Camelids in South America. Lama (*Lama pacos*) production systems in Bolivia

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Summary

In this paper, a review about the historical and actual context of the lama production systems, with special focus in the Bolivian Altiplano Lama Production Systems (BALPS) is presented. The BALPS are possible to include in two general systems manned *Pastoral (lama, or/and alpaca and sheep) System* and *Agropastoral System,* and gather near 54 thousands productive units. During the last five centuries, the life of many people in these systems was very hard, and the poverty and social exclusion are the principal results. Lama is the principal livestock component and has historically been used for their high protein meat, transporting merchandise along the Incan, colonial and republican roads, and in religious rituals; it provides the family with economic security, manure, traction and transport and has and specific cultural significance; moreover, in those Agropastoral Systems, the quantity of manure determined the extension of agricultural activities. In Bolivia as in other countries, the llamas' productive systems are, still, traditional and based on the extensive used of the native pastures. The productivity of the grasslands, not only is scare but too it has low quality as a result of the extreme climatic fluctuations, characterized for periods prolonged of frosts and droughts, and depended of a ecosystem fragile, marginal and inaccessible. However, the Altiplano, also presents opportunities as its biological diversity and the extreme conditions have generated traditional practices and knowledge that joint with modern technologies should be used to improve the actual low productive systems. The planners of *Ministery of Rural Affairs and Agricultural of Bolivia* consider that the successful developed of the camelid chain with fiber, meat, and leather productions require to develop of special markets as organic or ecological markets, and consider that this can be a one of a few opportunities that have the Altiplano people in order to resolved the secular poverty cycle.

Keywords: Lama (lama pacos), production systems, Bolivian highland.

Introduction

The camelids production systems in South America are located in the Andean Central Region, which include the highlands or Altiplano of Argentina, Bolivia, Chile, Ecuador and Peru. This mountainous area (with around 1.4 million square kilometres and more than 113 millions habitants) is inhabited by some of the poorest people in Latin America, most of them depend on agriculture for their livelihood. The majority of the farming systems are mixed systems based on crop-livestock. Livestock component plays an important role in the sustainability, because is less susceptible to widespread climatic risks than crops.

In 1580 with the initial Colonial Epoch, sheep and cattle were introduced to the Altiplano in order to replace the native livestock. This colonial behaviour was based more on religious consideration than on zootechnical criteria, because the catholic missionaries known the use of llamas in religious rituals. Moreover, llama meat was prohibited in the marketplace, as a way to reduce the availability of llamas for religious rituals.

Since immemorial times, in these systems, lamas have been used for their high protein meat, transporting merchandise along the Incan roads and in religious rituals. Five centuries later, with the construction of modern roads for transport, the demand for llamas for transporting drammatically decreasing, but, in the last decade the interest for lama's fiber increased and many rural developers agree that is possible to built an important textile industry based on lama fiber similarly to the alpaca sector that have been historically used for its fine fiber.

Actually, camelid take important roles such as: food supply, feed bank, work, and source of energy in the system, source of fertilizer, and link to local markets.

Livestock Andean problems

Before to the Spanish Conquest, Incan Empire developed agropastoral production systems that were able to produce significant goods based on the use of simple and low inputs external technologies. But, following the collapse, massive new genetic resources, socio-economic and administrative changes were introduced (Caro, 1992).

During the colonial times there were introduced new genetic resources, composted principally by sheep and cattle, that occupied the best lands and lamas and alpacas were confined to an obscure existence and used lands with increased agronomics difficulties. In addition, the mines demanded not only an important quantity of meat, vegetables and nature energy but also needed large llamas caravans, in order to transport the mines products from the highlands to the side cost. The irrational llamas' management and low prices for their products conduced to a development of the poverty cycle for livestock keepers.

Between these general context, in Bolivia 54 000 keepers depend on camelids productions. In the last five centuries, many people in these systems lived a very hard life, and the poverty and social exclusion are the principal results. They have only tree issues: poverty, soils of low

quality and camelids. And with these last, they reproduce the first issue (MACA, 2002).

Agropastoral and pastoral systems with lama in marginal lands of Bolivia

Under a simplistic view, in the Altiplano of Bolivia is possible to find out, two general production systems associated to South American camelids. It is possible to identificate apastoral (lama or lama and sheep) system and an agropastoral system. In the last systems, the use of various types of crop enables farmers to minimise climatic risks. Animal husbandry has many functions besides the pure productive ones. It provides the family with economic security, manure, traction and transport and has and specific cultural significance.

Inputs of Bolivian lama production system

In spite of diverse efforts carried out in the last 40 years by the Bolivian Governments, these productive systems have, practically, no provided a system of commercialization jousts that assure to producers a minimum benefit of its products market, nor an opportune and efficient sanitary control, infrastructure of support or credit and technical support. Probably, the combination of the previous constraints explains by itself the present low production indexes of the flocks (MACA, 2002).

Human resources

In the management of the Altiplano by agropastoral production system, the size of the family, the age of these members, the ability to management the system, the level of specific knowledge, the size of production units and the size of flock are very important (Quiroz *et al.*, 1995). On the other hand, in the last years, the explosive growth of the population and the collapse of mines activity has resulted in massive pressure on the highland natural resource and originated the greatest series of migrations in Andean Bolivian history. As a result we find out:

1. Extreme poverty: low incomes; low education levels; limited access health services, Overgrazing of natural pasture; scarcity of water resources.
2. Process of migration with lost of the youngest and most able population.
3. Environmental impacts in both original areas (highlands) and receiving areas (lowlands)
4. Severe socio-economic and political problems partially generated by the necessity to find out best condition of life.
5. A minor or a lack attention to crop-livestock management, that results in a low productivity.

This socio-economic framework describes a rather alarming situation which can adversely affect the future of the economy for the communities of the Altiplano. The migratory process towards the cities or the lowlands will continue, and eventually, the cocaine production can increase. Unless the national governments implement special programs to resolve the

Habitat component

poverty, some areas of the Altiplano will be the principal centres of social problems.

The Bolivian Altiplano is a large high plateaus above 3 500 m and has the same characteristics of the Central Andes Region. The variables temperature, precipitation, air pressure, solar radiation, and wind speed define the ecosystem's Altiplano. The southwest part is relatively arid with Regosols, Lithosols, Alluvial Soils, and the Calcimagnesian Sodic. The northern ranges are relatively more humid than the southern ones and have mixed brown forest soils, lithosols, and heavy-textured alluvial soils (MACA, 2002).

Elevation and the Humboldt Mass are important determinants of Andean cool climate, in this equation the latitude is only a minor factor in the expression of Andean climatic conditions. Moreover, local variations in topography influence temperature and humidity, particularly with respect to diurnal ranges.

Temperature has a range from 4°C to 6.5°C, but with much local variation. Under cloudy skies, the diurnal temperature range will decrease markedly. Within the tropical zone of Bolivia and Peruvian Altiplano, temperature gradients are very steep, at 10.5°C per 1 000 m during the cooler season and 12.5°C per 1 000 m during the warmer season (Alzérreca, 1992).

Since 1900, the pressure on natural resources has increased, according to high annual rate of human (2.9%) and livestock (2%) expansion. Today, the Altiplano ecosystem presents an important rate of degradation; only the soil lost is estimated in 14 000 kg per hectare / year (Le Baron *et al.*, 1979). This process was parallel to the mines development in the highlands. This erosive process results in an important lost of biodiversity and the most important in the reproduction of the poverty.

Biomass component

The Altiplano native vegetation is a result of a short rainy season and low temperatures. It is further influenced by the specific effects of solar radiation, wide variations in temperature, low humidity, and low oxygen pressure. Currently, the Altiplano vegetation is typical, but changes in humidity from north to south create three different types: the humid Altiplano with vegetation characterized by typical grass vegetation, named Chilliguar grassland; the dry Altiplano, where the bunch grasses, called *ichu (Festuca* spp.) and tola shrubs, are dominant; and, the desert region, as the Puna of Atacama and Argentina has typical xerophytic plants (Beck, 1992).

In the Altiplano region, the native grasslands constitute the main feed resources for both camelids and ruminant species. And those are composed by different associations of plant species. Table 1 summarises the main grass associations, dry matter yields (DM) and lama stock rate.

Table 1. Biomass production.

Main grass association	DM Yield (tn / year)	Stock rate (Lama units)
Chilliguar grassland	1.7 - 2.2	2.0
Pajonal	0.8 – 1.2	1.0
Tolar – Parestrepia, Bracharis	0.3 – 0.4	0.2
Paramo rangelands	0.2 – 0.3	0.1
Bofedals	4.0	4.0

Source: Campero, 2004 (modifided from Quiroz, 1995).

Other important type of forage is the aquatic vegetation that is composed of plankton and macrophytic. Within the macrophytic, there are about 15 species. The most important ones are the llachu (*Elodea potamogenon, Myriophyllum elatinoides*) and the totora (*Schoenoplectus totora*) (Alzérreca, 1992).

Livestock (lama) component

The actual population of lama located in Bolivia, Peru and Northern Argentina is aroubd 4.5 million heads. Their special adaptation to high altitudes is associated to a specialised haemoglobin, that can absorb more oxygen than that of other mammals. Their red blood cells also have a longer life span than other mammals, an average of 235 days versus 100 days for humans.

Archaeologic evidence indicates that the lama have been domesticated approximately 5 000 years ago. On the base of corporal conformation, is high probably that the llamas were selected as pack animal. In fact, lamas are larger and stronger than the guanaco, their more closed wild parent. On the other hand, the alpaca has probably been selected and breed for fiber. The vicuña is their more closed wild parent.

Flock composition

According to National Census (1998), the typical structure of Bolivian llamas' flock shows a higher proportion of females than males. The females constitute 64.6% of the total; while, the male contribute with 35.4% of the total. The ratio between reproductive females and males is colose to 11:1 (Table 2). This flock structure is the result of the strategies of the sale and familiar consumption, which prioritize sale or consumption of male within a small flock with no more than 50 lamas in average.

Table 2 Average composition to llama flock (in thousand).

	Females		Males		Total	
	Number	%	Number	%	Number	%
1. Temporally teeth	455.7	15.19	341.7	11.39	797.4	26.58
2. Permanents: Two teeth	417.6	13.92	417.6	13.92	835.5	27.85
3. Permanents: Four teeth	227.7	7.59	75.9	2.53	303.9	10.13
4. Permanents: Full mouth	987.3	32.91	75.9	2.53	1 063.2	35.44
Total	2 088.6	69.62	911.4	30.38	3 000.0	100.00

Source: MACA, 2002.

Reproductive efficiency

The reproductive efficiency in Bolivian llama flock is still low and cloose to 55%. This value is the results of tropical highland environment, low levels of management, poor sanitary controls and over-grazing of native pastures. According to actually investigations, the reproductive efficiency may be improved, whiting certain limits, as direct function of energy intake (Campero, 2004).

The female lama reaches sexual maturity at one year of age, but in Bolivia it is common not to mate he animals until the female is two or three years old; the lenght of the gestation is about 348 days. Males get sexual maturity at about three years of age.

Traditionally, the breeding season begins in February and it has 60 days of duration. The partition occurs during the day mainly between 6.00 a.m to 12.00 p.m in the months of January and February. The live born lama does not receive any attention; the abortion is frequent and it is estimated to around 9%.

The weaning is carried out naturally in the months from August to October with a rank from 240 to 300 days of lactation. Generally, the mass weaning is near the 2/3 of mass adult. No separation of animals by sex or age exists and all of them constituted a single flock.

Traditionally, the males are selected under phenotypic criteria, being the mass corporal (weight greater than flock average) and fleece colour (brown or black) the principal criteria for the selection.

Weight corporal variations

Five characteristics are frequently associates with the corporal weight variation of lama, i.e.: age, sex, breed, colour of fleece and management. Obviously, the age and the sex have the major effects. In Bolivia, on the base of a population of 9 680 animals, Loayza and Iñiguez (1995) developed the following equations of prediction of the corporal weight as a function of age.

Male: $Y = 59.5 + 4.3X - 0.14\ X^2$ ($R^2 = 0.97$)

Females: $Y = 60.7 + 3.9X - 0.42\ X^2$ ($R^2 = 0.92$)

These equations were corrected to effects due to localities, sex and age.

In male, the weigh corrected by effects of localities increases lineally until to the 7 years of age, when the curve has a descendent tendency. In the females, the weight corporal tendency has a parabolic course. The corporal weight constantly increased until 4 years of age.
Figure 1, shows these variations according to four categories of age and shows that the growth, in practical terms, finalize after the fourth year. The average for to corporal weight predicted with the equations 1 and 2, corrected only by age (correction to 4 years) and omitting localities, shows a weight of 90.6 ± 8.7 kg and 86.5 ± 8.4 kg for male and females, respectively.

Fleece characteristic

Lama fiber is a medulated natural protein with no lanolin, which is classified as a specialty fiber. Positive characteristics are: fine, strong, comfortable and warm, available in 16 natural colours; its little elasticity is considered as the principal limiting factor.
In the national flock of lama, the distribution of fleece colours is black and brown (69.6%), spotted colour (22.8%), and white (7.6%) (Figure 2). The spotted pattern includes those diverse colour or tones that on a white colour fleece fund are presented. Figure 3 presents this model of colours fleece (Campero *et al.*, 2004).
These patterns of colour distribution, may be possibly explained on the regional preferences of the people for the black and brown colours. The selection of male is guided, among others criteria, by favouring the lama with brown colour fleece. Preliminary observations consistently suggested that the taller and heavier animals are those that have dark colours.
Empirical observations show that lama with brown and white spots fleece produce longer fleece, following by animals which fleece are dark or white colours. In order to maintain the corporal temperature in the highlands Andean condition, animals with white fleece colour probably require more energy than animals with dark colour. If this is true, the dark colour animals are more efficient in produceing fiber in the Altiplano region.

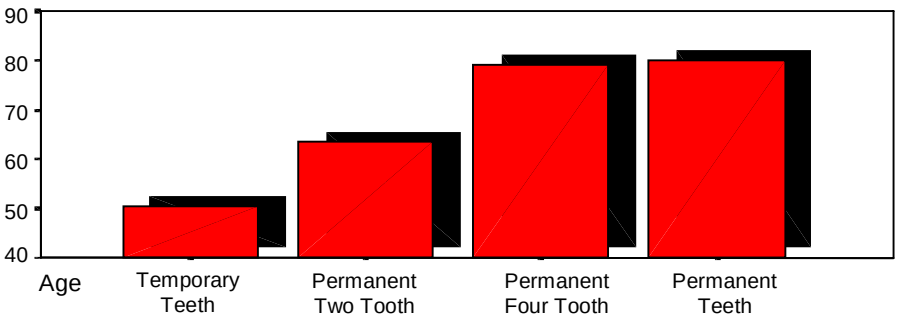

Figure 1. Weight corporal variations in lama (kg).

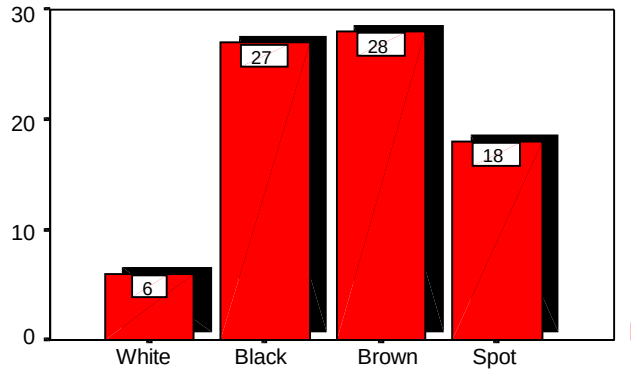

Figure 2. Fleece colour distribution in lama.

The below figure 3 shows only 12 colours of 30 tones of colours that are possible to find out in the fleece of lamas. A program, in order to improve the quality of fiber production in llamas, based on the selection by colour does not seem to be easy and quickly of development because is possible that at least four pairs of genes control and modify the colour of the fleece in llama.

Crop component

In pre-Colombian times, most Altiplano communities had land rights and cultivated land at lower elevations in the areas with temperate and tropical climates on the eastern slopes of the Andes. Today, the access to low lands has for them is not common, and each family has small parcels of land on the hill sides and these are often located in different ecological zones.

In order to minimize the climatic risks and protect their self-supplying production system, the farmers use various types of native crop like: potato, corn, ulluco, oca, mashua and tarwi. These species are sow together with barley, wheat and oats introduced by the Spanish 500 years ago. The extreme upper limit of potato cultivation is 4 200 m.

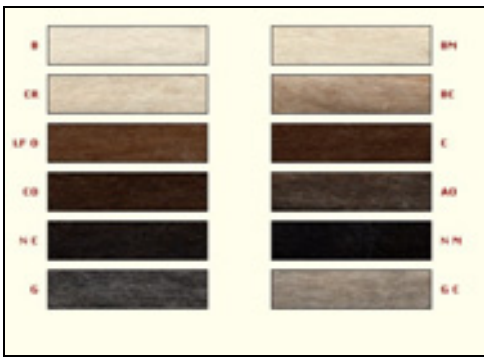

Figure 3. The image shows only 12 colours of 30 tones of colours that are possible to find out in the fleece of lamas.

Livestock has many functions besides the pure productive ones. It provides the family with economic security, manure, plough power and has a specific cultural significance. In these systems, the quantity of manure determined the extension of agricultural activities.
In the present days, most of the Andean producers are grouped in communities, with access to both private and communal lands. Usually, the community has rules for the management of the crops and animals. The crop cycle begins with potato, quinoa, followed by grain and barley and ends with a fallow cycle that has a range front of 5 to 8 year (Table 3). During the fallow, the secondary native grass is grazed, allowing a nutrient recycling through animal excreta. The Andean agriculture is frequently definite as an activity with high risk, and it principal constrains are frost and drought. In this regard, livestock minimizes the climatic and economic risks.

Outputs of lama production systems

In general, in these production systems, the animal production contributes to around 73% of the in-comes and the crops to 27%. However, 20% of animal production and 80% of vegetal production is for family consumption.

Meat production

The lama meat production is estimated ranging between 20 000 to 25 000 Tons per year, being Bolivia the principal producer, and its western region as the principal market. In these production systems, the annual crop of llamas was estimated in 11 per cent. It is certainly a low efficiency, but it can be explained by both low fertility and high rate of mortality of baby lama.
The carcase yield is not grater than 52%, and the ratio meat : bone is 4 : 1. Probably, under Altiplano conditions, the lama is the best option for meat and fiber production. Its products are more competitive than that of other more specialized species.
In Bolivia, the demand of lama meat increased of 76% during the period 1985 - 2004 and it is consumed as fresh or sun-drayed. In the same period, population of lamas increased more than 1 million of units. This facts may be explained by: a) the promotion of llamas' meat consume b) the nutritional value, which is high in protein and low in fats; c) the commercialization programs endorsement with norms of quality established by the Bolivian Institute for Norms and Quality (IBNORCA); and d) the lower price for special courts.

Table 3. Area and yields of principal crops in the Bolivian Altiplano.

	Potato	Quinoa	Barley	Pasture
Crop area (ha)	1.0	0.4	1.5	1.5
Yield (tn / ha)	5.5	0.6	1.2	3.5

Source: Campero *et al.*, 2004.

In order to resolve the extremely poverty of the people in Bolivian's highlands, the Ministery of Rural Affair and Agricultural (MACA) of Bolivia has been constructed the National Strategy of Rural Development (ENDAR) and its policymakers hope to increase the actual lamas meat demand. For this scope, it is necessary to resolve:

1. The presence of moderated infestation of *Sarcosystis aucheniae* and *S. lamacanis*. These parasite are not danger to human consumers and meat with high degree of infestation is confiscated; the parasitism incidence, which is transmitted by dog, is near to 46% in animals older than two years.
2. Other factor that limit llama husbandry are the degradation of the native pastures, external parasites, the high grade of inbreeding in many llamas populations, the high rates of mortality, and the use communal of natural pastures.
3. The breeding systems are placed, almost exclusively, in areas of extreme soil poverty and high climatic risk.

Despite to these limitations, llama is one of the species of highest potentialities in the Altiplano of Bolivia, which explains why families have continued in lama breeding activity. On the order hand, the Altiplano extended areas of natural pastures, paticularly adequate to camelids. These species are best adapted to this environment, being highly resistant to the effects of the altitude and climate and, differently from sheep or cattle, they do not disturb the fragile ecosystem of the Andean mountain during grazing activity.

Furthermore, as log as *Sarcosystiosis* can be controlled, the demand of lama meat will increas in both national and international markets, because its taste is similar to beef, the protein content is high, the fat content is low, and it does not promote the cholesterol formation in the humans. The amount of cholesterol for each 10 ml of serum blood of lama ranges fom 5 to 50 mg while in beef is 200 mg and in sheep is 300 mg. Table 4 describes the chemical composition of meat for four species including lama meat.

It is possible to reduce the mortality rate of the llamas by controlling external parasites, improving animal management and nutrition of the flocks. The actual llama meat production is near to 17 thousands tons, but it could be feasible to increase it to 34 tons as a result of the control of actual limiting factors.

Table 4. Chemical composition (%) of four species.

Species	Humidity	Protein	Fat	Ash
Llama	69.17	24.82	3.69	1.41
Alpaca	70.80	21.88	5.13	1.30
Cattle	72.72	21.01	4.84	0.91
Sheep	72.74	18.91	6.53	2.16

Source: MACA, 2002.

The shearing of lama is completely random and it occurs on same animal each two to three years. Technically, the annual shears is bette because the environmental factors cause less fleece damage, allows a better external parasites control and facilitates the selection for productive ability. Lamas fiber production is hardly influenced by genetic variation, as a result of the improvement and technician selection by this criteria. The present fiber production is probably the result of the natural selection for a better protection against adverse climatic conditions. Figure 4 illustrates the actual importance of fiber handcrafts for the altiplanic people.

Figure 4. Fiber handcrafts elaboration by the altiplanic people.

Today, the national fiber production is in rapid development, with a potential production of 714 tons. This production includes fiber and hair. The participation of the last one in the fleece, on the base of weight, is around 20%.

The de-haired lama fleece is possible through a manual or mechanical process. The fiber results without coarser hairs giving a soft, shiny and long hair. At the present, it is highly appreciated by the textile industry. The average general weight production of dirty fleece of llama in Bolivia is 1.14 ± 0.25 kg per animal (MACA, 2002), although, this information does not discriminate age of the fleece or shearing frequency. For Peruvian alpacas, Fernández reported averages of 2 600 g of fiber; while; average of 0.98 kg and of 2.6 kg of wool for Creole and Corriedale sheep, respectively were reported by Cardoso in Patacamaya (Bolivian Altiplano).

It is probable, that the length of camelids fiber has an average of 6.8 ± 1.5 cm; while the hair had a long average of 7.9 ± 2.0 cm. These values are smaller than 8.3 ± 0.7 cm reported for llamas originating in the Experimental Station of Patacamaya by Rodriguez (1982).

Nevertheless, this length is adequate to the characteristics requested by the industrial processes, and it is similar to many sheep breeds, higly productive in wool as the merino, that has a length of 8.1±0.1 cm.

Leather

The llama has a peculiar skin. Its collagen is very compact and provides a high elasticity to skin . For this particular structure, the camelids skin has a high versatility for manufacture production. This skin, appropriately processed, is used to produce jackets, boots, travel bags, suitcases.

The annual average production of skins by llama and alpaca is 434 000 units in Bolivia. Only the 20% of this production is used by national toners, being 25% exported legal and illegally to the Republics of Chile and Peru, and the remainder is badly utilized by rural people or simply is wasted.

In the last years, the demand for camelids skin or manufactured articles higly increased. This occurred not only in local markets but also in the international markets. It is a demonstration that the offer of manufactures with camelids leather, in case it posses a good quality, can contribute to increase the familiar in-comes.

Economic importance of South American Camelids

In Bolivia, the economic activity of the camelids chain is very dynamic. In the 2002, it represented 0.7% of to Gross National Product (GNP), generating 48 million dollars. This was possible with the participation of 54 thousandth of productive units and an indefinite number of small handcrafters. However, its distribution is not equal and primary sector is the least favourable and recieved back an income of only 160 dollars per year. A productive unit works with an average of 49 lama and 41 sheep.

During the last decade, with a investment of 11.3 millions dollars financed by the Bolivian Government, the camelid activity had, in average, an increase of near 6.2% per year. Its annual rhythm of growth was twice than the national economy and was bigger than agricultural production. In the context of this economy, the meat and dry meat of lama production grew at an average of 9%(MAA, 2002).

The dynamism of the camelids activity is reflected, also, by the positive growth of its export. In the period 1997-2002, the value of the export of camelids' fiber was increased by 5.2%; while, the exports of leather and leather manufactures was increased by 2.6%.

Moreover, in the chapter of the export, the most dynamic component was the exportations of manufactured products, as tops, textiles, clothes, processed leathers and leather manufactures. The export of these products represented between 23 and 27% of total camelids exports.

1. In the Altiplano ecosystem, besides to its fragility, other restriction or disadvantages are the marginality and inaccessibility. However, it also presents opportunities or advantages that should be use to improve

Conclusions

the actual agropastoral production systems. These advantages are its biological diversity and the extreme conditions that have generated traditional practices of Altiplano management.

2. In Bolivia as in other countries, the llamas' productive systems are, still, traditional and based on the extensive used of the native pastures. The productivity of the grasslands, not only is scare but it has low quality, too. Moreover, it is the result of the extreme climatic fluctuations, characterized by prolonged periods of frost and dry seasons. Probably, the fiber, meat and leather productions are the best opportunity that the region has to solve the secular poverty.
3. From the ecological point of view, the Altiplano ecosystems are susceptible to fast changes and loss of its ability to keep a sustainable crop-livestock production. Soils in most of the areas are acid, little fertile and of limited depth; however there are areas with better physical and chemical condition, particularly those of volcano origin. Consequently, an important problem in the Andean region is the soil erosion. Lands dedicated to agricultural and livestock systems need special attention. The action of the natural losses, plus the intervention of the man with inadequate agricultural and livestock practices contributes to the disappearance of native forage species.
4. Lamas have historically been used for their high protein meat, transporting goods along the Incan mountain roads, and in religious rituals. Alpaca fur is a finer fiber, and therefore alpacas have been historically been used for their fiber.
5. The resulting degradation of topsoil in the Altiplano region is a problem that has been more visible and publicized in the past few years, but its roots extend back to 400 years ago. In addition to other factors, this condition may be the root of traditional poverty cycle.
6. The impact of research on the feed resources has been limited and localized. The main constrains to adoption of research results are the heterogeneity of the region determined by factors such as altitude, climate, soils, quantity and quality of feed resources, and ethnic background.

Recommendations

In order to increase lama productiity, the following points need to be addressed:

1. To develop new national and international markets for the fiber, leather, meat.
2. To execute an integral plan of development focussed in the productive chain. This plan should consider that this activity represents the principal economic source for thousands of small livestock keepers, artisans and merchandises, whose optimized incomes will permit them to fight the poverty.
3. To establish a sanitary program associated to control or eradicate *Sarcosystiosis* and external parasites.
4. To promote recovery and management programs for native pasture.

5. To promote the continuity of the investigation and transfer of technology in the genetic aspects, improvement of pastures, credit programs for small producers.

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