World Population of SACs

According to the available census data, the current population of *llamas* and *alpacas* is 6,276,396, distributed along the Andean *cordillera* with the zone of greatest concentration located between 11° S and 21° S. Despite the relatively small population of *llamas* and *alpacas*, they play a role of primary importance in the economy of the high Andean regions of Peru, Bolivia, Chile, and Argentina. A very small population of *llamas* thrive in Ecuador where very recently the *alpaca* has been reintroduced.

Eighty-eight per cent of the world's 3,042,346 *alpaca* are found in Peru; likewise, the greatest percentage (62.5%) of the world's 3,234,050 *llama* are found in Bolivia. The rest of the South American population of domesticated camelids inhabit Chile, Argentina, and, a very few, inhabit Ecuador (Table 4). The highest population of *guanacos* is found in Argentina, where the estimated number is 600,000; in Chile there are an estimated 22,000 *guanacos*, while Peru and Bolivia have negligible populations. The *vicuna* population is distributed in Peru, with the highest population (107,421), Chile (27,900), Bolivia (13,000), and Argentina (15,000). At present, the *guanaco* and *vicuna* populations are probably larger than these estimates as a result of policies aimed at their protection. The exportation of hides from young *guanacos*, for instance, decreased from 86,062 in 1978 to 10,250 in 1984.

The population of SAC outside the Andean Region has not been very significant until now, but figures given by the exportation authorities from Chile and Bolivia, as well as the associations of *alpaca* and *llama* breeders in the USA, Canada, England, New Zealand, Australia, and other European countries, show that the population is significantly increasing in these countries. The number of *llama* in the USA is around 25,000 with a lesser number of *alpaca*; a similar number is said to exist in New Zealand.

Genetic Diversity

South American domestic camelids bred in different areas have sometimes been given local names, but it would be misleading to call them breeds. A recent survey studied the germplasm of South American Camelids from Bolivia, Peru, and Chile and the following conclusions were reached.

1. Chile has only one breed of *alpaca*, the *Huacaya* breed, representing 100 per cent of the total *alpaca* population in that country. Likewise, Chile has two breeds of *llama*: the *Lutica* (60% of the total *llama* population), called *Kara* or *Kcara* in *Peru* and Bolivia, and the *Tajulli* (40% of the total *llama* population), called *Tampully* in Bolivia and *Chaku* in Peru (Table 5).

2. The same occurs in Bolivia which has only one breed of *alpaca*, the *Huacaya* (100 % of the total *alpaca* population), although a few *alpaca* of the *Suri* breed live in the northern part of Bolivia, close to the Peruvian border. Also Bolivia has two breeds of *llama*: the *Tampulli* or *Thampully* (20 % of the total *llama* population), named *Tajulli* in Chile and *Chaku* in Peru; and the *Kcara* or *K'ara* breed (80% of the total *llama* population), named *Lutica* in Chile and *Kara* in Peru (Table 6).

Table 4: Estimated Population and Distribution of *Alpacas* and *Llamas* in the Andean Region

Country	*Alpacas*	*Llamas*	Total	% Regional (1)
Argentina	Few	75000 (2.30%)*	75000	1.20
Bolivia	324326 (10.75%)	2022.126 (62.50%)	2346452	37.40
Chile	30657 (1.0%)	66383 (2.10%)	97040	1.50
Ecuador	Few	Few		
Peru	2687363 (88.30%)	1070541 (33.10%)	3757904	59.90
Total:	3042346	3234050	6276396	100.00
Per cent**	48.50	51.50	100.0	

(1)Regional percentage by country.
* Probably some per cent are *alpacas* and hybrids.
** Per cent of total domestic SACs.

Table 5: Regional Names of the Different Breeds of *Alpaca* and *Llama*

Country	*Alpaca*	Breeds	*Llama*	Breeds
Bolivia	*Huacaya*	*Suri*	*Tampully*	*Kcara*
Chile	*Huacaya*	--	*Tajulli*	*Lutica*
Peru	*Huacaya*	*Suri*	*Chaku*	*Kara*

3. Peru has two breeds of *alpaca*: the *Huacaya* (95% of the total *alpaca* population) and *Suri* (5% of the total *alpaca* population); there are two breeds of *llama* also, the *Kara* (80 % of the total *llama* population), named *Kcara* in Bolivia and *Lutica* in Chile, and the *Chaku* breed (20% of the total *llama* population), named *Tampulli* in Bolivia and *Tajulli* in Chile.

Table 6: Percentage of the Different Breeds of *Alpaca* and *Llama* in the Andean Region

	Alpaca		*Llama**	
Breeds	*% Huacaya*	*% Suri*	*%Kara*	*% Chaku*
Country				
Bolivia	100.0	**	80.0	20.0
Chile	100.0	--	60.0	40.0
Peru	95.0	5.0	80.0	20.0

* 10% of the *llamas* are considered to be of an "intermediate type", crosses between both breeds of *llamas*.
** There is a small number of specimens of the *Suri* breed.

4. It has been observed that approximately 20 per cent of the *llama* in the three countries are of the "intermediate breed or type", that is, the result of crosses between animals of both breeds. In the survey, these animals were classified as belonging to the *Kara* breed. There are no phenotipic intermediate types of *alpaca* (as a result of crosses between animals of the *Huacaya* and *Suri* breeds).

5. In Tables 7 and 8 we can see the colour of the coat or fleece of the *alpaca* and *llama* in the different breeds in Bolivia, Chile, and Peru. In Peru the most frequent colour (unicoloured) in both breeds of *alpaca* is white, followed by different shades of brown, black, grey, and roan; patched animals (two colour combinations, very rarely three colours) represent 14 per cent of the total population of both breeds of *alpaca*. On the other hand, the predominant colour in Bolivia and Chile is brown (in different shades), followed by black, white, grey, and roan; patched varieties account for 17.5 per cent and 13.5 per cent for Bolivia and Chile respectively. The grey colour (with different shades) is a mixture of white and black hairs in the fleece, and the roan colour is a mixture of white and brown hairs in the fleece. The changes in the intensity of the grey and roan colours (shades) depend on the quantity of white hairs in the fleece.

Table 7: Coat Colours and Their Percentages in the Two Breeds of Andean *Alpaca*

	Huacaya			*Suri*		
Country	Bolivia	Chile	Peru	Bolivia	Chile	Peru
Colour						
Brown	41.0	52.0	23.5	---	---	32.0
Black	15.0	13.0	4.0	---	---	3.0
White	13.5	11.5	56.5	---	---	50.0
Gray	.0	5.5	1.0	---	---	1.0
Roan	5.0	5.5	1.0	---	---	--
Multi-coloured	17.5	13.5	14.0	---	---	14.0
	100.0	100.0	100.0	---	---	100.0

Table 8: Coat Colours and Their Percentages in Andean *Llama*

Country	Bolivia	Chile	Peru
Colour			
Brown	23.0	11.0	25.0
Black	12.5	1.5	1.5
White	11.0	12.0	33.0
Gray	9.5	6.0	9.5
Roan	1.0	0.5	---
Multi-coloured	43.0	69.0	31.0
	100.0	100.0	100.0

6. The most frequent colour (unicoloured) for *llamas* in Peru is white (33%), followed by brown, grey, and black (Table 8); patched animals with two colours account for 31 per cent of the total *llama* population. On the other hand, dark colours, such as brown and black, are abundant in Bolivia, followed by white - accounting for 11 per cent - and grey - accounting for 9.5 per cent. In Chile, the solid white colour in *llamas* is the most abundant (12%), followed by the brown and the grey. The patched animals account for 43 per cent and 69 per cent of the total population of *llamas* in Bolivia and Chile respectively. Information about the colours, of *llamas* according to their breed was obtained only in Peru (Table 9); white and then brown, grey, and black are the most abundant solid colours in both breeds of *llama*, and the patched colours, or colour combinations, account for 33.5 per cent and 22.5 per cent of the *Kara* and *Chaku* breeds.

Table 9: Coat Colours and Their Percentages in the Two Breeds of Peruvian *Llama*

Breeds	*Kara*	*Chaku*
Colour		
Brown	24.0	28.0
Black	1.0	3.0
White	32.0	38.0
Gray	9.5	8.5
Roan	---	---
Multi-coloured	33.5	22.5
	100.00	100.00

7. Average adult live weight and withers' height of the different breeds of *alpaca* and *llama* in the countries surveyed are shown in Tables 10 and 11.

Table 10: Average Live Weight (kg) by Gender in the Different Breeds of *Alpaca* and *Llama* in the Region

	Alpaca				*Llama*			
Breeds	*Huacaya*		*Suri*		*Kara*		*Chaku*	
Sex	Male	Female	Male	Female	Male	Female	Male	Female
Country								
Bolivia	55	47	---	---	80	75	80	75
Chile	55	50	---	---	80	75	80	75
Peru	60	57	60	58	90	85	90	85

Table 11: Average Withers' Height (cm) in Different Breeds of *Alpaca* and *Llama* in the Region

	Alpaca				*Llama*			
Breeds	*Huacaya*		*Suri*		*Kara*		*Chaku*	
Sex	Male	Female	Male	Female	Male	Female	Male	Female
Country								
Bolivia	80	80	---	---	105	95	105	95
Chile	80	80	---	---	105	95	105	95
Peru	90	90	90	90	110	105	110	105

8. Tables 12 and 13 show us the weight and fineness of the fleece. The weights given of *alpaca* and *llama* fleece are from the literature. Conflicting weights are given, because the authors usually do not refer to the frequency of shearing, and this information is important for establishing the real fleece yield. We have carefully selected existing information, critically collecting that which would establish clearly the frequency of shearing (annual or biennial).

As we can see from Table 5, all the *alpaca* and *llama* belong to well-known breeds, although with different regional names; attempts to classify them into sub-breeds, as some scholars do, are meaningless. There are a number of *llama* "varieties", in Bolivia, bearing the name of the district in which they are bred but differing little from each other.

Table 12: Average Fleece Weight (kg) in Different Breeds of *Alpaca* and *Llama* in the Region

	Alpaca		*Llama*	
Breeds	*Huacaya*	*Suri*	*Kara*	*Chaku*
Country				
Bolivia	2.5*	---	0.94**	1.31**
Chile	2.4*	---	0.82***	
Peru	1.8**	1.9**	1.02***	

* Biennial shearing
** Annual shearing
*** Annual shearing, average for both breeds

Table 13: Average Fleece Fineness (microns) in Different Breeds of *Alpaca* and *Llama* in the Region

	Alpaca		*Llama*	
Breeds	*Huacaya*	*Suri*	*Kara*	*Chaku*
Country				
Bolivia	24.0-28.0	---	24.98(87.07)*	23.20(71.16)*
Chile	24.0-30.5	---	-----	-----
Peru	24.02	23.8	33.88**	28.06**

* These numbers refer to the fineness of the "inner coat" of the fleece and the number in brackets to the "outer coat" of the fleece.

** Average fineness between the inner and outer coats of the fleece.

In Bolivia, there are some variations in size, conformation, and fleece characteristics, but there are no types that are recognised as being distinct. The variations here are probably greater than elsewhere, but no local strains have been described.

The breeder can improve the herd or flock through variation or genetic diversity, and both heredity and environment are important in producing differences among individual animals and, in some instances, this variability is a result of their interaction. By studying variations alone, we are not able to determine whether certain variations are due to environment or heredity. Nevertheless, the relative importance of hereditary and environmental influences on variations for individual traits has been determined for other domestic species, but not for *alpaca* or *llama*.

Inbreeding is the mating of animals that are more closely related to each other than the average of the population, i.e, mating animals that have one or more ancestors in common. The primary problem with inbreeding is that it results in not only a concentration of the "good" or desirable genes, but the "bad" (undesirable or deleterious) genes as well. As the homozygosity of the herd increases, so does the incidence of genetic defects (this will be discussed in the following section). A serious problem with inbreeding is that, when it is combined with selection, it causes a decrease in genetic diversity. Currently, most of the small herds of *alpaca* and *llama* are maintained by a single human family, and male animals tend to be used for years, with minimal or no rotation, promoting inbreeding. Therefore, the genetic diversity is reduced in small herds of *alpaca* and *llama*, and many problems arise as a result.

However, the Andean Region is host to numerous genetically different populations of *alpaca* and *llama*, populations that have been geographically isolated, hence increasing the genetic diversity.

Recently there has been a renewed interest in the preservation of genetic variation in farm livestock. This has come mainly through the desire of breeders and geneticists to store genes or germplasms of the minority breeds, some of which were on the verge of extinction.

Germplasm can be stored as semen for some species (the haploid state) or fertilised ova (the diploid state), or in live animals kept in zoological gardens, national parks, and privately-owned game ranches. In Peru, we know of three State farms involved in increasing the population of some colours of *alpaca* or *llama* that were very low in number. In Bolivia, an ambitious programme of regional scope for the establishment of a research and promotion centre for SACs is currently being negotiated with FAO's International Fund for Agricultural Development.

Traditional Breeding Practices: Criteria and Results

Animal selection for specific traits is an old and important aspect of SAC breeding among traditional herders of the Andes. Although the criteria for selection have changed over time, particularly after *alpaca* fibre became an important export item, the highland peasant has selected some traits that have been considered culturally desirable.

Several researchers have focussed on the traditional systems that herders use to classify and identify each of their animals. Traditional herders, as elsewhere in the world, treat and deal with their animals on a strictly individual basis. Each animal is recognised for its physical appearance as well as for its behaviour. Herders can easily point out each one of their animals and describe them in terms of somatic as well as ethological characteristics.

Animals are identified and classified by a number of criteria: age, sex, race, fibre quality, and colour; current status in terms of shearing, genetic defects, or visible marks; and by their behaviour (leadership, attentiveness, bewilderment, timidity, wildness, etc).

In the context of the current fibre market economy, classification by fibre quality and colour is crucial. *Suri* and *Wakaya* fibres may, in turn, be subclassified into *chharqa* (coarse and heavy) or *llamphu* (soft and light), the second being preferred for weaving. On the other hand, with regard to *llama* and *wari* (crosses between *alpaca* and *llama*) fibre quality is referred to by the terms *allin millmayuq* (good quality) or *manan allin millmayuq* (poor quality).

Colour of fibre is particularly important. In addition to the extremes of white and black, a wide range of tones are recognised by the term *kulur*, for which over twenty possibilities can be found (from cream white, light brown, grayish, dark brown, etc). Colour terminology usually provides the basis for the giving of individual names to each animal. Furthermore, the actual colour pattern for distribution of the many colours over the animal's body is described by rather extensive and elaborate Quechua terminology (Flores Ochoa 1988).

Identification of ownership of the animal is very important, especially when mixed herds of different animals graze in communal pastures. Andean herders have traditional ways to mark their animals (*señalakuy, marka*) for ownership identification. The *señalakuy* of animals is an important ritual ceremony for communal participation. Depending on the region of the Andes, the marks can be done in different ways. Usually small pieces of the ears are cut in different patterns. Twenty alternative ear-cutting patterns and 480 combinations of these have been reported. In some regions the ears are traversed across with coloured yarns and laces. All these clearly identify a family's property and sometimes the adscription of families to communities. In a few cases the branding of SACs with hot iron markers has been reported.

In terms of sex and reproductive age animals are equally classified with specific denominations (see Table 14).

Table 14: Sex-age Classification Denominations For SACs

Male	Neutral	Female
Alpaca		
Orqo (male)	*Chifón* (sterile male)	*China* (female)
Tatala (adult male)	*Urwa* (" female)	*Mama* (mother)
Huayñachu (sire)	*Machora* (" ")	
Malto (male without brood)		
Wari		
Orqo (male)	*Urwa* (sterile female)	*Mama* (mother)
Tatala (adult male)		
Llama		
Orqo (male)	*Malto* (sterile male)	*Mama* (mother)
Tatala (adult male)	*Urwa* (sterile female)	
Chullumpi (sire)		

Age in itself is also an important classificatory criterion. An animal is considered young (*tuwi*) during its first two years. After the second year it becomes *ankuta*, an animal able to breed. Old males and females are referred to as *machu* and *paya*.

Huallcas (colored laces or yarns) are also placed on parts of the animal (around their collar or on the rear right or left thigh) to match recently born offspring with their mothers. Sex, and sometimes ownership, is also marked by one or more large locks of hair left aside during shearing on a specific part of the animal's body.

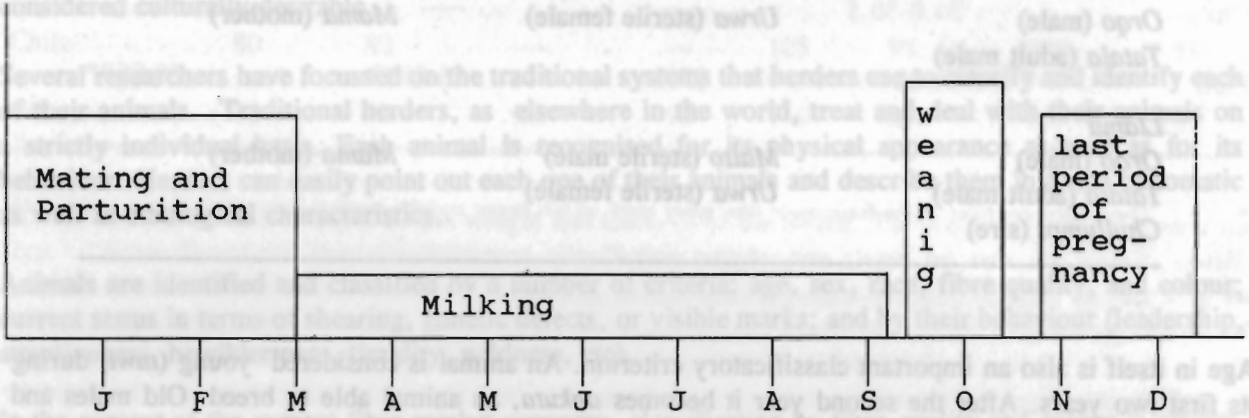
Although the elaborate ancient techniques related to animal selection and breeding were gradually forgotten after European colonisation, many aspects remain as part of the herding traditions of the highland indigenous communities. The reproductive period starts shortly after the onset of the rainy season, once pastures are abundant (anywhere from late November through January). New and full moon days are avoided. Healthy male sires, over two years old with preferred eye colour (light eye colour is a sign of disposition to infections), size, and fibre characteristics, are purposely placed in the female flock. Females should be receptive. If not, their back feet are tied and sometimes their tails are shorn. Once pregnant, a yarn or lace is tied around the female's tail to avoid confusion. Pregnant females also reject males. After a few months, pregnancy can be identified by the herders through actually touching the female's belly.

Sick or defective females are prevented from undesired pregnancy by covering their backs with plastic shields. Females with small teats and poor milk production are avoided. Some defects, such as polydactylity, are desirable and considered to be good luck. Market considerations nowadays favour pure white fibres, disregarding the many tones and shades.

Males with undesirable traits are usually castrated under the full moon once they are two years' old. Castrated animals are believed to become more resistant to infectious diseases, to fatten, and to produce more fibre. Castration is done by hand by cutting and pulling out the testicles.

Parturition occurs during the rainy season. Newly-born offspring are protected from the cold by wrapping their trunks with cloth (*wacachi*). This is believed to protect them from cold as well as from stomach pains. Towards March-April the offspring are counted and marked. After marking, old animals are destined for slaughtering for dried meat (*charqui*). The following figure offers a graphic representation of the *alpaca* vital cycle.

Figure 1: Critical Nutritional Periods in the Reproductive Cycle of the *Alpaca*



Source: FIDA 1990