Alpaca breeding in Peru and perspectives for the future

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INTRODUCTION

The worldwide alpaca population is 3,611, 730, comprising 87% in Peru, 9% in Bolivia and the rest distributed between the USA, New Zealand, Canada and Australia (INIA, 2004). Around 95% of the Peruvian population is located in the Andes and managed under a traditional extensive system characterized by low productive and reproductive parameters (Ministry of Agriculture, Peru, 2004). The following regions in Peru are important in terms of alpaca population: Puno (1,712, 110), Cuzco (400,877) and Arequipa (384,000). Eighty-five percent of the alpaca population is from the type called “Huacaya” and 15 percent are of the “Suri” type (CONACS, 2004). In socio-economic terms, alpacas are bred in the Andes for meat production (local market) for fibre that provides 82% of the worldwide demand and for sires sales, and it provides income for more than 500,000 families in high altitude areas (Ministry of Economy, Peru, 2004). Additionally, feces are utilized as a good fertilizer and, in the case of Llamas, are used as transport animals between rural areas which are not accessible by car due to the steep terrain.

The natural alpaca habitat in the Andes is confined to the fragile Puna ecosystem, located 3,800 to 5,000 meters above sea level. In this region the nutrient content of the pastures is very low due to poor soil composition, erosion and drought caused by overgrazing and improper pasture rotations (Flores, 1977). Alpacas have become well adapted to these predominant conditions. They can be fed with pastures that contain high levels of tannins; they tolerate low temperatures and weather inclemency, and have been reported to be more resistant to parasite infestations than cattle and sheep. Under these adverse conditions, alpacas can thrive and produce meat, fiber and skin, where other farm animal species are not viable.

PROBLEMS OF ALPACA BREEDING

The difficulties that confront alpaca breeders in the Andes are the product of several variables that cause low productive and reproductive performance. These have been studied by several social investigators during the late eighties (Bonavia, 1997; Flores, 1988; Agreda, 1988). One of the main problems is the limited number of sires of good quality due to the high degree of inbreeding (30 – 45 %) which causes malformations and low fertility (Huanca et al., 2004). Another problem is the lack of use of reproductive management in communal farms and of reproductive technologies like artificial insemination in farms that are managed under an intensive productive system. Genetic improvement and sanitary programs are also areas that require attention. Alpacas and llamas have

been hybridized in order to obtain a heavy fleece, as the textile industry pays for fiber by weight rather than diameter or fineness (Wheeler et al., 1992). This has resulted in low fiber quality over 28 microns in 70% of the herd (Carpio, 1991). There is also a high incidence of parasitic disease, including external parasites such as ticks, commonly called “sarna”, that damage the fiber and the skin, and internal parasites like Fasciola, Haemonchus and Taenia. These parasite infestations make the animals more vulnerable to infectious diseases such as Clostridium, E. Coli, Spherophorus and Streptococcus that cause high mortality in crias (alpaca offspring) (27%), reducing the supply of young replacement animals and thus limiting genetic improvement. Additionally, the reproductive characteristics of the alpacas are a limiting factor: these include a long gestation interval (11.5 months) (Hafez, 2003) and a long interval between birth and sexual maturity in males, as the prepuce adheres to the glans penis until the age of 2-3 years (Olarte and Melo, 1988; Vivanco, 1985; Pinares et al., 1985). These limitations make it difficult to achieve genetic gain, particularly within the traditional breeding systems.

The social and political environment contributes to make it worse the development of the alpaca industry in the Andes. In the sociological aspect, the Andean inhabitant has an “aversion to the risk”. This terminology was proposed in the late seventies for social researchers to explain a characteristic inherent to the Andean inhabit that is product of broken promises of the politicians in the past. Andean people prefer to keep their current technology and not to try

something new as they are afraid to adverse results. In most of the cases they do not have economical resources to afford basic treatments as simple as parasites or antibiotics. In the political area, the legislation has been created to promote the breed of formed species like cattle and sheep and the resources available were oriented to develop techniques in these species failing to remember the importance of the camelids for the Andean inhabitant. On top of these, the lack of resources destined to conduct research made the situation more difficult. Additionally, extended periods of drought, extremely low temperatures that destroyed native pastures produce adverse conditions for the alpaca industry in the Andes.

In summary, all these variables make it difficult to develop the alpaca industry on a technical level, and they involve a conjunction of social, political, economic and environmental issues.

INSTITUTIONS

For a long time, Peru has lacked any form of national long-term plan to develop basic technologies for alpaca breeding. This has been due to political reasons and lack of resources for research. The resources available were used in generating technology for the cattle and sheep industries and this reflected a lack of recognition of the importance of the alpaca to the families that live in the Andes. This situation has changed during the last decade with the creation of

CONACS (The National Council of South American Camelids) as an institution supported by The Ministry of Agriculture that promotes the repopulation of camelids in the Andes (alpacas, llamas, guanacos and vicunas) and the development of breeding strategies. The objective of this program was to promote alpaca breeding in new areas as an alternative way to increase the income of the Andean inhabitants. CONACS has established 272 reproductive alpaca breeding centres with high quality males. These sires were selected from communal enterprises that have been using a selection program for phenotypic characteristics like conformation, fleece finesses and reproductive performance in natural mating. Every breeding centre has 5 males, and farmers situated nearby bring their females to be served, with the aim of improving the genetics of their herd. The repopulation of alpacas was completed in 2004 after an 8 year project to move 33,070 alpacas to areas that had the potential in terms of pastures and climatic conditions to develop an alpaca industry as a new economic activity. This project benefited around 435 communities around the Andes. One of the most successful activities of CONACS was to establish a pedigree register of alpacas in 1997. There are now 7 regional councils in charge of alpaca registration, with approximately 60,000 alpacas registered and 15,646 breeders identified. Additionally, CONACS and the Ministry of Agriculture implemented legislation to permit alpaca breeders to export their animals. This put an end to the illegal trade in animals through Chile and Bolivia and provided breeders with the opportunity to get high prices for their animals from the United States market ($200 up to US $1,200 per animal). Since 1995, CONACS has

been responsible for the inspection and control of alpaca and llama exports from Peru. Recently CONACS in recognition of the work that is been doing by “Rural Alianza”, one of the most important and largest alpaca farm in the world situated in the south of Peru, gave 750 microchips and 2 portable electronic identification devices. These microchips were introduced into the skin of high genetic merit alpacas and it will help to follow up genetic improvement programs and to avoid illegal commercialization through Chile and Bolivia. In the future the pedigree register will use the microchip technology as a routine for every animal and it will make easier the follow up process.

RESEARCH ACTIVITIES

Research on alpaca production commenced in Peru during the late sixties at Universities and research centres, with programs studying management, behavior, nutrition and feeding, genetic improvement and reproduction. However, most of this research was conducted in isolation from the industry, with a lack of long-term planning focused on its development. This approach to research was exacerbated by a lack of knowledge of how important alpacas were for the people who live in the Andes. In the early 1980’s this misconception changed and camelids became of great interest overseas because of their extraordinary fiber quality.

In the area of reproduction, the first experiments on artificial insemination in alpacas were conducted by Fernandez-Baca and Novoa in 1968 at the University of San Marcos. One of the main technical problems inhibiting progress with the technique was the lack of a reliable method to collect consistently high quality semen from males. Collected semen has been reported to be high in viscosity, and is characterized by low motility and poor concentration of spermatozoa in comparison with other formed species like cattle and sheep. The average weight of a fully developed testis in the alpaca is only approximately 17g, and the daily production of spermatozoa is very low (Hafez, 2003). These characteristics of the ejaculate are common to all the species of camelids. Nevertheless, comparisons of male alpacas with the bull and ram may not be valid as all camelids are induced ovulators, and the chance for a female to conceive may be greater than for animals that present an oestrous cycle. Thus, there may be no need to produce a high concentration of spermatozoa from the male, as insemination synchronised with ovulation. In the case of cats, which are induced ovulators as well, poor quality of the ejaculate has been reported, which may indicate that this is a common characteristic of species that do not ovulate spontaneously. On the other hand, other factors may have reduced the quality of semen produced by alpaca males, such as the high level of high inbreeding, hybridization between llamas and alpacas and/or deficient nutrition during puberty.

The most satisfactory current technique for semen collection from alpaca males is the use of a mannequin (dummy female) fitted with an artificial vagina, which

has been described by Sumar (1991), Huanca et al. (2003) and Vaughan et al. (2003). Despite a number of studies on semen characterization and preservation in alpacas, there is no reliable technique to consistently obtain high quality ejaculates (McEvoy et al., 1992; Bravo et al., 1994; Huanca et al., 2001; Vaughan et al., 2003). Despite this limitation, there have been a number of reports on pregnancies in alpacas after artificial insemination (Bravo et al., 2002; Huanca et al., 2003; Vaughan et al., 2003).

The National Institute of Agricultural Investigation (INIA) in Peru has initiated a research project over the next 5 years with the objective of promoting alpaca breeding, using new technologies to improve production and productivity. The aim is to produce sires of high genetic value to be used in artificial insemination programs. INIA and San Marcos National University (UNMSM) have been collaborating since 1998 in an attempt to improve the technique of artificial insemination with fresh semen. Research has been conducted on the techniques for collection, processing and preservation of semen, and on the effects of nutrition, hormonal treatments and collection methods on the semen quality, with the aim of establishing a technology for artificial insemination of alpacas with preserved semen. A group of ten scientists under the direction of Dr. Teodosio Huanca at the Experimental Station of Illipa in Puno, south of the Andes, developed the technique for semen collection using the mannequin and artificial vagina, and evaluated semen parameters like color, concentration, and motility. This group has reported the successful use of artificial insemination in alpacas,

reporting pregnancy rates of 50% (Huanca et al., 2004). This was achieved under the conditions prevailing on small farms in the Puna, providing evidence that artificial insemination may be feasible technology to be applied under field conditions.

In the area of meat production, preliminary results from a crossbreeding program between alpacas and llamas, called “Huarizo”, suggest that carcass yield from the crossbred animals is 29% more than for pure alpacas (INIA, 2005). In the period before the Spanish conquest, the Incas consumed alpaca and llama meat exclusively. Nowadays, camelid meat consumption is restricted to the Andean population, especially in Arequipa, in the south of Peru. It is common to find dry alpaca or llama meat called “Charqui” in the local markets in the Andes. The name for this meat comes from the Quechuan (Andean dialect) word “Ch’arki”, and it is usually prepared in an exquisite dish with an Andean tuber staple called “Olluco” (Ullucus tuberosus). There are few studies that demonstrate the advantages of alpaca and llama meat in comparison with beef and lamb in terms of protein composition (21-24%) and low levels of fat (5.5 – 6.0%) (Hack, 2001). Since 1998, CONACS has been promoting alpaca and llama meat consumption in order to improve the income of the Andean farmers. Additional studies have been conducted at the Faculty of Food Technology at The National Agrarian University La Molina – UNALM - in Lima in the area of alpaca meat processing, in order to obtain sausages, hot dogs, alpaca chops, and canned by-products, with interesting results and acceptance in the local market.

Phylogenetic studies are currently being conducted in order to study the evolution of the alpacas and llamas and the degree of hybridization. A genome library of coloured alpacas is being created by INIA in order to identify and rescue alpacas of unusual colours that are in danger of extinction.

In summary, Universities, institutes and public institutions are putting a significant effort into the generation of the technology necessary to improve the alpaca industry in Peru. The aim is to increase productive and reproductive parameters to improve the income of the people who live in the Andes under condition of extreme poverty.

PERSPECTIVES

The next step in the development of alpaca breeding in Peru is to consolidate the artificial insemination technique, promote its use between breeders, and to create a nucleus of sires of high genetic merit. This may require the purchase of males from alpaca communal farms in the south of Puno that have been conducting genetic selection programs for several decades. An aggressive genetic improvement program is required, making this technology available to alpaca farmers through an extension program from the Ministry of Agriculture. Additionally, it would be desirable to work in the area of semen preservation and freezing to speed up the dissemination of quality genetics, thereby increasing production and productivity of alpaca herds. Current techniques to freeze alpaca

semen in Peru have only achieved low levels of post-thaw motility of spermatozoa, so that it is not possible to apply them on a commercial scale (Valdivia, 2003). Additionally, the development of a multiple ovulation and embryo transfer programs in alpacas would be desirable, to further increase the rate of genetic gain from the maternal side. Such plans need to be put together as an integral part of a plan that also covers improved nutrition and control of diseases, pasture management and legislation to promote the alpaca industry, possibly providing financial incentives for entrepreneurs who wish to invest in this industry. In the long term, the aim is to benefit the more than 500,000 families which currently live under condition of extreme poverty.

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