EFFN

The development of breeding schemes for improving European speciality animal fibres

Workshop IV

Escola Superiore Agraria de Castelo Branco, Portugal,

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The development of breeding schemes for improving European speciality animal fibres

Introduction to the workshop

This workshop was the last in the current series of workshops of the European Fine Fibre Network. The Network, a “Thematic network” of the European Commission, DGVI”, was set up in early 1997 to establish common protocols for measuring fibre traits and data recording in breeding programmes for different fibre types, e.g. fine wool, cashmere, mohair and angora, and to encourage the widespread use of the OFDA fibre measurement technology

The workshop series has established a framework for collaboration between researchers and breeding groups in eight EU countries and Norway.

The OFDA fibre measurement technology has been demonstrated to perform well for affordable and accurate fibre diameter measurements in a form appropriate for the objective selection of breeding animals.

Comprehensive sets of EU-wide performance traits in breeding programmes for cashmere and mohair goats, fine wool sheep and Angora rabbits have been established, and common data formats and sampling protocols for parameter recording have been agreed.

This final workshop was an opportunity to discuss how harmonisation of the genetic improvement schemes will be used in the future to enhance the quality and competitiveness of European speciality fibres. Plans were developed for the further implementation of the methodologies and for the dissemination of superior genetic material.

In addition to these technical objectives, the use of standardised objective fleece measurements in the improvement of marketing structures for European luxury fibres was discussed.

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The development of the speciality fibre sector in Portugal

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Introduction

Fine fibre in Portugal is almost limited to wool and, for the moment, the country is still responsible for a reasonable amount of production of fine wool.

There are no cashmere goats registered in Portugal, and so no cashmere fibre is available, as is the case with Angora rabbits. Angora fibre used to be produced in Portugal, however due to disease problems, the rabbits died and the production of this kind fibre disappeared in the sixties.

Currently, interest in farming Angora goats for mohair production is low. From the initial flocks set up in the late eighties (500 animals), there are now only 250 animals. Due to the small amount of fibre produced and to the rapid coarsening of the fibre with age, the national textile industries have never shown interest in developing technology for processing this particular type of fibre. Because of this, the producers need to send the small volumes of fibre produced to France or England for processing.

We think that in order to improve mohair production the resolution of industrial processing must be done at the production level in a modular way. It is also necessary that the official organisms have objective guidelines. Even if it is considered as a exotic breed, there are enough information that allows us to say that angora goats can be perfectly integrated in our traditional sheep management systems, and with fewer management problems that some of our indigenous goat breeds.

We think that from the three types of fibre-producing animals referred to, angora goat production is the best option in the short term, since it is the animal that is closest to our traditional system of animal production.

The Portuguese Textile Industry, since a long time ago, prepared to process the only animal fibre (wool) currently available in large quantities in the country. All the other speciality fibres are imported for incorporation into garments.

Wool seems still to have a role in Portuguese Agriculture, mainly fine wool, which is predicted to be in continuing and strong demand.

1- Historical Evolution of Portuguese wool production

In Portugal, in 1997 the sheep population was around 3,414 x 10^3 , responsible for the production of 8,768 tonnes of wool (Table 1).

Table 1- Historical evolution of sheep population, wool production and stored wool in Portugal (1987 - 1998).

Years	Animals (1) (x 10^3)	Wool Production (2) (ton)	Stored wool (3) (ton)
1987	3035	8700	1602
1988	3187	8800	1431
1989	3347	9100	1497
1990	3360	-	1935
1991	3380	-	1403
1992	3348	-	689
1993	3305	8850	1467
1994	3416	8658	788
1995	3428	8998	444
1996	3380	8636	556
1997	3414	8768	468
1998	3433 (4)	8995	818

(1)- Anuário Pecuário (1998/99)
(2)- Anuário Estatístico de Portugal (1998)
(3)- Martins Abrantes (non published)
(4)- Provisional data

Within this animal population there is a relatively high number of breeds, aggregated in three different ethnic groups: Merino, Bordaleiro and Churro. In the ethnic group Merino there are three breeds: Merino Branco do Alentejo, Merino da Beira Baixa and Merino Preto do Alentejo. Available data show the existence of 1,300 x 10^3 animals from the two first breeds.

2- Wool collection

Portugal has established since 1940 a system for collecting (livestock cooperatives that also work as wool storage centres) and classifying wool (technicians from the Ministry of Agriculture), so that lots can be grouped for deals with industrial concerns.

In Portugal, the concentration of the wool is done by farmer associations in three different places - Beja, Évora and Castelo Branco. It is predicted that only 15 to 20% of the wool produced in these regions is delivered to the collection depots (Pinto de Andrade and Várzea Rodrigues, 1997).

The wool depots for concentration/grading/storing are distributed within the regions related to the distribiution of the threemerino breeds - Merino Branco and Merino Preto do Alentejo (Beja and Évora) and Merino da Beira Baixa (Castelo Branco).

Table 1 shows the evolution of the quantity of stored wool from 1987 till 1998.

3- Wool price

On the basis of the results presented in Table 2, it is possible to verify that the differential between the price of the wool directly sold to intermediates or to the industry and the price obtained in auctions is significant and can greatly vary (25,78% in 1991 to 88,08% in 1992) with the prices realised in private deals lower than the price obtained at auctions. From 1993 till 1997 that differential has been in the region of 50%.

Table 2- Price of direct sell, at the auctions and percentage of variation.

Years	Price Direct Sell ($/kg)	Price at the Auctions ($/kg)	Percentage of Variation
1991	90	113,20	+ 25,78
1992	95,6	179,80	+ 88,08
1993	84,6	134,47	+ 58,95
1994	85,3	141,27	+ 65,62
1995	86,4	132,87	+ 53,78
1996	80	125,73	+ 57,16
1997	128	225,20	+ 75,94

Source: Ovinos e Caprinos (1998)

Most breeders are on their own when negotiating with traders since they do not want to deliver their wool production to the wool storage centres (authorised to certify the product´s origin and quality to buyers) and wait four to five months for the wool auctions with higher prices. These farmers receive an identical price irrespective of the quality of wool, with a lower price per kg.

The higher value obtained in the auctions where the wool is graded is dependent on the variations in international markets. Wool merchants and textile processors import large lots of wool which have been rigorously graded and meet rigid specifications. The small companies process small quantities of raw wool are less reluctant to buy small batches of locally grown wool, which are of variable quality and often heavily contaminated with vegetable matter.

4- Quality of Portuguese wool

Wool produced in Portugal is quite heterogeneous and is dependent on the ethnic group. It is assumed that the Churra ethnic group has poor quality wool, with low crimp, a rough feel, and with a variable fibre length from 15 - 30 cm. Commonly, mean fibre diameter is in the range 30 - 57µm. The wool has specific uses in handicraft (blankets and carpets).

At the other end of the scale, the Merino breeds are considered to be high quality wool producers with high crimp, soft handle, and with variable fibre length between 6 and 8 centimetres. Mean fibre diameter is in the range 18 - 30µm.

This work aims to develop a credible plan for future development of fine wool production (< 22,5 µ) in Portugal. All the data refer to Merino wool production.

Table 3 shows the changes in the relative production volumes of different wool grades between 1990 and 1997. It can be seen that in the southern regions of the country (Évora e Beja) the percentage of AA wool (19- 22µ) shifted between 35 to 55%, 1996 except in the region of Évora. In Castelo Branco, the evolution in percentage of AA wool has been decreasing since 1990 (46.4%) reaching its minimum in 1995 (12.9%). This situation results from the crossbreeding between indigenous and exotic breeds (Frísian, Manchego, Awassi and Assaf) which have been introduced to increase milk production (Pinto de Andrade and Várzea Rodrigues, 1997; Pinto de Andrade *et al.*, 1998).

Table 3- Changes in the relative production volumes of different wool grades between 1990 and 1997.

	ÉVORA			BEJA			CASTELO BRANCO		
YEARS	AA	A	B	AA	A	B	AA	A	B
90	35.4	34.9	15.4	51.4	27.0	12.2	46.4	22.7	17.3
91	44.9	20.3	20.8	42.8	24.9	15.1	34.2	29.6	14.4
92	37.0	26.7	14.6	50.1	23.3	15.8	39.5	27.9	19.8
93	40.5	29.1	15.5	54.8	17.6	8.40	29.0	28.6	25.0
94	41.5	19.0	25.6	45.3	29.1	15.2	24.7	27.5	30.7
95	47.7	25.1	19.0	49.0	26.5	9.20	12.9	32.5	31.1
96	29.0	30.3	17.4	39.4	31.4	18.8	18.6	25.9	29.3
97	34.3	35.9	18.9	41.6	31.6	15.3	28.3	24.5	24.4

AA- [19- 23μ[; A – [23 - 25μ[and B – [25 - 36μ[
Source: Chabert, personal communication, (1997)

Table 4 shows the consolidated data and illustrates the trend for a decrease in the proportion of AA wool produced (44.4% in 1990 vs. 29.0% in 1996), corresponding to an increase in the production of A wool [23 - 25μ]; B and D classes suffer slight changes. This trend ought to be reversed.

Table 4- Evolution of finesses (%) in the 90´s in Portugal

Years	AA [19- 23μ[	A [23 - 25μ[	B [25 - 36μ[	D Defective
90	44.4	28.2	14.9	12.4
91	40.6	24.9	16.7	17.4
92	42.2	25.9	16.7	15.1
93	41.4	25.1	16.3	17.1
94	37.1	25.2	23.8	13.8
95	36.5	28.0	19.7	15.6
96	29.0	29.2	21.8	19.7
97	34.7	30.6	19.5	15.1

Source: Chabert, personal communication (1997).

If we look at the data from merino wool obtained at the wool depots in 1998 and 1999 (Table 5), it is possible to verify that wool from class AA [19 - 23μ] represents 31.5 and 31.2% of the 550,477 kg (1998) and 420,195 kg (1999) of the total merino wool classified.

Table 5- Merino wool quality and prediction of the total Merino wool production.

	Classified Merino Wool (kg)		Percentage related to classified Merino Wool		Prediction of Merino Wool Production (kg)	
Years	**1998**	**1999**	**1998**	**1999**	**1998**	**1999**
Classes						
AA (19-23 μ)	173214	133068	31.47	31.22	973563	966019
AA Extra (19 - 22 μ)	23510	14137	4.27	3.32	132140	102629
AA Fine (21 -23 μ)	149 704	118 931	27.20	27.91	841 423	863 390
< 20 μ	9 373	6 475	1.70	1.52	52 682	47 006
20 - 22,5 μ	79 593	60 639	14.46	14.23	447359	440 214
22,5 - 25 μ	60 549	47 453	11.00	11.13	340 320	344 489
> 25 μ	23 699	18 501	4.31	4.34	133 202	134 310

Based on census data indicating 1,300,000 Merinos in Portugal, and 2.38 kg mean fleece weight, this corresponds to a total annual production of 3,094,000 kg Merino wool. This predicts that there are almost 1 000 tonnes of AA wool class produced annually, based on the tactile/visual assessment done by the technicians from the Ministry of Agriculture.

AA wool class is divided in two sub classes: AA Extra (19 - 22μm) and AA Fine (21 - 23μm). It is possible to see that within the AA class (31%) only 3-4 % are AA extra, the remaining 27-28% are AA fine. After random sampling fleeces of each subclass and determining the fibre diameter, we concluded that within the AA class, 1.5 to 1.7% of stored/graded Merino wool is found with a diameter of < 20μ and 14.2 to 14.5% of wool with [20 -22.5 μm].

The results obtained at the laboratory (OFDA), predict an annual availability in Portugal of 487 to 500 t of wool with the desired characteristics (<22.5 μ), and only 47 to 53 t with diameters less than 20μm. This means that only 19 000 to 22 000 animals from the total Merino population have such high quality wool. In the farms that deliver their wool for grading, there are only 2700 to 3900 animals with fine wool (< 20μ).

5- Economic contribution of the Wool sector in the Animal Production (AP)

The contribution of wool to total income from animal production at current prices decreased from 1994 to 1997 (0.26% in 1994 down to 0.21% in 1996 and 1997) (Table 6).

Table 6- Final product at Production at current prices and at constant prices from 1986 from the wool sub sector and from animal production sector in Portugal.

Years	Final Product at Production at Current Prices (x 10^6 Euros)		Product Wool Current prices related to Constant prices (%)	Product Wool relate to the product AP (%)	Final Product at Production at Constant Prices from 1986 (x 10^6 Euros)		Product Wool relate to the product of AP at constant prices (%)	Differential Current prices - Constant prices (X 10^6 Euros)	
	Wool	Total AP			Wool	Total AP		Wool	AP
1994	5,6	2 185	75,4	0,26	7,5	1 869	0,40	-1,8	315,5
1995	4,9	2 006	63,7	0,25	7,7	1 778	0,44	-2,8	227,6
1996	4,7	2 245	63,8	0,21	7,4	1 820	0,41	-2,7	424,8
1997	4,8	2 304	63,7	0,21	7,5	1 864	0,40	-2,7	439,9
1998	5,0	2 061	65,0	0,25	7,8	1 822	0,43	-2,7	238,8

Note: AP- Animal Production

a) Provisional Data

Table 6 shows that the wool has been suffering high devaluation:

1- Wool production is referred in national statistics as almost constant;

2- the differential between the final product at current prices and the final product at constant prices from 1986 is negative in all years considered.

In practical terms, we can see that the final product wool in the production, and at current prices is only 63,7 to 75,4% of the final product from the same sector at constant prices from 1986.

Final considerations

The sale of stored wool through auctions, based on lots containing parcels of fine wool and wool with less quality must be changed. At least part of the fine wool (< 22,5μ) should be sold in individual lots, and so properly valorised, with a consequent economic reward to the farmer. This policy has the advantage to stimulate producers to have a specific production goal. The disadvantage is the difficulty to commercialise the wool of less quality.

Is necessary to implement a systematic work in two ways:

- show to the producers the economic advantages of fine wool production;
- establish genetic selection programmes that at least encourage the improvement of wool quality.

It does not appear possible at present to establish selection programmes for wool production only, given the sheep systems used in Portugal. However, it seems crucial, possible and practical to introduce wool improvement criteria within the existing selection programmes, which currently focus on meat production traits.

Delaying the decisions related to the wool production is leading to a rapid decrease of available breeding animals. It is necessary that farmer's associations assume their responsibility as soon as possible.

The small number of animals that produce fine wool with less than 20µm, their distribution by a high number of farms, the introduction of other breeds in crossbreeding, the difficulties of the wool market, the losses of profit from this sub sector, and the absence of objective policies, could lead in a short time to the disappearance of this genetic basis, making irreversible the process of regression of the wool quality.

The social aspect is significant, since the sheep production sector involves thousands of people across Portugal. The standard of living of these people could be improved if wool was more efficiently used.

Crossbreeding to improve certain aspects of the animal's meat and milk is resulting in genetic deterioration. The results of hundreds years of painstaking selection have disappeared or are at risk. This genetic heritage, from which the wool stock of the Southern hemisphere producers originates, must be preserved from the point of view of preservation of genetic resources (Pinto de Andrade *et al*., 1997).

Biodiversity maintenance is an indisputable goal, however it must be supported by society and must have the unequivocal support and stimulation from the Government, from the central organisms and regional responsible in order that the production could pursue the same goals.

Currently, we believe that there is a political will to improve the wool sector. Professional training has restarted with the support from the Ministry of Agriculture, and financial aid is a real possibility.

We believe that the necessary conditions exist in order that the farmer's associations responsible for the herd books for the Merino breeds rethink the genetic selection programme of respective breeds and introduce the necessary criteria to improve wool quality without negative consequences for meat traits.

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Cashmere Group
Margaret Merchant

Fibre measurements in breeding programmes using OFDA
The group were satisfied with the performance traits that were being measured in breeding programmes. The OFDA measurement technology had provided the opportunity to measure cheaply key parameters, such as fibre diameter, on a large number of animals, and was now being used to measure other variables, such as lustre and medullated fibres, as breeding programmes developed. The database structure is operating satisfactorily and the Network was deemed successful.

Wider issues
The group then discussed a number of key issues in relation to the development of cashmere production in Europe. The expansion of cashmere production is being held back by a number of factors. Significant of these are fluctuating prices of raw fibre, which is a barrier to enterprise planning, and prejudicial attitudes amongst farmers and consumers in certain EU countries against goats and goat meat. The participants discussed methods of promoting goat keeping and in particular cashmere production. Goats need a better image in the eyes of the public, the farmer and the forester for full establishment of a viable industry. In countries where goat meat consumption and goat milk production is well established, cashmere production has considerable potential.

The marketing and processing stage in the production chain is extremely important, and at the establishment stage, the problem of increasing the numbers of cashmere goats in the absence of a market for small quantities of fibre, and for example in the UK for meat has been a considerable impediment. Niche markets offer potential, but require considerable venture capital or grant funding to establish.

The cashmere trade is under increasing pressure to act against mislabelling. The marketing of blended materials as pure cashmere, is becoming increasingly widespread. In this respect, work to better identify fibres in processed cloth, and an accurate definition of cashmere is extremely important. A new definition is required for European and N. American cashmere.

It was considered that an aspect of the cashmere production system that has widespread application is in landscape management– marketing the goats on the basis of their grazing habits. Goats are highly effective at scrub & weed control, and suitable to be kept in a low input system.

Mohair Group
Daniel Allain

Fibre measurements in breeding programmes using OFDA
Progress in the harmonisation of mohair breeding objectives and collaboration between national breeding initiatives has been good. The three main countries involved have been France, Denmark and the UK, and the three national breeding associations have been involved.

Priorities for action were to disseminate information:
- about database and data recording for angora goats in all EU countries

- on feeding angora goats
- Identification of fibre quality : what is medullation and how to determine it?
- Identify quality traits to aid the marketing of the EU mohair production
- Improve data flow between database and farms

Niche markets are the future of EU fine fibre production. Measures need to be taken to improve the use of fine fibres as new final products and the marketing on niche markets. This should involve identifying quality and potential uses of this EU production, taking into account size (small usually) and heterogeneity of fibre lots as the whole production needs to be processed and marketed.

Ideas were explored for the development of a new EU project for mohair and by extension for both fine fibre and wool EU production. This project needs to be supported and co-ordinated by a SME involved in fibre production, processing or marketing.

Objectives would be to:

1. Identify wool and fine fibre quality produced by different animal breeds (mainly sheep) raised in EU.
2. Identify the different processing and marketing systems in use for raw or processed wool or speciality fibres produced in EU.
3. Identify and analyse the different initiatives developed to valorise local wool and speciality fibres as final products directly to consumers on niche markets.
4. Identify and explore new non-textile uses of wool

Angora wool Group
Arja Simola & Asko Maki-Tanila

Much attention in the group was focused on an important case study in Finland, where there has been small-scale production with angora rabbits since the early 80's, mainly as an additional source of income on a farm. To strengthen the volume and quality of production there is a need for genetic improvement of animals, for development of angora processing and for specialised courses. These elements would serve as a basis in creating quality control system to cover the entire production chain. The objectives of a pilot project running between 1997 and 1999 were:

1) development of nutrition, husbandry and selection of angora rabbits;
2) an entrepreneur network covering production, processing and marketing
3) an educational programme.

The results were, in the order of the project targets, the following:

1) The selection programme was designed to improve the production and reproduction traits. For this purpose, unique ID number was given to all individuals. The database for pedigrees and production traits was set up. A feed containing high amounts of methionine and fibre was development to meet the special nutritional requirements of angora rabbits. In the recommendations for good husbandry, there was high emphasis on animal welfare.
2) The network was formed by 8 processors/entrepreneurs at Jokioinen and near-by towns together with a spinning milt at Mikkeli. Very versatile education was offered to producers.

The spinning process was scrutinised with expertise the Tampere University of Technology.
3) Basic courses were designed by the project co-ordinator and given at Tammela of the Forssa Unit of Hiime Polytechnic. They covered angora rabbit production, angora processing and economics. The futher education concentrated on processing, entrepreneur legislation and quality control. Teaching was carried out by persons from the collaborating organisations.

The Project had benefited from close collaboration with researchers from France and Norway, which had been facilitated by the EFFN network on animal fibres.

Fine wool group
Jerry Laker

The fine wool sector on Europe, already for many years declining due to pressure from efficient high quality wool production in the Southern hemisphere, continues to face severe challenges in the face of the current world over-supply situation. The EFFN had made an important contribution to sustaining the key major populations of Merino sheep in an attempt to maintain genetic improvements, and reduce losses of that gene pool, as breeding stocks are decreased. This had been through the use of OFDA measurement technology. The most active of the wool breeding associations within the EFFN has been UPRA Merino d'Arles, located in Southern France, with a breeding population of some 25,000 sheep, with 30 breeders. The total population of the breed is in the region of 30,000 animals.

A breeding group has recently been established in Germany to preserve and develop a gene pool of fine wool merinos to prevent the further decline of the breed following the economic collapse that accompanied the reunification. A nucleus breeding flock of Fine Wool Merino sheep has been established on the Hohenheim University Experimental Farm "Oberer Lindenhof". The development of fibre characteristics is monitored in comparison to a group of merino land sheep of similar age and sex structure, using the OFDA-methodology. Additionally the reproductive traits as well as growth and carcass traits of the lambs are regularly recorded.

The objectives of Merino breeding in Portugal have also aimed to arrest falling wool quality arising from the poor economic stimulus to maintain an interest in wool. The INTERREG project "Evaluation of fine wool production in Portugal" is now active, and a wool testing laboratory is established in Castelo Branco, using the OFDA technology.

Projects such as the Bowmont sheep, a hardy merino-type, that is adaptable to the rigourous climate of the Scottish highlands, while producing wool of less than 20 microns, are continuing in a developmental phase, again using the OFDA technology.

The production volumes of quality wools in Europe are at a low level, and this is causing severe marketing inefficiencies. Coupled with low world prices, this has made it essential for many producers to look to value adding activities to achieve economic viability. As reported elsewhere in this report, the Finnish Fine Wool Project makes full use of the best characteristics of the Finnsheep to supply small-scale producers with a quality, locally identifiable product.

To provide better support for European wools on a wider scale, it has been strongly argued by the wool group that a system needs to be established for classifying and centrally marketing European wools. A grading system could be developed based on reliable objective fibre quality testing that would enable faith to be established in an electronic auction system. In such a way, many of the market inefficiencies may be reduced. Considerable resources will be required for this, however, to reverse the trend of declining fibre quality, which is essential in the establishment of profitable markets for European wools.

Collaboration in the Danish and French mohair breeding programmes.

Annette Holmenlund and André Billant.

The Danish Goat Registration has 126 mohair breeders with 1,041 breeding female goats who gives birth to 1500 kids each year. There are about 3500 live animals in the breeding database and about 15 tons of mohair are produced each year.

Fibre evaluations before EFFN and now.

Previously we had a Danish Mohair test developed by Dr. Palle Rasmussen at the Danish Institute of Agricultural Sciences. It was developed from mink-skin technology and made by cross section of a lock of fibres. This demands a high labour input with fixing and preparing the samples. 4-500 fibres were tested in each sample. The results of the tests showed medullated fibres, kemp and fibre diameter. Usually we tested about 70 bucks and very few does each year. The price was twice as much as the price of the OFDA tests, and the Danish Institute of Agricultural Sciences could not even cover the wages for the work. The Danish Mohair test was a part of research, and it was not ready to be done on a larger scale.

The Danish Angora Breeders Association has participated in the EFFN and used the OFDA measurement on 170 samples taken in 1998 and to 320 samples in 1999. The aim was to test all the bucks and young goats at the 3rd. shearing i.e. from 14-18 months of age. This ghas provided results which could be used in our well developed breeding database. Because of the EFFN-network a greater interest in mohair evaluations has been stimulated in 1999. This will give the Danish Mohair goats a good chance to enhance the breeding for fibre quality traits.

Comparison of OFDA with other subjective tests.

The test was taken by the judges who has written down their subjective results in a scoring scale from 1 to 6. Fineness was highly correlated with fibre diameter in the OFDA-tests, but the measurement of kemp and medullation, which are very imporant breeding traits, was less well correlated. We have found a correlation between OFDA measurement and subjective evaluation results of 60%-70%.This means that the Angoa Goat Association can use the OFDA measurements and rely on the results in the fibre tests.

Common database with the French Angora Goat Association.

The OFDA measurements were measured by the Macaulay Land Use Research Institue in Scotland and we are greatful to Hilary Redden because of her helpfulness in explaining the results. The French Angora Goat Association has a similar database to the Danish one, and they present their results in a very understandable way to the breeders. In summer 1999, 7 French angora breeders visited the National Angora show in Denmark and we discussed very constructively how we could make a common breeding database.

At the EFFN meeting in Portugal the Danish breeders finally decided to try to make the mohair tests in France aiming to make readable results which could be easily understood by the goat farmers. The French textile Institute is collaborating with Daniel Allain and the Danish mohair breeders to translate the French mohair tests into Danish.

The results have just arrived and the translation and presentation are very satisfactory. Now it will be very easy to put the data in our database and to exchange data with the French Angora Goat Association.

Collaboration with British Angora Goat Society

In summer 1999, 6 judges and the advisor of the Danish Angora goat Association visited the British Angora Goat Society at the mohair show in Stafford. The best goats had a very fine quality but the breeding programme lacked a database. That is, you cannot calculate the breeding values, and you have to record many generations and use a lot of paperwork to identify if a mohair goat has a high genetic value.

The National Department of Cattle Husbandry at The Danish Agricultural Advisory Centre will offer the British Angora Goat Association an internet solution to participate in the Danish breeding database. That should give knowledge about the production results of the British Angora goats. We hope that this will consolidate a common breeding programme for the European Angora Goats.

Conclusions of the agreements are that:

1) It will be possible to establish common rules for collecting and storing data,
2) The data can be used in estimation of genetic parameters.
3) The data can be used when exchanging animals to make advances in the breeding programmes, and;
4) The data can be used in calculation of synthetic indices.

A tableshowing the steps taken to harmonise the French and Danish recording systems is published in Newsletter 6 of the EFFN.

The breeding scheme for wool traits in the Finnsheep in collaboration with Swedish and Danish breeders.

Marja-Leena Puntila

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The aim of the breeding programme is to create a regional network of sheep breeders, who are interested in improving wool quality. The network will allow the determination of the recorded traits and criteria for assessment of wool traits, in co-operation with the rural advisory centre. Selection criteria, used in the wool line of Finnsheep nucleus flock, will be utilised in this study. The targets for the second year are to estimate genetic parameters for all considered wool traits, to estimate the breeding values, using the animal model BLUP for wool quantity and quality traits, to start analysing wool samples for fibre diameter (measured with OFDA technique), and to work out the method of utilisation of elite sires. The ultimate purpose is to transfer the BLUP-system for wool traits to the national field-recording scheme. Although the main breeding objective is to improve wool quality, other production characteristics, such as prolificacy and meat traits, are also considered.

Data recording and evaluation procedure

The first year's data (1997) included 600 Finnsheep lambs, sired by 24 rams from 22 flocks. Half of the animals were white and the other half, coloured. The flocks, with an average size of 27 ewes, belonged to the Finnish Sheep Recording Scheme. Besides identity and pedigree information, birth date, birth-rearing type, sex, age of ewe, 42-day live weight, 120-day live weight and live weight at assessment, were recorded. The following wool characteristics were assessed: staple length, fineness according to grades (60-48), number of crimps per 3 cm, density, fleece uniformity, staple formation and lustre (point scale 5-1). The evaluation of wool quality was carried out by a trained team. Fibre diameter measurements for small amount of wool samples, using Airflow apparatus, were carried out at the Agricultural Research Centre of Finland.

The second year's data (1998) consisted of the records from 795 lambs, sired by 27 rams from 18 flocks. 49% of the lambs were white, the rest were black, brown and grey. The wool samples for the OFDA measurements were taken from the flocks of the Fine Finnwool project and, as a comparison, from the Finnsheep nucleus flock and another large pure Finnsheep flock. The samples will be analysed in the Macaulay Animal Fibre Evaluation Laboratory.

The target of the first year OFDA measurement is to determine the fibre diameter (fineness) in white and coloured Finnsheep.

The analyses of the second year of OFDA measurements will cover different sire lines and progeny groups.

Conclusions

- Well-trained staff are needed to have reliable results for the subjective assessment of wool quality.
- The collection of the assessed data should be carried out at a standardised age of the animal.
- Besides wool quality assessment, the weighing of greasy wool during shearing is also necessary to improve wool quantity in breeding programs of white and coloured Finnsheep.
- A strong emphasis will be put on the objective fineness measurements, using the OFDA methodology.
- The animal model BLUP evaluation for wool traits is now under development, which will allow the sheep breeders to select next year replacements, using BLUP indices.The flock size is small among the breeders in the Fine Finnwool project. Therefore, it is important to develop a scheme to utilise the top ranked sired, to ensure the genetic improvement in the most desired wool traits.

Recent progress in Norwegian Cashmere Production.

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Introduction

In Norway, milk is the major product of the goat industry. Kidding normally takes place in February and the goats are barnfed until start of grazing in May or June. The grazing on the natural range pastures ends in September or October. The goats are then milked for a period of 1 - 3 months and dried off 2 - 3 months before parturition. The result of this system is peak deliveries of milk from April to September and shortage during mid winter. Reduced consumption of traditional Norwegian brown whey cheeses (brunost) has resulted in overproduction of goats milk and decline in income for farmers.

A new brand of cheese «Snøfrisk» (i.e. Snow-fresh), has been successfully marketed locally as well as in Germany, UK, USA and Canada. «Snøfrisk» is a white spreadable cheese which can be stored for about three months. Producing the cheese requires even supplies of high quality milk throughout the year.

The Norwegian dairy goat population amounts to 60,000 does. Today, only kids for replacement are saved and most of the other approximately 75,000 kids are disposed of shortly after birth, without any attempt being made to utilise them for meat production. Killing of surplus kids has been criticised by animal rights advocates, and goat farmers dislike the practice themselves. Raising the goat kids may yield additional incomes and the farmers can avoid negative publicity.

Norwegian dairy goats have been reported to produce high quality cashmere although with short fibres (Vegara et al., 1999) and cashmere might provide additional income to goat farming. Improvement of cashmere production is possible both by selection in the native goat population and by crossbreeding with cashmere goats recently imported from New Zealand. The cashmere goats will be used both for combined meat and fibre production and for supplying bucks to be used as terminal sires in dairy goat herds. Since there is currently no Norwegian cashmere industry, grading and marketing of the fibre will take place in co-operation with the Scottish Cashmere Producers Association.

Encroachment of extensive grazing land is a major threat to the traditional Norwegian countryside. Combined grazing of meat and fibre producing sheep and goats might be a cost effective production system for the preservation of extensive grazing land and also beneficial for the sheep due to improved pastures.

In this paper we will discuss the possibility for a change of the Norwegian goat farming system, from specialised dairy to a combined system providing meat and fibre in addition to more even milk supplies. The Scottish model of replacing some sheep with meat and fibre producing goats will also be discussed.

Different production systems under study

In Norway, climate as well as farm resources, such as size of farm and milk quota, vary both between farms and regions. Therefore, different management systems adapted to local conditions need to be developed. Table 1 summarises systems currently under study.

Table 1. Different management systems for goats in Norway.

	Production systems						
	Milk	Milk-, meat- and fibre				Meat- and fibre	
		Meat from young kids	NLH-model	Nygårds-model	Aurlands-model	Guddals-model	Seter-model
Time of kidding	Nov. - Feb.	Feb. - April	April - June	April - May	Jan. - April	April - June	April - June
Milk, effect on:							
Seas. Distrib.	Insignificant	Small	High	High	Small	-	-
Var. in flavour	High	High	Low	High	Low	-	-
Meat							
Age at kill., month	-	1	2,5 - 8	3 - 8	8 - 11	3 - 8	3 - 8
Type of meat	-	Kje	Fjellsprett	Fjellsprett	Fjellsprett	Fjellsprett	Fjellsprett
Kill weight, kg	-	3,5 - 6	Min. 7	Min. 7	Min. 7	Min. 7	Min. 7
Grade, (EUROP)	-	Min. O -	Min. O -	Min. O -	Min. O -	Min. O -	Min. O -
Cashmere, prod.							
Goats	-	Moderate	Moderate	Moderate	Moderate	High	High
Kids	-	-	Higher	Higher	Higher	High	High
Effect on landscape	Moderate	Moderate	Higher	Higher	High	Very high	High

Specialised milk production under controlled indoor feeding conditions in the first part of lactation is commonly practised in Norway. This gives a high annual production per goat. On the other hand, improvement of seasonal distribution of goat's milk on the same farm is difficult and production of meat and fibre will remain low. Rearing of the now culled kids can redistribute production of milk over the year. Slaughtering surplus kids at one month of age has only a small effect on milk distribution. There seems, however, to be a market for meat from young goat kids. Farmers may also improve their profit slightly and avoid negative publicity by producing this type of meat (Asheim & Eik, 1999).

Combined milk, meat and cashmere production systems.

The alternative systems currently studied are either combined milk, meat and cashmere or combined meat and cashmere. In both alternatives time of kidding should normally be delayed until spring (Asheim & Eik, 1998 and 1999; Asheim et al., 1999; Eik et al., 1999). The reasons for this being:

a. There is a surplus of goats milk during summer months, thus suckling during this period is more economical.
b. Good liveweight gains are obtained using no housing and only a minimum of supplementary feeding.
c. With spring kidding, kids meat may be marketed more easily either before or after the peak lamb slaughtering season in September and October.

In the Aurlands - model, goats may kid in January. The farmers in this area specialise in small-scale cheese production and the cheese is mostly produced and sold during summer months. Therefore it is not beneficial to reduce milk production during this period.

Off-flavour of milk is a problem in the production of Norwegian goat cheeses. The problem may be due to negative energy balance in goats having exhausted their energy reserves. A strong seasonal effect has been reported. Most problems with off-flavour occur when the goats are in peak lactation, normally towards the end of the barn-feeding period. Another critical period is august, probably because of deteriorating pastures and long walking distances of the goats. With suckling during the summer, milk deliveries are reduced in the critical period. Instead more milk is produced on barnfed goats in mid and late lactation. Such goats are easier to feed to a positive energy balance and milk quality is consequently improved (Eik, et al. unpublished data).

When 150 or fewer goats in the herd are grazing together and pastures are freely available, combined milking and suckling of goats during first part of lactation (the NLH - model) seems most promising (Asheim & Eik, 1998 and 1999; Eik et al., 1999). The goats may kid at the start of the grazing period from April to June. Two days after kidding the goats and offspring are let out for grazing on fenced pastures near the farm. The goats and offspring stay together all the time, but only the does are brought in for milking once a day. After 2-3 weeks goats are normally moved to mountain pastures were does are grazed both day and night and kids during daytime only. The does are then milked in the morning before kids are allowed to suckle. In August kids are separated from their dams and either slaughtered, used for replacement of the herd or fattened until slaughtering in December. After weaning of kids, does are kept on a high plane of nutrition for the rest of the lactation.

Often 150 does or more are kept together during the mountain grazing period. For such conditions a separate system (the Nygård - model) was developed. The herd is then separated in does which are suckled and milked for seven weeks and does which are only suckled during the first 2-3 months of lactation. The latter may be kept on distant pastures similar to sheep keeping practises. After weaning of kids, the goats are brought into the herd and fed similarly to the other milking goats. The economics of this systems seem promising (Asheim et al., 1999) and we hope the system will prove to be easily adapted by the farmers.

A new class of kid meat labelled *Fjellsprett* (i.e. Mountain jump) has become popular in Norway and farmers get a price which equals that of lamb. In order to be sold as Fjellsprett it is a prerequisite that:

a) farmers have made a contract for deliveries with the Norwegian Meat.
b) minimum carcass weight of 7 kg.
c) minimum grading of O- based on the EUROP grading system.
d) minimum two months of grazing on range land.

Fjellsprett - suckling kids born in spring are ready for slaughter after weaning in August. The kids may however be kept until December in order to harvest the cashmere fibre and to increase the carcass weight. Kids suckling for seven weeks only, will not be ready for slaughter before December.

Goats of the Norwegian Dairy Breed produce small quantities of good quality down fibre, ranging from 0 g (21% of all goats without down fibre) to 136 g down fibre / goat / year (Vegara et al., 1999). The results indicate a possibility to include cashmere traits in the National Breeding Program. By adding fibre to all Norwegian dairy goats and assuming an annual production of 200 g per goat per year, it would be possible to produce about 15 tons of cashmere. However, the fibre production could increase by 85 percent by raising all the kids. It is possible to further increase fibre production substantially by feeding the kids for another year, however the extra feeding cost of such a system will make it unprofitable. On the other hand, such yearlings might prove efficient for bush control and it may also be possible to market new and higher valued products based on the meat.

Combined meat and cashmere production system

Another option might be to adopt the Scottish system with mixed grazing of sheep and goats and only harvest meat and fibre. Research on such system has just started and two different management systems are currently under investigation. In the «Guddal - model», adult cashmere goats are grazed outside throughout the year while first fresheners are kept indoor on a higher plane of nutrition during winter In the «Seter - model», goats are kept indoor during winter on a feeding regime commonly used for sheep. The former would be suitable in the mild Winters of the coast whereas the latter model may fit in the eastern and northern part of the country.

Grazing with goats may have an important part to play in future agricultural systems. The reason being public concern for increasing encroachment of former grazing land and its potential detrimental effects on biodiversity and income from tourism. Cost of fencing has been a major concern for the development of this type of enterprise in Norway. However the initial experience with free roaming goats is that they move together in large flocks and are as easy as sheep to gather in fall. Goats may also stay in enclosures during night and still perform satisfactory. Therefore, goat keeping might be an option for farmers in areas with increasing numbers of predators.

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Preliminary results of the Italian fine fibre breeding programmes.

Raffaelli Celi and Maria-Antonetta Collonna

Introduction

The population of the Italian goat livestock has been estimated to be about 1,200,000 heads. Goat breeding is mainly orientated to dairy and meat production, accordingly to the traditional systems.

Until recently, little regard was paid to the production of animal fibre. Therefore, even if the Italian textile industry is well known throughout the world for the high quality of processing technology and expertise in manufacturing knitted and woven garments, our country has to import all the fibre necessary from other producer countries, such as China, Mongolia and Australia, at significant cost. The future perspectives are quite worrying for the European import market since the development of processing facilities has been increasing in recent years in China (Russel, 1993). Export of raw cashmere is expected to decrease and in turn prices for importing will obviously rise.

Therefore, successful fine fibre production in Italy would provide great economic benefits, both because of the diminishing need to import fine fibre from foreign countries. The indigenous production would be able to satisfy at least partly, the textile industry demand. There would also be additional income from fibre to supplement that from milk and meat production, thus achieving diversification of our traditional products, which often encounter marketing problems.

Cashmere goat breeding could be effectively integrated into the existing traditional livestock systems without requiring any kind of investment, because cashmere goats show a good adaptability to extensive systems and to the poor land resources of marginal areas. Moreover, their grazing habits may play an important part in pasture and vegetation management and exert a positive ecological impact on the landscape (Del Pozo and Wright, 1995).

Unlike wool and mohair, cashmere production seems to be less affected by extra-genetic factors (Russel, 1994); hence it may be potentially produced in regions quite different for geographical resources. Indeed, cashmere goats may be somehow considered “cosmopolitan”, since they were originally bred in high altitude countries such as China, Outer Mongolia, Iran, Afghanistan, Turkey, India, Pakistan and Russia (Teh et al., 1992) but recently they have been successfully introduced into the United States, South Africa and Australia and in the last fifteen years also in Europe, with particular regard to Scotland.

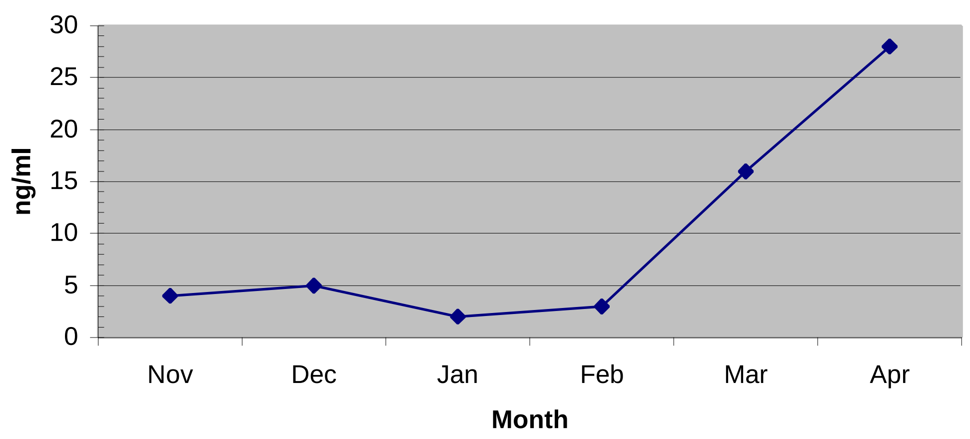
Based on the encouraging results obtained in Scotland, for the first time in Italy we have imported a few herds of goats, in order to evaluate if the wide range of environmental conditions of Southern Italy regions is suitable for cashmere goat breeding.
For this purpose, we have undertaken research in order to evaluate the responsiveness of the imported goats to Southern Italy environment beginning on the study of their reproductive performances, which is an important step for planning any breeding programme.

We found that goats responded to hormonal treatment for oestrus induction and synchronization during seasonal anoestrus. They showed a mean ovulation rate, assessed by laparoscopy, equal to 2.8 corpora lutea (Celi et al., 1996).

In autumn the goats underwent the same hormonal treatment and were naturally mated. At parturition, fertility and fecundity rates were 82.5 and 137.5%, respectively (Celi, 1997, unpublished data). We consider these results as quite satisfactory since they are very similar to those obtained from local goat breeds (Martemucci et al., 1992).
Secondly, we have focussed our attention also on follicle activity. Primary and secondary follicle activity is known to be influenced by many hormones (Rhind and Mc Millen, 1996). Blood samples were collected in order to monitor the circannual patterns of thyroid hormones (T3, T4), growth hormone (GH), prolactin and melatonin and to establish their implications in fibre growth. Hormonal assays are still in progress; however, data on prolactin and GH patterns are already available.

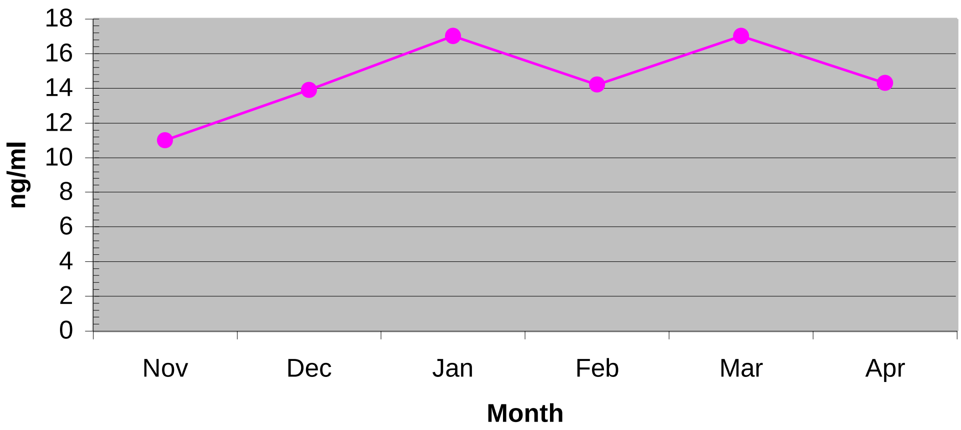
Preliminary results showed that prolactin levels were constantly low until February (Figure 1) while they rose onwards during the moulting time, accordingly to previous reports (Dicks et al., 1994).

Figure 1 - Mean Prolactin levels



Mean plasma concentrations of GH were quite similar throughout the year (Figure 2). However, there was a trend towards an increase of GH concentration from November to January; afterwards, the circulating levels of growth hormone did not markedly change.

Figure 2 - Mean Growth Hormone levels



Furthermore, a study in progress is investigating on the seasonal evolution of primary and secondary follicle activity. Fibre growth cycle will be studied by histological examination of skin biopsy samples taken from the mid-side of each animal, every four weeks throughout a whole year period.

Although we have outlined the objectives and the preliminary results of our research programme, we mean to give an account on the study conducted to examine the influence of altitude on cashmere production. This experiment is described below.

MATERIALS AND METHODS

Location, animals and husbandry

The trial was carried out from June 1998 to February 1999, on a total of 50 mature, female, non lactating and non pregnant cashmere bearing goats. Of the 50 goats, 23 were kept at 50 m above the sea level (41°07’ N; 16°52’ E) while 27 at the altitude of 1,180 m (40°8’ N; 15°49’ E). Mean temperatures, rainfall and humidity were recorded throughout the experiment (Figure 3).

Goats were grazed on grass pastures and at housing, in the evening, they were fed with a daily supplementary ration of 200 g concentrate and hay *ad libitum*.

Sample collection and measurements

Samples were taken every 4 weeks, alternatively on the mid-side of each animal. Dye-banding was performed at the beginning of the trial and at intervals of 4 weeks thereafter in order to evaluate fibre growth. Fibre samples collected from an area of 4 cm^2 were clipped at the skin level and separated by hand into guard hair and down, and the weight and length of each were determined. In the patch, the proportion of cashmere by weight (yield %) was determined.

Secondary fibre diameter was measured using the OFDA method.

The total production of cashmere per goat was calculated proportionally to the total body skin surface using the equation of Couchman and Mc Gregor (1983).

Statistical analyses

Data expressed as percentage, such as yield, were subject to an angular transformation before being processed. Fibre length, growth rate, diameter, yield and total cashmere production were analysed by one-way analyses of variance considering altitude as the main effect (ANOVA, SYSTAT, 1992).

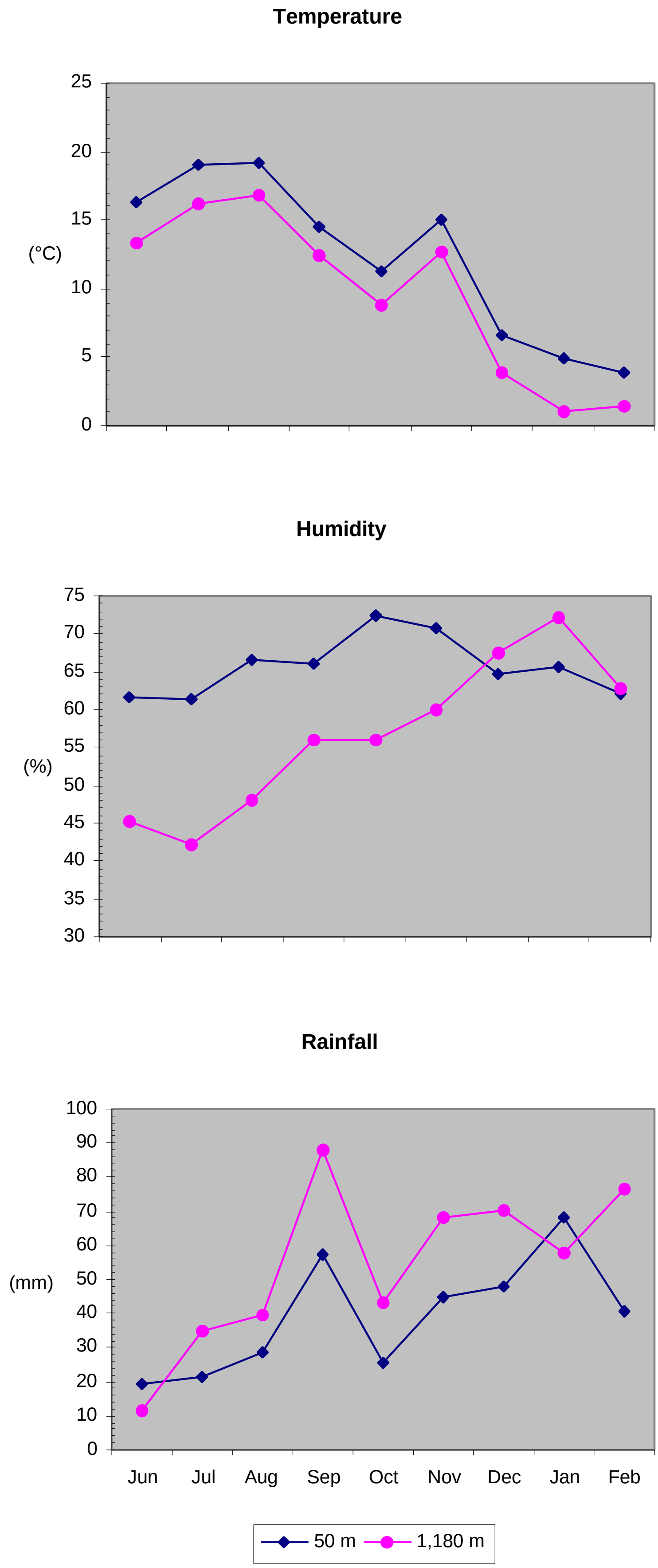


Figure 3 – Average monthly temperatures, humidity and rainfall recorded at the two

altitudes during the experiment.

RESULTS

Patch weight

Patch weight increased continuously between June and January in goats reared at 1,180 m and from June to February at the lower altitude (Table 1). The highest weights were recorded in January (294.9 mg) and in February (277.1 mg), respectively in upland and lowland areas.

On the whole, patch weight was always higher at 1,180 m compared to 50 m, but significant differences were observed only in June ($P<0.01$), July ($P<0.001$), December and January ($P<0.05$).

Table 1 – Patch weight (mean ± S.E.).

	Patch weight (mg)						
	50 m(1)				1,180 m(2)		
June	65.8	±	8.0	**	95.1	±	7.5
July	68.7	±	10.1	***	116.8	±	9.5
August	129.1	±	12.9		147.2	±	12.1
September	165.5	±	18.7		197.6	±	17.5
October	203.4	±	20.1		214.7	±	18.8
November	208.5	±	20.1		216.6	±	18.1
December	226.1	±	18.2	*	273.7	±	16.6
January	251.3	±	15.2	*	294.9	±	14.1
February	277.1	±	21.2		234.2	±	18.6

(1)N° = 23 and (2)27 goats.
*P<0.05; **P<0.01; ***P<0.001

Down length

Down elongation became detectable in August at both altitudes (Table 2), even if not in all the goats. Down length was always greater in goats reared at the high altitude, especially in September (P<0.001), October (P<0.01) and November (P<0.001). At both altitudes, down growth was linear until December; afterwards, down length remained nearly constant. Photoperiod has been shown to influence cashmere growth (Henderson and Sabine, 1992; Kloren and Norton, 1995; Merchant and Riach, 1995; Rhind and Mc Millen, 1996), but it may be that growth is also related to ambient temperatures. Indeed, in this experiment temperatures dropped in December at both the altitudes (Figure 3); thus, the low temperatures recorded from December to February may have somehow inhibited follicle activity. In agreement with our results, and also with other authors, such as Kuanhu et al. (1992), down length was maximum in winter when temperatures were the lowest of the year.

In October, down was detected in all the goats at both the altitudes (Table 2). Afterwards, while all the goats kept at the high altitude showed down growth, in lowland growth was absent in some goats. The proportion of goats showing down growth ranged from 82% in February to 91% in December and January. Perhaps the results of the histological study will be able to provide an explanation for this phenomenon.

Down growth rate

Secondary fibre growth displayed similar patterns at the two altitudes, except than in September and December (Table 2). In September, fibre growth rate was significantly higher (P<0.001) in upland unlike December, when down growth rate was greater in lowland (P<0.01).

The pattern of down growth we have observed is similar to the one reported by Henderson and Sabine (1992). Down growth rate was low until September. Subsequently, it increased continuously and reached the maximum value in November at the high altitude (0.33 mm/d) and in December at 50 m (0.36 mm/d). Globally, the mean growth rate was equal to 0.27 and 0.21 mm/d, respectively in upland and lowland.

Table 2 - Influence of altitude on down length, growth rate and on the percentage of goats showing down (mean ± S.E.).

	Goats showing down (%)			Down length (cm)			Down growth rate (mm/d)		
	50 m(1)		1,180 m(2)	50 m(1)		1,180 m(2)	50 m(1)		1,180 m(2)
June	0		0	0.0		0.0	0.0		0.0
July	0		0	0.0		0.0	0.0		0.0
August	39	**	54	1.0 ± 0.2		1.6 ± 0.2	0.16 ± 0.05		0.20 ± 0.06
September	65	**	87	1.1 ± 0.3	***	2.2 ± 0.3	0.03 ± 0.04	***	0.18 ± 0.04
October	100		100	2.0 ± 0.2	**	3.0 ± 0.2	0.30 ± 0.06		0.27 ± 0.04
November	86		100	3.0 ± 0.2	***	4.0 ± 0.2	0.33 ± 0.07		0.33 ± 0.05
December	91		100	4.2 ± 0.3		4.7 ± 0.3	0.36 ± 0.04	**	0.21 ± 0.05
January	91		100	4.2 ± 0.2		4.9 ± 0.2	0.00 ± 0.02		0.07 ± 0.07
February	82		100	4.4 ± 0.2		4.8 ± 0.2	0.06 ± 0.02		-0.03 ± 0.01

(1)N° = 23 and (2)27 goats.
**P<0.01; ***P<0.001.

Down growth interval

Henderson and Sabine (1992) reported that follicle activity occurred over a period of 10-11 months, although fibre growth is detectable only for 4-7 months (Mitchell et al., 1991). There may be several reasons for this variability. However, genotype seems to play an important role as previously reported by other authors (Da Wenzheng, 1991, quoted by Jianwen, 1992; Kuanhu et al., 1992; Rhind and Mc Millen, 1996).

Our results clearly suggest an interaction between genotype and ambient conditions. In fact, growth persists for 188 days at low altitude against 164 days in upland (data not shown). The longer duration recorded at the low altitude is due to the fact that the onset of down growth occurred earlier (2^{nd} vs 28^{th} July; P<0.05), while the dates of cessation of down growth differed only for 2 days (6^{th} vs 8^{th} January, respectively at 50 and 1,180 m).

Total cashmere production

Cashmere production is linked to growth period and to the degree of follicle activity during this period (Rhind and McMillen, 1995). Fibre growth is a function of the simultaneous increase in length and diameter with time. Our results show that goat breeding at 1,180 m positively affected the total production of cashmere (187.7 vs

141.6 g, $P<0.05$). This is in agreement with the results of a research carried out in Spain on goats genetically similar to ours (Del Pozo et al., 1997).

Yield

Yield increased by time at both altitudes (Table 3). Again, at the upland site yield was always higher compared to the low altitude, mostly in August ($P<0.05$), November ($P<0.01$), December and January ($P<0.05$).

According to Pattie and Restall (1992) and Bigham et al. (1993), cashmere yield ranges from 15 to 50%. Our results show that at both altitudes yield reached the maximum value in January, with 37 and 30%, respectively at the high and low altitude. This clearly suggests that timing for fibre harvesting should be in late January at both the altitudes.

Table 3 - Yield (mean ± S.E.).

	Yield (%)						
	50 m(1)				1,180 m(2)		
June		0.0				0.0	
July		0.0				0.0	
August	3.7	±	1.8	*	12.8	±	2.3
September	12.9	±	2.5		19.3	±	2.1
October	20.0	±	1.9		24.6	±	1.8
November	21.8	±	1.9	**	32.7	±	1.7
December	27.1	±	1.7	*	34.5	±	1.6
January	30.2	±	1.7	*	37.0	±	1.6
February	26.8	±	2.1		31.4	±	1.9

(1)N° = 23 and (2)27 goats.
*P<0.05; **P<0.01.

Fibre diameter

Three researches conducted on Liaoning goats reared at different altitudes showed that different mean cashmere diameters were obtained, as quoted by Min and Junquian (1992). In this study, we found that fibre diameter was unaffected by altitude and measured 16.6 micron at both 50 and 1,180 m. It may be hypothesised that altitude, along with the respective climatic, nutritional and sanitary conditions, may not have been determining factors of fibre diameter variation.

Guard hair length

At the beginning of the trial, guard hair showed approximately the same mean length at both the altitudes (Table 4). Afterwards, although in an uneven way, guard hair length increased up to December at the high altitude and until February at the low one. In these months, hair reached the maximum length of 5.9 and 6.4 cm, respectively. These results are comparable to those obtained by Merchant and Riach (1995).

Guard hair growth rate

Guard hair growth rates were moderate (Table 4). At the low altitude the daily growth rate was highest between August and September (0.27 mm/d; Table 4). In upland growth rate was steady between September and November (0.20 mm/d). These results are in agreement with those reported by Mitchell et al. (1991), who observed that primary follicle activity was lowest in late winter and at the beginning of summer.

Globally, the mean growth rate for guard hair was 0.10 and 0.12 mm/d, respectively at 1,180 and 50 m.

Table 4 - Influence of altitude on guard hair length and growth rate (mean ± S.E.).

	Guard hair length (cm)			Guard hair growth rate (mm/d)		
	50 m(1)		1,180 m(2)	50 m(1)		1,180 m(2)
June	3.4 ± 0.2		3.5 ± 0.2			
July	3.1 ± 0.2	**	4.2 ± 0.2	-0.11 ± 0.06		0.27 ± 0.05
August	3.4 ± 0.3	**	4.3 ± 0.3	0.11 ± 0.02	**	0.04 ± 0.01
September	4.3 ± 0.3		4.4 ± 0.3	0.27 ± 0.04	**	0.03 ± 0.07
October	4.6 ± 0.3		5.0 ± 0.3	0.10 ± 0.03		0.20 ± 0.03
November	5.0 ± 0.2		5.6 ± 0.2	0.13 ± 0.03		0.20 ± 0.02
December	5.5 ± 0.3		5.9 ± 0.2	0.15 ± 0.02		0.09 ± 0.04
January	5.6 ± 0.3		5.8 ± 0.3	0.03 ± 0.08		-0.03 ± 0.06
February	6.4 ± 0.4		5.9 ± 0.4	0.26 ± 0.05	**	0.03 ± 0.02

(1)N° = 23 and (2)27 goats.
**P<0.01.

CONCLUSIONS

Based on the findings of this study, the conclusion that altitude affects cashmere production may easily be drawn. In particular, goat breeding at high altitude positively influenced all the quantitative parameters investigated, but not fibre quality. Undoubtedly the two environments differed between each other for the pasture characteristics; however, it is well documented that cashmere production is not markedly affected by nutrition above maintenance (Merchant and Riach, 1995). Therefore, we think that the differences found between the two altitudes may be fundamentally due to the different temperatures recorded in the two environments. Further investigation conducted in conditioned environmental chambers will help to establish whether temperature influences the parameters examined.

These first results suggest that cashmere may be effectively produced in Southern Italy and lead us to believe that the development of this new goat breeding strategy will be a worthwhile goal for the future.

This preliminary attempt must be followed by further research. Firstly, we mean to identify the Italian double-coated goat breeds, which will be necessary for planning cross-breeding programmes.

We believe that an appropriate agricultural and economic policy is necessary to encourage animal fine fibre production as a promising livestock enterprise for the rising generations of Italian farmers and breeders, since it could be profitable and useful to fight unemployment, especially in marginal rural areas.

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Conclusions

Future developments in European speciality fibres and their research needs and opportunities

The workshop concluded with a group discussion on how a co-ordinated approach could enhance future development of breeding schemes for improving European speciality animal fibres. Concern was raised in all quarters at the increasingly bleak prospects for producers of medium quality textile fibres. Prices are remaining low, due to continuing competition, not only from Australasia and South America, but now also from Central Asia. Consumers of wool are increasingly demanding fineness, as demand trends for wool garments move away from everyday apparel to quality garments in the face of competition from synthetic fibres.

Low wool prices have contributed to a breakdown in marketing structures throughout most of Europe, and a spiral of increasing market inefficiency. Low returns have reduced the incentive on farmers to pay attention to fibre quality, both in livestock genetics and in fleece presentation, and there has resulted a general increase in mean fibre diameter.

In the case of mohair, cashmere and angora, the situation is slightly different. These systems have more focus on the fibre as a main product, but are facing a strong challenge to reach a threshold size, at which economies of scale in marketing will allow efficient marketing structures to be established, enabling stable prices to be secured.

Against this backdrop, the establishment of viable enterprises based on fibre is a stiff challenge. However, textiles are an important part of the European cultural heritage, and there is significant enthusiasm to maintain the strategic value of these systems. The initiatives networked within the EFFN are continuing efforts to maintain and improve genetic quality, as well as beginning to develop appropriate marketing structures that will put sufficient emphasis on quality traits.

There are clear market signals from EFFN-networked pilot projects all over Europe that there are good opportunities for high value niche marketing of European quality textiles. There are numerous examples of small-scale textile manufacture producing many types of products from scarves, sweaters and socks to specialised fabrics for aircraft interiors and therapeutic uses.

Common to all the niche marketing operations is that they concentrate on producing products with high end-values, and avoid sale of raw materials at commodity prices. Fibre systems tend to be low intensity in terms of their use of non-renewable natural resources, and have a low demand for agrochemicals which may have wider environmental impacts. The systems thus, environmentally speaking, are highly appropriate within a context of sustainable agriculture, and can play a complementary role in mixed farming systems, especially where there is an emphasis on non-marketable farming activities, such as maintaining wildlife habitats within agri-environmental schemes, or the conservation of rare livestock breeds.

It is clear that sustained growth in fibre farming systems can be achieved through further development of networks of co-operating small enterprises, competing to exploit niche markets, but working together on generic sectoral marketing (trade fairs, catalogues of regional products etc.) and sharing appropriate technology. This can be achieved within the context of farm diversification under the Rural Development Regulation. Some of the important issues that need to be addressed at this collaborative level are:

- Continued efforts to maintain product quality, both in the genetics and presentation of raw material, and also in finished products. Measurement of quality has been well established within the EFFN and this needs to be applied within the context of an expanding sector, where there are sufficient resources to allow effective quality control to be implemented.

- Appropriate technology is needed for adding value to the raw material before it leaves the farm. This technology may range from equipment to dehair cashmere before sale, to the looms and knitting machines required for production of finished garments for on-farm retail.

- Market research is required to model consumer expectations and consumption behaviour in regard to locally identifiable goods.

Four key ideas for projects which may make significant contributions to the development of speciality fibres were discussed in Castelo Branco:

1) The setting up of a pilot project**, networking small-scale producer/ manufacturers of textiles in Scandinavia**. The project would focus on collective marketing, and the sharing of knowledge and equipment, to help establish a strong consumer image of product quality and local distinctiveness. The project would aim to stimulate rural businesses in remote areas, and help to support systems of farming appropriate to the available land resources and pastoral landscapes.
2) There is a need for **specific PC software for management of genetic performance data on-farm**. Such software would provide the appropriate forms to link data collection with dedicated databases held at centralised locations with the breed associations. The work of EFFN has provided a significantly more standardised format for data recording and protocols for parameter measurement. This now provides a good opportunity greatly to increase the efficiency by which records may be collected and analysed. The software, linked via Internet, would also be able to feed back cumulative collective results from the breeding programme, and provide useful technical information to producers.
3) The European model of the multi-functional role of agriculture has created new non-market values for livestock. The most obvious application of this is in the agri-environmental measures, which have created the possibility for livestock to be kept more for their role in maintaining pastoral habitats, as for their traditional role in meat production. **The development of systems for landscape management using breeds that produce high value fibre** is therefore a significant priority. Fibre breeds are generally highly appropriate for cost-effective control of vegetation for the maintenance and improvement of habitats

and biodiversity, as well as the reduction of risk of fire. Within this context the fibre can provide an important additional income, as well as link public impressions of well-managed and scenic landscapes with quality regional products.

4) As European sheep farming is under severe pressure, so there are increasing efforts to protect rare breeds from the danger of extinction. There are active breed preservation societies in most European countries, but there is a strong need for the establishment of an accurate and **scientific database of sheep breeds** and their phenotypic characteristics. Such a database would provide important data on wool parameters (diameter, length, lustre, strength, colour etc.) that will help in linking small producers with industrial concerns seeking innovation with different wool types. A database of sheep breeds would also provide an important resource for designing strategies to maintain genetic diversity within the European sheep population, at a time when market pressures are increasingly causing genetic losses.

The Castelo Branco meeting of the European Fine Fibre Network, was a successful end to the programme of collaborative activities. Given the serious economic pressures on the sector, there was significant optimism that there are good opportunities for expansion in certain areas, particular in local niche marketing. The standardisation of genetic recording is now well established, and beginning to pay back dividends in terms of increased international collaboration between the breeding programmes. The personal and commercial links that have been formed will form the basis for some of the R&D ideas put forward in this report, and the technical harmonisation will form the basis of future opportunities to establish European level marketing initiatives.

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