

Fine fibre production from Argentine camelids - a development perspective

M. Antonini ⁽¹⁾ & S. Vinella ⁽²⁾

⁽¹⁾ ENEA Innovation Dpt, Biotech. and Agricultural Sector,
Animal Production Division, Rome ITALY

⁽²⁾ ENEA Studies and Development Strategy Directorate, Rome ITALY

SUMMARY

This paper presents the results of an investigation into the fine fibre production from domestic and wild Argentine South American Camelids (ASAC), carried out within a cooperation programme between the Argentine Republic and European Union, started in 1992 and financed by European Commission, - DG 1 -, Economic Cooperation Program. The programme has been planned for the following main reasons: the great potential for development of ASAC fine fibre production and genetic resources, the opportunity for the poorest land resources (Puna) to develop alternative livestock production systems, the existence of Argentine projects in the same field (PROMECAD - PROgrama MEjora CAmelidos Domestico- and INTA research activity - Instituto Nacional de Tecnología Agropecuaria -), the current low volume of fibre production due to the reduced number of animals reared in Argentina (150,000 heads), the low product valorisation, the lack of marketing knowledge, and the low technological level of fibre processing. The main objectives of the programme have been: 1) to set up a methodology for the genetic improvement of ASAC and for the optimal management of fibre production; 2) to analyse the international market for camelid fibres and to identify new trading opportunities, 3) to study technical, economic and financial problems associated with the commercial exploitation of camelid fibres. Among the benefits resulting from this project, there has been an improvement in the level of cooperation between public and private operators for the development of the sector and the opportunity for the economic valorisation of ASAC fibres, while new possibilities for the commercial cooperation between Europe and Argentina have been identified. Finally, the establishment of a selection flock for ASAC in its indigenous region, has enabled a supply of high quality animals for fine fibre production to the local farmers.

INTRODUCTION

In order for camelid fibres in Argentina to reach adequate qualitative and quantitative production values to compete on the international textile market,

it takes a long time because of the long time scale required for genetic selection work. Nevertheless, this sector may grow rapidly because there is sufficient technical knowledge available, and the government of Argentina has a new national policy aiming to improve the exploitation of its native resources.

At present, there is a great interest in the production of fine fibres from wild camelids. In Argentina, the outlook for these textiles is promising, especially for the guanaco because of the large population (500,000 head), and research on new reproductive techniques which is being carried out within INTA, the national agricultural research organisation. It is nevertheless currently not possible to exploit guanaco fibre because there is no national legislation on guanaco fibre production and marketing.

A cooperative initiative between the European Union and the Republic of Argentina has allowed the possibility to study the production of fine fibre from Argentine South American Camelids (ASAC), with the aim of estimating their potential economic value. The initiative, proposed by the Argentine authorities and promoted by the European Union (DG1 - Economic Cooperation Program) involved in Argentina: SAGyP (Secretaria de Agricultura Ganadería y Pesca), CFI (Consejo Federal de Inversiones) and Catholic University of Cordoba, and in Europe: ENEA (Italian Agency for New Technology, Energy and the Environment), Deputación Foral de Bizkaia (Spain), INRA (France) and University of Camerino (Italy). The programme began in 1992 and ended in 1994.

COOPERATION PROGRAMME

The cooperation programme was initiated for the following reasons:

1. there is a strong economic potential for domestic and wild ASAC fibres, due to the existence of a rich genetic base, and in particular in the broad range of natural fleece colours;
2. the development of this field is supported both by public interests, with the objective of promoting the economic growth of Argentine regions traditionally involved in camelid breeding and lacking production alternatives, and by private interests which look for new economic enterprises;
3. the existence of Argentine projects in the same field: PROMECAD (PROgrama MEjora CAmelidos Domestico) and INTA research activity (Instituto Nacional de Tecnologia Agropecuaria)
4. volume of fibre production is low, due both to a relatively low population

of domestic camelids (about 150,000 in Argentina) and to poor product value in the low productive farming systems (non-annual shearing, lack of fibre classification, etc.)

5. there is insufficient local knowledge of the international market for camelid fibres;
6. fibre processing is currently carried out locally mainly at a handicraft level;
7. to diversify fibre exports to Europe, through the production and commercialisation of typical Argentine products;
8. to promote economic cooperation and technology transfer between Europe and Argentina.

OBJECTIVES

To address these issues, a work programme was designed, together with the Argentine partners, to define the necessary actions, the potential for improvements in production, and to identify marketing opportunities.

At the beginning, the attention was focused on domestic camelids, as these were already the subject of a local investigation. Nevertheless, future activities are planned for wild camelids, that will broaden the product range of fibres on the market

The objectives of the programme were defined as follows:

- 1) to establish a methodology for the genetic improvement of ASAC and for the optimal management of fibre production;
- 2) to analyse the international market for camelid fibre and identify new trading opportunities,
- 3) to study technical, economical and financial obstacles to the identification of industrial innovation proposal.

RESULTS

Breeding system to improve fibre production

Building on the work of PROMECAD, the aim was to define correctly the ASAC population and to establish a genetic improvement programme in which local breeders would participate directly to obtain:

- an effective link between the producers and the research;
- direct contact for researchers with real problems and needs;
- the possibility to apply rapidly the results of the research.

In the genetic improvement programme, the following production characters were considered:

1. Fleece weight. There was no previous data available, due to the absence of systematic shearing practices
2. Fibre diameter. The Argentine partners classified camelid fibres in the following fineness classes:

<i>Superfine</i> (SF)	<21.9 μm
<i>Fine</i> (F)	22 to 24.9 μm
<i>Medium</i> (M)	25 to 29.9 μm
<i>Coarse</i> (G)	>30 μm

The most frequent class in the study population was F.

3. Fleece homogeneity (fleece type). There is a great variability in the type of fleece. A subjective evaluation analysed lock form, fleece extension, ratio within the lock between primary and secondary fibres, fibre crimp and lustre. This classification distinguishes between 4 major fleece types: llama, huacaya, Chile (huarizo) and suri (Frank *et al.*, 1985). The type most represented in the population is the Chile (42 %), while least common is the Suri.
4. Fleece colour. Colour has significant importance in determining the price. Using a subjective method, the Argentine researchers defined 39 distinct colours, divided into 22 mixtures and 17 simple colours. This high variability within the population means that it is important to develop an objective colour classification systems.

The selection objectives and criteria have been defined as:

1. Fleece weight. Recorded at first shearing between the age of 6 and 12 months.
2. Fibre diameter. Recorded at first shearing.
3. Fleece homogeneity. As type of fleece and body cover in the adult animal.
4. Colour. Using the Lauvergne (1984) classification based on 4 main parameters:
 - i. Pigmentation pattern, in relation to the type of melanin distribution in the fibres (eumelanin and feomelanin).
 - ii. Eumelanin type.
 - iii Alteration of pigmentation, referring to different fibre colour dilution and mixtures.
 - iv. Spotting, referring to defined white areas in naturally pigmented fleece

First a pre-selection was made, based on 3 traits, to establish the founding nucleus herd. The three characters were:

Morphology	i.e body morphology and fleece type
Colour	i.e. white, black and uniform brown fleece;
Fibre diameter	i.e. average diameter less than 24 and coefficient of variation less than 27 %.

Genetic selection was based on a performance test. The open nucleus breeding scheme (James J.W., 1977) was organised at 3 levels:

1. Male nucleus herd - here the best males were obtained following a performance test and then utilized in the lower levels.
2. Founder nucleus herd - females, utilized both as genetic nuclei but mainly as multipliers. The females are evaluated valued by a performance test and on reproductive efficiency. At this level, the best male from the male nucleus herd, are used and the male offspring are performance tested to join the male nucleus.
3. Commercial flocks - the farmers that take part in the genetic programme profit by having the best animals. The genetic improvement programme success is evaluated at this level. At the beginning, the commercial flocks were located in the PROMECAD farms and on the other farms participating in the selection programme.

The open nucleus breeding scheme was chosen because it most simply and effectively allowed contacts between the different camelid breeders who, because of the great distances and the difficult roads, are isolated. Much time will be needed before there are concrete results, but this is an essential step in assessing the genetic resources available within the ASAC population and to establish a systematic selection programme.

At present, 3000 individuals have been evaluated according to an objective method for population analysis; 400 animals were pre-selected and divided into 4 nuclei: one male nucleus (60 submitted to the performance test) (Table 1) and 3 female nuclei.

TABLE 1.

Male nucleus

	Number	Mean parameter values	
Males tested	300		
Pre-selected animals	81		
Male nucleus	60	Fleece weight	1.64 ± 0.21 kg
		Fibre diameter	20.10 ± 1.18 kg

Fencing, food, veterinary supplies, electromechanical clippers and livestock transport were supplied to the nucleus breeders. The genetic selection plan is now in operation. In the performance test, the ranking, by a selection index procedure, has been performed and the males divided in the following way: the top 4 (7%) were used in the the founder nucleus, the next 9 (15%) in the PROMECAD commercial flocks, the next 26 (43%) in the other farms participating to the selection programme, and the last 21 (35%) rejected.

The next step will be the evaluation of the offspring from the nuclei, and the continuation of the population analysis so as to involve more suitable animals in the selection programme. At present, the progeny test is more a measure of genetic progress than of the genetic parameters obtained in the performance test. Moreover a further genetic evaluation using an animal model has been planned to obtain a more exact valuation of sire genetic value.

MARKETING AND NEW TRADING OPPORTUNITIES

Market analysis was initiated using the following information sources: fine fibre traders, textile manufacturers, textile and fine fibre category associations. ASAC production occupies a small niche in the world textile fibre market. The total production - around 4000 tons in 1992 - represents only 0.001% of world wool production. Peru produces about 90% of world camelid fibres, the remainder is produced in Bolivia, Argentina and Chile. Italy is the leading world importer since 50% of the world production is processed by the Italian textile industry (Table 2).

TABLE 2.

Final destination of SAC hair (data refer to final users, not to imports).

Italy	50 %
Germany	10 %
Great Britain	10 %
Japan	15 %
Holland	5 %
Other country	10 %

COMMERCIAL CLASSIFICATION

There is no product classification system officially recognised by an official regulatory agency. The only existing ASTM (American Society for Testing and Material) standard is the "Standard Specification for Fineness of Types of Alpaca", N° D2252, established in 1976 and reconfirmed in 1991. This standard is not followed commercially, either for the micron categories nor for the limits suggested by the coefficient of variation. Nowadays, the acceptability standards are defined in terms of contracts between seller and purchaser, according to a general classification which is based on the diameter, which is the main factor in determining prices (Table 3). Other categories have to be added to this one, such as the type of animal from which the fleece derives (i.e. suri, huacaya and huarizo, with the latter the most widespread in Argentina).

MARKET TRENDS

The most evident case of market trend variation has occurred between 1993-1994 when, after a slow and progressive drop in prices during the 1983-93 period, prices have gone up on the European markets. For example, Table 3 shows an increase of more than 148 % of Superfine price.

TABLE 3

Commercial Classification and white alpaca tops price (US \$ / kg)

		1983	1993	1994
Baby	(20-22 μm)	34	14.5	21
Suri	(27 μm)	23	8.75	18.1
Superfine	(24-26 μm)	26	6.8	16.85
Adult	(28-30 μm)	19.5	6.6	15.75
Huarizo	(32 μm)	20.75	5.4	10.25
Coarse	(>30 μm)	20.25	5.4	7.25
Llama	(>30 μm)	20.25	5.4	11.5

Suri and Baby fibres are in great demand because of their high quality, but their availability represents only 10% of the total amount. This price trend may be partially a result of the low prices of December 1993 (resulting from situation in Peru which practically defines the market) which has led to an obvious reduction in the amount marketed. Nevertheless the price increase may also be ascribed to a rise in demand due to:

- a growing consumer interest in articles that have a positive environmental value. Alpaca yarns enable the production of articles with naturally coloured fibres and also have an exotic image.
- the growing Japanese market which is inclined to pay 1-1.5\$/kg more than the European market.

However, it would be difficult to conclude that there will be continued growth in future demand. In 1994, the European operators were not able to make long term provisions and they only foresaw for the following year a further quotation increase of no more than 15-20%. In addition, another factor influencing the international market is the continuously changing interest of Japanese operators, that is not possible to foresee.

COLOURS

All of the 14 basic natural colours are required, since it is through them that it is possible to spin a range of colours and match existing colour ranges. The white colour, even though it is easier to dye, does not appear any more as the colour of choice and its abundant production limits its price. Therefore, coloured fibres can reach prices 1-1.5 \$/kg higher than the white fibre. Currently, it does not appear possible to address production to specific fibre colours because there can be no prior indication which will be the premium colours. In addition, apart from a few colours, the breeding systems are not yet able to assure the selection of flocks of uniform coloured animals, particularly for the total repeatability between lots.

QUALITY

Normally, the principal quality characteristics influencing a price quotation are first fineness and its coefficient of variation, and second, colour. The other characters are less relevant. There is limited attention to quality in the weaving sector, where processors are not willing to pay higher prices until low price lots of less quality are available on the market. On the contrary, with regard to the tops for hosiery, the product quality is competitively advantageous. Well-worked tops, with a fineness of less than 20 and a lack of kemp and contaminating fibres, are required, and suri is the more prized type.

INDUSTRIAL SYSTEM PROPOSAL FOR FINE FIBRE TRANSFORMATION IN ARGENTINA

Annual fibre production in Argentina is estimated at 180 tons. As a modern wool factory is able to work 20 tons of fibre per day, this must be considered to be a small amount. Given this low production and the analysis of the demand for fibre by European traders and manufacturers, it is suggested that attention in Argentina should be concentrated on tops production. Later, it will be possible to assess the opportunity for the manufacture of products with higher added value such as yarn or fabric. Moreover, knowledge of the Argentine wool industry suggests that it would be inappropriate to attempt to establish a new enterprise which would only transform speciality fibres, but that there are opportunities to revitalise the existing wool fibre industry. On this basis, a technical-economical analysis model for investment in the area of fibre processing for combed tops production has been established. More specifically, the analysis refers to the development of enterprises to utilise wool and camelid

fibres for tops production in pure or mixed fibre, where the raw material is represented mostly by wool while camelid fibres are used on an occasional basis. In the establishment phase of ASAC fibre processing, it has been calculated that the profitable production unit for dehairing, washing and combing for tops production, should have a capacity not less than 500 tons per year. It is acceptable to appoint about 15% of such a capacity to ASAC fibres with the aim of increasing this amount year on year.

THE OPPORTUNITIES FOR ARGENTINE FINE FIBRE PRODUCTION

In conclusion, the priorities for the profitable development of Argentine fine fibre production should be:

- to attain and guarantee a consistent and uniform product of defined quality
- to offer a wide range of colours, with colour uniformity and with corresponding stock colours and pattern-book
- to support the increase of Suri fleece which is quite rare but much appreciated because of its softness and silkiness
- to organise the initial steps towards indigenous production of carded tops
- to exploit the synergy with the Argentine wool trade, since there is no economic motivation for an investment in modern combing equipment which will process only speciality fibre
- to begin tops production with machinery, not necessarily of the latest technology and to train personnel with the necessary skills up to defined standards
- to document these standards within reliable and certified test utilising facilities already available in Argentina (INTI, “Istituto National de Tecnologia Industrial”)
- it is not advisable at the moment to create a quality trade mark because of the high costs which are not justified by the low volume of production
- to focus, at the beginning, on the production of weaving tops of high quality which will command a premium price
- to exploit the synergy with the wool trade sector also on a commercial level;

It will be possible to start a direct commercial relation with an European company dealing with weaving only when the production of high qualities are reached.

CONCLUSIONS

The genetic improvement programme for ASAC, the appraisal of marketing opportunities, and the identification of new technologies for the manufacture of local textile products, concluded that there are substantial opportunities for the economic development of ASAC fibres. It is now necessary that such opportunities should be realised. Regarding genetic improvement, it will be necessary to spread the improved animals in the population, to increase the number of flocks participating to the programme and organise production improvement strategies and their distribution in the territory. Moreover, it seems opportune to consider the development of wild camelids (Guanaco and Vicuna). In Argentina the perspectives are very promising especially for the Guanaco because of the great number of animals (500.000 heads) and the research on new breeding techniques which is being carried out in INTA. Nevertheless at the moment it is not possible to exploit this product for the lack of national legislation on the guanaco fibres production and trading. Regarding technological and commercial development it will be necessary to set up a fibre processing chain which should be technologically and commercially adequate to local conditions and to individuate concrete market opportunities in order to support the development of industrial and training enterprises which are of fundamental importance for the sector growth.

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