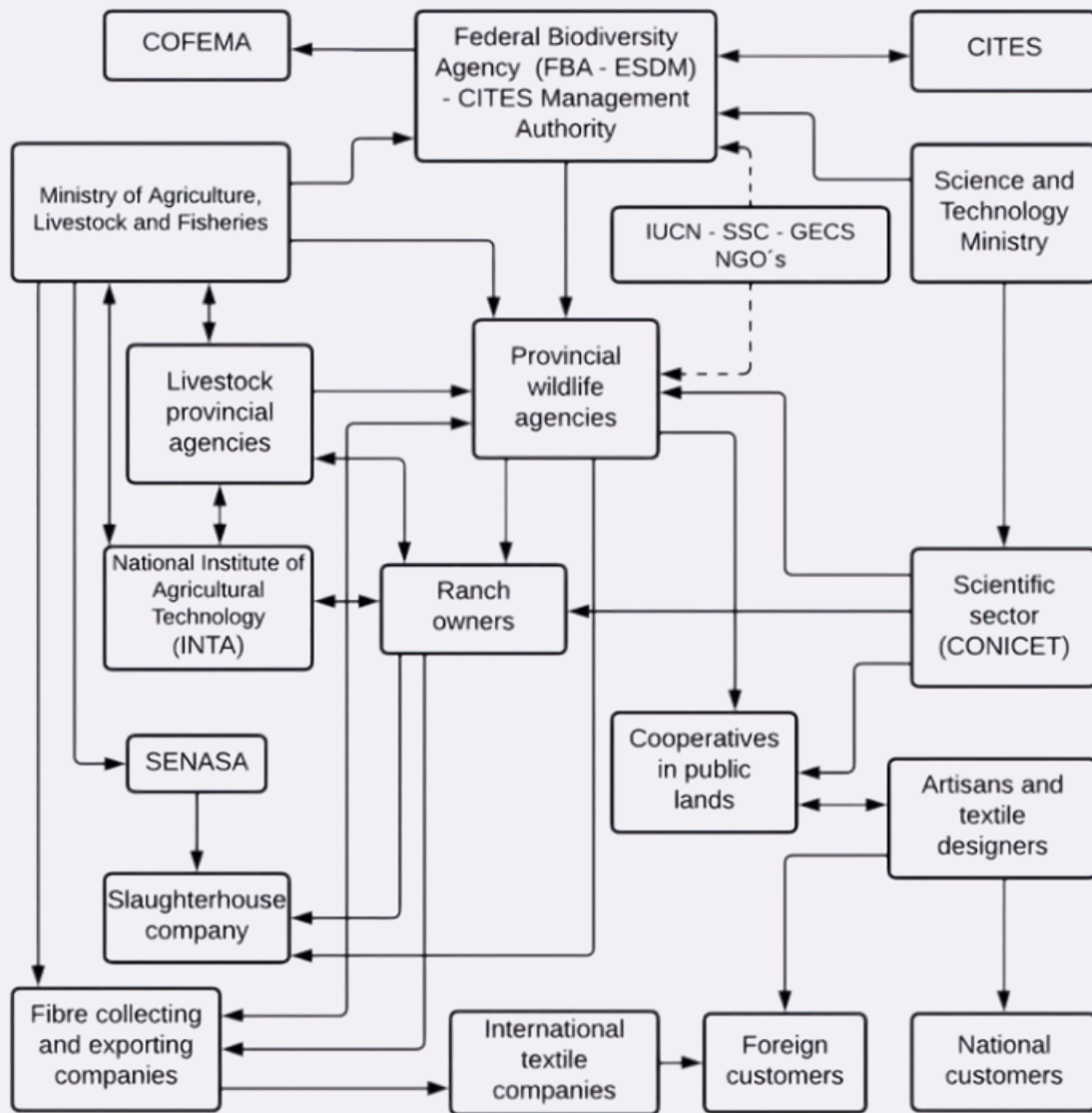
Guanacos and vicuñas are wild camelids that can be sustainably used by shearing their fibre without significantly harming their welfare (Vilá, Arzamendia & Rojo 2020). Their distribution in Latin America is wide and they can be found in northwestern Peru, western and southern Bolivia, northwestern Paraguay and the Patagonia region of Argentina and Chile. In the latter region, about 90% of the guanaco population is concentrated (Ruiz 2019; GECS n.d.). Currently, this species is on the IUCN Red List of Threatened Species as Least Concern, although studies indicate that this classification applies only to some areas where guanacos are distributed (Carmanchahi et al. 2022). According to Carmanchahi et al. (2022), in Peru, it is classified as Critically Endangered (Supreme Decree No. 004-2014-MINAGRI), as it is in Bolivia, where it is protected under Supreme Decree No. 11238 of 1973. In Paraguay, it is classified as Endangered; in Chile, depending on its distribution, its conservation status ranges from Least Concern to Vulnerable (Supreme Decree No. 33/2011-MMA). In Argentina, its status is Least Concern, although it varies according to distribution. Figure 3 is a map of the stakeholders involved in the management of guanacos in Argentina.

Guanaco management models include i) controlled extraction, which is based on hunting a proportion of animals and requires expensive population studies to determine the volume; ii) semi-captive breeding, or extensive in-the-wild model, which presupposes not affecting the species' behaviour (Villareal 2003) and is based on separating family groups and castrating males with undesirable characteristics; and iii) captive breeding, which requires a significant capital investment (Quispe et al. 2009). The model of capturing and shearing live animals was introduced in the 1990s in Argentina and corresponds to a community-based natural resource management initiative. It actively involves the local population in the sustainable use of the resource and has helped conserve and recover the species (Lichtenstein & Carmanchahi 2012; Lichtenstein 2013). However, guanaco exploitation activities are strictly regulated in the countries and only allow the commercialization of fibre from live animals (Quispe et al. 2009).

The main limitations in guanaco management are overgrazing, excessive hunting (legal and illegal) and interspecies competition with domesticated livestock (foraging behaviour, diet and habitat overlap), which has been one of the greatest threats to guanaco populations (Carmanchahi et al. 2022; Villareal 2003; Lichtenstein & Carmanchahi 2012). Severe droughts and increasing desertification in Patagonia have exacerbated the conflict between guanaco protection and sheep farming, leading ranchers to consider guanacos a pest species (Lichtenstein 2016). Additionally, as Baldi et al. (2009) show, guanacos and other native species of Patagonia were excluded from the development model focused on sheep farming. Thus, about 95% of arid Patagonia corresponds to private and fenced ranches, representing an additional mortality factor for the species as fences limit the mobility of young guanacos.

The diets of guanacos and sheep are based on high proportions of grasses and shrubs, which accentuates competition between these two species, especially in the summer when food is scarce in Patagonia (Baldi et al. 2009). Overgrazing by sheep is estimated to have led to the desertification of approximately 30% of the steppes in Patagonia, making it the primary cause of vegetation deterioration, forage cover loss and species richness reduction. This has motivated the development of strategies combining sheep farming with the wild management of guanacos as a strategy for the long-term conservation of Patagonia's grasslands (Baldi et al. 2009; Schroeder et al. 2022; Rodríguez et al. 2024; Burgi et al. 2011).

Figure 3. Stakeholder mapping for guanaco management in Argentina.



Source: Based on Linchtenstein et al. (2022).

Diseases such as sarcoptic mange also pose a threat to the guanaco population. This variant has been detected in wild camelids in Peru, Argentina, Chile and Bolivia. In 2014, an outbreak of this disease resulted in a 95% reduction of the guanaco population in San Guillermo National Park, San Juan Province, Argentina (Carmanchahi et al. 2022).

Guanaco fibre is considered one of the finest in the world, surpassed only by vicuña fibre. Its quality depends on the body area of the animal (Davilt & Zabalo 2021). However, over the past 30 years, the relative price of guanaco fibre has decreased (USD 280 to USD 40 per kilo of raw fibre), a situation common to the wool sector in Argentina (Carmanchahi & Lichtenstein 2023). Thus, as with vicuña, few companies buy raw fibre for export to Italy (Lichtenstein & Carmanchahi 2012). Therefore, pricing mechanisms are ambiguous and many local traders deal in small quantities with intermediaries who sell to exporting companies (Davilt & Zabalo 2021). According to Davilt & Zabalo (2021), Argentina, the main producer of guanaco fibre, exported 13.2 tons between 2002–2017 to Italy, Peru, Germany, France, Bolivia, Chile, Ecuador and the United States.

The paradigm shift in the textile and fashion industry increasingly demands high-quality products that protect the environment and the rights and welfare of people and animals. Thus, according to Carmanchahi and Lichtenstein (2023), guanaco fibre managed under high sustainability standards can represent a sustainable and beneficial development opportunity for communities. The authors point out that, given guanaco fibre has similar attributes to vicuña fibre but is not as recognized in the international market, it may be mixed with vicuña fibre in the early stages of processing, contributing to its lack of recognition in foreign markets. Other characteristics of the guanaco fibre market described by the authors include: i) limited and inelastic supply, as Argentina is the country with a sufficiently large population and the technology to exploit it; ii) low levels of processing and added value of the exported fibre; and iii) Italy being the main destination for industrial processing.

Regarding the commercialization of guanaco fibre, Lichtenstein and Carmanchahi (2012) identify bottlenecks related to fibre traceability methods and cooperatives and shepherds do not exploit the economic potential due to high transaction costs, distance to markets, absence of formal markets, access to information and lack of fair-trade agreements. Additionally, in semi-captive systems, the sheared volume varies from year to year, leading to shearing animals at different fibre growth stages (Quispe et al. 2009). This complicates commercial agreements and maintaining a stable supply.

Lastly, the use of guanaco meat was approved by the Guanaco Sustainable Management Plan in Argentina, but there have been few experiences and no cost-benefit analyses have been reported (Carmanchahi & Lichtenstein 2023).

## Alpacas (*Vicugna pacos*)

### Overview

The alpaca is a domesticated camelid found in the Andean mountains of Peru, Bolivia, Ecuador, northern Chile and northwestern Argentina at altitudes between 3,000 and 4,800 metres above sea level (Bartl et al. 2023). Raising these animals is one of the main economic activities in Peru, which is the leading producer of alpaca fibre with a global market share of about 80% (Lukacs de Pereny et al. 2019; Wurzinger & Gutiérrez 2022), followed by Bolivia with around 400,000 alpacas supporting over 10,000 families (Agronomes Vétérinaires Sans Frontières-AVSF, 2013). Two breeds of alpacas segment the market: i) the Huacaya alpaca, characterized by compact, fluffy fleeces with fine, soft and wavy fibres; and ii) the Suri alpaca, with long fibres in hanging curls, giving it an angular appearance (Quispe et al. 2009). Suri fibres are very soft and mainly used in lightweight fabric applications, while Huacaya fibres are blended with other fibres to make knitwear and high-fashion coats (Barra 2023). In Peru, it is estimated that 85% of the alpaca population are Huacayas and 15% are Suri (Ruiz 2019).

Alpaca management in Peru is mostly community-based, with primary producers in vulnerable and poverty situations (Quispe et al. 2009) and small producers owning fewer than 50 head (Cardellino & Mueller n.d.). According to Quispe et al. (2009), the production system is extensive, traditional, and has little technological adoption, where animals are in mixed herds grazing on native fields. In Peru, it is estimated that over 120,000 families depend on alpacas (Cardellino & Mueller n.d.). Shearing periods are determined by forage abundance, as nutrition influences fibre quality and diameter, concentrating supply during the rainy season (October–April) while maintaining a stock during the remaining period in anticipation of price improvements (Quispe et al. 2009; Ruiz 2019).

Numerous government initiatives have been implemented to promote and develop the alpaca value chain in Peru (Law No. 008/96/AG, Supreme Decree No. 022-2005-AG, Supreme Decree No. 013-2011-AG and the 2017–2027 livestock development plan). However, productivity levels are low. This is attributed to the lack of a breeding and improvement programme, poor pasture management and veterinary services (Reyna 2005). Therefore, genetic improvement programmes have been promoted, although they vary in sizes, the promoting organization and the complexity of genetic value estimation, resulting in significant variability in their development and few studies disclosing progress (Wurzinger & Gutiérrez 2022; Morante et al. 2011).

Regarding commercialization, estimates indicate that the global alpaca fibre market could reach USD 3 billion by 2026 and since the main competitor is petrocarbon-based synthetic fibres, animal fibres are well-positioned for being natural and renewable (Barra 2023). According to Barra's (2023) analysis of the animal fibre industry, there is a growing trend for much lighter and more comfortable garments, which emphasizes the type and diameter of alpaca fibres. The export of this material is growing globally, with countries such as the United States, Australia and New Zealand reporting the largest increases (Haytara 2020; AVSF 2013). The resurgence in the United States and Australia is a response to public policies that have boosted alpaca breeding, focusing on genetic improvement research, pasture availability, and the production of fine fibres and yarns (AVSF 2013). According to Lukacs de Pereny et al. (2019), the main importing countries of alpaca fibre garments and yarns are Italy (28%), China (20%), Norway (12%) and the United States (49%).

Italy is one of the main buyers of alpaca fibre, with a growing and sustainable demand, increasing imports from USD 28,290 in 2014 to USD 59,846 in 2018 (Haytara 2020). Some of the requirements for exporting textile fibres to Italy include: i) the authorized exporter certification, managed in Peru by the Ministry of Foreign Trade and Tourism (MINCETUR); ii) proof of origin using the Certification System by authorized entities (MINCETUR approves the Association of Exporters ADEX, the Lima Chamber of Commerce CCL, the National Society of Industries SNI, or self-certification through the Foreign Trade Single Window VUCE); iii) Italy requires the importing entity to authorize the import of animal-origin textile products and may conduct on-site inspections as part of the verification process (Haytara 2020).

Among the main exporting companies in Peru are Michell y CIA S.A., INCA Tops S.A., Productos del Sur S.A., Clasificadora de Lanac Macedo S.A. and Lanac y Curtiduria Valencia S.C.R. Ltda. In Bolivia, Altifibers has a production capacity of 100 tons of fibre mainly supplied by Peru and COPROCA has a collection capacity of 130 tons/year (AVSF, 2013). Table 12 presents the companies exporting alpaca fibre to the Italian market. Other stakeholders in the alpaca chain are the National Council of Science and Technology (CONCYTEC), the National Institute of Intellectual Property Protection (INDECOPI), the Peruvian Institute of Alpacas and Camelids (IPAC), the Peruvian Society of Alpaca and Llama Breeders (SPAR) and the Central Alpaca Cooperatives of Puno (CECOALP) (Lukacs de Pereny et al. 2019). Figure 4 summarizes the segmented structure of the alpaca fibre chain under the framework of the Peruvian Technical Standards for fibre standardization, an initiative carried out in Peru between 2002–2013.

Emerging sectors for alpaca fibre include sustainable fashion markets driving demand for sustainable South American camelid fibres; novel applications of animal fibres for carpet production; increased consumption of fresh and dehydrated alpaca and llama meat due to its low saturated fat levels; and the use of discarded material for thermal insulation (Barra 2023). Because the alpaca fibre market segment includes environmentally concerned consumers (Barra 2023), measuring the environmental impacts of its production is highly relevant. Bartl et al. (2023) estimate the carbon footprint of an alpaca fibre sweater to be 0.449 kg of CO<sub>2</sub>e. According to the authors, most emissions are attributed to the production and distribution lifecycle (70%), so GHG emission impact mitigation strategies should focus on production system efficiency.

The main certifications for alpaca fibre include ISO 6938, Fair-Trade, Fair-Trade Textile Production, Global Organic Textile Standard (GOTS), Organic Content Standard (OCS), Naturtextil, OEKO Tex, Allergy Certified, WRAP Certification and the Global Recycled Standard (MIDAGRI, n.d.).

According to Barra (2023), the main weaknesses and threats to the alpaca fibre market are: i) inconsistent supply, as small-scale production does not allow quality and quantity standardization; ii) high infrastructure costs; iii) a lack of genetic improvement programmes and disease control and prevention systems; and iv) low yield levels.

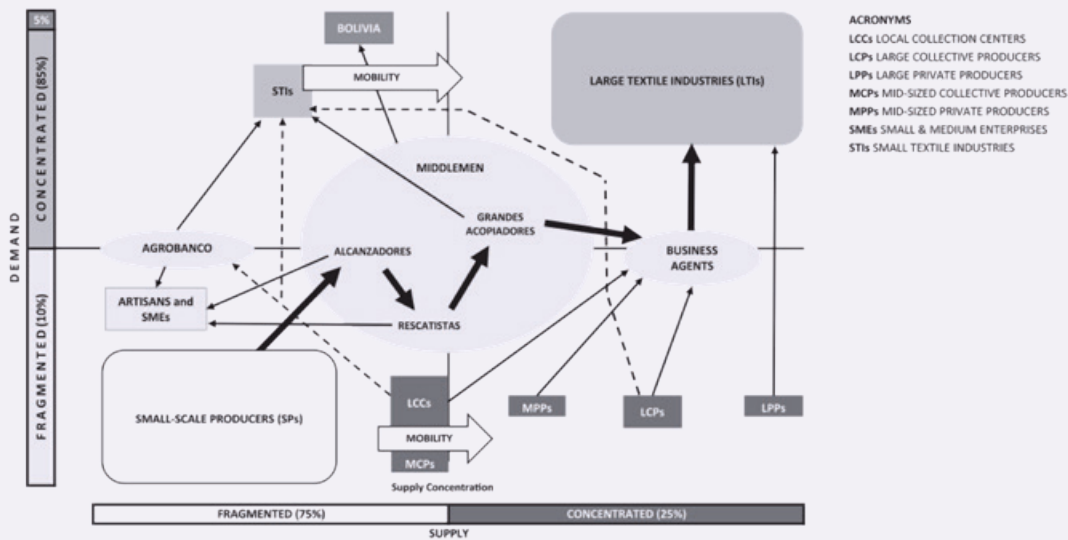
Lastly, as described by Ruiz (2019), the alpaca meat trade in Peru is mainly for self-consumption or regional markets, without any quality and health regulations. Producers have no direct market contact, resulting in high product handling and the presence of sarcocystosis, which, while not harmful to humans, gives the product an unpleasant appearance.

**Table 12.** Peruvian companies exporting alpaca fibre to the Italian market, according to FOB export value and volume in 2018.

Company	FOB USD	Kilograms
Clasificadora de Lanas Macedo S.A.C.	8,658,062	456,445
INCA Tops S.A.	8,402,985	416,639
Michell Y CIA S.A.	6,108,613	221,163
Texao Lanas S.A.C.	4,402,379	194,325
Coopecan	3,008,948	156,455
Negociación Lanera ALFA S.A.C. Nelana S.A.C.	659,503	27,393
ALPROSER S.A.C.	234,351	11,517
Peru Export	171,436	8,384
Pitata S.A.C.	191,826	6,699
Empresa comercializadora de residuos sólidos no peligrosos NEFI S.A.C. – ECONEFI S.A.C.	23,160	5,125
Lanas Sud America EIRL	86,875	5,101
Industrias textiles de Sud America S.A.C.	22,191	505
Incalpaca textiles peruanos de export SA	742	12

Source: Based on Haytara (2020).

Figure 4. Segmented structure of the alpaca fibre chain within the framework of the Peruvian Technical Standards for fibre standardization, 2002–2013.



Source: Based on Lukacs de Pereny et al. (2019).

Table 13. Main exporter of alpaca fibre companies (2014–2018) in Perú

**Inca Tops S.A.**

Share (%) in total volume: 32%

Founded in 1965, INCA TOPS is an alpaca yarn and tops company with 50 years of experience. It offers a collection of Baby Alpaca, Alpaca Silk and special blends, produced with high quality through innovation and tradition. The company supplies the market with industrial fabric and hand knitting threads, benefiting more than a thousand families and supporting rural communities through social responsibility programmes.

Web Page: <http://www.incatops.com>

Tel: +51 54 602500

Address: Ave. Miguel Forga No. 348, Arequipa, Arequipa ARE01, PE

Facebook: <https://www.facebook.com/IncaTopsAlpaca?mibextid=ZbWKwL>

Instagram: [https://www.instagram.com/inca\\_tops?igsh=NzA1YzVuN2xuZ2ls](https://www.instagram.com/inca_tops?igsh=NzA1YzVuN2xuZ2ls)

Linkedin: <https://www.linkedin.com/company/incatops/about/>

**Certifications:**

- Responsible Alpaca Standard
- Responsible Wool Standard
- Responsible Mohair Standard
- Alpaca Trazable por SGS – Traceable Alpaca by Inca Tops
- OEKO-TEX – SteP
- Huella de Carbono Perú
- OEKO TEX – Estándar 100 Clase 1
- INTERWOLLABS
- Operador Económico Autorizado Perú

**Collaborators:****Brands:**

- KUNA: launched in 2007
- INCALPACA

**Sustainability efforts:**

PACOMARCA: research genetic recovery centre for breeding alpacas. Nowadays, they have developed the “Black Alpaca” which produces 100% natural black fibre and counts more than 1,000 animals (the largest herd in the world).

**Michell y Cía S.A.**

Share (%) in total volume: 24%

See Table 9

**Texao Lanas S.A.C.**

Share (%) in total volume: 22%

No online information is available.

**Clasificadora de Lanas Macedo S.A.C.**

Share (%) in total volume: 12%

Founded in 1967, CLAMASAC is a family business dedicated to marketing and processing alpaca fibre, seeking to position itself in the best world markets. It supplies textile companies with high-quality alpaca tops, combining traditional and industrial processes. CLAMASAC is committed to economic and social development and environmental protection, maintaining good relationships with suppliers and optimizing its processes for harmonious coexistence with the environment. They offer sorting, washing, styling and marketing services for alpaca and vicuña fibre nationally and internationally.

*Contact information:*

**General manager:** Cecilia Luisa Macedo Vargas

**Tel:** +51 (054) 42 52 0

**Address:** Cal. Colón 187 Paucarpata AREQUIPA, AREQUIPA Perú

**Web page:** [www.clamasac.com.pe](http://www.clamasac.com.pe)

Their strategic partners are alpaca breeding communities in the south of our country, especially those in Arequipa and Puno.

**Cooperativa de Producción y Servicios Especiales de los Productores de Camélidos Andinos Coopecan Perú**

Share (%) in total volume: 4%

See Table 9

**Negociación Lanera Alfa - Nelana S.A.C.**

Share (%) in total volume: 4%

EXPORTER



## Pitata S.A.C.

**Share (%) in total volume:** 2%

A Peruvian company was founded in 2009 and dedicated to the textile industry, focusing on natural fibres from South American camelids (alpaca, llama, vicuña). Initially, it sold unclassified fibres and then began classifying Huacayo and Suri alpaca fibres. Currently, it sells alpaca tops and bumps, alpaca and llama yarns and garments made with these fibres.

*Contact information:*

**Address:** Ave. 28 De Julio 226, Urb. Semi Rural Pachacútec, Cerro Colorado, Arequipa; Arequipa, Perú

**Tel:** +51-54-347510, +51-958637960

**Email:** [sales@pitata.com.pe](mailto:sales@pitata.com.pe)

*Executive staff:*

- Leyla Valdivia
- Patricia Soncco
- Klaus Frederik Ackermann Roberts

## Llamas (Lama glama)

### Overview

The other domesticated South American camelid is the llama, descended from its guanaco ancestor. Like the guanaco, llamas are larger compared to alpacas and vicuñas and, therefore, meatier (Cardellino & Mueller n.d.). Their population is concentrated in Bolivia and Peru, with 2,800,000 and 1,200,000 head, respectively. Argentina has 200,000 and Chile 80,000 (Vilá & Arzamendia 2022a). There are two subspecies of llamas, the Q'aras/Kharas and T'amphullis/Thamphullis. They are differentiated by their fleece yield and fibre quality (Quispe et al. 2009). Llamas are multipurpose animals that provide meat, fibre, and power. Like alpacas, they have a strong cultural significance (Vila & Arzamendia 2022a).

As described by Quispe et al. (2009), llama production systems are small-scale, with producers having limited resources (both economic and natural). These systems are based on exploiting communal native grasslands, with Andean wetlands (bofedales) contributing the most to forage availability during the dry season, on which the supply of llama products depends. However, overgrazing has led to the degradation of these grasslands, which are characterized by their fragility and susceptibility to erosion. There are also systems where grazing is done rotationally, but this is only possible in larger areas. Community arrangements are essential for determining herd management. Nonetheless, llama production has a lower environmental impact than other livestock (Muñoz et al. 2015).

## SELECTED VALUE CHAINS ANALYSIS

Llama and alpaca production is well-suited to the geographically isolated conditions of the Andean Altiplano, making it fundamental for the livelihoods of its inhabitants who face conditions of extreme poverty (Starkman 2017; Turín 2023). Small-scale production in the Andean Altiplano of Bolivia is defined by productive areas of 3.5 hectares or less, with fewer than 100 animals and communal land ownership.

Llama fibre is not as favoured in the market as alpaca fibre due to its different colours and a high proportion of coarse hair (Cardellino & Mueller n.d.; Quispe et al. 2009). A considerable proportion of the fibre production is for self-consumption. In Bolivia, this percentage is estimated at 30%, while in Argentina, a third is sold raw and the producer transforms or uses the rest. In both countries, producers and communities typically purify and classify the fibre to add more value to the product. However, this added value is often not recognized (Quispe et al. 2009). Table 14 presents some of the actors in the llama value chain in Bolivia.

**Table 14.** Stakeholder list of the llama's value chain in Bolivia.

Actor	Functions/Sector	Details
Cotopaxi - USA	Transformation	Company registered as a Benefit Corporation. Its product lines include clothing, blankets, sleeping bags, tents and backpacks made with llama fibre and polyester filament.
Altifibers - Bolivia	Manufacturing source of llama fibre for Cotopaxi	Processing fibre that Cotopaxi uses in its products. It specializes in fibre and yarn products from llamas, alpacas and sheep.
International Fund for Agriculture Development	Intergovernmental organization	Integral Strengthening Programme for the Camelid Value Chain in the Bolivian High Plateau (Pro-Camélidos) Pro-Camélidos aims to improve camelid-related production in Bolivia. This project builds on their previous project, Enhancement of the Peasant Camelid Economy Support Project (Proyecto Vale)
Department of Agriculture and Livestock Service (SEDAG)	Government	Agency of the Ministry of Rural Development and Land (MDRyT; Ministerio de Desarrollo Rural y Tierras) They are proposing the construction of an industrialization plant for camelid meat and fibre in Oruro.
Promueve	Government	Agency of MDRyT They are partners in IFAD's Pro-Camélidos project.
Heifer International	NGO	Their current project (2014–2024) is the Andean Plateau, Paramo, Camelids and Yarn (PACHA) programme. It is designed to increase the economic, environmental and social capital of alpaca and llama-breeding families in Bolivia, Peru and Ecuador.
Fundación PROFIN	NGO	Works to promote inclusion and financial innovation for the most disadvantaged populations in Bolivia. Their current project is the Rural Markets Project, which is designed to address challenges present in rural markets for farming families.
CHOICE Humanitarian	NGO	Work with poor rural communities to reduce poverty. They have a Weavers Cooperative Program in Bolivia and previously had volunteers who worked with llama farmers.
Center for Research and Promotion of Farmers (CIPCA)	NGO	Work with INIAF and MDRyT to carry out training programmes and technical assistance to support farmers.
SUYANA	NGO	Work with rural communities in Bolivia in areas of health, education, agriculture and environment.
National Association of Producers in Camelids (ANAPCA)	Association	ANAPCA partners with the National Technical Committee of Camelids, which is made up of more than 40 institutions working with camelids.
Universidad Técnica de Oruro	University	Research on llamas: genetics, parasites, breeding.
Tupak Katari University	University	Research on llamas: genetics and medicine (Universidad Indígena Boliviana Aymara Tupak Katari)

Source: Based on Starkman (2017).

# THE LLANOS AND THE PAMPAS RANGELANDS: HIGH-VALUE BEEF

Research indicates that beef production systems in grasslands can promote the sustainable development of these ecosystems. Modernel et al. (2018) studied the economic and environmental performance of 280 farms in the Rio de la Plata grassland region (covering 700,000 km<sup>2</sup> across Argentina, Brazil and Uruguay) with the aim of providing policy recommendations and support mechanisms that favour local beef production systems and the provision of ecosystem services. The authors found that while exploitation models still have ample room to improve livestock productivity and income indicators, the farms provide provisioning and regulation ecosystem services, particularly in nitrogen and phosphorus cycles and transforming solar energy into primary productivity. These services depend on the area of native grasslands available on the farms and the greater the dependence on natural grasslands, the lower the use of nitrogen fertilizers and fossil energy. However, additional studies are needed to identify the underlying management practices that enable these outcomes.

In Uruguay, management practices for native grasslands and livestock include stocking adjustments, which aim to achieve sustainable resource use while improving animal production performance. This was presented by Onyango et al. (2022), who describe the stocking adjustments made under mixed grazing with cattle and sheep. This practice allows the structure of native grasses to maintain tall and short species in adequate proportions for both herbivores to feed.

In the context of promoting sustainable beef production, various efforts are being made in Latin America and the Caribbean in terms of sustainability standards (Moreno et al. 2023). As described by Moreno et al. (2023), sustainability labels in the region vary according to their development time, sustainability goal, promoting organization and type of certification granted. Among the established labels is Grassland Beef. The label has been promoted since 2010 by BirdLife International and focuses on protecting South American grasslands. This label involves Aves Argentinas, SAVE Brasil, Guyra Paraguay and Aves Uruguay (Miñarro and Marino 2013; cited in Moreno et al. 2023). The main objective of the Grassland Beef Program is to improve the use and health of grasslands through the use of technologies and practices for better pasture management (Aves Argentinas n.d., Marino et al. 2013).

In Brazil, the Brazilian Agricultural Research Corporation (EMBRAPA) designed and registered a label aimed at certifying beef produced under silvopastoral and agroforestry systems that contribute to the decarbonization of livestock production (Moreno et al. 2023). This label was registered with the National Institute of Industrial Property (INPI) as Carbon Neutral Beef for the domestic market and Carbon Neutral Brazilian Beef for export. Other livestock production labels and their characteristics are summarized in Table 15.

Table 15. Sustainable beef production labels in Latin America and their characteristics.

Label	Organization	Certifying Body	Label Guarantees
<b>Argentina</b>			
Grass Fed	Asociación Grass Fed	LIAF Control	Cattle feeding on pasture (rational Voisin grazing rotational grazing)
<b>Bolivia</b>			
Bolivian Natural Beef	Federation of Santa Cruz Cattle Farmers (Fegasacruz), Government of Bolivia	Fegasacruz	Free cattle grazing on pastures
<b>Brazil</b>			
Carbon Neutral Brazilian Beef; Carne Carbono Neutro	EMBRAPA	Public or private agencies at the municipal, federal or state level	Beef production from silvopastoral and agroforestry systems, ensuring the neutralization of GHG emissions
Angus Sustentabilidad	Brazilian Angus Association	TÜV Rheinland	Good practices in sustainability, traceability, social responsibility, health, animal welfare and biosecurity in the production of Angus cattle
<b>Uruguay</b>			
Never Ever 3	National Meat Institute of Uruguay (INAC)	Organizations endorsed by INAC (Latu Sistemas, SGS Uruguay and Certicarnes)	Use of antibiotics, hormones, or animal protein prohibited in cattle throughout their lives
Carbon Neutral Meat being developed	Montes del Plata and Breeders and Packers Uruguay	Independent Organizations (Deloitte, Control Union)	Carbon neutrality from forestry plantations
<b>International</b>			
Certified Humane	Ingleby Farms (Uruguay) and Florestal Agropecuária LAR Ltda. (Brazil)	Certified Humane Latino	Cattle welfare from birth to slaughter
Carne del Pastizal	Alianza del Pastizal	Carne del Pastizal Ltd.	Grassland, biodiversity and nature conservation

Source: based on Moreno et al. (2023).

## Rangelands restoration with ongoing cattle farming initiatives: Ganadería Sostenible (GANSO) in Colombia

Created in 2019 with support from Climate Focus and the International Center for Tropical Agriculture (CIAT), GANSO is a Colombian organization whose main objective is to transform degraded pastures and soils through livestock intensification with tree crops (silvopastoral systems) to reduce emissions, deforestation, restore ecosystems and formalize ecosystem services (GANSO n.d.). The organization’s business model is based on providing technical assistance services, monitoring deforestation, investing in livestock farms, and obtaining GANSO certification for commercializing beef with sustainable characteristics.

### a. GANSO certification

The GANSO certification is a voluntary evaluation tool that allows for grading the management of livestock enterprises in terms of sustainability. It is based on five pillars for beef and milk production standards adapted to the Colombian context, encompassing a total of 52 sustainable livestock production practices for cattle, buffalo and milk. These five pillars are based on the principles of the Global Roundtable for Sustainable Beef (GRSB), the Dairy Sustainability Framework (DSF), the Sustainable Agriculture Network (RAS), Global GAP, International Finance Corporation's Environmental and Social Performance Standards (IFC-PS) and Good Livestock Practices (BPG) from the Colombian Agricultural Institute (ICA). The pillars cover i) environment, ii) people, iii) animals, iv) management and v) meat and dairy quality.

The GANSO has its own certification scheme that allows for achieving three levels of progress based on the practice and pillar management evaluation results. Thus, achieving 50% compliance results in Motivated GANSO certification, 51–79% in Committed GANSO certification, and over 80% in Responsible GANSO certification. A third party conducts compliance verification. Reported benefits of GANSO certification include access to differentiated markets, supplier loyalty, evaluation of supplier sustainable management (by the certifying body), continuous improvement processes with producers, assessment and monitoring of the supply chain to comply with Tropical Forest Alliance (TFA) Zero Deforestation Agreements, access to credit lines focused on green and sustainable markets and reliability and transparency to consumers.

Currently, over 41,000 hectares are certified under GANSO in Colombia, distributed across the departments of Córdoba, Cundinamarca, Caldas, Meta, Sucre, Casanare and Vichada (Figure 5). Beef cuts with GANSO certification are sold in Grupo Éxito and Carulla chain stores, specifically in 190 stores across 33 major cities such as Bogotá, Medellín, Barranquilla, Cali.

Figure 5. Evolution of the GANSO certificate, 2019–2023.



Source: Personal communication with the Director of GANSO (2024).

### b. Farm investment model

As an innovative investment approach, GANSO offers capital financing to livestock farms interested in adopting sustainable production systems. This type of financing allows the corporation to be a shareholder with the livestock producer, thereby participating in investment decisions and the operation of the enterprise. The results of the direct farm investment model indicate significantly favourable outcomes in terms of the productive parameters of the meat system (Personal communication with the Director of GANSO (2024).

### c. Deforestation monitoring

With support from Grupo Éxito, GANSO monitors deforestation in the supply chain of meat products. Thus, 18 departments and 158,186 hectares, corresponding to 68 suppliers, were monitored in 2023.

## Small ruminants

### Sheep

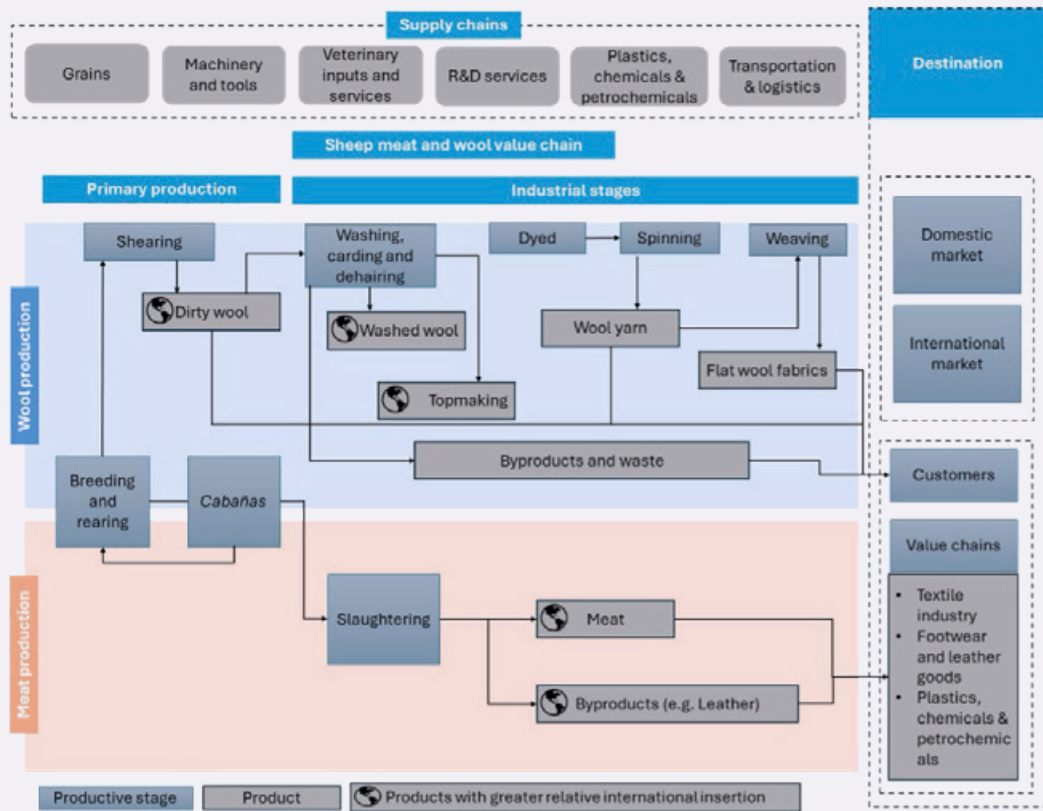
The production of small ruminants (sheep and goats) is a widely extended activity in the mixed farming systems of South America (Toro-Mujica & Riveros 2021). The heterogeneity of the biophysical and socioeconomic conditions of the grasslands where sheep production can be found shapes a broad mosaic of productive and commercial systems for this chain. It is estimated that globally, the three countries with the highest concentrations of sheep are China, India and Australia, while Latin America and the Caribbean (LAC) account for 6.5% of the total inventory of these animals. The leading countries in the region are Brazil (26%), Argentina (19%), Peru (15%), Mexico (11%), Bolivia (10%) and Uruguay (9%) (Villareal-Ornelas et al. 2022a). According to Villareal-Ornelas et al. (2022a), the economic value generated by sheep production (meat, milk and wool) in Latin America and the Caribbean is USD 2,288 million, with Argentina, Mexico and Brazil generating 65% of this value, with notable participation from Mexico.

Some general trends indicate that sheep farming has transformed in Latin America in recent decades to focus more on meat production, slightly displacing wool production. This shift has been accompanied by the introduction of specialized breeds. According to De Lucas (2019), wool breeds such as Merino, Rambouillet and Australian Merino can be found in Mexico and Uruguay, while synthetic breeds imported or developed in America, such as Corriedale, Ideal (a cross of Merino and Lincoln), Lincoln and Romney, are present in Uruguay, Argentina, Brazil, Chile, Colombia and Peru. Meat breeds include Hampshire and Suffolk from Canada, found throughout Latin America; Dorset, Ile de France, Texel and Charollais in Mexico, Brazil, Chile and Uruguay. Though less known in Latin America, the most commonly used dairy breeds are Churra, La Lacha (Latxa), Manchega, Frisona, Lacaune and Awassi, found in Mexico, Chile, Argentina, Colombia and Bolivia. Lastly, Spanish Creole breeds are present in indigenous community herds in Mexico, Guatemala, Peru, Ecuador, Bolivia, Brazil and Argentina, though their purity has been significantly reduced due to crossbreeding.

In Argentina, sheep production focuses on meat and wool, with lesser quantities of by-products like milk and leather being commercialized. Both production chains involve similar activities, except for wool production, which includes shearing (Busellini et al. 2016). Figure 6 represents the value chain scheme for sheep meat and wool in this country. At least six links are identified, starting with the breeding farms, a common link in meat and wool production, where genetic crosses for production specialization are developed. The breeding and rearing stages also correspond to primary production, according to Busellini et al. (2016). An extensive production model (raising and grazing in fenced fields) is distinguished in Argentina. The fattening stage is practically non-existent since domestic meat consumption focuses on lambs and old sheep are slaughtered for self-consumption. Sheep mono-production is concentrated in Patagonia, as the region's conditions hinder the development of other economic alternatives. With varying levels of added value, Argentine wool production is mainly destined for foreign markets.

In Chilean Patagonia, about 97% of farms combine sheep production with crops managed under pastoral systems to produce lambs for sale and self-consumption. Therefore, small ruminant production systems are a significant source of food security and income generation for the populations in these areas (Toro-Mujica & Riveros 2021). According to Toro-Mujica & Riveros (2021), production systems in this area are small-scale, with shepherds maintaining fewer than 60 sheep. Lamb sales occur locally and on the farms, generally allowing shepherds to obtain a better price by avoiding losses associated with intermediaries.

Figure 6. Sheep meat and wool value chain mapping in Argentina.



Source: based on Busellini et al. (2016).

However, specific contextual challenges in this area include geographical isolation, which dictates a subsistence model with reduced market connections, labour shortages and weak access to technology, genetics and technical assistance, which has accentuated herd reductions.

A wide variety of sheep production systems can also develop in Mexico. Estevez-Moreno et al. (2019) describe the role of sheep in the livelihoods of communities near protected areas, such as the Ojo de Agua community of the Zinacantepec municipality, State of Mexico. Based on production models, household strategies to access sheep and other socioeconomic characteristics of sheep production, the authors describe at least four productive systems: i) shepherd breeders, highly related to sheep farming due to their high human capital investment in the activity, the importance of income generation and reinvestment in the system; ii) non-shepherd breeders, farmers linked to sheep farming through joint ventures; iii) fatteners, combining sheep production with other non-agricultural activities under a more intensive production system; and iv) small shepherds, combining extensive systems with non-agricultural employment.

The contrast analysis of the economic value and ecological footprint conducted by Villa-Ornelas et al. (2022a) between 1998–2018 indicates that sheep production systems (SPS) in LAC have favourable and eco-efficient performance. The authors' annual average production estimates for the period studied were 80.84 million sheep, 305.84 kt of meat, 147.95 kt of wool and 89.34 kt of milk. There is a positive balance when contrasting the economic value of SPS (USD 1,203.34 million), the economic value of the blue water footprint (USD 763.38 million) of 1.09 m3 H2O kg protein of meat-milk-wool and the economic value of the carbon footprint (USD 217.44 million) of 69.56 kg CO2eq kg-1 of meat-milk-wool.

This research suggests a scenario of a low ecological footprint combined with a positive socioeconomic impact, with high potential for promoting sustainability in the region. Additionally, studies find that sheep grazing management can be an ally in the control and general availability of forage at the community level (Oñatibia & Aguiar 2019; Oñatibia et al. 2020). However, socio-environmental challenges persist around sheep farming in terms of overgrazing, which leads to soil compaction, vegetation homogenization and competition with endangered wild species (such as the guanaco, Rodríguez et al. 2024).

### Goats

Goat farming is widely distributed globally, thanks to their ability to survive in arid and semi-arid environments with limited access to water and vegetation (Dayenoff 2019). However, its presence in Latin America is limited (Villareal-Ornelas et al. 2022b). According to Dayenoff (2019), in 2003, the goat population in Latin America comprised 33 million head, mainly concentrated in Brazil (31.7%), Mexico (29.25%), Argentina (14.6%), Bolivia (5.9%) and Peru (5.9%). The main breeds used come from European lines introduced during the colonial period, including Blanco Celtibérica, Castellana de Extremadura, Pirenaica, Moxotó and Boer, the latter being more prevalent in Brazil and Mexico.

Dayenoff (2019) describes the meat production models in the region and states that they are characterized by concentration in marginal areas, being primarily empirical with little productive planning or technological implementation and having limited technical and business capacity. Commercialization focuses on suckling kids slaughtered at 60 days with a weight of less than 12 kg and a carcass yield of approximately 50%. Supply is markedly seasonal (depending on births, which are determined by climatic conditions) and informal, as slaughter generally does not occur in authorized slaughterhouses but is carried out directly by producers or intermediaries.

Regarding milk production, which is also minor compared to that produced by other animals Andrade-Montemayor et al. (2019) describe how most goat milk is transformed into regional products such as fresh cheeses and artisanal sweets, which are sold in local markets at low prices. Generally, producers do not have adequate market access, so value distribution is inequitable, with industries and processors obtaining higher prices for the products in the market. This highlights the need to establish collaborative models among small producers to improve their bargaining power and market access, as well as to enhance technological adoption and add more value to the product. Nevertheless, the market has allowed for the development of goat products in response to the demand from consumers with cow milk intolerance, arteriosclerosis and obesity. This has, in turn, driven the development of small family industries for the production of derivatives such as gourmet cheeses in recent years. Some contrasted characteristics of the chemical composition of goat milk are presented in Table 16.

Table 16. Chemical composition of goat, sheep, cow, and human milk.

Composition %	Goat	Sheep	Cow	Human
Fat	3.8	7.9	3.6	4
Non-fatty solids	8.9	12	9	8.9
Lactose	4.1	4.9	4.7	6.9
Protein	3.4	6.2	3.2	1.2
Casein	2.4	4.2	2.6	0.4
Albumin and globulin	0.6	1	0.6	0.7
Non-protein nitrogen	0.4	0.8	0.2	0.5
Calories	70	105	69	68

Source: based on Andrade-Montemayor et al. (2019).

The economic evaluation and quantification of the ecological, carbon and blue water footprint conducted by Villareal-Ornelas et al. (2022b) indicate that in 2020, the economic value of the goat production chain in Latin America and the Caribbean was USD 766.4 million. A total of 761.7 thousand tons of milk and 125.8 thousand tons of meat were produced, with 4866.5 total emissions of CO<sub>2</sub>eq and 102.4 million m<sup>3</sup> of blue water consumed. In milk production, the leading countries were Brazil, Jamaica and Mexico, while in meat production, the leaders were Argentina, Haiti and Peru. The largest environmental impact, linked to the size of the goat inventory, was attributed to Brazil (28%; 1276 Gg y<sup>-1</sup>) and Argentina (12%; 556 Gg y<sup>-1</sup>). According to the authors, their results suggest the good performance of goats in marginal production systems, making them a potential alternative for the sustainable development of the most vulnerable regions where they are distributed.

# FINAL REMARKS

Rangelands are essential resources for livestock production (fibre, wool, cashmere, beef) of the various value chains presented in this report. In the vicuña and alpaca fibre value chain of the high Alto-Andean areas, vicuña and alpaca face competition for feed resources and geographic habitats with other domesticated animals such as sheep. This is particularly worrying given that overgrazing significantly impacts the health of ecosystems such as bofedales and their ecosystem services. These impacts are exacerbated given that camelid populations are increasing and the regulation of the water cycle and snowmelt in glacial areas are also pressing concerns.

In their sustainability reports product certifications, some private companies state their intentions to invest in regenerative approaches, protect biodiversity and improve soil management. The reports reviewed include these as '*materiality*' issues that could generate significant (positive or negative) impacts where the companies operate. This is demonstrated by firms with certifications such as the Responsible Alpaca Standard. However, the actions of this type of certification, for the time being, rest in the hands of large exporting firms and not in rural communities.

This can be an entry point for private companies to negotiate potential investments in rangeland restoration since most of this investment now comes from government sources or development organizations. It would also increase the added value of these products by the communities that face a market in which there are only a small number of buyers for a product, which reduces value capture. The prevailing communal basis of vicuña production and marketing is thought to be supported by some government expenditure on rangeland preservation. To date, this has not been linked to investment initiatives by brand owners, although the history of vicuña preservation does feature investments by LVMH's brand.

Brand owners (exporters mainly) acquire fibre from the trading network, although the location and processing stage of ownership change remains unclear. The small volumes of internationally traded fibre, yarns and garments suggest that owners of fashion brands are diverse businesses. However, brand owners' investments in land and animals have been observed, for example, Schneider Group's purchase of land and animals (Kasterine & Lichtenstein 2018) and LVMH-owned Loro Piana's funding of preservation programmes for vicuña.

Andean countries have taken various approaches to land and animal resource management associated with vicuña. In some cases, this extends to traceability mechanisms that track physical production and address equitable distribution of marketing proceeds. The standards and procedures involved are not coordinated across countries, and there are no known connections between brand owners' purchasing. There is an opportunity for brand owners to further develop these systems. However, standards and compliance would need to reflect the diverse nature of household production and land use. This situation suggests a holistic Rangeland Standard as proposed by STELARR project partners.

As noted above, a rationalization of standards and compliance will be required to provide a consistent basis for product claims made by value chain participants. This would reflect the diverse smallholder production systems and their use of the rangelands. The interlocking set of trading and export/re-export networks requires standardization because high-value brands will be encouraged by the option of using fibre from multiple sources without changing the product claims made.

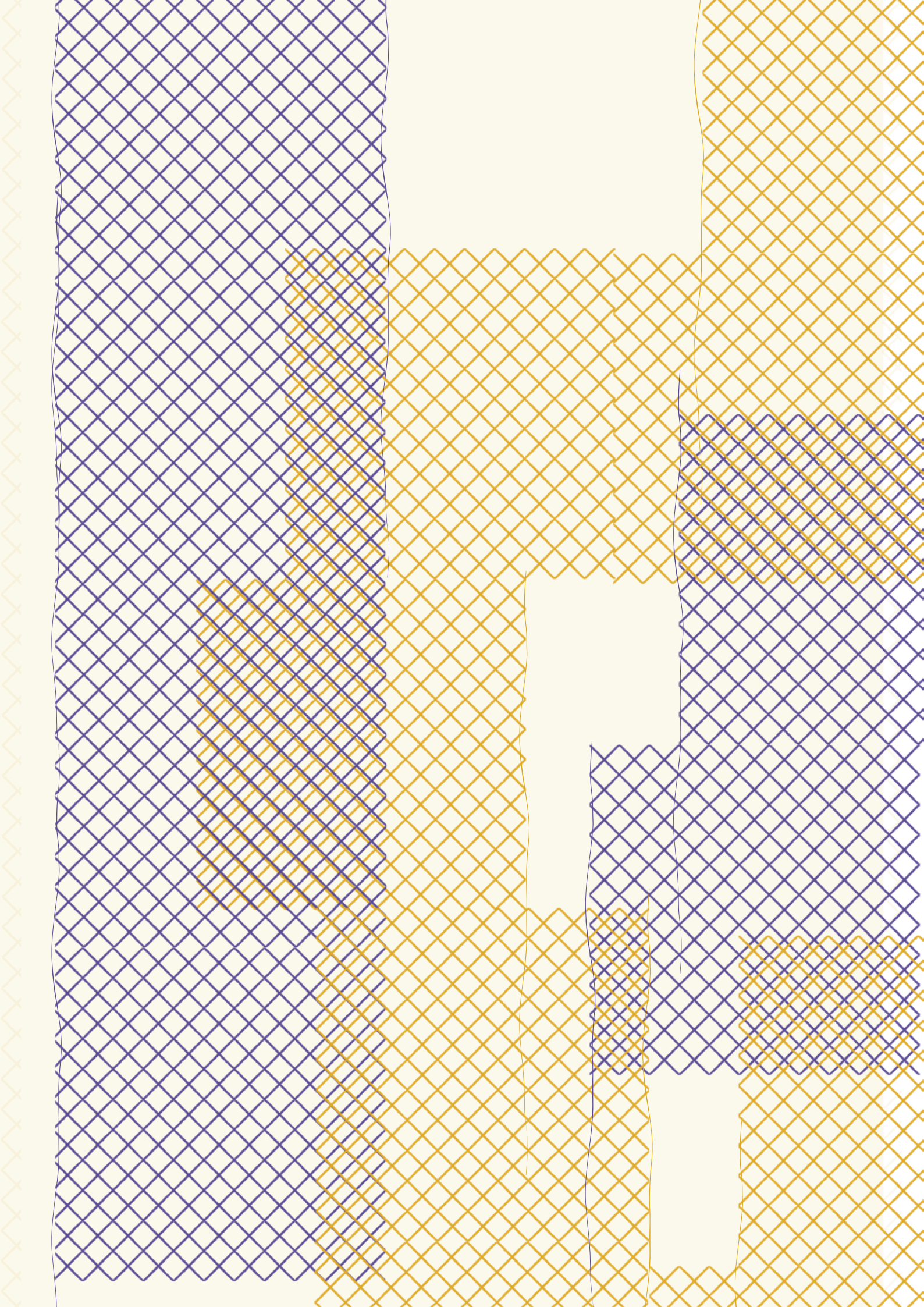
In the case of high beef-value chains, producers' compliance with GANSO's standard system is the basis for retail branded product claims across several dimensions of sustainability. The standards accommodate several forms of rangeland use and related grazing and silvicultural systems. GANSO has its own certification scheme and includes innovative financing models by offering capital seed for investments in the farms and becoming a shareholder. This has significantly impacted the scheme's adoption, productivity yields, and reduced environmental impacts.

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This report presents an overview of the livestock value chains present in the rangelands of Latin America, their key components, social and environmental impacts, ongoing strategies for the restoration of rangelands that include diversified activities (livestock, agro-forestry, minerals, oil and gas industry), a description of the main bottlenecks and opportunities for the development of value chains and the identification of stakeholders with their respective roles.

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