A genetic database for performance parameter recording in Danish Angora goats

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SUMMARY

The Danish Goat Registration System is a database storing data on pedigree, reproduction, growth rates, mohair yields, mohair quality and health.

The database is based on an unambiguous identification system for individuals and on the farmers' own recordings of breeding and production data. The data stored in the database is used as documentation for descent, to estimate breeding indexes and to produce management lists for the farmers.

The Goat Registration System has been developed since 1991 and today 227 Angora herds are on the system, including 25 Swedish and 7 Norwegian herds. The Nordic Angora goat population consists of many small herds (a total of 4,277 Angoras). This is one of the reasons why we have developed a genetic indexation system over the past 2 years, enabling us to compare animals from different herds and to find the best bucks and does in the Nordic countries. This will ensure the best possible basis for breeding progress and thus a profitable mohair production.

How then can we incorporate more figures about mohair quality in the goat registration system? This is one of the main questions to be dealt with in the next two years. We have defined 2 pre-conditions: Firstly, we would rather accept many quality figures and thus a higher degree of unreliability on the figures than vice versa and secondly, the method should be cheap, simple and user-friendly in order to get full breeder support.

INTRODUCTION

Since 1991 the Danish Angora goat breeders have reported their pedigree, breeding and production data to the computer-based goat registration program which also stores all pedigree data on live animals and embryos imported since 1987.

The purpose of the goat registration program is to develop profitable mohair production, both in breeding stock and fibre production through the development of breeding values and management lists for the farmers. The registration program is used by 227 Angora producers, including 25 Swedish and 7 Norwegian herds. The Danish, Swedish and Norwegian Angora goat populations together amount to a total of 4,277 live Angora goats (2,777 does) and is thus characterized by many small herds. 86% have between 0-9 does per herd (1995).

The Angora goat population consists mainly of Angoras of the Australo-Asian type imported from New Zealand and they are at present upgraded using Angoras of the Texas and South African type imported in 1992 and 1993 from Australia and New Zealand, respectively.

The goat registration program is currently under development, and the latest initiatives are the development of linear classification, breeding values (Pedersen, 1994) and "Herd Prints".

Input
The goat registration system is based on an unambiguous nine-digit eartag number which follows the animal from birth to death, thus also in the goat owners' own recordings of: services (inclusive of the buck's ID), kiddings (ease of kidding, mortality, birth weight and ID of the kid), kid weights at 2 and 4 months, all fleece weights, disease recordings, purchase, sale and deaths. Furthermore classification results and mohair test results are recorded.

All recordings are always linked to the unambiguous eartag number of the animal and to the date of the event, e.g. date of kidding and date of shearing.

Output
From the goat registration system, the herd owner gets:

- Pedigrees, among other things, a 4-generation pedigree, classification results, mohair test and breeding values.

- Estimated breeding values for all animals so that they can be compared with other Danish Angoras

- "Hit lists" of the best bucks and does in Denmark

- Herd Printouts where the lists to be printed can be designed according to the wishes of the herd owner, lists of, for example, indices, pedigrees, surveys, kiddings, services, mohair test, classification etc.

- Knowledge about Angoras in Denmark

The purpose of Herd Printouts is that the lists can be adapted to the day-to-day needs of the individual farmer and they can replace some paper work.

Mohair yield and quality
Mohair production is measured by two parameters: yield (quantity) and quality. The Angora herds report the fleece weights of every shearing, which is done twice a year - the first at the age of 5 - 7 months. A total of 3,136 fleece weights were reported in the period from 1 September 1994 to 31 August 1995.

The quality of the mohair is measured objectively through a mohair test and subjectively through classification. The mohair test is analysed at the National Research Center Foulum and the parameters measured include fibre diameter, standard deviation of fibre diameter, per cent kemp and medullation and per cent roundness. A total of 375 mohair tests have been done since the system began operating.

The linear classification results are divided into a figure for body and legs and a figure evaluating the mohair quality: fibre fineness, kemp & medullation, lustre, lanolin, style, character and cover. 157 animals were classified in 21 herds in 1995 when linear classification was introduced.

As both mohair yield and fibre fineness are the two most important economic production parameters, it is important that as much data as possible is collected on these two parameters. It would be a major progress if more data on mohair quality was available in the database.

In 1996 we will in addition be able to extend our knowledge on Angoras when we are able to analyse data from the three different types of Angoras and their crossbreds.

Indexes in Angora breeding

Figure 2 shows a survey of the measurements included in the calculations and the indexes estimated and published on each individual goat. The traits are divided into 5 main categories:

Female traits:

- Litter size, total no. of kids born, also the no. of stillborn
- Vitality or no. of stillborn kids evaluated as a trait in the mother
- Ease of kidding, evaluated as a trait in the mother
- Weight at 2 months evaluated as a trait in the mother

The animal's own traits re. vitality and constitution

- Vitality (mortality) evaluated as a trait in the kid
- Ease of kidding evaluated as a trait in the kid
- Weight at 4 months evaluated as a trait in the kid

Conformation of body etc.

- Score for body, original classification system
- Score for constitution, original classification system
- Score for udder and sexual organs, original classification system
- Linear classification of body and legs

Mohair production

- First-year mohair production
- Second-year mohair production
- Average of all following years

Mohair quality

- Fineness, orginal scoring system
- Measured fibre diameter
- Linear classification of fineness

Kemp and medullation

- Measured percentage of kemp
- Measured percentage of medullation

· Linear classification of kemp and medullation

Mohair evaluation
· Mohair evaluation from original classification system
· Linear classification of other mohair characters (lustre, lanolin, style and character)

Besides the 5 main indexes and the 3 sub-indexes describing the mohair quality, a total breeding index is estimated, the S-index, combining all the

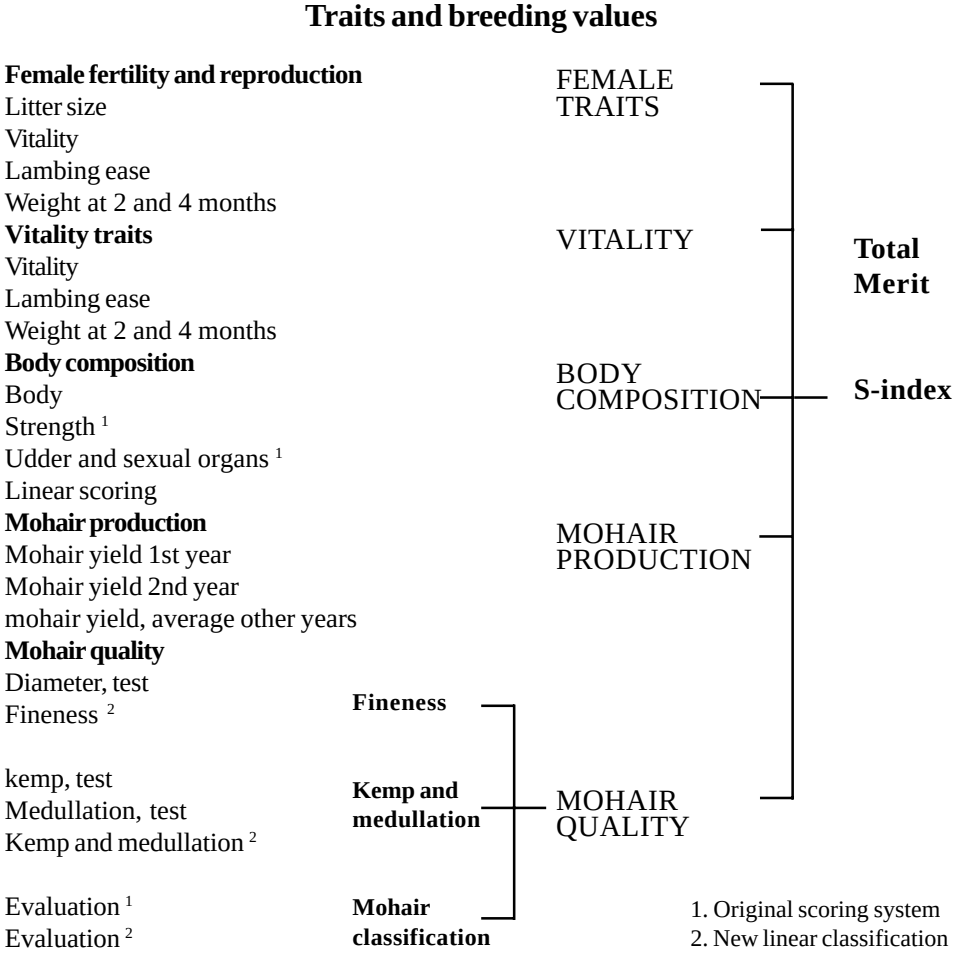

Figure 1. Relationships between traits and breeding values.

indexes.

Like sheep and beef cattle breeding, Angora goat breeding is characterized by a very limited number of artificial inseminations. Therefore the breeding animals have only a small number of progeny, often born in one herd. Normally this has the effect that it is very difficult to estimate breeding values which can be compared - from one herd to another and for animals born in different years. In connection with sale or exchange of breeding stock - and perhaps insemination - some relationships will however be established to other herds. By using the Animal Model it is thus possible to estimate fairly reliable breeding values.

The Animal Model estimates breeding values, making allowance for the heritabilities of the traits and the known relationships and at the same time a correction is made for systematic environmental impacts. These corrections have the effect that results collected in different environmental conditions (e.g. herds) and for different categories of animals (e.g. sex and age) can be compared.

In order to combine these traits into indexes each individual trait is weighted. This weighting is as far as possible based on studies of the economic value of the traits. The economic values used are listed in table 1.

Table 2 shows the average indexes of all Angora goats born during the past 6 years. When comparing the results of the different years we can estimate the breeding progress achieved. According to the table Angora breeding activities have been based on the evaluation of the mohair. Progress has also been achieved in the field of production and fineness because there is a positive correlation between the evaluation of mohair and the mohair quality.

The purpose of estimating the S-index is to increase the total breeding progress in the years to come. It should be possible to heavily improve production figures and fineness while at the same time maintaining or moderately improving mothering traits and vitality.

Table 3 shows a list of the very best proven bucks as they are published. Similar lists are published for the young improven bucks and for the goats.

TABLE 1.

Economic values used for indexation

Litter size	DKK 300.00/kid
Vitality at birth, mothering trait	DKK 400.00/kid
Lambing ease, mothering trait	DKK 200.00/kid
Weight at 2 months	DKK 2.50/kg
Vitality at birth, own trait	DKK 400.00/kid
Lambing ease, own trait	DKK 200.00/code unit
Weight at 4 months	DKK 2.50/kg
Body, original classification system	DKK 10.00/point
Constitution, original classification system	DKK 2.50/point
Udder and sexual organs, original class. system	DKK 2.50/point
Body, linear classification	DKK 2.50/point
Mohair, first year	DKK 250.00/kg
Mohair, second year	DKK 125.00/kg
Mohair, average following years	DKK 62.50/kg
Diameter, measured	DKK -50.00/my
Fineness, linear classification	DKK 4.90/point
Kemp, measured	DKK -15.00/percent
Medullation, measured	DKK -15.00/percent
Kemp and medullation, linear classification	DKK 2.50/point
Mohair evaluation, original classification system	DKK 15.00/point
Mohair evaluation, linear classification	DKK 2.00/point

TABLE 2

Average of indexes for birth year and breeding progress per year (1990-1995)

	1990	1991	1992	1993	1994	1995	Ave. change per year*
Number of animals	651	1.281	1.817	1.867	1.518	1.277	-
S-index	99.4	100.1	100.4	101.8	105.4	107.9	1.6
Female traits	100.0	99.7	98.5	98.6	98.8	99.5	-0.2
Vitality	99.8	101.2	101.9	102.4	100.7	101.0	0.1
Body	100.0	99.8	100.1	99.7	101.4	102.1	0.4
Mohair production	99.9	99.8	100.4	100.9	102.5	103.8	0.9
Mohair quality	99.4	100.4	100.9	102.5	103.7	103.1	1.0
Fineness	99.7	100.2	100.6	101.1	100.6	100.5	0.2
Kemp & medullation	100.4	100.0	99.8	100.6	101.3	101.7	0.4
Evaluation	98.9	100.8	101.1	102.7	106.4	105.6	1.6
Reliability	12.0	13.9	13.5	10.2	8.2	5.8	-

*) Calculated by means of regression analysis

The future

The goat registration system has been developed since 1991 and our most important job the coming two years will be how do we incorporate more mohair quality figures into the system?

Pre-conditions:

We would rather have many quality figures and accept a higher degree of unreliability than vice versa. The method must be cheap, simple and user-friendly in order to get full breeder support.

Some of the questions we have to deal with are:

- How can we obtain more information on quality. We could use mohair test, classifications of live animal or of the shorn fleeces.

- At what age should quality be measured? How are the genetic and phenotypic relationship between quality measured at different ages? We would like to have the results on quality as early as possible in order to reduce the generation interval.

- Who is to collect the quality results? Are selected persons going to make the quality evaluations or can the herd owner take out samples for mohair tests and can he evaluate the quality subjectively.

- Development of a breeding plan for Danish Mohair with a systematic testing program for young bucks.

Other questions to be considered are:

- How do we include the coefficient variation of the mohair test in the breeding values as an expression of the homogeneity of the fibres?

- Should we calculate breeding values for percent purity or lanolin content - or should we correct fleece weight for effect of purity and lanolin content.

- How is is fibre roundness of the mohair test correlated to style and character?

- How large is the correlation between mohair test results, linear assessment of live animals and classification of the fleeces?

- Is it possible to get reliable estimates of breeding values for mohair quantity and quality by means of skin biopsies from very young animals.

As regards information we should produce advisory leaflets, slides, videos, papers on: registration, breeding values, mohair sampling, shearing, treatment of fleeces after shearing etc.

REFERENCE

Pedersen, J. 1994. Genetic evaluation of Danish Angora goats. In: J.P. Laker & S.C. Bishop (editors). Genetic Improvement of Fine Fibre Producing Animals.European Fine Fibre Network No. 1.