ADDING FURTHER VALUE TO SOUTH AFRICAN INDIGENOUS GOATS THROUGH THE PRODUCTION OF CASHMERE

Albie L Braun
CSIR Division of Textile Technology, Port Elizabeth, South Africa

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ABSTRACT

South Africa has over 6 million indigenous goats, many of which have two coats of fibre, namely a fine down (cashmere) i.e. finer than 18,5 micron and a coarse guard hair. These goats are primarily kept for their meat, milk, skin products and other traditional purposes as well as for controlling bush encroachment. A programme was launched three years ago aimed at establishing the fine down fibre production and associated value addition potential of these indigenous goats.

Against this background, the paper discusses CSIR's Division of Textile Technology (Textek) involvement in the utilization and promotion of fine down (cashmere) fibre production from indigenous goats in a joint project with Grootfontein and Döhne Agriculture Development Institutions.

This paper reports on a study undertaken to determine the ability of South African indigenous goats to produce a cashmere like fibre and records the results obtained on some 4 000 fleece samples tested during the past three years. Reference is made to the fibre quality, yield and profile of the down component of the samples compared to those of Chinese cashmere.

This paper also discusses the reasons why cashmere production is ideally suited for subsistence farmers and the importance for South Africa to utilise and improve the fine fibre production potential of indigenous goats and the future possibilities of establishing a viable cashmere industry in South Africa.

INTRODUCTION

During the past two decades, consumers have increasingly moved towards more comfortable, lighter, casual and easy care clothing. This, together with a worldwide trend towards natural fibres, has increased the demand for what is known as rare, luxury or specialty animal fibres. These fibres are highly desirable, largely as a result of their comfort and softness, being characterised by properties, such as fineness, softness, warmth, lightness and often also lustre, include goat hair (mohair, cashmere), camel hair, Llama hair, Alpaca and Angora rabbit hair. The scarcity of luxury animal fibres is largely due to the fact that they are difficult to produce on a large scale, because of climatic, genetic and other factors.

Because of its superb softness and comfort and being the second finest animal fibre produced in fairly large quantities, cashmere has become one of the world's most sought after animal fibres. With the exception of the Angora, all goats have fleeces containing two distinct populations of fibre; a long coarse waterproof overcoat (outer coat or guard hair) and a soft, fine dense undercoat (down). Goats producing both types of fibre, i.e. fine and coarse fibres, are generally referred to as cashmere goats, there being no specific or pure cashmere goat breed. Cashmere is defined as the fine, soft undercoat or down (cashmere) component after the mechanical removal of the coarse guard hair (dehairing). Classification as cashmere is done on the ability of the goat breed to produce a fleece consisting of two distinct fibre populations and on the down fibre quality and yield i.e. sufficient fine down (finer than 18,5 micron) of at least 250 grams per goat, rather than on the basis of zoological origin. The average fibre diameter of cashmere varies between 14 to 18,5 micron, its colour varying from white to black. Cashmere price is mainly determined by colour and fibre diameter, with down yield (i.e. ratio between fine and coarse components) and fibre length also important. The lighter the colour (white) and the finer the fibre, at a minimum down fibre length of 4 cm., the higher the price. Cashmere can be regarded as a versatile fibre because it can be utilised on its own or in blends with other natural fibres, such as super fine wool, silk or alpaca.

Although the world's annual demand for cashmere is approximately 12 000 tons and the production approximately 8 000 tons, world cashmere prices are just as prone to market fluctuations as any other natural fibres.

SOUTH AFRICA'S POSITION

Indigenous Goat Population

South Africa has a rich resource of approximately 6,3 million indigenous goats (Eastern Cape 3 million, KwaZulu Natal and Northern Province 900 000 each, North West 700 000, Northern Cape 440 000, Western Cape 240 000, Mpumalanga 82 000, Free State 71 000 and Gauteng 10 000). These goats include Boer, Savannah and other traditional goats (mainly owned by small farmers) which are primarily kept for their meat, milk, skin products and for other traditional purposes as well as for controlling bush encroachment. Many of these goats possess the ability to produce two coats, viz a fine under down (cashmere type in a lesser or more quantities) and coarse outer guard hair although over the years breeding have tended to favour attributes other than the fine down ignoring the quality and quantity of the down.

Cashmere Programme

Recognising South Africa's rich indigenous goat resource and the possibility that the utilization of the fine cashmere type down of such goats could lead to additional income for farmers as well as the creation of a cashmere processing industry, led Textek together with the Grootfontein/Döhne ADI's to embark on a Cashmere Programme aimed at the establishment of an economically sustainable and SMME based local cashmere agro-industry.Grootfontein / Döhne ADI's concentrate on the breeding and genetic side (selection, upgrading etc.) whereas Textek concentrates on the fibre evaluation, processing and utilisation including rapid techniques for analysing the fibre quality (fineness and down yield), processing techniques, product development and marketing.

This Programme is guided by a Cashmere Working Group, comprising the following members: Textek/CSIR, Grootfontein/Döhne, Cedara, Vredendal and Potchefstroom ADI's, Agricultural Research Council (ARC), Fort Cox Agricultural College, Agricultural and Rural Development

Research Institute (ARDRI), and the Boer Goat Breeders Association. The Cashmere Working Group also receives support from the National Department of Agriculture and Provincial Agriculture Departments in various provinces. Great progress has been made during the past three past years to identify the relevant role players, such as the Directors of Extension, Extension Officers, animal scientists of the various regions and the first National Strategic Meeting of the Cashmere Working Group was held in August 1997 to determine the goals and objectives of the project. A first step in the cashmere programme was to investigate the potential of indigenous goats breeds to produce fine down (cashmere) down yield.

Various avenues, such as Extension Officers in various goat producing provinces, Farmers Associations, Community Leaders, Boer Goat Association, Agriculture News, Farmer=s Weekly, Landbou Weekblad, Land, Agriforum and brochures in various languages were used to communicate information as widely as possible and to motivate farmers to become involved in a project and to harvest the fine down (i.e. cashmere) of their goats for evaluation purposes. Workshops were also set up in the various provinces for training interested farmers and Agricultural Extension Officers who play a key role in the cashmere project and who act as consultants and organise fibre harvesting and collection of combed hair in rural areas.

Approximately 300 combs were constructed at Textek during the past three seasons and distributed countrywide, free of charge, to interested parties to enable the combing of goats.
The harvested fleeces were sent to Textek for evaluating the down fibre quality (fineness and yield). An accurate and rapid method, using an OFDA instrument, for the simultaneous determination of down fibre fineness and yield (ratio of down fibre to guard hair) without prior physical separation of the fractions, has been developed by Textek and used for evaluating the samples. The results were reported to the producers and analysed..

A data base of all interested farmers and parties has been established and serves as a basis for the rapid identification of individual farmers or farmer groups for the realisation of future breeding and production goals.

The results obtained from the first stage of the Programme, covering 3 years have been assessed and it was found that, of the ± 4 000 goat fleeces tested, over 80% contain typical cashmere type

down (i.e. 18,5 micron or finer), the average fleece weight being 20 grams per goat (ranging from 0,5 up to 400 grams per goat).

The following table gives a summary of the OFDA measured down fibre characteristics (quality and quantity) of the different goat breeds (indigenous and imported) over the past three seasons. Samples submitted to international cashmere dehairers also received favourable comment and their comments regarding the down fibre length, crimp, style and other aspects are given in the table below.

TABLE 1

Down Fibre quality and quantity in South African double-coated Goat Breeds					
	SOUTH AFRICAN			**RUSSIAN**	**AUSTRALIAN**
	Boer	**Savannah**	**Traditional**	**Gorno Altai**	**SAFFER**
Down diameter(μm)	16,0 - 18,5	16,0 - 18,5	14,0 - 16,5	18,5 – 19,0	16-18,5
Down length (mm)	20-31	20-31	15 - 30	28 – 31	25-32
Down crimp	good	good	good	poor	good
Down style	good	good	good	poor	good
Down weight (g)	10-50	10 - 50	5 - 15	150-400	150-300
Down yield (%) (Combed fleeces)	50 - 70	50 - 70	60 - 80	50-70	50-60
Down colour	white and coloured	white	white and coloured	brown	white
Other comments	--	--	--	silky handle, very matted, intermediate fibres	--

According to the results obtained during this phase of the programme the down fibre from the three indigenous breeds (Boer, Savannah, traditional goats (non Cashgora type) and Saffer goats is superior to that from the Gorno Altai goats in terms of crimp, style, down fibre and guard hair diameter ratio (1:4), with a good diameter profile, i.e. with low percentages of intermediate

fibres (30 to 60 micron) present. The low down fibre length (less than 40mm.) of the indigenous goats ,however, can result in considerable fibre loss and waste, during dehairing while the Saffer and Gorno Altai goats have commercially acceptable down fibre weights. The down fibre diameter of most of the Gorno Altai fleeces tested to date, exceed the commercial accepted range of 18,5 micron and finer for cashmere. This, together with the poor crimp and style of the down fibres as well as the colour of the down and the presence of an intermediate or third fibre component (Cashgora type) do not allow the Gorno Altai to be classified as cashmere of good quality. The presence of intermediate fibres in fleeces is undesirable because it is difficult to remove such fibres during the dehairing process. Consequently, the value of such fleeces is adversely affected. For this reason, industrial dehairing of raw cashmere requires a strong distinction between the two fibre populations (fine and coarse) to enable easy and effective dehairing. It is generally desirable that the ratio of the diameter of the guard hair to that of the down fibre be 4:1 and that the guard hair has a mean fibre diameter greater than 60 micron.

The down fibre diameter profile of the South African indigenous goats (such as the Boer Goat) generally compare very favourably with the profiles of Chinese cashmere as shown in the table below.

TABLE II

Down fibre diameter profile in fleeces of male and female SA Boer goats and Chinese Liaoning goats

Down fibre diameter class	Percentage of fibres per diameter class			
	S A Boer goat		Chinese Liaoning goat	
	males	females	males	females
<10 μm	2.1	2.9	4.3	8.4
10 - 20 μm	88.9	91.1	77.9	85.6
20 - 30 μm	8.8	5.9	17.3	5.7
>30 μm	0.2	0.1	0.6	0.3

The proportion (%) of indigenous and other goats animals producing cashmere type of down fibre (defined as having a diameter less than 18,5 micron) in the different yield classes is given in table 3.

TABLE III

	DOWN YIELD (gm.)					
	<10	10-50	50-100	100-150	150-200	>200
% Boer and Savannah goats	0,6	76,3	17	4,5	1,1	0,5
% Traditional goats	46	41	11,7	0,8	0,5	-
% Gorno Altai goats	-	-	-	-	5	95
% Saffer goats	-				70	30

The Boer- and Savannah goats showed an average down weight of ± 25 grams per goat whilst the "traditional" goats averaged ±12 grams per goat, with a coefficient of variation as high as 55%, indicating a considerable variation in down weight within a breed, and therefore a good genetic pool for future improvement by selective breeding. Goats with a "woolly neck" are generally good cashmere producers, down fibre yields of up to 150 grams per goat and even as high as 400 g/goat having been encountered.

Small quantities of the high quality Boer and Savannah goat hair received by Textek/CSIR during the past three seasons were scoured, dehaired (using a Shirley Analyser laboratory machine) and processed successfully into two qualities and blends thereof with wool. Knitted garments were produced which had a very soft handle.

FUTURE OF CASHMERE IN SOUTH AFRICA

Owing to global trends in apparel, a large market exists for the finer and high quality textile fibres in the world. The vast number (± 4 million) of indigenous goats in South Africa which possess the ability to produce a double coated fleece (fine and coarse fibres) therefore represent a way of diversifying existing agricultural resources without a large capital outlay. The utilization of the fibres as an additional source of income (value addition) would make the goat flocks more profitable. For example, at the present fleece weight of 20 grams per goat and a fibre price of R90 per kilogram the fibre income would be R1,80 per goat, whereas after upgrading to 100 grams per goat the fibre income would be R9,00 per goat. Added to this is the potential income from processing (i.e. beneficiation) the fibre into consumer products.

Considering the qualities of the Boer goat, such as high meat production, good fertility, mainly white coat colour, the ability to control bush encroachment and the large variation in down weight (yield) and fineness, there can be little doubt that provided a special breeding programme is followed, which involves the selection of high down producing animals and a cross breeding programme with high yielding imported rams, such as the Saffer cashmere goat, a viable cashmere industry in South Africa is possible. For this purpose, the German Volkswagen Foundation has funded the importation of Australian Feral rams in 1998, with the aim to cross breed them with Boer goats to produce a type of goat that will produce, in addition to meat, also substantial amounts of cashmere. The necessary research is being carried out by Grootfontein / Döhne ADI's.

The release of approximately 500 Gorno Altai cashmere goats in 1997 and the availability of Australian Feral goats since 1999 has caused great interest in the project in so far that even selective cross breeding of indigenous goats, such as Boer goats, has started which will no doubt provide further momentum to the project.

This project supports the whole process of rural and economic development in South Africa, aiming to provide a potential source of supply of this high quality, high priced sort after fibre locally, together with the associated value addition industry largely in the form of SMME's.

Employment creation potential

Cashmere production is highly labour intensive, (it takes ±20 minutes to comb one goat) and is ideally suited for farmers who have a small number of goats and have close contact with their animals, enabling them to identify those animals with good cashmere producing potential and to know exactly when optimum shedding takes place so that the goats can be combed. The utilization of the fibres as an additional source of income would make the goat flocks more profitable and also provide an opportunity to beneficiate in the form of small agro-industries, which convert the fibre into the final products as discussed below.

Economic Potential

The project is aimed at both short and long term benefits. While the project is centred on the long term development of related Somme's, it also makes provision for immediate income generation for farmers who can sell cashmere in those cases where it is economically attractive for farmers to comb their goats and to sell the hair.

The upgrading of the goats and the establishment of cashmere beneficiation are, however, key to the economic viability and success of a local cashmere industry. This can be illustrated by the fact that at a production of 100grams of down fibre per goat, the farmer can earn annually R900 of additional income per 100 goats. These 100 goats can produce a total of 5 kg of cashmere (i.e. 50 % down of combed hair) from which one could produce about 10 jerseys, which generally retail at around R1000 each giving a total beneficiated product value of some R10 000 per 100 goats.

Future work

On the basis of the results to date it can be concluded that the establishment of a viable cashmere industry in South Africa is possible provided that the down fibre length and yields are improved by introducing a breeding programme using current indigenous goat ewes with imported high yielding cashmere rams. This will be a way of diversification of existing agricultural resources without a large capital outlay.

The next stage of the project is therefore to pilot cashmere projects in six provinces where most goats are found. The goats will be upgraded by selective breeding, i.e. selecting the best

current indigenous ewes and crossing them with high yielding imported cashmere rams such as the Saffer. Appropriate technologies will be sourced and, where necessary developed, for converting the combed cashmere into consumer products. Product development will be undertaken and also the development of SMME's in rural areas, with a particular emphasis on tourist textiles and export. Human resource development and training will underpin all these initiatives so as to create the necessary cashmere fibre production, processing and product manufacturing expertise and culture locally.