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# Organisation of sheep breeding in France

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## ABSTRACT

Production systems in France are variable with many localised and adapted breeds, spread among small flocks lambing at different times of the year. In these ways, specialised selection schemes of varying importance and complexity including those designed for improvement of milk production and for out-of-season breeding have been developed.

Selection objectives for dairy production concentrate upon milk production with recent attention to total solids content. For meat sheep, lamb production per ewe is important for competitive efficiency.

Number of lambs and maternal contribution to lamb survival and lamb growth during suckling are important for the suckling breeds in the South and the improved breeds in easier conditions in the North, the latter also receiving emphasis on later lamb growth and carcass quality.

Selection programmes are highly organised nationally under the data-processing control of INRA and the national coordination of ITOVIC. Twenty Breed Promotion Committees (UPRA's), 77 Professional Advisory Organisations (EDE's) and 11 Data Processing Associations (CRI's) are involved with a well-structured relationship among them.

Selection schemes use different tools to give emphasis to dissemination of genetic merit in addition to ranking animals for breeding worth.

The National Recording Scheme provides the common essential ingredient for all schemes. Animal information embraces natural oestrus or induced oestrus, litter size and live weight of lambs. Maternal pedigree is always recorded at birth while paternal pedigree is known if single-sire natural mating or AI is used. Electronic development is being introduced to assist automated collection of live weights and early provision of on-farm flock summaries.

AI is used to assist genetic improvement over about 200 000 ewes, mainly dairy breeds. It allows superior ewes to remain on farms—it is estimated that in this way AI can increase genetic progress by up to 30%. AI also avoids the need for centralised progeny testing and assists the gene dissemination from superior rams. Nucleus flocks are promoted as centres of gene dissemination only for scarce breeds and for those with very small flock size.

Rearing of rams in a central location gives breeding schemes greater control over gene dissemination and organisation of elite matings, especially through AI. Considerable emphasis is given to this aspect of the French breeding programme to ensure effective gene flow for production of the next generation of sires.

Central testing stations are also used, mainly to evaluate young meat breed rams which are the progeny of elite matings for growth and carcass merit in a standard environment and as a baseline for live animal performance assessment.

Not all the schemes use the same tools in the same way. Breeder commitment and cooperation is nevertheless an important ingredient of the effectiveness in each case.

**Keywords** France; sheep; recording schemes; genetic improvement; meat production; milk production; national organisations; data processing; artificial insemination.

## INTRODUCTION

Sheep farm production systems and flock management strategies in France are extremely variable. The flocks are generally small; the global average size is only 42 animals with specialised sheep farms (more than 100 ewes) comprising 58% of the total flock (compared with respectively 160 ewes and 90% in the United Kingdom). However, a major feature of French sheep production is the trend towards an out-of-season breeding system which results in a peak in the supply of slaughter animals in April (spring), diminishing to a trough in supply in November (autumn). This is the reverse of the traditional European production systems (e.g. in the United Kingdom).

The 8.5 million sheep in France consist of about 40 different breeds, most of which are geographically localised in very small areas. This heterogeneity is useful for maintaining genetic variability and adaptability to cope with diverse environmental conditions, but the small numerical size of each breed imposes limits on the efficiency of the selection schemes, which are developed specifically for each breed. The organisation and recording of sheep breeding in France reviewed by Flamant and Elsen (1979), must therefore account for selection programmes which vary greatly in the complexity of breeding objectives and the systems of recording and selection.

## STRUCTURE OF SHEEP IMPROVEMENT

The structure of all livestock improvement in France involves 2 chains which are linked, and for a large part financed, by the CNAG (Commission Nationale d'Amelioration Genetique), a Commission of the Ministry of Agriculture. The first chain concerns "sets" of selection structures extending from users and breeders to rearing centres, AI centres etc, through to the UPRA (Unite de Promotion de Race). Each set is specific for each species, and for each breed within a species, although the general structure and breeding principles applied are common to all. The second chain in livestock improvement links all the organisations involved in the data processing function. Here, data from all livestock species are collected, checked, punched, collected with previous data and finally processed. Thus, the following description of the structures of sheep improvement in France could be almost as equally applicable to other livestock species.

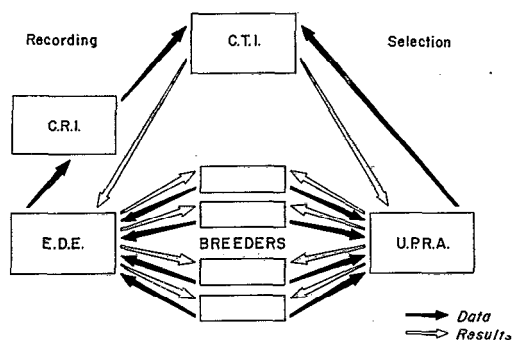


FIG 1. Relationship between selection organisations involved in sheep improvement in France (see text).

### Selection Structures

Each set in the selection structure (Fig. 1) is breed-specific, and involves the definition and realisation of selection gains.

#### U.P.R.A. (Unite de Promotion de Race)

Succeeding from the former breed society or flock book, each UPRA is responsible for determining the selection objectives and the means by which these objectives can be attained for its particular breed. Its board gathers together members representing breeders, users (e.g. producer groups, insemination centres), and the EDE (Etablissement Departemental de l'Elevage). Moreover, representatives of INRA (Institut National de la Recherche Agronomique) and ITOVIC (Institut Technique Ovin Caprin) are attached to its technical committee. An UPRA (there are about 20 today) may be created for one or several closed breeds by the Ministry of Agriculture advised by the CNAG.

Generally, each breed may only have one UPRA and hence only one recognised selection scheme.

Performance recording stations and insemination centres

These are fully part of selection schemes, are often independent and can be used by several breeds at the same time. These are considered in more detail when selection methods are discussed.

#### Breeders

Breeders are a vital link in the selection process. Their commitment and cooperation is of great importance, particularly when planned elite matings are done and when sires are progeny tested.

### Data Processing Organisation

There are 3 organisations involved in the processing of data, extending from on-farm collection to the estimation of breeding values or indexes.

#### E.D.E. (Etablissement Departemental de l'Elevage)

EDE is a professional regional organisation providing information and advice in agriculture. Its sheep department, in addition to providing advice for all sheep farmers, offers a full recording service and provides the permanent identification (ear tattooing) for farmers involved in a selection scheme. It receives all lists, edits and corrections, liaises with breeders and data processing centres, and despatches output. There are 77 EDE in France, having a major responsibility in the processing area for all livestock data to ensure a rapid turnaround of data is met for the benefit of users. A.R.S.O.E. (Association Regionale au Service des Organisations d'Eleveurs)

There are 11 existing ARSOE which handle all livestock data. They are responsible for data punching and checking, with reference back to the EDE. They can also establish some summaries (which did not use data recording previously) before sending the standardised information to the CTI.

#### C.T.I. (Centre de Traitement de l'Information)

CTI is the central headquarters of the national livestock recording board. Here all the data are processed and stored under the control of geneticists of INRA. This huge bank of data provides sample files used in some genetic studies, but generally it estimates breeding values and indexes and provides annual summaries and lists useful for the breeders. Some outputs are sent to the breeders through the EDE, but others, mainly those concerning sire indexes, are sent to the organisation of selection which decides on the use of these sires (UPRA).

#### I.T.O.V.I.C. (Institut Technique Ovin Caprin)

All the bodies depicted previously are independent but their coordination is ensured within species by a

technical institute. Thus, the ITOVIC oversees the sheep recording scheme and coordinates all the different activities. It is also implicated in the methodology, outputs distribution and the provision of technical information to advisers and technicians in the EDE and UPRA organisations.

In common with INRA, the ITOVIC determines the selection criteria for each breeding objective and the way these criteria may be recorded and used for indexation. The introduction of new selection criteria, measurement methods (electronic weighing, fat scanning, etc) and methods for indexation (e.g. iterative BLUP methodology) are studied by ITOVIC and INRA.

In addition to the technical results and summaries returned back to the breeders, an annual review of results is made by region and by breed. Although the estimation of genetic progress is not routinely made since it needs large calculations, the efficiency of various selection schemes could be easily assessed, which is of great importance for financiers.

The provision of technical information to assist advisers and technicians is also an important function of ITOVIC if breeders are to appreciate the importance of genetic improvement through accurate performance recording.

### SELECTION OBJECTIVES

Selection objectives are decided within breed by the UPRA. Because of the variety of breeds, environmental conditions and production systems, selection objectives will only be described for the main breed groups. In France, the large variation in selection objectives is dictated by the environmental conditions, mainly climate and soil, which impose certain types of feeding systems. This feature enables discussion of the selection objectives of 4 major geographical areas.

#### Mountain Area (Pralpes du Sud—Merinos d'Arles—Races des Pyrennees)

Animals are wintered indoors but graze mountain areas in summer either next to the folds, or a long way away. Mating must take place at a precise time (mainly in spring) to avoid births in the mountain pasture in summer and to ensure that the lambs will be old enough to follow the rest of the flock. Fertility in out-of-season breeding, maternal ability and good adaptation under fluctuating feed supply are then the features required and selected for in the breeds of these areas.

#### South of the Massif Central (Lacaune, BMC, Causse du Lot, Limousine)

This is one of the regions with the greatest density of sheep. In some cases sheep farming is the only possible form of production, but in other situations it has to compete with more profitable production systems

through emphasising increased productivity per ewe. Maternal features are consequently given emphasis to the detriment of meat characteristics; the main traits selected for involve fertility, litter size, perinatal viability and milking ability. However, several situations have to be considered according to the given priority of each trait. When the environmental conditions are not restrictive for lambing and suckling, litter size and milking ability are given emphasis, but fertility in out-of-season breeding is also regarded as an important objective under accelerated mating systems of 3 lambings in 2 years. Such a system offers the additional advantage of adjusting the reproductive period to best fit market demands or to synchronise animal nutritional requirements with the amount of feed available.

#### Pastures of the Atlantic Coast (Vendee, Avranchin, Cotentin, Rouge de l'ouest Bleu du Maine)

In these regions, where sheep co-exist with cattle, the feed requirements of ewes and lambs are satisfied in spring with the abundant pasture growth but lambs have to be sold before the dry period to leave pasture for the cattle. In this context, sheep have to be highly productive to compete with cattle, and numeric productivity is obviously desired, but lamb growth on pasture and conformation are also required.

#### The Industrial Crop Area of the Parisian Basin (Ile de France, Berrichon, Texel)

As there are possibilities for intensive and abundant nutrition in autumn and winter, the lambs in this region are produced in sheds in out-of-season breeding. As for the pastures of the Atlantic coast, the rich feed conditions allow emphasis on meat production, in addition to prolificacy and fertility in out-of-season breeding. The breeds in this region are also used as terminal crossing sire breeds for lamb production or they are exported. Furthermore, because adaptive capacities are not required, the number of purebred breeders is declining while the number of flocks using Romanov or Finn crosses with meat purpose breeds is increasing, leading to the remaining purebred flocks putting more emphasis on meat traits.

#### Other Objectives

##### Milk

Dairy sheep farming in France (860 000 ewes) provides 110 000 t of milk, predominantly for Roquefort and Pyrenis cheeses. Dairy sheep breeds are localised in 3 areas:

- South of Massif Central, with the Lacaune breed (450 000 ewes) farmed for the Roquefort cheese it produces
- French Basque country, with the Manech and the Basco Bearnaise breeds (300 000 ewes)
- Corsica, with the Corsica breed (75 000 ewes).

For these breeds the dairy objective is milk quantity, although their quality (fat rate and protein content) may be taken into account in the selection schemes. With milk quantity being easily recorded and having a high heritability, it was subjected to selection for more than 20 years in the Lacaune with efficient schemes using progeny testing. However, the high prices of slaughter lambs and young culled ewes have encouraged breeders to consider the growth characteristics of their animals. In the same way, reproductive traits (fertility with or without induced oestrus, litter size, etc) have been recorded since 1982 by the national dairy sheep recording scheme, but breeding values are not yet estimated for these traits.

### Wool

Apart from some breeds (different breeds of Merinos, Ile de France), French sheep have poor wool productivity and in many cases, the shearing cost just balances the financial returns from wool (Rougeot, 1985). Wool is therefore rarely an objective of selection, although most breeds consider fleece appearance in their breed standards, culling spot-fleeced or hairy animals and those with too much (or not enough) cover on the faces and legs.

Even the French Merino breeds and Ile de France breed, which are famous for their fine wool, have not included any objective wool measurements in their selection criteria. Fleece standards are maintained by eliminating the worst-fleeced animals during the culling period before breeding. Although other traits are also considered at the time of culling, quality seems effectively to be kept.

## SELECTION METHODS

The 2 classical and inter-dependent steps essential in a selection scheme (selection of animals for breeding and dissemination of genetic progress) use several methods, the number of which and the way they are linked determining the kind of selection scheme and its efficiency.

### On-farm Performance Recording

Since its establishment about 25 years ago, the recording of performance for meat purpose sheep was conceived on farms to supply management and technical information and to provide data for sheep improvement. It concerns the lifetime reproduction of suckling ewes and the growth rate of their lambs in order to estimate the genetic worth of the animals recorded.

The most basic information comes from data on ewe lambings (date, litter size, etc) and the maternal pedigree of each lamb born. Lambing control is added to by data concerning reproduction (date of joining, mode of oestrus: induced or not, etc) allowing the assessment of ewe fertility and prolificacy. According

to the needs of each breeder and the selection requirements of the scheme, this reproductive control can be completed for each lambing group (all lambs born in a 42-day period) by either 3 or 5 weighings spaced 21 days apart starting 3 weeks after the first lamb is born.

The first 2 weighings of each lamb are used to predict indirectly the dam's milking ability, while the later weights estimate lamb growth rate between 30 and 70 days of age.

Sire identification requires a special mating system using individual sire groups or artificial insemination, although this latter option does not avoid mob-mating of sires on the oestrus following the induced oestrus.

### Data processing

Sheep indexation in France does not go beyond the assessment of individual trait breeding values. Moreover, they are mainly estimated by univariate statistical methods, although for some traits 2 variates are computed together (e.g. natural litter size breeding value is assessed from natural and induced litter sizes). For each animal, all breeding values with their accuracies are printed and sent to the UPRA (generally litter size, milking ability and sometimes 30 to 70 day growth rate). There are more breeding values when carcass measurements are made. This policy stems from the difficulties in obtaining accurate genetic correlations among traits for each breed and relative economic values that each trait should have in an index.

Today an iterative BLUP technique is being developed to cope with the large number of reproducers to index each year for each breed. It will furnish the best predictor taking into account for each sire all the information of his relatives (dam, sire, daughters, half sibs, etc).

### Nucleus Flocks

The use of nucleus flocks in France, is only justified where either:

- (i) the population size is very low, and the nucleus flock is closed
  - breed in maintenance: Merinos de Rambouillet flock
  - breed recently imported or breed recently created by crossings:
    - INRA-401 breed—Booroola trials . . . or
- (ii) where because of their high genetic value, the number of elite individuals is low (e.g. Texel nucleus flocks). This is comparable with the open nucleus flocks of New Zealand Group Breeding Schemes.

### Insemination Centres

In France the use of artificial insemination (AI) in sheep has a dual purpose. As a reproductive technique, it has a vital role in out-of-season breeding, e.g. avoiding problems of out-of-season fertility of rams, and exploit-

ing the opportunity to use synchronisation of oestrus without increasing the number of rams. In 1983, about 112 000 and 45 000 meat and dairy ewes were inseminated with such a purpose. As a genetic improvement technique, interest is taken in the higher potential value of the progeny either for slaughter or for stud (respectively about 30 000 for meat ewes and 165 000 for dairy ewes in 1983).

AI is used in French selection schemes in 2 essential steps: firstly any breeding scheme will be efficient if each year the best ewes are mated with the best rams in order to produce the next generation of sires. These "planned matings", more easily made using AI, are essential to ensure that genetic progress can be accumulated through each generation. AI permits the increase of selection intensity and therefore the genetic progress can be obtained by reducing the number of rams used and increasing the dissemination rate of each one. AI also introduces controlled recording of matings, especially in small flocks with few elite ewes located throughout a region.

Secondly, AI can improve assessment of genetic merit depending on the number of inseminated ewes in the population. When their number is low, AI can be used to improve the statistical design, allowing an estimation of flock effects and a comparison of reference sires with sires used in natural matings. When the number of inseminated ewes is high, AI can be used to organise progeny tests. In this case there is then a triple advantage over natural matings: better accuracy of progeny-ram links and easier management and control of matings; increase of family size and thus the accuracy of index; better dissemination of rams among flocks for assessing and correcting the fixed effects.

### Recording Stations

There are 2 sorts of central performance recording stations for young rams.

#### Rearing centres

These are an essential element of a selection scheme. Young rams of planned elite matings are selected at 2 to 3 months of age and reared together in a common environment. Those with poor performance or with breed defects are culled after an initial rearing period. After this step, according to the selection practised on ancestry value, individual performance or progeny test, the rams are disseminated within the scheme between the breeders, out to the remainder of the population, or they are directed towards an insemination centre for progeny testing.

#### Individual performance recording stations

These stations have the same important role of recording the performance of rams. Young rams are selected at 2 to 3 months of age and after a 2-week period of adaptation, they are fed *ad libitum* for 8 weeks with

body growth, conformation and fatness being recorded. At this level of feeding, genetic differences are expected to be fully expressed—for the benefit of ranking the individual rams. After this period of *ad libitum* feeding, which is not applicable for future reproducers, the rams are generally exposed to another adaptation period before being sold at about 7 months. In most cases, fatness is recorded by handling which has shown a close relationship with fat recorded at slaughter, compared with the low accuracy of other methods (scanning, ectography, etc).

Although these stations appear to be an essential element for the meat-purpose sheep breeds, only a few of these breeds have such a station. The high capital cost and animal health problems of gathering animals coming from different flocks slow their development down. Recently an individual indexation programme using BLUP has been developed for rams, combining the data collected on the farm with those recorded in the station.

### Progeny Testing Stations

It is necessary to distinguish 2 types of progeny testing stations according to the selection objective: ewe fecundity or meat purpose. The first type of station originally involved 2 flocks, the dam flock mated each year with rams under test, and the progeny flock lambing once or twice before sire indexation and culling. Given the high cost of such a station, limited flock size restricts the number of rams that may be tested. In addition, the need for a dam flock disappears with the facilities offered by AI, which in turn permits an efficient progeny test to be conducted on farms. Nevertheless, 2 such progeny testing stations still exist.

Progeny testing for meat production is carried out at Berry-test, which is a multi-breed progeny testing station. Here a small number of rams of meat purpose sire breeds are measured by the body growth and carcass performance of their progeny. A great number of variates are recorded at slaughter for indexing on butcher features. Strictly speaking, it is not a test for further selection, but merely a regular measure in each breed to evaluate the correspondence between individual performance testing evaluation through handling for degree of fatness and the carcass records of the progeny.

One other sort of station for progeny testing concerns the original scheme for the Lacaune meat purpose breed. Dairy ewes are inseminated by young rams under test with the lambs being weaned at about one month and sold for fattening indoors. There are more than 300 000 dairy Lacaune lambs fattened each year in this way between December and April in the little area of Aveyron. Records collected during this period and carcass measurements taken at slaughter serve to estimate the breeding value of a large number of sires.

Testing meat purpose sires on the dairy breed ewes carries a great deal of interest for both populations:

the dairy producers can sell crossbred lambs after weaning, which have a higher growth potential, and the meat sheep breeders may test a great number of young rams and only use the elite rams in their flocks.

### EXISTING SELECTION SCHEMES

Not all the recognised breeds have an organised selection scheme, and among those existing schemes not all of them are using all the selection methods available.

The simplest schemes (Southdown, Berichon de l'Indre, Romanov), consist of within-flock selection of future rams and ewes according to the required features determined by the UPRA. In these cases, the breeder chooses his young rams and presents them to a commission of the UPRA for agreement. This is not strictly a selection scheme *per se* and the rate of genetic improvement is not expected to be high.

Most other schemes use a rearing centre or an individual performance recording station. In these cases the organisation of selection follows the information on the sires, from which selections can be made taking into account their dam performance from the national recording scheme. There is really a common objective of selection and breeders can buy the best sires of the breed and use them over their best ewes. However, this kind of scheme is much more efficient as soon as an AI centre exists to organise the planned matings between best sires and elite ewes to produce the next generation of rams, and to disseminate the genetic progress made. In fact these 2 activities in association with rearing centres constitute the keystone of all selection schemes in France, and have priority in the official politics of French sheep improvement. Some schemes use an individual performance recording station (Lacaune, Vendéen, etc) instead of a rearing centre and hence real selection can be applied from objective measurements.

Although there are few schemes developing a progeny test, different models can be found. When the traits involved are easily recorded on-farm (weight, litter size, milk quantity, etc) the trend is to implement progeny testing exclusively on farms. Then AI is used to avoid the sire-flock confounding effect and to improve the accuracy of indexation of sires serving naturally within the flocks (Ile de France, BMC, Vendéen). However, in some cases progeny tests are based exclusively on AI (Lacaune). In fact, in these populations, oestrus induction and synchronisation treatments are already massively used to ensure fertility in out-of-season breeding, with AI services used routinely.

Progeny testing on stations is undertaken and favoured in populations where the traits are not suitable for on-farm recording (either because of the sophisticated method of measurement, or when a common and controlled environment is sought).

### CONCLUSION

Faced with the great diversity of sheep production systems, French selection schemes incorporate the same structures and use common methods but the manner in which these aspects are used and combined leads to a great diversity of schemes. However in this context improvement of any selection method modifies the efficiency of all schemes using it. In particular 2 ways are undertaken today:

#### Recording Simplification

Even if the constraints of the recording are balanced by the individual and collective interest of the results provided, there is a degree of breeder resistance to recording because of the tedium of repeated weighings, the high costs of recording and the slowness of response time. The current trend is to simplify the recording and to accelerate data turnaround. Electronic scales linked to micro-computers are used to check the data and to supply an immediate first-summary, allowing regional decentralisation (CRI Fig. 1) of those calculations not requiring other items previously recorded and maintaining some regional specificity. However, in small flocks or in isolated areas it is sometimes more practicable to use manual methods than electronic systems of recording.

#### BLUP Programming

Adoption of an iterative BLUP technique for the estimation of breeding values will provide, not only a higher accuracy in taking account of environmental effects and all the relationships between animals, but also it will permit a greater accuracy in breeding value estimation of sires used only in one flock by natural mating.

Most important of all, genetic improvement realised in commercial flocks in France depends on the commitment and cooperation of the ram breeders. Even if new sophisticated selection criteria are developed today (e.g. plasma gonadotrophin levels), the greatest increase in selection efficiency will come through better breeder cooperation in sharing rams, using AI, breeding the progeny and merely maintaining the guidelines that they themselves have laid down.

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### REFERENCES

- Flamant J.C.; Elsen J.M. 1979. Diversité, organisation et enseignements des schémas de sélection des ovins en France. *5th Journées de la recherche ovine et caprine. Paris, Dec. 1979.* Ed. ITOVIC S.P.E.O.C.
- Rougeot J. 1985. Valorisation de la production de laine et de Peaux en France, chez les ovins et les caprins. *Commission ovine et caprine. Mai 1985 Document INRA FRANCE.*